Abrasion

Exaggerated mechanical wear of tooth structure caused by a foreign abrasive material (e.g. improper toothbrushing technique or deleterious habits such as pipe smoking, tobacco chewing and chewing on pens or pencils). Toothbrush abrasion is the most common example, which may sometimes present as a sharp V-shaped notch in the gingival portion of the labial surface of the teeth.

[Compare with Attrition (Dental wear, Occlusal wear)]

Abrasive strips (Finishing strips, Lightening strips, Coated abrasive strips)

Strips containing abrasive particles on a flexible backing material (heavyweight paper, metal or plastic). Used mainly for interproximal enamel reduction.

[See Interproximal stripping (Interproximal reduction of enamel, Reproximation, Slenderizing)]

Anterior guidance

Term used to describe a particular scheme of disclusion of the dental arches during a protrusive mandibular excursion. Contacts between the maxillary incisors and the mandibular anterior teeth guide the mandible downward, to create disarticulation (separation) of all other teeth.

Acceleration, Law of

[See Newton's laws]

Achondroplasia

An autosomal dominant condition characterized by failure of the primary growth cartilages of the limbs and cranial base to grow properly. Early fusion of the sphenoethmoidal, intersphenoidal and sphenoooccipital synchondroses and early closure of the epiphyseal plates of the long bones result
in very short arms and legs and a characteristic midface deficiency that is most accentuated at the bridge of the nose. The anterior cranial base appears to be of approximately normal length, whereas the posterior cranial base is extremely short (i.e. the sphenooccipital synchondrosis seems to be affected more than the sphenoethmoidal). Affected patients also exhibit short bodies with thick extremities and stubby fingers, often associated with limited motion of the joints, lumbar lordosis, protruding abdomen, and inability to straighten the elbows. Correction of the midface deficiency and the resulting Class III malocclusion in achondroplasia may require a Le Fort III, or modified Le Fort II, osteotomy to advance the entire midface.

**Acid etching**

An enamel bonding technique invented by M. G. Buonocore in 1955. During this process a selected area of tooth substance is prepared for bonding via the application of a corrosive agent (most commonly a solution or gel of 37% orthophosphoric acid). The effect is a removal of a small amount of less mineralized, interprismatic enamel and opening of pores between the enamel prisms, substantially enlarging the surface area of the bonded part so the adhesive can penetrate into the enamel, providing micromechanical retention.

**Acromegaly**

Chronic metabolic disorder caused by hyperfunction of the anterior pituitary gland after maturity, usually due to an adenoma. The resulting overproduction of growth hormone induces an overgrowth of the bones, connective tissue and viscera. Skeletal changes principally involve the skull, with frontal bossing, prominent cheek bones, grossly overdeveloped mandible with a protrusive chin and consequent mandibular prognathism. The small bones of the hands and feet are also affected, and there is associated broadening of the hands, fingers and feet.

Enlargement of the soft tissue usually is manifested by large ears and nose, thick lips and macroglossia. The tongue, which exhibits a lobulated margin and papillary hypertrophy, fills the oral cavity and results in associated labial and buccal tipping of the teeth. There is generalized splanchnomegaly and hypertrophy of the target organs for anterior pituitary hormones, including the adrenal cortex, thyroid gland, parathyroid glands and gonads.

[See Gigantism]

**Acrylic (Methyl methacrylate)**

An organic resin commonly used for the construction of dental removable appliances, including appliances used during orthodontic treatment and retention. [Modified from the AAO Glossary of Dentofacial Orthopedic Terms, 1993.]

**Action and reaction, Law of**
Activation

The process of storing mechanical energy into an active member of an orthodontic appliance (e.g. stretching an elastic, or compressing an open coil spring) in order for it to produce the desired force system, which will be delivered to the dentition. The force system that must be applied for activation of a spring is the opposite to the force system desired (during deactivation).

Active member

The part of an orthodontic appliance that is involved directly in tooth movement.

Adaptability (Adaptive capacity, Adaptive potential)

Relative ability to adjust to the demands of the environment.

Adaptation

1. The progressive adjustive changes in sensitivity that regularly accompany continuous sensory stimulation or lack of stimulation. The process by which an organism responds to the functional demands of its environment.

2. The process by which a dental device is fitted to another structure (e.g. adaptation of a band to a tooth).

"Adenoid facies"

A long-standing descriptive term implying a relationship between mouth breathing (due to enlarged adenoids) and the development of malocclusion through altered function. The classic description of "adenoid facies" consists of narrow nasal and alar width, hypotonic musculature, "dull" or "vacant" facial expression and lips separated at rest. It is important to stress that the presence of "adenoid facies" does not necessarily mean that the patient is an obligatory mouth breather, or in other words, mouth breathing is habitual in certain patients.

Adhesion

1. Attractive force between atoms or molecules of dissimilar materials, when they are in close approximation. The attachment of one substance to another.

2. The abnormal fibrous joining of adjacent structures following an inflammatory process or as a result of injury repair.
SUBTERMS:

Adhesion
  • Capsular adhesion

Fibrosis of the capsular tissues of a joint.

Adhesion
  • Extracapsular adhesion

Fibrosis of pericapsular tissues such as muscles or ligaments.

Adhesion
  • Intracapsular adhesion (Fibrous ankylosis, Pseudoankylosis)

Fibrosis between intra-articular surfaces within a joint capsule, resulting in reduced mobility of the affected joint.

Advancement (of the mandible)

An orthognathic surgical procedure aiming at sagittal (anterior) augmentation of the mandible, most often performed through a standard, or modified bilateral sagittal split ramus osteotomy (BSSO).

[See Setback (of the mandible)]

[See Osteotomy, Bilateral sagittal split osteotomy (BSSO)]
Advancement (of the maxilla)

Anterior repositioning of the maxilla by orthognathic surgery. It most often involves a Le Fort I osteotomy.

[See Osteotomy, Complete maxillary osteotomy]

Aesthetic

[See Cephalometric lines (planes), S-line (Esthetic plane of Steiner)]

[See Bends (Archwire bends), Artistic bends (Esthetic bends)]

[See Cephalometric lines (planes), Rees esthetic plane]

[See Facial esthetics]

[See Bracket, Esthetic bracket (Clear bracket)]

[See Cephalometric lines (planes), E-line (E-plane, Esthetic line of Ricketts)]

Agenesis

Congenital absence of a tooth.

Ala

The lateral rim of the nostril.
Alar cinch

A procedure performed during any orthognathic surgery that includes mobilization of the entire maxilla, in order to prevent excessive widening of the alar bases. It involves passing a permanent suture in a figure-eight fashion through the alar base tissues and through a bur hole placed in the region of the anterior nasal spine. This is repeated on the opposite side. Each suture is tightened independently, taking care to maintain symmetry, until the desired alar base width is attained (as determined from measurements before surgery). A situation in which an alar cinch may not be performed during maxillary orthognathic surgery is when very narrow alar bases exist preoperatively.

Alloy

A material that exhibits metallic properties (high electrical and thermal conductivity) and is composed of two or more elements, at least one of which is a metal (e.g. steel is an alloy of iron and carbon, brass is an alloy of copper and zinc).

Alpha position

The anterior component of an orthodontic spring or the anterior point of attachment of a spring.

[Compare with Beta position]

Alveolar crest

The most coronal portion of the alveolar process.

Alveolar process

The U-shaped ridge of maxillary or mandibular alveolar bone that surrounds and supports the roots of the erupted teeth, as well as the unerupted tooth buds.

Anchorage

The sites that provide resistance to the reactive forces generated as a (most commonly, undesirable) consequence of the activation of an orthodontic or orthopedic appliance. [Short definition: resistance to unwanted tooth movement].

SUBTERMS:
• Cervical anchorage
Anchorage provided by the back of the neck when extraoral appliances such as a cervical pull headgear are used.

**Extraoral anchorage**
Anchorage provided by sites located outside the oral cavity.

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**Infinite anchorage**
The term is commonly used when referring to implants used as anchorage in orthodontics, to indicate that they show no movement (zero anchorage loss) as a consequence of reaction forces.

[See Implant, Orthodontic implant]

**Intermaxillary anchorage**
Anchorage for tooth movement provided by the teeth of the opposing arch.

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**Intramaxillary anchorage**
Anchorage provided by teeth within the same arch as the ones that are to be moved.

**Maximum anchorage (Type A anchorage)**
A situation in which the treatment objectives require that no or very little anchorage can be lost.

**Minimum anchorage (Type C anchorage)**
A situation in which, for an optimal result, a considerable movement of the anchorage segment (anchorage "loss") is desirable, during closure of space.

**Moderate anchorage (Type B anchorage)**
A situation in which anchorage is not critical and
space closure should be performed by reciprocal movement of both the active and the anchorage segment.

**Occipital anchorage**
Anchorage provided by the superior and posterior portions of the head, when extraoral appliances such as a high-pull headgear are used.

**Reciprocal anchorage**
A situation in which the movement of one or more dental units is balanced against the movement of another, or more dental units, on which the reaction forces are placed. [The term generally means that the movement of both the active and the reactive component is desirable.]

**Anchorage loss**
The undesirable movement of the reactive anchorage segment, which happens as a side effect of the movement of the active segment (e.g. mesial movement of the maxillary molars during retraction of maxillary incisors with intramaxillary mechanics).

**Anchorage preparation**
A procedure commonly used in the Tweed technique, during which the molars and premolars are tipped distally prior to retraction of the anterior teeth. The theory behind it is that it increases the anchorage value of the posterior segments, allowing further retraction of the canines and incisors with less anchorage loss.

**Anchorage reinforcement**
The process of increasing the anchorage value of the reactive segment to resist anchorage loss. This can be done in a number of ways, e.g. by incorporating more teeth into the reactive segment; by using additional stabilizing arches such as a lingual arch, a Nance holding arch or a transpalatal arch; or by using extraoral or intermaxillary traction.

**Anchorage value**
Relative resistance of a tooth (or a segment of teeth) in comparison to another, which usually is estimated on the basis of comparison of root surface areas and density of the supporting bone.

**Angle classification**
- "Subdivisions" (left or right)

are used in asymmetric situations to indicate the side that deviates from a Class I molar relationship.

**Angle of activation**
A measure (in degrees) of the activation placed into an orthodontic wire by bending or torsion, with regard to its initial passive state. When the wire characteristics and the interbracket distance are known, the clinician can estimate the magnitude of the force produced.

**Angulation (Second order, "Tip")**
Angular deviation of the long axis of a tooth from a line perpendicular to the occlusal plane, in the mesiodistal direction.

[Compare with Inclination (Third order, "Torque")]

**Ankylosis**
Abnormal immobility, union or fusion that may occur between two bones at their articulation (e.g. ankylosis of the TMJ) or between teeth and alveolar bone. In the instance of the TMJ, bony or fibrous ankylosis can be caused by conditions such as congenital defects, trauma, inflammation, infections, arthritis or neoplasms.
In the case of an ankylosed tooth, the periodontal ligament is obliterated in one or more localized areas, and a "bony bridge" is formed by penetration of alveolar bone into the cementum. Dental ankylosis eliminates the potential for both eruption and orthodontic movement. In a growing individual, an ankylosed tooth is accompanied by a localized vertical deficiency of the alveolar ridge, and consequently appears to "submerge" as adjacent, unaffected teeth continue to erupt. Ankylosis of deciduous teeth (usually molars) is a more common phenomenon than ankylosis of permanent teeth.

[See Tooth mobility, Reduced mobility (Hypomobility)]

**Annealing**
A heat treatment and cooling schedule used to reduce the hardness and increase the ductility of a metal by removing residual stress.
Anomalad
A malformation, together with its subsequently derived structural changes (e.g. the Robin anomalad).

Anodontia
A rare condition characterized by congenital absence of all teeth (both deciduous and permanent). Most commonly related to ectodermal dysplasia.

[Compare with Oligodontia]

Antegonial notch
A depression or concavity usually present in the inferior border of the mandible, immediately anterior to the angle, near the insertion of the masseter muscle. A deeper than normal antegonial notch may be indicative of a dolichofacial pattern or of mandibular underdevelopment. Pronounced antegonial notching also is a common characteristic of some syndromes with micrognathia of the lower jaw, such as Treacher Collins syndrome.

Anterior component of occlusal force
A theory attempting to explain the tendency of posterior teeth to drift mesially with time. Factors that are considered related to this phenomenon are: morphology and angulation of teeth, occlusal and muscular forces and transseptal fibers.

Anterior cranial base
The anterior aspect of the floor of the cranial vault, commonly delimited cephalometrically by sella turcica and nasion.

Anterior guidance
Term used to describe a particular scheme of disclusion of the dental arches during a protrusive mandibular excursion. Contacts between the maxillary incisors and the mandibular anterior teeth guide the mandible downward, to create disarticulation (separation) of all other teeth.

**Anteroposteriorly**

In a direction parallel to the sagittal plane; in radiology it denotes beam direction from front to back.

**Antrum**

A cavity or chamber. The term usually refers to the maxillary sinus.

**Apical area (of the bone)**

The apical area in the newborn child and during the first year of life is the region in which the developing deciduous and permanent teeth are found. In the deciduous dentition it comprises the area occupied by the apices of the deciduous teeth and the developing permanent teeth. In the mixed dentition, the apical area is the region in which lie the apices of the deciduous and erupted permanent teeth, as well as developing unemerged permanent teeth. In the adult, the apical area consists of the region in which normally the apices of the permanent teeth can be located. The concept of the apical area was introduced by F. P. G. M. van der Linden in 1979.

**Apical base**

Maxillary and mandibular bone that supports and is continuous with the alveolar processes, as well as with the maxillary and mandibular bodies. Although the demarcation between alveolar and basal bone is not specific, it generally is thought to lie at or slightly above the level of the apices of the roots. The concept of the apical base was introduced by A. F. Lundström in 1923.

[See Bone, Basal bone]
Any device used for a particular functional, diagnostic and/or therapeutic effect.

SUBTERMS:

Appliance
- ACCO appliance

A combination of a modified maxillary removable appliance with a straight-pull J-hook headgear. The acronym "ACCO" was suggested by H. I. Margolis (1976) and stands for ACRYlic-Cervical-Occipital.

The maxillary removable appliance includes an anterior bite plane, a labial bow, clasps for retention and finger springs for distalization of the maxillary molars. The J-hook headgear is attached to loops on the labial bow that are bent between the maxillary central and lateral incisors. Its purpose is to counteract the reaction force on the maxillary anterior teeth caused by the distalizing force of the finger springs on the maxillary molars. A cervical headgear also may be attached on the maxillary molars to complement the action of the ACCO.

In the original design of the appliance by Margolis, molar distalization took place one side at a time. During distalization on one side, ball clasps or passive finger springs on the other side enhanced retention of the appliance. Once a Class I molar relationship was achieved on the active side, a new ACCO was made. The new acrylic configuration and clasps on the completed side would retain the correction achieved, at the same time providing anchorage to correct the residual Class II relationship on the contralateral side of the arch.

Appliance
- Activator (Monobloc)

The first removable functional appliance, developed by V. Andresen. Historically, the term "activator" was introduced to describe the "activation of mandibular growth," to which the achieved correction of a Class II malocclusion was attributed. The term currently is used in a generic sense, referring to a family of functional appliances used to treat Class II malocclusions characterized, at least in part, by mandibular deficiency. [For activators designed for patients with Class III malocclusions, see Appliance, Class III functional.] These appliances position the mandible forward, promoting a new mandibular postural position. The reactive forces from the stretch of the muscles and soft tissues are transmitted to the maxillary dentition and through that, to the maxilla.

The acrylic body of the Andresen activator covers part of the palate and the lingual aspect of the mandibular alveolar ridge. (Note: In its original design the appliance contacted the mandibular anterior teeth only on the lingual side and did not extend over the incisal edges.) A labial bow fits
anterior to the maxillary incisors and carries U-loops for adjustment. On the palatal aspects of the maxillary incisors, the acrylic is relieved to allow their retraction.

A main feature of the appliance is the faceting of the acrylic on palatal and lingual aspects of the maxillary and mandibular posterior teeth, respectively, designed to direct their eruption. On the palatal aspect of the maxillary posterior teeth the facets are cut so as to allow occlusal, distal and buccal movement of these teeth. This movement is achieved by keeping the acrylic in contact with only the mesiopalatal surfaces of the premolars and molars. On the lingual aspect of the mandibular posterior teeth the facets only permit occlusal and mesial movement, with the acrylic contacting the distolingual surface of these teeth.

[See Appliance, Class Class III functional appliances (Reverse functional appliances)]

[See Appliance, Functional appliance]

Appliance
• Active vertical corrector

An appliance introduced by E. L. Dellinger, attempting to correct anterior open bites by intrusion of posterior teeth. The appliance consists of maxillary and mandibular posterior biteblocks with incorporated repelling samarium-cobalt magnets. A commonly reported side effect of treatment with the appliance is the creation of a posterior crossbite owing to the lateral force components of the repelling magnets.

[See Orthodontic magnets]

Appliance
• Bass appliance

A removable functional appliance designed by N. M. Bass, consisting of a basic maxillary expansion plate on which various other parts can be mounted. The expansion plate covers the occlusal surfaces of all maxillary teeth and has torquing springs for the maxillary central incisors. The appliance also carries tubes in which buccal shields can be attached, and has mandibular lip pads extending in the vestibule in a fashion similar to the Fränkel appliance. On the lingual side there are specially designed flanges that can be gradually advanced. The Bass appliance also can be combined with a high-pull headgear.

Appliance
• Begg appliance (Light-wire appliance)
Begg for his light-wire technique. The appliance consists of narrow (single-wing), ribbon-arch brackets (originally developed by E. H. Angle as the "pin and tube" appliance) and light, round stainless steel archwires. It allows a series of tipping movements of teeth in conjunction with intermaxillary elastics. Treatment with the Begg technique is classically divided into three stages:

The first stage includes initial alignment by simple tipping, with the exception of the anchor teeth. Any spaces present between the anterior teeth are closed and any rotations or crossbites are corrected. Deep anterior overbites or open bites are eliminated, and the anteroposterior occlusal relationship between the maxillary and mandibular teeth is overcorrected. Arch forms are coordinated and extraction spaces are reduced, to some degree, during the first stage.

During the second stage all extraction spaces are closed completely, by allowing significant lingual tipping of the anterior teeth (incisors and canines), brought upon by a combination of intramaxillary and intermaxillary elastic traction.

The third and final stage basically includes uprighting of the teeth by movement of the roots. This root movement is performed by round archwires with bent-in torquing loops, in combination with root-torquing auxiliaries of various designs. Individual tooth positioning is performed with bends and root-tipping springs.

[See Appliance, Tip-Edge appliance]

[See Differential force theory]

[See Orthodontic wire, Australian wire]

Appliance
• Bimler appliance (Bite former, Bimler stimulator)

A modification of the activator by H. P. Bimler. There are three main kinds of Bimler appliance: type A for patients with Class II Division 1 malocclusions, type B for those with Class II Division 2 and type C for patients with a Class III malocclusion. All of the above appliances are flexible and carry springs and bows on the labial and lingual side in both arches. The springs and bows are connected together by two acrylic wings which extend toward the palatal and lingual mucosa. Each appliance type is subdivided further into two main categories, space creation or space closure; the space creation variety carries additional active springs.

In the type A appliance the mandible is held in its advanced position by engagement of the mandibular incisors in a splint. The splint contacts the labial aspect of the mandibular incisors while special springs engage on their lingual aspect. A mandibular labial wire holds the splint in place, extending distally to connect with the maxillary part of the appliance. The maxillary part of the appliance carries a labial arch and palatal springs for the maxillary incisors.
In the type B appliance the palate is covered by acrylic, with an incorporated midline screw. No labial arch exists for the maxillary incisors.

In the type C appliance occlusal wires covered with plastic tubing are used to achieve bite opening. There is no labial splint, but the mandibular incisors are retracted by a labial bow originating from the maxillary part of the appliance.

Appliance
  • Bionator

A modification of the activator, developed by W. Balters in the 1950s. Its design is significantly less bulky compared to the activator, thus reducing interference with speech. The bionator consists of a lingual horseshoe of acrylic, with a palatal spring shaped like a (reversed) Coffin spring. Facets are created in the acrylic to guide the maxillary and mandibular posterior teeth and hold them in the postured relationship. A labial bow exists anterior to the maxillary incisors that extends distally to keep the buccal musculature away from the teeth. In the original design of the appliance, the mandibular incisors were not capped with acrylic.

Appliance
  • Crefcoeur appliance

A removable appliance designed by J. Crefcoeur, most often used to increase space at a specific location in the dental arch. The appliance is in essence a Hawley-type acrylic plate, sectioned (split) at the point where space creation is necessary. A heavy-gauge stainless steel wire (Crefcoeur spring) is embedded in the acrylic at the posterior aspects of the appliance bilaterally. This wire runs parallel to the edges of the acrylic on the lingual aspect and can be activated appropriately to increase the separation between the two sectioned parts of the appliance. After sufficient space has been created, the two parts of the appliance can be reconnected with rapid-curing acrylic. The appliance also can be used to reduce a localized space in the dental arch and to expand or constrict the dental arches. Good retention and adequate clasps are very important for the Crefcoeur appliance, particularly in the area of the separation. The retention of the appliance can be enhanced by creating artificial undercuts with composite on certain teeth.

Appliance
  • Chin cap (Chin cup)

Extraoral orthopedic appliance that consists of a cap that fits on the patient’s chin and a headstrap similar to that of a high-pull headgear. It is designed to deliver a superiorly and posteriorly directed force to the mandibular condyles, via the chin. The appliance has been used for decades in an attempt to correct mandibular prognathism in young patients by restraining or redirecting mandibular condylar growth.
Appliance
• Class III functional appliances (Reverse functional appliances)

Various types of functional appliances that position the mandible posteriorly and rotate it open. Such appliances are advocated for the correction of maxillary deficiency and/or mild mandibular prognathism in a growing child. The mode of action of Class III functional appliances includes correction of any anterior crossbite by labial tipping of the maxillary incisors and retroclination of mandibular incisors (introducing an element of dental compensation for the existing skeletal discrepancy). The prominence of the chin is decreased by causing the mandible to rotate down and back and by increasing the lower face height. Treatment with such appliances is not indicated for patients with excessive lower face height, as is often the case with Class III problems.

Appliance
• Combined functional/extraoral traction appliance

A functional appliance on which a facebow can be attached for extraoral traction (e.g. the Bass and the Teuscher appliances), or on which a facebow is rigidly fixed (e.g. the Van Beek appliance).

[See Appliance, Bass appliance]

[See Appliance, Teuscher-Stückli activator/headgear combination appliance]

[See Appliance, Van Beek appliance]

Appliance
• Crib

An interceptive appliance used for correction of deleterious habits such as a deviating tongue position and/or digit-sucking. A crib typically consists of a fixed transpalatal [0.036-inch (0.90-mm) or heavier gauge] wire, soldered on two maxillary first permanent molar bands. The wire extends toward the anterior palate where it forms a crib-shaped "fence" meant to interfere with the habit. A crib also can be incorporated in a removable appliance. Posterior (lateral) tongue cribs can be used as part of removable appliances in patients with unilateral or bilateral posterior open bite.

[See Appliance, Habit-breaking appliance (Habit reminder)]

[See Crib]

Appliance
• Crozat appliance

Removable orthodontic appliance which was developed by G. Crozat in the early 1900s. In its original design the appliance was fabricated entirely of precious metal. Heavy gold wires
constituted the framework and lighter gold fingersprings produced the desired tooth movement. The Crozat appliance can be used in the maxilla and/or mandible. Tight circumferential clasps ("cribs") on the molars provide adequate retention to permit the use of light intermaxillary elastics with the appliance.

[See Appliance, Crib ]

Appliance
• Delaire appliance

[See Appliance, Face mask (Reverse-pull headgear, Protraction headgear, Face frame)]

Appliance
• Edgewise appliance (Standard edgewise)

Fixed multi-banded orthodontic appliance, introduced by E. H. Angle in 1928. It involves a rectangular labial archwire ligated into attachments (brackets) that are fixed on bands which are cemented to individual teeth, or that are directly bonded to individual teeth. The term "edgewise" refers to the fact that the bracket slot is fabricated in a way that permits insertion of the archwire with its long dimension perpendicular to the long axis of the tooth, instead of parallel to it, as in the (earlier) "ribbon arch" bracket.

Appliance
• Elastic open activator

A modification of the activator developed by G. Klammt. The appliance has reduced acrylic bulk, facilitating increased appliance wear. The acrylic is replaced by wires which increase the flexibility of the appliance. The flexible design allows isotonic muscular contractions (in contrast to rigid appliances, which only allow isometric contractions).

Appliance
• Expansion appliance

An orthodontic appliance used to expand the maxillary or, less frequently, the mandibular dental arch. An expansion appliance can be removable (e.g. split-plate appliance with a jackscrew) or fixed on the teeth (e.g. the Hyrax appliance or the Quad-helix).

[See Expansion, Slow maxillary (palatal) expansion (SME or SPE)]

[See Expansion, Rapid maxillary (palatal) expansion (RME, RPE)]
Appliance
• Extraoral traction appliance

An orthodontic appliance that makes use of extra-oral anchorage (e.g. headgear, face mask).

Appliance
• Face mask (Reverse-pull headgear, Protraction headgear, Face frame)

Extraoral appliance that utilizes rests on the chin and forehead (and occasionally the cheek bones) as anchorage for elastic traction, with the purpose of orthopedically protracting the maxilla. This maxillary protraction is performed as an early treatment modality in Class III malocclusions associated with maxillary hypoplasia. The face mask also can be used as an orthodontic appliance, to provide extraoral anchorage for protraction of posterior teeth. Usual side effects of face mask treatment include elongation of the face (caused by extrusion of the teeth to which the elastic traction is applied) and proclination of the maxillary incisors, when the traction is applied to the maxilla. The appliance was designed by J. Delaire and subsequently modified by H. Petit and others.

Appliance
• Fixed appliance

An appliance that is cemented or bonded to the teeth and thus cannot be removed by the patient. The term commonly refers to fixed attachments (brackets, tubes, bands) placed on the teeth in conjunction with archwires to move them to a new position.

Appliance
• Fixed/removable appliance

Orthodontic appliance that is fixed to the teeth but can be removed by the clinician for adjustment and subsequently re-inserted, without taking off any brackets or bands. Fixed/removable appliances make use of special sheaths welded on the palatal or lingual aspect of molar bands (e.g. the fixed/removable lingual arch or transpalatal arch).

[See Sheath]
• Frankel appliance (Function Regulator)

Group of functional appliances developed by R. Fränkel to treat malocclusions, while aiding in the maturation, training and reprogramming of the orofacial neuromuscular system. Four main types of appliances have been described by Fränkel: Function Regulator (FR)-I was designed for treatment of Class I and Class II Division 1 malocclusions. The FR-II appliance is meant for patients with Class II Division 1 and 2 malocclusions, the FR-III was designed for patients with Class III malocclusions and the FR-IV for patients with hyperdivergent facial patterns and anterior open bite. The appliances consist of acrylic buccal (vestibular) shields and lip pads, connected by wires, to restrain and retrain aberrant musculature and to prevent the effects of restricting muscle forces on the dentition. The extension of the buccal shields into the full depth of the vestibule is supposed to stimulate the periosteum in order to achieve a skeletal expansion of the apical bases. Lingual shields also are included to accomplish a gradual, stepwise advancement of the mandible.

Appliance
• Functional appliance

A removable or fixed appliance that alters the posture of the mandible and transmits the forces created by the resulting stretch of the muscles and soft tissues and by the change of the neuromuscular environment to the dental and skeletal tissues to produce movement of teeth and modification of growth.

Appliance
• Haas appliance (Haas rapid maxillary expansion appliance, Haas palatal separator)

A fixed expansion appliance that was popularized by A. J. Haas. The appliance consists of bands cemented on the maxillary first premolars and first molars that are rigidly connected to each other with heavy-gauge wires on the buccal and palatal aspect of the teeth. Two acrylic pads encase the palatal connecting wires and are joined with a midline jack screw. The acrylic pads are in close contact with the palatal mucosa. The Haas appliance was designed to expand the maxillary arch by opening the midpalatal suture, thereby causing a skeletal expansion of the maxilla. According to Haas, the contact of the pads with the palate allows the forces from the appliance to be dissipated against the underlying hard and soft tissues of the palate, thus minimizing the amount of dental tipping and maximizing the skeletal effect. Others consider this a disadvantage of the appliance with regard to hygiene, resulting in inflammation of the palatal tissues.

[See Appliance, Expansion appliance]
[See Appliance, Hyrax appliance (Hygienic rapid palatal expander)]
[See Expansion, Rapid maxillary (palatal) expansion (RME, RPE)]
[See Expansion, Slow maxillary (palatal) expansion (SME or SPE)]
Appliance

• Habit-breaking appliance (Habit reminder)

Any removable or fixed appliance designed to correct undesirable habits such as digit-sucking, tongue interposition, tongue-thrusting, or infantile swallow.

[See Appliance, Crib ]

[See Appliance, Vestibular shield (Vestibular screen)]

Appliance

• Harvold-Woodside activator

A modification of the activator developed by E. P. Harvold and D. G. Woodside. Its distinguishing feature is the overextended vertical opening to which the appliance is constructed. The bite is opened by 5 mm to 6 mm beyond the freeway space. The rationale is that maximum stretching of the muscles will produce a force that will be transmitted to the bones and teeth, inducing a compensatory anatomic correction. It is claimed that the Harvold-Woodside activator requires minimal mandibular advancement to produce the desired sagittal correction, as the extreme muscle stretch can cause intrusion (or inhibition of eruption) of the maxillary posterior teeth, resulting in "closure" or counterclockwise rotation of the mandible with a relative Class II correction (bite-block effect). Relieving the acrylic occlusally to the mandibular posterior teeth allows them to erupt in a mesial direction, which also facilitates Class II correction.

Appliance

• Herren activator (L.S.U. activator)

A modification of the activator developed by P. Herren (also known as the Louisiana State University modification of the same appliance). It is essentially an activator made to a construction bite that positions the mandible forward and downward to a significant degree. According to P. Herren, the wearing of this appliance is not supposed to increase the activity of the lateral pterygoid muscle.

Appliance

• Hickham protraction appliance

A modification of the face mask developed by J. H. Hickham. It consists of a chin cup with hooks extending upwards and forwards, for application of anterior elastic traction to the maxilla and/or the maxillary (or mandibular) dentition.
• Harvold-Woodside activator

A modification of the activator developed by E. P. Harvold and D. G. Woodside. Its distinguishing feature is the overextended vertical opening to which the appliance is constructed. The bite is opened by 5 mm to 6 mm beyond the freeway space. The rationale is that maximum stretching of the muscles will produce a force that will be transmitted to the bones and teeth, inducing a compensatory anatomic correction. It is claimed that the Harvold-Woodside activator requires minimal mandibular advancement to produce the desired sagittal correction, as the extreme muscle stretch can cause intrusion (or inhibition of eruption) of the maxillary posterior teeth, resulting in "closure" or counterclockwise rotation of the mandible with a relative Class II correction (bite-block effect). Relieving the acrylic occlusally to the mandibular posterior teeth allows them to erupt in a mesial direction, which also facilitates Class II correction.

Appliance
• Hyrax appliance (Hygienic rapid palatal expander)

A commonly used type of banded rapid maxillary expansion appliance developed by W. Biederman and originally licensed to Dentaurum. The components now are available from several suppliers internationally. The framework of the appliance is made entirely of stainless steel or cobalt-chromium alloy, with no acrylic contacting the palatal mucosa. Bands are cemented (usually) on the maxillary first premolars and first molars. The bands are connected by means of rigid wires to a special expansion screw which is located in the midline of the palate, in close proximity to the palatal contour. Hyrax-type expansion screws are available in various sizes (more commonly 7 mm, 11 mm and 13 mm) depending on the application. Buccal and palatal support wires also may be added for rigidity.

[See Expansion, Rapid maxillary (palatal) expansion (RME, RPE)]
[See Appliance, Expansion appliance]
[See Appliance, Haas appliance (Haas rapid maxillary expansion appliance, Haas palatal separator)]
[See Expansion, Slow maxillary (palatal) expansion (SME or SPE)]
[See Expansion, Surgically assisted rapid maxillary expansion]

Appliance
• Jasper jumper appliance

A type of fixed functional appliance developed by J. J. Jasper. In essence it is a flexible version of the Herbst appliance. The Jasper jumper is used in combination with fixed appliances for correction of Class II malocclusions. It consists of two polyurethane-coated stainless steel coil springs (force modules), attached at both ends to stainless steel end-caps. The force modules are
available in seven lengths (from 26 to 38 mm, in 2-mm increments). The end-caps carry holes so they can be attached to the anchoring unit. One end-cap is attached to the distal aspect of the headgear tube of the maxillary molar by means of a special ball pin attachment. The other end-cap is attached to the mandibular arch, between the canine and the first premolar, either directly onto the main archwire, or on a segment utilizing the auxiliary slot of the mandibular molar. Upon insertion, the appliance bows out towards the cheek, promoting an anterior mandibular position. The Jasper jumper may be used as an alternative to intermaxillary elastics and requires minimal patient cooperation, as it is fixed on the archwires.

Appliance
• Jones jig

A fixed orthodontic appliance designed by R. D. Jones for unilateral or bilateral maxillary molar distalization without patient cooperation. The appliance consists of a heavy-gauge wire and an open-coil nickel-titanium spring delivering a force of approximately 0.7 to 0.8 N (70 to 80 g) over a compression range of 1 to 5 mm. The distal end of the jig assembly carries a soldered additional wire that is inserted into the main tube of the maxillary first molar band, whereas the heavy-gauge wire is placed in the headgear tube. The sliding part of the jig is attached on the anchor teeth by a stainless steel ligature so that the coil spring is compressed. The bands on the anchor teeth (which can be either the first premolars, second premolars, or deciduous second molars) are soldered to a large, modified Nance button to make maximal use of palatal anchorage.

Appliance
• Kinetor

A removable functional appliance developed by H. Stockfisch. The appliance consists of two acrylic plates joined by vestibular steel loops and supported by occlusal rubber tubes. This design gives the appliance a certain degree of flexibility, which is supposed to reinforce muscular impulses and stimulate function.

Appliance
• Kingsley appliance (Bite-jumping appliance)

Probably the first removable functional appliance (developed by N. W. Kingsley in 1877). The appliance consisted of a vulcanite palatal plate with an anterior inclined plane, which forced the mandible in an anterior direction ("jumping of the bite"). It also contained a mechanism for retraction of maxillary incisors and was retained by silk threads to the maxillary molars.

[See "Jumping of the bite"]

[See Appliance, Herbst appliance]

Appliance
• Labiolingual appliance
Early orthodontic fixed appliance system introduced by O. A. Oliver. The appliance consisted of bands on the molar teeth in conjunction with heavy mandibular lingual and maxillary labial base arches. Movement of individual teeth with this system was achieved by activating fingersprings and other accessory springs soldered on the base archwires.

Appliance
• Lehman appliance (Lehman activator)

A combination activator-headgear appliance developed by R. Lehman. It consists of a maxillary acrylic plate that carries two rigidly fixed outer bows and a mandibular lingual shield. The acrylic plate covers the palate and it extends over the occlusal and incisal surfaces of the maxillary teeth, up to the occlusal third of their buccal and labial surfaces.

Selective expansion of the maxillary arch is possible by appropriately activating the two transverse expansion screws (one anterior and one posterior) that are embedded in the plate.

Occipital traction is applied through a headstrap attached on the outer bows, which are fixed at the anterior aspect of the appliance. The mandibular lingual shield is connected to the maxillary plate by means of two heavy S-shaped wires. Unlike many activator-type appliances which are constructed with the mandible in a protruded position, this appliance is made from a bite registration taken in centric occlusion. According to R. Lehman, the S-shaped wires are activated by approximately 2 mm every 4 to 6 weeks, to achieve a gradual advancement of the mandible.

Appliance
• Lingual appliance

1. Any removable or fixed orthodontic appliance, placed on the lingual (palatal) side of the dental arches.

2. An esthetic, "invisible" fixed orthodontic appliance consisting of special orthodontic attachments bonded on the lingual surfaces of the teeth. The principle of a rectangular wire in a rectangular pre-adjusted (straight-wire) slot is the same, but the design of the attachments is modified. The maxillary anterior brackets have a flat surface that occludes with the mandibular incisors in patients with deep bite and acts as an anterior bite plane. The archwire shape also is modified to fit the configuration of the lingual surface of the dental arch ("mushroom" configuration). Accuracy of bracket placement is critical, so indirect bonding is advocated. Disadvantages of the lingual appliance include smaller interbracket distance, more difficult access, arguably reduced comfort for the patient due to tongue impingement, and usually higher treatment fee.

Appliance
• Lip bumper
Intraoral removable orthodontic appliance consisting of a U-shaped 0.036-inch (0.90-mm) stainless steel wire, which in its anterior portion may carry a plastic or acrylic pad. The ends of the lip bumper are inserted into tubes on the mandibular first or second permanent molars. Its anterior portion is adjusted to lie in the vestibular area, 2 to 3 mm away from the alveolar process and the mandibular incisors (the vertical height varies).

Lip bumpers commonly are worn on a full-time basis and occasionally may be ligated in place (in case of reduced patient compliance). They are used to control or increase the mandibular dental arch length, to upright mesially or lingually tipped mandibular molars and to prevent the interposition of the lower lip between the maxillary and mandibular incisors.

Depending on the anterior configuration (with or without lip pads) the appliance has two effects: First, by removing the soft tissue forces from the labial aspect of the mandibular incisors it can cause labial tipping of these teeth. Second, by transmitting the force from the lip to the mandibular first molars, the lip bumper causes distal movement (mainly tipping) of these teeth. This distal movement is accomplished more easily when the second molars are still unerupted or have been extracted as part of the treatment plan.

Appliance
• Mouthguard

A removable appliance, usually made from flexible or rigid thermoplastic material, used to cover and protect the teeth while engaging in contact sports.

Appliance
• Open activator

An activator with reduced acrylic coverage of the anterior palate in comparison to the classic activator. It is meant to facilitate speech by allowing contact between the tongue and palate.

Appliance
• Pendulum appliance

A fixed orthodontic appliance introduced by J. J. Hilgers as a means for molar distalization without patient compliance.

The appliance makes use of palatal anchorage through a large Nance button, which is retained with bands on the maxillary first premolars and occlusal rests on the distal aspect of the maxillary second premolars.

Two "pendulum" springs fabricated out of 0.032-inch (0.81-mm) TMA wire extend from the posterior edge of the Nance button. Each spring contains a closed helix (close to the midline), a small horizontal adjustment loop and a recurved portion that inserts into palatal sheaths soldered
on the bands of the maxillary first molars. The thickness of the palatal sheaths on the molar bands is 0.036 inch (0.90 mm), so that the 0.032-inch (0.81-mm) diameter wire fits loosely in them. If expansion of the maxillary arch is necessary, the appliance can be fabricated in a split-plate design ("Pend-X" or "Pendex" appliance) by incorporating a midpalatal screw in the center of the Nance button. Prior to cementation the springs are bent (preactivated) so that they lie parallel to the midsagittal plane, and they subsequently are inserted into the sheaths.

As the molar is driven distally, it also moves palatally (on an arc). This palatal movement can be counteracted by slightly opening the adjustment loop. Distal root movement of the molars also can be produced by adjusting the recurved portion of the "pendulum" springs in order to avoid distalization by mere tipping.

**Appliance**

- **Pin-and-tube appliance**

Early fixed orthodontic appliance (now archaic) consisting of vertical tubes soldered onto bands placed on the permanent teeth. Movement of the teeth was achieved by use of an archwire with soldered vertical pins that were forced into the tubes. The system, originally developed by E. H. Angle, was later replaced by the ribbon-arch appliance.

**Appliance**

- **Positioner (Tooth positioner)**

A removable orthodontic appliance originally developed for closing band spaces after debanding. It currently is used mainly to achieve fine adjustments and retain corrected positions following fixed appliance treatment.

The positioner is fabricated of rubber or elastomeric plastic material covering the maxillary and mandibular dental arches, as well as part of the alveolar process. For its construction, individual teeth are cut from a plaster model and are reset subsequently in an ideal relationship.

The patient is instructed to wear the positioner immediately following fixed appliance removal and to clench the teeth into it. The appliance functions by molding of the individual teeth into the correct position within the arch through the forces generated by the elastic material in contact with the teeth. When used in patients who exhibited a Class II malocclusion prior to treatment, the positioner can be constructed in a slightly overcorrected Class I relationship, providing a "functional appliance" component.

Advantages of the positioner include its resistance to fracture, stimulation of tissue tone and continuous improvement of tooth position if it is worn properly. Disadvantages are its bulkiness (making it less comfortable for the patients), and the possibility that it may keep teeth loose by producing intermittent forces on them. Positioners are contraindicated in patients with airway obstruction and in patients with a history of temporomandibular disorders. Their use often is preferred in patients with minimal overbite or open bite tendency, as they tend to deepen the bite.
Appliance
• Propulsor (Mühlemann appliance)

A removable functional appliance similar to the activator. The appliance carries a vestibular acrylic extension over the maxillary alveolar process. The intention is to distribute the posteriorly directed force over the basal bone to maximize the skeletal and to minimize the dentoalveolar effect.

Appliance
• Quad-helix appliance

An all-wire fixed orthodontic expansion appliance originally developed by E. Herbst and popularized by R. W. Ricketts, among others. It typically consists of a 0.036-inch (0.90-mm) stainless steel wire, containing four helices (two anteriorly and two posteriorly) to increase its range and flexibility. The wire is soldered (or attached in a fixed/removable design) onto bands on the maxillary first molars (and occasionally also on the maxillary first premolars). Various other designs, such as a tri- or a bi-helix, also are described. The appliance is used for symmetrical or asymmetrical expansion of the maxillary dental arch, as well as for derotation of the molars. It has a tendency to produce buccal tipping of the teeth, and is not advocated in patients who require a significant amount of expansion. It is considered advantageous for patients with cleft lip and palate, in whom a localized expansion of the anterior aspect of the collapsed lesser maxillary alveolar segment often is necessary.

Appliance
• Ribbon-arch appliance

A fixed multibanded orthodontic appliance developed by E. H. Angle, which marked another stage towards the development of the edgewise appliance. Each band carried a vertical slot capable of receiving a rectangular wire in a vertical orientation (with the longer dimension of the cross-section parallel to the long axis of the tooth), hence the term ribbonwise. The archwire was retained in place by pins. Control of buccolingual (third-order) root position was difficult with the appliance. This problem was overcome later with the development of the edgewise appliance. [See "Ribbonwise"]

Appliance
• Sagittal appliance

An active removable appliance with expansion screws in the anteroposterior direction bilaterally ("two-way sagittal") or additionally in the transverse direction ("three-way sagittal"), when expansion is also necessary. Retention is achieved by a combination of Adams clasps and arrowhead clasps. Sagittal appliances are used mainly in patients with labially displaced canines to
increase the arch length by advancing the incisors and to apply a distalizing force on the posterior teeth.

Appliance
• Schwarz appliance

A removable orthodontic appliance introduced by A. M. Schwarz for expansion of the maxillary and/or the mandibular dental arch. The appliance consists of a horseshoe-shaped acrylic plate fitting along the lingual surface of the teeth and covering a large portion of the lingual aspect of the alveolar process or palate. A midline expansion screw is incorporated in the acrylic, and ball or arrowhead clasps on the deciduous and permanent molars provide the necessary retention. Although Schwarz developed a variety of "split-plate" appliances, the mandibular appliance is widely considered as the one that bears his name.

Appliance
• SPEED appliance

(Strite Industries, Ltd.) Fixed, self-ligating orthodontic appliance system developed by H. G. Hanson. The appliance consists of miniaturized self-ligating brackets with built-in flexible, escape-proof spring-clips that obviate the need for conventional elastomeric or stainless steel ligatures and permit light force delivery. The spatial relationship between the spring-loaded clip and the archwire allows a continuous dynamic interaction between them, while maintaining three-dimensional control of tooth position. [SPEED is an acronym of the words Spring-loaded, Precision, Edgewise, Energy and Delivery.]

[See Bracket, Self-ligating bracket]

Appliance
• Split-plate appliance

See Appliance, Expansion.

[See Appliance, Expansion appliance]

Appliance
• Stabilization appliance

[See Splint, Relaxation splint (Stabilization splint, Muscle relaxation splint)]

Appliance
• Straight-wire appliance (Preadjusted appliance, SWA)
A modification of the edgewise appliance, introduced by L. F. Andrews in 1972. In the standard edgewise appliance the orientation of the bracket slot was at right angles to the long axis of the tooth and the thickness of the bracket base was the same for all types of teeth. During treatment, bends were placed in the archwire to individually position each tooth in the buccolingual direction (in-out or first-order bends), as well as to idealize the angulation of the long axis of the tooth in the mesiodistal direction (tip or second-order bends) and in the buccolingual direction (torque or third-order bends).

In the straight-wire appliance this information is incorporated in the brackets and tubes for each individual tooth, by varying the thickness of the base and the angulation of the slot relative to the long axis of the tooth, in both the mesiodistal and buccolingual directions. As a result, a "straight" archwire can be used to ideally position the teeth, avoiding though not completely eliminating the need for placing such bends in the archwire. Accurate placement of the brackets on the teeth is of paramount importance with this appliance. Straight-wire appliances of various prescriptions (sets of characteristic values for each individual tooth) are available on the market.

[See Appliance prescription]

[See Appliance, Edgewise appliance (Standard edgewise)]

Appliance
• Teuscher-Stuckli activator/headgear combination appliance

A modified activator used in combination with a high-pull headgear. The appliance was introduced by U. M. Teuscher and P. W. Stuckli as a means to avoid the detrimental profile effects of cervical traction when treating Class II malocclusions in growing individuals. Buccal headgear tubes are incorporated in the interocclusal acrylic at the level of the maxillary second premolar or first molar. The vector of the high-pull headgear force is directed through a point midway between the estimated center of resistance of the maxilla and that of the maxillary dentition. In this way it is claimed that the best compromise is reached between a resulting counterclockwise rotation of the maxillary occlusal plane and a clockwise rotation of the maxilla itself, possibly maintaining the inclination of the maxillary occlusal plane. The design includes reduced palatal acrylic coverage to provide more space for the tongue. The acrylic covers the occlusal and incisal surfaces of the maxillary teeth to distribute the headgear force over the entire dentition. The labial bow can be substituted by torquing springs to counteract palatal tipping of the maxillary incisors. Long lingual flanges extend from the lower portion of the appliance to enhance forward positioning of the mandible. In addition, Fränkel-type lower lip pads may be added to enhance normal perioral muscle function. Finally, a jackscrew is added occasionally for controlled expansion.

Appliance
• Tip-Edge appliance
Fixed orthodontic appliance developed by P. C. Kesling as a combination of the Begg and the straight-wire appliance (marketed by TP Orthodontics). The appliance consists of specially designed brackets with modified slots that have the shape of an asymmetric bowtie. The brackets are equipped with auxiliary vertical slots that can receive a variety of auxiliaries, including rotation springs, uprighting springs, power pins and position indicators to facilitate bonding. The shape of the main slots allows tipping of the teeth during space closure (a basic principle of the Begg technique). After space closure the angulation of the teeth is idealized by uprighting springs (side-winders). When a rectangular archwire is used during this uprighting process, the beveling and the dimensions of the modified, fully programmed slot permit gradual expression of the torque to simultaneously control tooth inclination.

[See Appliance, Begg appliance (Light-wire appliance)]

Appliance  
• Tongue crib

[See Appliance, Crib ]

Appliance  
• Tri-helix appliance

A modification of the quad-helix, used in situations in which the constriction of the anterior maxilla is too severe to accommodate two helices in the anterior aspect of the appliance (e.g. in patients with a history of cleft lip and palate).

Appliance  
• Twin arch appliance (Twin wire appliance)

An early orthodontic fixed appliance introduced by J. Johnson in 1931. The appliance made use of the resilience of two thin-gauge stainless steel wires ranging in size from 0.09 inch (0.23 mm) to 0.014 inch (0.35 mm) in diameter. Two end-tubes were soldered onto the first molar bands, capable of receiving the twin wire strands. The bands on the remaining teeth carried special locks forming channels with a rectangular cross-section. The twin wires were held in the locks by special sliding caps. Differential crown or root movement was achieved by using two archwires of different sizes (one longer than the other) and by appropriately squeezing both into the lock so that they lie on top of each other (in a coronal-apical direction). Occasionally, a lingual arch also was used in conjunction with the appliance.

Appliance  
• Twin block appliance
Tooth-borne removable functional appliance that was developed by W. J. Clark. It consists of a maxillary and mandibular portion, which carry inclined planes constructed in such a way that an anterior displacement of the mandible and a certain amount of vertical separation of the arches are effected upon closure of the mouth. Due to the two-part design, the appliance is tolerated easily by the patient and thus increased wear is facilitated. The maxillary portion of the appliance includes capping of the molars, with an inclined plane at its mesial end. This plane engages a similar incline on the mandibular portion of the appliance, thus causing the mandible to assume the desired protruded position. Retention of the maxillary portion is achieved by modified Adams clasps that span the second premolars and first molars. A labial bow with U-loops also is included in the maxillary portion. A headgear can be attached to the maxillary portion of the appliance by inserting a facebow into special coils incorporated in the delta clasps. The occasional addition of a midline expansion screw can provide compensatory maxillary arch expansion as the anteroposterior relationship improves. The mandibular portion of the appliance carries capping in the premolar region only and is retained by delta clasps on the first premolars and C-clasps on the canines.

[See Clasp (Retention clasp), Delta clasp]

Appliance
• Two-by-four appliance (2x4)

A term denoting partial use of fixed orthodontic appliances, only including the 2 first permanent molars and the 4 permanent incisors. A 2x4 is most often used for treatment in the mixed dentition, e.g. for alignment, intrusion, or proclination of the incisors.

Appliance
• U-bow activator

A removable functional appliance developed by R. Karwetzky consisting of a maxillary and a mandibular part, which are connected by a U-shaped bow on either side. These U-bows allow gradual displacement of the mandible from its original position in small increments. The appliance exists in three variations, proposed for the treatment of Class II, Class III, or asymmetric malocclusions.

Appliance
• Universal appliance

An early fixed orthodontic appliance developed by S. R. Atkinson, combining some of the principles of edgewise and ribbon-arch appliances to achieve precise control of individual teeth in all planes of space. The appliance consisted of bands for all the teeth in both arches. Each band carried a bracket with two horizontal slots, of which the larger, occlusal slot opened occlusally and the smaller, gingival slot opened buccally. The occlusal slot could accommodate a ribbon arch of up to 0.015 x 0.028 inch (0.38 x 0.70 mm) in cross-section, or alternatively up to three 0.010-inch (0.25-mm) archwires. The wires for the gingival slot were 0.008 inch (0.20 mm) to 0.014 inch (0.35 mm)
in diameter. Special lock pins held the archwires in place. A lingual arch was used, which was secured in horizontal sheaths soldered on the lingual aspect of the molar bands.

Appliance
  • Van Beek appliance

A removable functional appliance/high-pull headgear combination, developed by H. Van Beek. The facebow of the headgear is embedded rigidly in the acrylic at the anterior aspect of the appliance and is its only metal part. The appliance provides labial acrylic coverage of the maxillary incisors.

Appliance
  • Vestibular shield (Vestibular screen)

A simple removable appliance made of 2- to 3-mm-thick acrylic or thermoplastic material, occupying the vestibule and extending posteriorly to the distal margin of the last erupted molar. The appliance can be constructed with the mandible placed in an anterior position so that the incisors are in an edge-to-edge relationship. The appliance is intended to eliminate an abnormal sucking habit or lip dysfunction, to establish a competent lip seal and to interrupt contact between the tip of the tongue and the lower lip, promoting maturation of the swallowing pattern. In patients with a persistent tongue thrust, the vestibular shield can be combined with a tongue crib.

[See Appliance, Oral screen]

Appliance prescription

The set of characteristic values (in degrees) for mesiodistal tip ("angulation"), buccolingual inclination ("torque"), and rotational offset, which are incorporated into each bracket for every individual tooth; the "specifications" of a fixed orthodontic appliance. The prescription of an orthodontic appliance usually is specified by the clinician at the time of placing the order with the manufacturer or distributor.

[See Appliance, Straight-wire appliance (Preadjusted appliance, SWA)]

Appliance setup

[See Bracket setup]

Appliance trimming
Selective grinding away of acrylic from a removable appliance at areas that contact the teeth. The purpose of this process is to guide tooth eruption and aid in the development of a proper arch form. Trimming is an important aspect of treatment with removable and functional appliances.

**Arch**

A structure with a curved or bow-like outline. The term sometimes is used in orthodontics as a synonym for archwire.

**SUBTERMS:**

**Arch**

- Alveolar arch

The arch formed by the ridge of the U-shaped maxillary and mandibular alveolar processes.

- Auxiliary arch

An accessory archwire commonly used in addition to the main or base archwire.

- Base arch

The main archwire occupying the bracket slots of a fixed orthodontic appliance system. Use of the term "base arch" implies the presence of other auxiliary arches or springs active at the same time.

- Closing-loop arch

An archwire in which closing loops are incorporated (unilaterally or bilaterally), commonly used for retraction of the incisors. A closing-loop arch usually is made out of full-dimension stainless steel wire in an attempt to maintain the inclination and angulation of the teeth as they are being retracted.

- Dental arch

The arch formed by the maxillary or the mandibular teeth,
when viewed from the occlusal.

Arch
• Horseshoe arch

Special type of transpalatal arch with the shape of a horseshoe, oriented in the horizontal plane.

Arch
• Intrusive arch

An archwire used as the main wire, or as an auxiliary in the segmented arch technique, to achieve leveling of the dental arch by intrusion of the incisors. An intrusive arch is activated for incisor intrusion by placing tip-back bends mesial to the molar tubes.

[See Arch, Utility arch]

Arch
• Lingual arch

A single, heavy-gauge orthodontic wire, adapted to the lingual aspect of (usually) the mandibular arch, attached to bands on the first permanent molars. Two U-loops, often bent into the wire mesial to the first molars, offer the possibility of adjustment in the sagittal direction. The lingual arch is generally used for stabilization (anchorage reinforcement), as a holding arch for space maintenance, for expansion, for increase of dental arch length or for anchorage when intermaxillary traction is used. Lingual arches can be of fixed (soldered) or fixed/removable design.

Arch
• Nance holding arch

Maxillary fixed appliance developed by H. N. Nance, consisting of a heavy palatal wire soldered to the palatal aspect of the first molar bands. The wire is directed from the molars anteriorly and is attached to an acrylic button that rests against the most superior and anterior aspect of the palatal vault. Used as a space maintainer, or as a means to reinforce anchorage.

Arch
• Overlay arch (Piggyback arch)
An auxiliary archwire added to the main (base) archwire, most commonly used to achieve transverse changes in the dental arch or individual tooth movements. An overlay arch can be inserted in the auxiliary slots or the headgear tubes of the molar attachments, or it may be simply tied onto the main archwire.

[See E-arch]

Arch
• Porter arch (W-arch)

Maxillary fixed/removable appliance consisting of a heavy-gauge (0.036 inch or 0.90 mm) transpalatal wire with a W-shaped configuration, secured to the palatal aspect of the first molar bands. It is used to achieve expansion of the maxillary dental arch and/or derotation of the molars.

Arch
• Transpalatal arch (TPA, Palatal bar, Goshgarian-type palatal arch)

Maxillary fixed or fixed/removable appliance consisting of a 0.036-inch (0.90-mm) or higher gauge wire that extends from one maxillary first molar, along the contour of the palate, to the maxillary first molar on the opposite side. The arch is adapted to the curvature of the palatal vault, so that it lies 2 to 3 mm away from the palatal mucosa. A U-loop, which usually is incorporated midway across its span, can be activated for expansion or constriction of the intermolar width. The TPA also is used commonly for anchorage reinforcement, for derotation of the molars, or for producing root movements of these teeth.

Arch
• Utility arch

A maxillary or mandibular continuous archwire bypassing the canines and/or premolars to achieve leveling of the arch and/or uprighting of the molars, or to function as a stopped arch for incisor proclination. The utility arch, which was introduced by R. W. Ricketts, usually is made out of
0.016 x 0.016-inch (0.41 x 0.41-mm) or 0.016 x 0.022-inch (0.41 x 0.56-mm) stainless steel or cobalt-chromium wire. The wire is stepped away from the occlusal plane between the first molars and lateral incisors for convenience and comfort. Avoiding engagement of the premolars and canines results in improved load/deflection properties because of the length of wire between the molar and incisor segments. The stepping of the archwire in a gingival direction in the buccal segments also reduces the risk of deformation during mastication. The utility arch can be used for movement of the incisors in the vertical and/or sagittal plane of space.

[See Arch, Intrusive arch]

Arch

• Stopped arch (Proclination arch, Advanced arch)

An orthodontic archwire with stops or loops (usually placed mesial to the first molar tubes) to procline the incisors, or to maintain the existing arch length.

Arch bars

Half-round, oval, round or flat wire bars, bent to fit the labial surface of the dental arches, in the cervical third of the crowns. Arch bars may carry special bases so they can be bonded to the teeth, or more commonly, they can be attached to them with interdental ligature wires. They may contain supporting elements, such as hooks or eyelets,
for attaching elastic bands or tie wires. Arch bars are used to facilitate intermaxillary fixation in orthognathic surgery, or for stabilization of fractures of the maxilla or mandible. Single arch bars also are used sometimes for stabilization of traumatized teeth.

**Arch coordination**

One of the aspects of fixed appliance orthodontic treatment by which it is made sure that the maxillary and mandibular dental arches fit harmoniously with each other, with corresponding arch forms and good anterior and buccal overjet.

[See Archwire coordination]

**Arch depth**

The perpendicular distance in the midsagittal plane from the most labial midpoint between the central incisors to a line connecting the distal surfaces of two posterior corresponding teeth in a dental arch, usually the second premolars (or second deciduous molars).

**Arch form**

The shape of an individual dental arch, or of an archwire formed to fit or shape that arch. The arch form can be parabolic, hyperbolic, ellipsoidal, square, tapering, V-shaped etc.

**Arch length (Arch perimeter)**

A measurement of space available in the dental arch, for alignment of the teeth.
Arch length discrepancy

A difference between the space available in the dental arch and the space required to align the teeth. An arch length discrepancy can either be in the form of a deficiency or an excess of arch length.

SUBTERMS:

Arch length deficiency (Crowding)
Arch length excess (Spacing)

• Arch length deficiency (Crowding)

A negative difference between the space available in the dental arch and the space required to align the teeth. With regard to the severity of space deficiency, crowding is divided into three categories: first-degree (mild) crowding, second-degree (moderate) crowding and third-degree (severe) crowding.

The classification into primary, secondary and tertiary crowding takes into account the etiology of the space deficiency.

Primary (hereditary) crowding is
determined genetically and is caused by disproportionately sized teeth and jaws.

Secondary crowding is an acquired anomaly caused by mesial drifting of the posterior teeth after premature loss of deciduous teeth in the lateral segments and/or lingual or distal displacement of the anterior teeth.

The etiopathogenesis of tertiary crowding is still under debate. This type of crowding—primarily in the mandibular anterior teeth—occurs during and after adolescence and was previously thought to be associated with third molar eruption. Others attribute the anomaly to differential anteroposterior growth of the maxilla and mandible terminating at different times, in combination with differential rotation of the maxilla and mandible with growth. Malocclusions with crowding are more common in modern populations than those involving interdental spacing and wide arches.

• Arch length excess (Spacing)

A positive difference between the space available in the dental arch and the space required to align the teeth. As with crowding, a distinction can be made between primary, secondary and tertiary spacing.

Primary (hereditary) spacing is determined genetically and is caused by disproportionately sized teeth and jaws, including tooth agenesis.

Secondary spacing is an acquired anomaly caused by drifting of teeth, subsequent to loss of a permanent tooth.

Tertiary spacing is caused by bone loss due to periodontal disease, resulting in a disturbance of the equilibrium of forces acting on the teeth and associated tooth movement.
**Arch width**

The breadth of the dental arch, determined by measuring distances between corresponding contralateral teeth (e.g. intercanine width, intermolar width).

**Archwire (Arch wire)**

A wire engaged in orthodontic attachments that are affixed to the crowns of two or more teeth to cause or guide tooth movement.

**SUBTERMS:**

- Continuous archwire
- Finishing archwire
- "Full dimension" archwire
- Multiloop archwire
- Sectional archwire (Segmental archwire)
- Stabilizing archwire
- Surgical archwires

An archwire that engages, through crown attachments (brackets and tubes), many or all of the erupted teeth in the maxillary or mandibular dental arch (i.e. from molar to molar).
• Finishing archwire

The archwire used in the finishing stage of treatment.

Archwire (Arch wire)
• "Full dimension" archwire

A large rectangular archwire that will practically "fill" the bracket slot. Usually referring to an 0.017 x 0.025-inch (0.43 x 0.64-mm) or 0.018 x 0.025-inch (0.46 x 0.64-mm) archwire, when a 0.018 x 0.025-inch (0.46x 0.64-mm) slot size is used, or an 0.021 x 0.025-inch (0.53 x 0.64-mm) archwire when a 0.022 x 0.028-inch (0.56 x 0.70-mm) slot is used.

Archwire (Arch wire)
• Multiloop archwire

A stainless steel archwire with loops of various configurations bent in the interbracket spaces, to increase the flexibility of the wire to facilitate bracket engagement. The use of multiloop archwires was very common in earlier days of orthodontics, when the only way to reduce the load/deflection characteristics of the appliance was to increase the length of wire between brackets. It has now been largely replaced by multistrand wires, or wires made of various superelastic materials.

[See Loop]

[See Load/deflection rate (Force/deflection rate)]

Archwire (Arch wire)
• Sectional archwire (Segmental archwire)

An archwire that engages only a few teeth within an arch (e.g. only the four incisors, or only the teeth in a posterior dental segment.)

[See Mechanics, Segmental arch mechanics (Sectional mechanics)]

Archwire (Arch wire)
• Stabilizing archwire

A stiff, full-dimension archwire, used to maintain the actual position of the teeth (e.g. prior to orthognathic surgery), or to consolidate a number of teeth, forming a large anchorage segment.

Archwire (Arch wire)
• Surgical archwires

The stabilizing archwires that are in place during the orthognathic surgical procedure. They usually are rectangular stainless steel wires to which hooks have been added in the interbracket spaces to
facilitate intermaxillary fixation. Surgical archwires must fit passively to be effective. If they create any tooth movement after the impressions are made for the model surgery and for splint construction, the splint will no longer fit.

**Archwire coordination**

The process of superimposing the maxillary and mandibular archwires prior to placing them in the patient's mouth, to ensure that their arch form fits with each other, with the objective of achieving coordinated dental arches.

[See Arch coordination]

**Archwire cross-section**

Various diameters and cross-sectional shapes of orthodontic archwires exist. The ones most commonly used, specified by the size of the cross-section in inches (mm) are:

Round:

- 0.012 inch (0.30 mm),
- 0.014 inch (0.35 mm),
- 0.016 inch (0.40 mm),
- 0.017 inch (0.43 mm),
- 0.018 inch (0.46 mm),
- 0.019 inch (0.48 mm),
- 0.020 inch (0.51 mm)

Square:

- 0.016 x 0.016 inch (0.41 x 0.41 mm),
- 0.017 x 0.017 inch (0.43 x 0.43 mm),
- 0.018 x 0.018 inch (0.46 x 0.46 mm),
- 0.019 x 0.019 inch (0.48 x 0.48 mm)

Rectangular:
0.016 x 0.022 inch (0.41 x 0.56 mm),
0.017 x 0.022 inch (0.43 x 0.56 mm),
0.017 x 0.025 inch (0.43 x 0.64 mm),
0.018 x 0.025 inch (0.46 x 0.64 mm),
0.019 x 0.025 inch (0.48 x 0.64 mm),
0.020 x 0.025 inch (0.51 x 0.64 mm),
0.021 x 0.025 inch (0.53 x 0.64 mm).

**Archwire locks**

[See Gurin lock]

**Archwire stop**

A bend, auxiliary attachment, or occasionally a drop of solder placed on an archwire to prevent it from sliding mesially or distally through the orthodontic attachments.

**Arthritis**

Inflammation of a joint, usually accompanied by pain.

**SUBTERMS:**

- Hypertrophic arthritis
- Juvenile rheumatoid arthritis (JRA, Still's disease)
- Rheumatoid arthritis
**Arthrography of the TMJ**

Radiographic visualization of the TMJ.

**SUBTERMS:**

- Single-contrast arthrography
- Double-contrast arthrography
- Single-space arthrography
- Double-space arthrography

**Arthrography of the TMJ**
- Single-contrast arthrography

Arthrography following injection of a radiopaque contrast medium into the joint space(s) to determine the location and integrity of intra-articular soft tissue structures, including disc position, soft tissue contours, presence of perforations, joint motion, intra-articular free bodies and adhesive capsulitis.

**Arthrography of the TMJ**
- Double-contrast arthrography

A procedure similar to single-contrast arthrography but with injection of a small amount of radiopaque contrast agent followed by inflation of the joint with air.

**Arthrography of the TMJ**
- Single-space arthrography

Contrast arthrography with injection of a radiopaque contrast medium into either the upper or the lower synovial joint compartment of the TMJ.

**Arthrography of the TMJ**
- Double-space arthrography

Contrast arthrography with injection of a radiopaque contrast agent into both the upper and lower synovial joint spaces.
Arthrokinetics of the TMJ

Temporomandibular joint motion.

SUBTERMS:

Depression of the mandible
Distraction of the mandible
Elevation of the mandible
Lateral excursion of the mandible
Protrusion of the mandible
Retrusion of the mandible

Arthrokinetics of the TMJ
• Depression of the mandible

Movement of the mandibular alveolar process away from that of the maxilla.

Arthrokinetics of the TMJ
• Distraction of the mandible

Separation of the surfaces of the TMJ by extension, without injury or dislocation of the parts.

Arthrokinetics of the TMJ
• Elevation of the mandible

Movement of the mandibular alveolar process toward that of the maxilla.

Arthrokinetics of the TMJ
• Lateral excursion of the mandible

Right or left movement of the mandible away from the median plane.

[Compare with Mediotrusion]

[See Laterotrusion]

Arthrokinetics of the TMJ
• Protrusion of the mandible
Anterior mandibular movement with bilateral forward condylar translation.

Arthrokinetics of the TMJ
• Retrusion of the mandible

Posterior mandibular movement with bilateral backward condylar translation.

**Arthroscopy**

Direct visualization of a joint with an endoscope.

**Arthrosis**

Degeneration of a joint, evidenced by bony alterations.

**Articular disc (Intra-articular disc, Meniscus)**

A thin biconcave pad of dense fibrous connective tissue, interposed between the temporal bone and the mandibular condyle, that divides the articular space into an upper and a lower compartment. It is devoid of any blood vessels or nerve fibers and its anterior and posterior borders (bands) are thick, whereas its central part (where the condylar head fits) is thinner. Anteriorly it may be attached to fibers of the superior head of the lateral pterygoid muscle. Posteriorly it attaches to a structure consisting of loose connective tissue, which is richly vascularized and innervated, known as the retrodiscal tissue (retrodiscal lamina). The medial and lateral aspects of the disc are attached to the lateral poles of the condyle by the collateral ligaments, which permit rotational movement of the disc on the condyle during opening and closing of the mouth.

**Articular eminence**

A convex bony ridge situated immediately anterior to the glenoid fossa of the temporal bone, that also is involved in the temporomandibular joint. The degree of convexity of the articular eminence is highly variable but important because the steepness of this surface dictates the pathway of the condyle when the mandible is positioned anteriorly.

**Articulator**

A mechanical instrument that represents the temporomandibular joints and the jaws, to which maxillary and mandibular casts may be attached, with the intention of reproducing mandibular movements. Depending on the amount of adjustments that an articulator can accommodate (which increases the accuracy and precision of the simulation of the clinical situation), there are non-adjustable, semi-adjustable (anatomic) and fully adjustable (gnathologic) articulators.
Articulators have all the mechanical limitations imposed by their construction. The various types and models show great variation in their function depending on the way they were constructed and the occlusal concepts on which they were based.

SUBTERMS:

Arcon articulator
Non-arcon articulator

Association

A recognized pattern of morphological defects or malformations that currently is not considered to constitute a syndrome or an anomalad, but that may be reclassified as a syndrome or as an anomalad as knowledge advances.

Atherton’s patch

The small red triangular patch of thin and non-keratinized gingival epithelium often observed on the side opposite from the direction in which a tooth is moving. The first report of this phenomenon was made by J. D. Atherton and N. W. Kerr in 1968, associated with the mesial aspect of maxillary canines being distalized after extraction of the first premolars.

Attachment, Gingival

The part of the gingiva that is bound down to the underlying cementum and bone.

Attachment, Orthodontic

A precision component that can be welded or soldered to a band, or bonded directly to a tooth, to facilitate the application of forces during orthodontic treatment. The general term encompasses items such as brackets, tubes, buttons, eyelets, and "pigtail" attachments.
Attrition (Dental wear, Occlusal wear)

Loss of tooth structure due to repetitive physiological or parafunctional occlusal contact between the teeth. Attrition results in the formation of flat areas on the surface of teeth (wear facets) that have a polished appearance and readily reflect light. Although a certain degree of attrition is considered physiological with age, the presence of deleterious parafunctional habits such as bruxism may accelerate it. Attrition also affects the interproximal surfaces of the teeth.

[Compare with Abrasion]

Austenite

The face-centered cubic (FCC) crystalline structure of iron and steel, or the body-centered cubic (BCC) structure in nickel-titanium alloys, at higher temperatures. In stainless steels, certain elements such as nickel maintain the austenitic structure at room temperature. Appropriate cooling of nickel-titanium alloys can induce a transformation to a close-packed hexagonal martensitic phase (martensitic transformation). The transformation from austenite to martensite and vice versa is what gives alloys such as nickel-titanium the characteristic properties of "shape memory" and "superelasticity" ("pseudoelasticity").

[See Martensitic transformation]

Autorotation (of the mandible)

The rotation of the mandible around the condylar axis (or an axis in the region of the condyles), after repositioning of the osteotomized maxilla. Mandibular autorotation can be simulated approximately during preparation of the surgical prediction tracing by rotating the mandibular template until the mandibular teeth contact the repositioned maxillary teeth. The same can be accomplished during model surgery using an articulator or one of the various operation simulation systems. This significant step in the surgical treatment planning process will determine the feasibility of a single-jaw (maxilla only) procedure, versus the need for bimaxillary surgery.

For example, in a patient with a Class II, Division 1, anterior open bite malocclusion, it may be feasible to achieve an ideal overjet/overbite relationship and to decrease the elongated lower anterior face height just by a maxillary differential impaction and subsequent mandibular autorotation, without the need for a mandibular osteotomy.

Avascular necrosis

Bone infarction not associated with sepsis, but with circulatory impairment (occlusion of blood vessels), leading to bony necrosis.
**Avulsion**

The complete separation of a tooth from its alveolus as a result of trauma.

**Axes, System of**

[See Global reference frame]

**Axis of rotation**

The line about which rotation of a three-dimensional object actually occurs.

[See Center of rotation (CRot)]

**Banding**

The process of cementing an orthodontic band in place, which involves the selection of the appropriate band for a certain tooth, its fitting and adaptation and, finally, its fixation on the tooth by means of cement.

**Basilar kyphosis (Kyphosis of the cranial base)**

A term indicating a reduced cranial base angle (NSBa).

[Compare with Platybasia]

**Behavioral therapy**

An attempt to change the attitude and habits of an individual, without the use of appliances or medications; a means to improve patient cooperation and compliance. Behavioral therapy is performed under the assumption that all elements of behavior can be learned. Essential in this approach is a clear explanation of the rationale of the therapy and the importance of the necessary motivation and persistence.

**Bending test**

Experimental setup to determine the material properties of a specimen in bending. This involves the measurement of angular or linear deflection of an archwire segment, resulting from a bending moment or an applied force. A bending test designed for orthodontic wires is the American National Standards Institute/American Dental Association (ANSI/ADA) Specification No 32.

**Bends (Archwire bends)**
Localized permanent deformations, placed into an archwire, that change its direction and/or orientation from the original. Bends are added to an archwire for various reasons. Some bends are placed without the purpose of generating any forces (e.g. bends placed to account for discrepancies in bracket positioning or tooth anatomy, to bypass teeth that will not be included in the archwire, or to avoid possible deformation of the archwire due to chewing). However, most bends are added with the purpose of generating a force system necessary for a specific tooth movement. Archwire bends were an indispensable part of treatment with the standard edgewise appliance, whereas with the straight-wire appliance they are supposed to be either avoided or greatly reduced. According to the orthodontic coordinate system introduced by C. H. Tweed, bends on an orthodontic wire are roughly categorized as 1st-order, 2nd-order and 3rd-order bends.

SUBTERMS:

- **Artistic bends** (Esthetic bends)
  - Bends to position anterior teeth for optimal esthetic appeal. (Usually referring to second-order bends on anterior teeth).

- **Distal-end bends** (Cinching bends, Distal-end stops)
  - Bends (usually in a gingival and/or medial direction) made on the archwire (after it is placed in all the brackets), distal to the terminal attachment, to secure the archwire in place and prevent it from shifting through the brackets and causing soft tissue impingement during the time interval between patient visits. Distal-end bends are also useful in avoiding excessive proclination of the anterior teeth during leveling.

[See Cinching (of the archwire)]

- **First-order bends** (Offsets, In-out bends, Bayonet bends)
Labiolingual offsets (step bends) in the archwire in the horizontal plane (in the plane of the wire), to accommodate for variations in the prominence and contour of labial/buccal surfaces of individual teeth. Typical locations along the archwire in which first-order bends were placed with the standard edgewise appliance were mesial to the maxillary lateral incisors (insets or step-in bends), canines (offsets, canine eminence bends, curvature or step-out bends) and first molars (offsets, step-out or molar bayonet bends). [Note: Vertical step bends that do not change the angulation of a tooth (e.g. step-up mesial and equal step-down distal to a bracket) are also considered first-order bends.]

Bends (Archwire bends)
- Second-order bends (Tip bends)

Offsets in the archwire in the vertical plane, to change the angulation (mesiodistal tipping) of a tooth.

Bends (Archwire bends)
- Step bends

Labiolingual or occlusogingival offsets in an archwire, in such a way that the segments of the wire on either side of the bend remain parallel to each other. A step bend generates equal and opposite forces and moments of equal magnitude and identical sense between the two teeth adjacent to it (corresponding to Burstone’s geometry I). The magnitude of these forces and moments depends on the size of the step, the type and size of wire and the interbracket distance. Unlike V-bends, the force system created by a step bend remains practically unaffected by changing the location (mesiodistal position) of the step bend along the span between the two brackets.

[Compare with Bends (Archwire bends), V-bends]
• Stop bends

Bends that serve as archwire stops to keep the arch length constant, or to maintain the actual position of certain teeth.

Bends (Archwire bends)
• Third-order bends (Torquing bends)

Twists in a rectangular archwire, placed when a change of the buccolingual or labiolingual inclination of specific teeth is desired.

Bends (Archwire bends)
• Tip-back bends

V-bends placed to tip teeth distally (as is typically done during the anchorage preparation stage of the Tweed technique).

Bends (Archwire bends)
• Tip-forward bends

V-bends placed to tip teeth mesially.

[Compare with Bends (Archwire bends), Tip-back bends]

Bends (Archwire bends)
• Toe-in bends

V-bends in the horizontal plane, typically placed at the ends of an archwire, to achieve derotation or constriction of the terminal molars.
Bends (Archwire bends)
• V-bends (Gable bends)

1. "V"-shaped bends with multiple applications, such as to avoid tipping of teeth into extraction sites during space closure. V-bends generate different force systems between two teeth, or two segments of teeth, depending on the location of the "V" along the wire (in relation to the two brackets). When the V-bend is in the center of the interbracket distance, the created force system involves equal and opposite moments between the teeth (corresponding to Burstone’s geometry VI). [Note: According to the above definition, a V-bend changes the orientation of the long axis of the wire (i.e. the segment of the wire distal to the bend is no longer parallel with that mesial to it)].

2. The term V-bend occasionally is mentioned to denote a V-shaped stop (lug) bent into the archwire, maintaining the original wire orientation distal to it, as it is mesial to the bend.

[See Burstone’s geometry classes]
[See Archwire stop]

**Bennett angle**

On a lateral mandibular excursion, the non-working side condyle moves inferiorly, anteriorly and medially. The projection of this trajectory on the horizontal plane creates an angle with the sagittal plane, called the Bennett angle.

**Bennett movement**

Lateral translation (sideshift) of the working side condyle during a lateral mandibular excursion.

[See Bennett angle]
Beta position

The posterior component of an orthodontic spring, or the posterior point of attachment of a spring.

[Compare with Alpha position]

Beta-titanium alloy (TMA, b-Ti, Titanium-molybdenum alloy)

A group of titanium-based alloys in which the elevated temperature body-centered cubic beta phase (crystalline structure) is stable at room temperature, rather than the hexagonal close-packed alpha phase. One such alloy, made of 77.8% titanium, 11.3% molybdenum, 6.6% zirconium, and 4.3% tin, was introduced to orthodontics in 1980 by C. J. Burstone and J. A. Goldberg, under the commercial name TMA (Ormco/Sybron). TMA has a modulus of elasticity which is approximately 40% of that of stainless steel and double that of Nitinol. As well, it has excellent resilience and reasonably good formability, which allows stops and loops to be bent into the wire. In addition, beta-titanium wires can be spot-welded. However, its drawback is its high friction coefficient. The properties of TMA make it a good choice for fabrication of auxiliary springs and for intermediate and finishing archwires.

Bidimensional technique

A fixed-appliance orthodontic treatment approach, developed by A. A. Gianelly, that is aimed at retraction of maxillary incisors by means of sliding mechanics, with good control of their inclination. This is attempted by using a 0.022-inch (0.56-mm) non-torqued bracket setup and a 0.016 x 0.022-inch (0.41 x 0.56-mm) stainless steel archwire, which has ninety-degree bends immediately distal to the lateral incisors, so as to fit into the incisor slots in a "ribbonwise" fashion. Alternatively, the incisors are bonded with 0.018-inch (0.46-mm) brackets and the canines, premolars and molars with 0.022-inch (0.56-mm) brackets, while an edgewise 0.018 x 0.025-inch (0.46 x 0.64-mm) stainless steel wire is used for retraction with sliding mechanics. The filling of the slot of the incisor brackets by the full-dimension archwire is supposed to result in good control of their root position and minimal lingual tipping as a side effect of retraction.

Bifid uvula

A congenitally "split" uvula; a mild form of cleft palate.

Bilateral

Occurring on both sides.

[Compare with Unilateral]
**Biocompatibility**

The ability to exist in harmony with the surrounding biological environment. The absence of all material properties that can harm biological tissues. In general, biocompatibility is measured on the basis of localized cytotoxicity (such as pulpal or mucosal response), systemic responses, allergenicity and carcinogenicity.

**Biofeedback**

A method of behavioral modification in which signals are relayed to the patient regarding the status of certain physiologic functions such as muscle activity, heart rate and blood pressure.

**Bite block**

An interocclusal acrylic shelf that can be incorporated in a functional or other removable appliance to contact the occlusal surfaces of (usually) the posterior teeth. Posterior bite blocks that are high enough to impinge into the freeway space are advocated by some clinicians for the treatment of patients with a long anterior lower facial height and an anterior open bite tendency.

[See Appliance, Harvold-Woodside activator]

**Bite collapse (Posterior bite collapse)**

Reduction of the occlusal vertical dimension through (partial) loss or drifting of the posterior supporting dentition, often resulting in protrusion (flaring) of the maxillary anterior teeth.

**Bite plane**

The horizontal shelf-like part of a bite plate, on which the teeth touch. Bite planes also can be used in a fixed design (i.e. bonded to the teeth, or attached to a palatal arch).
Bite plate

A removable orthodontic appliance designed to (temporarily) disengage the teeth and/or prevent selected teeth from occluding. A posterior bite plate commonly is used to disclude the anterior teeth and thus facilitate correction of an anterior crossbite. Anterior bite plates can be used to increase the lower anterior face height, to facilitate tooth movement and to correct a deep bite by extrusion of posterior teeth.

Bite raising

The increase of lower face height by extrusion of the posterior teeth, as can be accomplished, for example, by a maxillary anterior bite plate contacting the incisal edges of the mandibular anterior teeth, while the opposing posterior teeth are kept apart and are free to erupt. Alternatively, extrusion of the posterior teeth can be obtained by using an anterior bite plane and fixed appliances, in combination with vertical posterior elastics.

[See Opening of the bite]

Bite registration (Wax bite)

A wax record of an occlusal relationship between the maxilla and mandible, used in the trimming of orthodontic casts or in the mounting of casts on an articulator. A wax bite usually is taken in centric occlusion, or in centric relation (if there is a large mandibular CR-CO shift).

[See Construction bite]

Bolton analysis
A method developed by W. Bolton (1958) for the evaluation of mesiodistal tooth size discrepancies between sets of corresponding maxillary and mandibular teeth. The analysis distinguishes between the "overall ratio," which involves all permanent teeth except the second and third molars, and the "anterior ratio," which encompasses only the six anterior teeth of each jaw. For this analysis it is assumed that the relatively smaller tooth material is the correct one. A table of standard values lists the tooth width value in the opposing arch that is ideally related to this given correct value. The difference between the ideal and actual dental width in the arch with the excess value gives an estimate in millimeters of the severity of tooth size discrepancy between the arches.

[See Tooth size discrepancy (Bolton discrepancy)]

**Bolton-Brush Growth Study**

The Bolton Growth Study is a longitudinal study of over 4,000 subjects from birth to adulthood, which was started in 1929 under the direction of B. H. Broadbent, Sr., at Case Western Reserve University in Ohio. The records that were obtained included lateral and P-A cephalometric radiographs, hand-wrist radiographs and dental casts, as well as nutritional, dental and medical health status data. Approximately 2,900 of the subjects of the Bolton study were also enrolled in the Brush study, which involved radiographs of the entire skeleton taken on a yearly basis, as well as extensive anthropometric, nutritional, health and psychological data, also recorded annually. All records of subjects in both studies are currently housed and curated through the Bolton-Brush Growth Study Center at Case Western Reserve University.

**Bonding**

The attachment (adhesion) of a material directly onto a tooth by means of a bonding agent. In common orthodontic use the term denotes the process by which orthodontic attachments are affixed to the teeth, which has become a routine part of fixed appliance therapy. The most commonly used bonding techniques involve acid etching and composite resin, or conditioning and glass-ionomer cement.

**SUBTERMS:**

- Direct bonding
- Indirect bonding
- Sequential bonding

**Bone**

A dense type of connective tissue, consisting of cells in a matrix of intercellular ground substance and collagen fibers. This organic matrix is impregnated with the mineral component of bone, consisting mainly of calcium phosphate and hydroxyapatite, which imparts rigidity to bone. Bone is
a highly dynamic type of tissue that constantly remodels. Modeling and remodeling of bone constitutes the basis of orthodontic tooth movement.

SUBTERMS:

Alveolar bone
Basal bone
Bundle bone
Cancellous bone
Cartilaginous bone (Endochondral bone)
Compact bone (Dense bone)
Cortical bone
(Intra)membranous bone
Lamellar bone
Woven bone

**Bone apposition**

Addition of new bone to bony surfaces by osteoblastic activity.

**Bone plate**

[See Fixation plate]

**Bone resorption**

The removal of bone by osteoclastic activity.

SUBTERMS:

Direct resorption (Frontal resorption)
Undermining resorption (Indirect resorption)

Bonwill triangle
An equilateral triangle, each side of which is supposed to be 4 inches (102 mm) long, as advocated by W. G. A. Bonwill in 1858. The triangle is formed by connecting the medial contact point of the mandibular central incisors (or the midline of the residual mandibular alveolar ridge) to the centers of the condyles.

Boot loop
[See Loop]

Border movements (of the mandible)
Movements of the mandible at the boundary or margin of the envelope of movement, as determined by the joint anatomy and function. All other mandibular movements take place within the limits of the border movements.

Brachycephalic
Anthropometric term used to denote an individual with a larger than average cranial width; having a cephalic index greater than 81. Brachycephaly may result from premature synostosis of the coronal suture.

[Compare with Dolichocephalic]
Bracket

Precisely fabricated orthodontic attachment made of metal, plastic or ceramic material, which can be bonded to a tooth or welded to a band. It carries a horizontal and/or a vertical channel of standard size, called a "slot," that can receive an archwire or other orthodontic spring as part of a fixed orthodontic appliance. The size and shape of the slot vary with the orthodontic technique practiced and the type of appliance used. The base of the bracket usually contains a welded mesh or other retentive structure to increase bonding strength.

[See Bracket slot]

[See Bracket setup]

[See Bracket wings]

SUBTERMS:

Broussard bracket
Ceramic bracket
Edgewise bracket
Esthetic bracket (Clear bracket)
Extraction series bracket
Fully programmed bracket
Lewis bracket
Metal bracket
Plastic bracket
Pre-angulated bracket
Pre-torqued bracket
Self-ligating bracket
Single bracket (Single-width bracket)
Twin bracket (Siamese bracket, Double-width bracket)

**Bracket position indicator**

A disposable, color-coded plastic attachment that is provided by the manufacturer with some types of brackets. It is meant to facilitate bracket identification, as well as assist with the occlusogingival placement and axial orientation of the bracket during bonding.

**Bracket prescription**
[See Appliance prescription]

**Bracket setup**

Usually referring to the size of the bracket slot. The term "0.018-inch (0.46-mm) setup" refers to a bracket slot size of 0.018 x 0.025 inch (0.46 x 0.64 mm) and the term "0.022-inch (0.56-mm) setup" refers to a slot size of 0.022 x 0.028 inch (0.56 x 0.70 mm).

[See Appliance prescription]

**Bracket slot**

A standard component of an orthodontic bracket. A precisely fabricated horizontal and/or vertical channel, which can receive an archwire or other orthodontic mechanism as part of orthodontic treatment. The size and shape of the slot vary with the orthodontic technique practiced and the type of appliance used. The two bracket slot sizes most commonly used today, are 0.018 x 0.025 inch (0.46 x 0.64 mm) and 0.022 x 0.028 inch (0.56 x 0.70 mm).

**Subterms:**

Main slot
Vertical slot

**Bracket slot engagement**

A measure of the play between the orthodontic archwire and bracket slot.

[See "Play" of an orthodontic wire in the bracket slot]
Bracket width

The mesiodistal dimension of an orthodontic bracket.

Bracket wings

Four projections (only two, in a single bracket) extending from the center of the bracket in a mesial-occlusal, distal-occlusal, mesiogingival and distogingival direction, creating undercuts that facilitate retention of the elastic or stainless steel ligatures that secure the archwire in the bracket slot.

Brazing

[See Soldering]

Brittle

A material exhibiting little or no permanent deformation before fracture. In other words, a brittle material fractures at or near its proportional limit.

Brittleness

The relative inability of a material to sustain plastic deformation before it fractures.

Bruxism

A diurnal or nocturnal parafunctional activity that includes clenching, bracing, gnashing and grinding of the teeth. Bruxism is a common cause of dental wear, muscle hypertrophy, pain and fatigue, and damage to the supporting tissues. It also is associated frequently with temporomandibular joint problems. Some consider occlusal interferences as a major factor in its etiology, whereas others believe that it is a centrally mediated phenomenon, related to emotional tension and stress. In absence of subjective awareness, bruxism can be diagnosed from the
presence of shiny facets that are not generated by masticatory function. Bruxism can be observed through sleep laboratory recordings.

**Bruxism splint**

[See Nightguard (Bruxism appliance)]

**Buccally**

In the direction of the cheeks.

**Buccolingually**

In a mediolateral direction, perpendicular to the sagittal plane (along the z-axis), for posterior teeth. When referring to anterior teeth, the term "labiolingually" is appropriate.

[See Global reference frame]

[See Labiolingually]

**Buccoverison**

Buccal inclination of a tooth or a group of teeth.

**Burlington Growth Study**

A prospective longitudinal investigation that was started in 1952 in Burlington, Ontario, Canada, by R. E. Moyers of the Faculty of Dentistry, University of Toronto, under the responsibility of F. Popovitch. The 1,258 children in the Burlington sample represented 85% to 90% of the children in Burlington, within the specified ages, at the time the study was started. By the time the data collection was completed in 1971, the population of Burlington had risen to 90,000 (from an initial 9,000 in 1952). Records were collected annually from age 3 to 21 years. The records consisted of medical history, periodontal evaluation, six cephalometric radiographs, one hand-wrist radiograph, impressions for dental casts, intraoral radiographs (where necessary), height and weight records, anthropometric data, social histories and electromyographic records for some subjects. The entire material is currently housed at the Burlington Growth Centre, Faculty of Dentistry, University of Toronto.

**Burstone’s geometry classes**

When two teeth or two tooth-segments are connected by a straight wire fully engaged in both brackets, the generated force system varies depending...
on the relative angulation of the two brackets. There are six different possibilities (6 geometry classes) as described by C. J. Burstone and H. A. Koenig (1974), which are independent of the interbracket distance. The geometries are based on the ratio between the angles (JA of the anterior bracket and (JB of the posterior bracket with respect to a straight line passing through the centers of the two brackets. In the description of the six geometries that follows, (JA is always (by convention) the smaller of the two angles.

SUBTERMS:
Burstone’s geometry classes
  • Geometry I

  In Class I geometry both brackets are angulated in the same direction and by the same amount (JA/JB = 1). The same situation is created when a straight wire is inserted between two brackets, which lie at different vertical heights, with parallel slots (or equivalently, when a step bend is placed on a wire between two aligned brackets). The force system generated in this situation consists of two equal and opposite forces and two moments of equal magnitude and the same sense. Since the moments at A and B are equal in magnitude, the ratio MA/MB = 1. Although the magnitude of the moments may vary depending on the size of the vertical discrepancy (step) and the interbracket distance (assuming the material and size of the wire segment is always constant), the ratio MA/MB always remains +1 in Class I geometry.

Burstone’s geometry classes
  • Geometry II

  In Class II geometry, both brackets are angulated in the same direction but the angle of the A bracket with the axis connecting the centers of the two brackets is half the size of that of the B bracket (JA/JB = 0.5). As in geometry I, two equal and opposite forces are created at the positions A and B, as well as two moments of the same sense. The magnitude of the moment at A is 0.8 times that of the moment at B (MA/MB = 0.8); thus it is reduced with respect to the value developed in geometry I. Since the SM is reduced, the magnitudes of the forces are also reduced.

Burstone’s geometry classes
  • Geometry III

  This geometry is created when the slot of the bracket A is parallel to the line connecting the centers of the two brackets (JA = 0, and consequently (JA/JB = 0). A straight wire engaged in the bracket slot at A would thus pass through the center of the bracket B. As in the first two geometries, two equal and opposite forces will be produced at the brackets A and B, as well as two moments of the same sense. In this situation, the magnitude of the moment at the bracket A is only half of that at the bracket B (MA/MB = 0.5). The magnitudes of both forces and moments are reduced with respect to those developed in geometry II.
Burstone's geometry classes
• Geometry IV

In this situation the ratio JA/JB is -0.5. In other words, the bracket at position A is angled one-half of the bracket at the position B (and in the opposite direction) relative to the axis connecting the centers of the two brackets. The wire is now said to be tied - to the A bracket - at the "point of dissociation". This means that forces are independent from moments at position A, where only a force is present and no moment. The total force system that is produced by tying a straight wire into two brackets with this geometry includes equal and opposite forces at the two brackets and a moment at B, with no moment at A (MA/MB = 0). The SM and the magnitudes of the forces are further reduced in this geometry compared to the previous ones.

Burstone's geometry classes
• Geometry V

Class V geometry describes a situation with a ratio JA/JB of -0.75. In other words the two brackets still have opposite angulation (as in geometry IV), but the bracket A is now angulated 75% as much as the bracket B relative to the axis connecting the centers of the two brackets. In this situation the moment at bracket A is opposite in sense to that of the moment generated at bracket B, and the ratio between them is MA/MB = -0.4. The magnitude of MB is reduced further, as are the magnitudes of the forces acting on the two brackets.

Burstone's geometry classes
• Geometry VI

In this geometry the two brackets are tipped towards each other by an equal amount (JA/JB = 1). The force system created consists of equal and opposite moments at the two brackets. No forces are generated. SM, the sum of all the moments, is equal to zero and the ratio MA/MB is equal to 1.

Button

A small, mushroom-shaped orthodontic attachment that can be bonded directly onto a tooth or welded on a band. Buttons are mainly used as handles for elastic traction.
[See Attachment, Orthodontic]

Calculus (Tartar)

Mineralized bacterial plaque, strongly attached to the tooth surface. According to its location there are two general types: supragingival and subgingival.

Callus
The newly formed tissue (composed of varying amounts of fibrous tissue, cartilage and bone) that initially connects the bony fragments where a fracture has occurred.

**Camouflage orthodontic treatment**

The treatment of malocclusions with underlying mild to moderate skeletal jaw discrepancies, which achieves a good dental occlusion (Class I canine relationship and an ideal overjet and overbite), through extraction of certain teeth, to mask the skeletal problem. This type of treatment should be performed only if it will not have a harmful effect on facial esthetics, and if growth modification or orthognathic surgery are not applicable or not accepted by the patient. Extraction of teeth provides space for repositioning of the remaining teeth only in the anteroposterior plane of space. Patients with vertical or transverse skeletal problems would not benefit from extractions for camouflage. Similarly, if there is severe crowding, or excessive incisor protrusion in addition to a skeletal discrepancy (so that the extraction spaces will merely be used for alignment of the remaining teeth), camouflage treatment usually is contraindicated.

**Canine guidance (Canine-protected occlusion, Canine "rise")**

![Canine guidance diagram]

A particular scheme of disclusion of the dental arches during a lateral mandibular excursion. The labial (or distolabial) surface of the mandibular canine on the working side comes into contact with the lingual (or mesiolingual) surface of the maxillary canine, causing disarticulation of all other teeth.

**Canine retraction**

Movement of the canine in a distal direction, usually into an extraction space. Individual retraction of the canines often is performed in an attempt to preserve posterior anchorage in patients with Class II malocclusions, and subsequently is followed by retraction of the incisors. Canine retraction can be performed by sliding or sectional mechanics. Control of root position usually is critical, as bodily movement of the canines generally is required.

[See Moment, Counter-moment]

**Canine-to-canine retainer**

See Retainer, Bonded lingual.
Cartilage

A semi-rigid specialized form of supporting/connective tissue, the characteristics of which mainly stem from the nature and predominance of ground substance in the extracellular matrix. Proteoglycans make up the ground substance and account for the solid, yet flexible, consistency of cartilage. Within the ground substance are embedded varying proportions of collagen and elastic fibers giving rise to three main types of cartilage: hyaline cartilage, fibrocartilage and elastic cartilage.

On completion of growth the cartilage mass consists of chondrocytes embedded in a large amount of extracellular matrix. At the periphery of mature cartilage is a zone of condensed supporting tissue called "perichondrium" containing chondroblasts with cartilage-forming potential. Growth of cartilage occurs by interstitial growth from within and appositional growth at the periphery. Most cartilage is devoid of blood vessels and consequently the exchange of metabolites between chondrocytes and surrounding tissues depends on diffusion through the water of solvation of the ground substance. This limits the thickness to which cartilage may develop whilst maintaining viability of the innermost cells.

SUBTERMS:

Elastic cartilage
Fibrocartilage
Hyaline cartilage

Caudal

Inferior, towards the tail.

[Compare with Cephalic (Cranial)]

Cementation

The attachment of bands or a fixed orthodontic appliance on the teeth by means of a dental cement.

Center of mass (CM)

A point in a body where its entire mass can be considered concentrated for theoretical purposes. For homogeneous bodies with a regular geometrical shape, the CM is located at their geometric
center (i.e. the center of a sphere, or the junction point of all three-dimensional diagonals of a cube).

**Center of resistance (CRes)**

The point in a body at which resistance to movement can be considered concentrated, for mathematical analysis. For a free object in non-gravitational space, the center of resistance coincides with the center of mass. However, for a partially restrained object (as is the case for a tooth that is partially embedded in bone), the CRes is determined by the mass, shape and form of the tooth, as well as by the characteristics of the constraining elements (bone, PDL). [Other definition: CRes of a tooth is a point in the tooth on which the application of a single force will produce bodily movement of the tooth.] The location of the CRes is estimated to be between halfway and two thirds along the distance between the crest of the alveolar bone and the root apex in single-rooted teeth, and at the furcation area of multi-rooted teeth (assuming that the periodontal support is intact).

**Center of rotation (CRot)**

The point around which rotation actually occurs, when an object is being moved. The location of the CRot is variable and depends on the movement performed. The actual CRot of a tooth for a specific movement is almost impossible to determine and can be estimated only by the initial and final positions of the tooth. In orthodontics, the approximate location of the CRot can be controlled by varying the moment-to-force ratio at the bracket. The CRot during bodily movement is considered to lie at infinity. [For three-dimensional objects, the term "axis of rotation" is more accurate.]

**Centric relation (CR)**

A gnathological term that has been used in dentistry for many years, especially in prosthodontics (as it was meant as a reproducible reference mandibular position, mainly in the construction of complete dentures). Although CR has had a variety of definitions (which has led to great confusion), it generally is considered to designate the relation of the mandible to the maxilla when the condyles are in a physiologically stable position, independent of tooth contacts. Centric relation has been described as:
1. The relation of the mandible to the maxilla when the mandible is in its most retruded, unstrained position from which lateral movements can be performed, at any given degree of jaw separation; also termed the "ligamentous" position, as it is determined mainly by the ligaments of the TMJ.

2. The maxillomandibular relationship in which the condyles articulate with the thinnest avascular portion of their discs, with the disc-condyle complex in the anterior-superior position against the slope of the articular eminence.

3. The most superoanterior position of the condyles in the articular fossae with the discs correctly interposed. Centric relation may be impossible to record in the presence of dysfunction of the masticatory system.

**Cephalic (Cranial)**

Towards the head.

[Compare with Caudal]

**Cephalometer (Cephalostat)**

A head-holding device introduced in 1931 by B. H. Broadbent in the USA and by H. Hofrath in Germany. The original design included two ear rods for insertion into the external auditory canals, an infraorbital pointer and a forehead clamp, to achieve parallelism of the Frankfort plane with the floor. The cephalometer is used to obtain standardized and comparable craniofacial images on radiographic film.

**Cephalometric analysis**

The process of evaluating skeletal, dental and soft tissue relationships of a patient, by comparing measurements performed on the patient's cephalometric tracing with population norms for the respective measurements, to come to a diagnosis of the patient's orthodontic problem. Refers also to the various standardized sets of cephalometric measurements (e.g. Downs' analysis, Steiner analysis) commonly used in the evaluation.

**SUBTERMS:**

- Burlington cephalometric analysis
- Di Paolo (Quadrilateral) cephalometric analysis
- Downs cephalometric analysis
- Harvold cephalometric analysis
- McNamara cephalometric analysis
- Sassouni cephalometric analysis
Steiner cephalometric analysis
Tweed cephalometric analysis
Wylie cephalometric analysis

Cephalometric landmarks

Readily recognizable points on a cephalometric radiograph or tracing, representing certain hard or soft tissue anatomical structures (anatomical landmarks) or intersections of lines (constructed landmarks). Landmarks are used as reference points for the construction of various cephalometric lines or planes and for subsequent numerical determination of cephalometric measurements.

In the definitions of the specific landmarks the following convention is used: "midsagittal" identifies landmarks lying on the midsagittal plane, "unilateral" identifies landmarks corresponding to unilateral structures and "bilateral" applies to landmarks corresponding to bilateral structures.

SUBTERMS:
A-point (Point A, Subspinale, ss)
Anterior nasal spine (ANS)
Articulare (Ar)
B-point (Point B, Supramentale, sm)
Basion (Ba)
Bolton (Bo)
Condylion (Co)
Crista galli
Dacryon
Glabella (G)
Gnathion (Gn)
Gonion (Go)
Incision inferius (Ii)
Incision superius (Is)
Infradentale (Id, Inferior prosthion)
L-point
Menton (Me)
Nasion (N, Na)

Opisthion (Op)
Orbitale (Or)
Pogonion (Pog, P, Pg)
Porion (Po)
Posterior nasal spine (PNS)
Prosthion (Pr, Superior prosthion, Supradentale)
Pterygomaxillary fissure (PTM, Pterygomaxillare)
R-point (Registration point)
Sella (S)
Cervical point (C)
Inferior labial sulcus (IIs)
Labrale inferior (Li)
Labrale superior (Ls)
Pronasale (Pn)
Soft tissue glabella (G')
Soft tissue menton (Me')
Soft tissue nasion (N', Na')
Soft tissue pogonion (Pg', Pog')
Stomion (St)
Stomion inferior (Sti)
Stomion superior (Sts)
Subnasale (Sn)
Superior labial sulcus (Sls)
Trichion (Tr)
Soft tissue gnathion (Gn')

Cephalometric lines (planes)

Most analyses utilize one or more cephalometric lines that are joining two landmarks, are tangent to an outline from a landmark, or are perpendicular to another line from a landmark.

SUBTERMS:

A-B plane
Basion-Nasion line (Ba-N)
Bolton plane
Camper’s base plane
De Coster line
E-line (E-plane, Esthetic line of Ricketts)
Facial axis of Ricketts
Facial plane (FP, Facial line)
Frankfort horizontal plane (FH, Frankfort horizontal line, Auriculo-orbital plane, Eye-ear plane)
H-line (Harmony line of Holdaway)
Intergonial line
Mandibular plane (MP, Mandibular line, ML)
Nasion-perpendicular
Occlusal plane (OP)
Palatal plane (ANS-PNS, PP, Nasal line, Nasal floor, Spinal plane)
Rees esthetic plane
Reference line
Riedel plane
S-line (Esthetic plane of Steiner)
Sella-Nasion line (SN, Nasion-Sella line, NSL)
True horizontal line
True vertical line
Y-axis (Growth axis)
Z-line (Profile line of Merrifield)

Cephalometric radiograph (Cephalogram)

A radiograph of the head obtained under standardized conditions, introduced simultaneously in the United States and Germany (1931), by B. H. Broadbent and H. Hofrath, respectively. Cephalometric radiographs are taken on a cephalometer, which dictates a standardized orientation of the head and a precisely defined relationship among x-ray source, subject and film. By convention, the distance between x-ray source and the midsagittal plane of the subject is either 5 feet (152.4 cm) or 150 cm. The distance between the midsagittal plane of the subject and the film may vary between 10 cm and 18 cm, depending on head size. Measurement of the subject-film distance and the source-subject distance allows calculation of the image magnification. The standard projections are lateral (profile), posteroanterior (P-A) and oblique projections.

SUBTERMS:

Lateral cephalometric radiograph
Oblique cephalometric radiograph
Posteroanterior (P-A) cephalometric radiograph

Cephalometric tracing

An overlay drawing produced from a cephalometric radiograph by copying specific outlines from it with a lead pencil onto acetate paper, using an illuminated view-box. Tracings are used to facilitate cephalometric analysis, as well as in superimpositions, to evaluate treatment and growth changes.
Chief complaint (CC)

The patient’s statement of the main problem or primary concern.

Chronic pain disorders

Persistent pain that lasts more than six months, with associated behavioral and psychosocial factors.

Cinching (of the archwire)

Placing a sharp bend on the archwire distal to the terminal attachments in an arch. Cinching is done to avoid excessive proclination of the anterior teeth during leveling or to prevent the archwire from sliding in an anterior direction during the interval between patient visits.

[See Bends (Archwire bends), Distal-end bends (Cinching bends, Distal-end stops)]

Circumferential supracrestal fibrotomy (Edwards’ procedure)

An adjunctive periodontal surgical procedure developed by J. G. Edwards to reduce the relapse tendency of corrected individual tooth rotations. The procedure consists of inserting the sharp point of a fine blade into the gingival sulcus, down to the crest of the alveolar bone, to sever the gingival fibers around the tooth (including the transseptal fibers between it and the adjacent teeth).

Clasp (Retention clasp)

An element of a removable appliance made of metal that serves to secure the appliance in place by engaging on undercuts provided by the morphology and inclination of the teeth.

SUBTERMS:

Clasp (Retention clasp)
• Adams clasp (Modified arrowhead clasp)

A clasp made of stainless steel wire, which was designed by C. P. Adams to retain removable appliances, by means of point contact with the mesio- and distobuccal undercuts of individual posterior teeth. The clasp is bent from a single piece of round wire and crosses the occlusal table at the mesial and distal embrasures of a posterior tooth (typically
first permanent molar). It consists of a mesial and a distal retentive U- or V-shaped loops, which are pointed in a gingival direction and joined by a buccal bridge.

[See Clasp (Retention clasp), Arrowhead clasp (Arrow clasp)]

Clasp (Retention clasp)
- Arrowhead clasp (Arrow clasp)

Clasp made from stainless steel wire, bent in the shape of an arrowhead. It is meant to engage the distobuccal and mesiobuccal undercuts of adjacent teeth (in a fashion similar to a ball clasp). Two or more arrowhead clasps may be combined, joined by a buccal bridge.

[See Clasp (Retention clasp), Adams clasp (Modified arrowhead clasp)]

Clasp (Retention clasp)
- Ball clasp

Clasp bent from round stainless steel wire, with a ball-shaped end. The clasp crosses the occlusal table at the embrasure between two adjacent teeth and engages their mesiobuccal and distobuccal undercuts.

Clasp (Retention clasp)
- Circumferential clasp (Three-quarter clasp, C-clasp)

A single-tooth cast or bent stainless steel wire clasp that engages the cervical region of the canines and posterior teeth. The clasp usually crosses the occlusal table at an interproximal embrasure between two teeth, then progresses gingivally toward the other interproximal surface, engaging in the interproximal gingival undercut, thus traversing three surfaces of the tooth.
The diameter of the wire used for its fabrication typically is 0.024 inch (0.60 mm) for deciduous canines; 0.028 inch (0.70 mm) for deciduous molars, premolars and permanent canines; and 0.032 inch (0.80 mm) for permanent molars. Circumferential clasps function well on maxillary teeth as the morphology and the inclination of the posterior teeth provide adequate undercuts. In the mandibular dental arch this is not always the case. By creating artificial undercuts with composite, circumferential clasps can provide firm retention of mandibular removable appliances. An advantage of the circumferential clasp is the possibility of avoiding occlusal interference of the part of the clasp that crosses the occlusal table.

Clasp (Retention clasp)
• Claw clasp

A clasp introduced by F. P. G. M. van der Linden for retention on maxillar incisors. It is made of a 0.024-inch (0.60-mm) stainless steel spring-hard wire crossing the incisal edge and forming a small rectangular box on the labial surface of those teeth. The addition of composite at that point, to create an artificial undercut, greatly enhances retention.

Clasp (Retention clasp)
• Delta clasp

A modification of the standard Adams clasp by W. J. Clark, for retention of the twin block appliance. The major difference is the shape of the retentive loops, which in the case of the delta clasp are shaped in a closed triangle, unlike the open V- or U-shaped loops, of the Adams clasp. Subsequent modification of the delta clasp produced circular loops, which are easier to construct and have similar retentive properties. The advantage of the delta clasp, according to its designer, is that the loops do not open with repeated insertion and removal of the appliance. Delta clasps, which are constructed from 0.028-inch (0.70-mm) or 0.030-inch (0.75-mm) stainless steel wire, can provide good retention on mandibular premolars and can be used on most posterior teeth.
Cleft lip and/or palate (CLP)

The most common craniofacial anomaly (approximately 1 in 600 to 1 in 700 live births higher in some populations), characterized by failure of fusion between certain embryological processes (swellings) during facial morphogenesis. Failure of fusion between the medial and lateral nasal and the maxillary swellings results in a cleft of the lip and/or alveolar process. Failure of fusion between the lateral palatine swellings results in a cleft of the palate. These problems are thought to result from a deficiency of mesenchyme in the facial region, brought about by failure of neural crest cells to migrate or failure of the facial mesenchyme to proliferate. A cleft can be complete or incomplete, and it can occur unilaterally or bilaterally. Cleft lip may occur without clefting of the alveolar process or the palate, and cleft palate also can occur as an isolated phenomenon. A useful classification divides the anatomy into primary and secondary palates. An individual thus may have clefting of the primary palate, the secondary palate, or both. In addition, a CLP may be an isolated phenomenon, or may occur as part of a syndrome.

The etiology of cleft lip and palate is thought to be multifactorial. Genetics is implicated in 20% to 30% of patients. Even in those individuals whose genetic background may verify familial tendencies for clefting, the mode of inheritance is not understood completely. Environmental factors that have been shown in experimental animals to result in clefting include nutritional deficiencies, radiation, several drugs, hypoxia, viruses, and vitamin excesses or deficiencies. In complete unilateral or bilateral clefts of the lip, alveolus and palate, the maxillary arch typically is collapsed in the transverse direction, especially in the area of the cleft. The maxillary permanent lateral incisors may be congenitally missing or malformed, and many atypically shaped supernumerary teeth may be present in the area of the cleft.

The treatment of patients with cleft lip and/or palate is a long and involved process, requiring many stages of intervention by many different specialists, forming a "cleft lip and palate team." The involvement of the team orthodontist starts a few days after the baby is born, with presurgical infant orthopedic treatment (if applicable), in preparation for the initial repair.

Repair of the lip usually is performed within the first three months after birth, and the palate subsequently is repaired within the first year. The scar tissue created from these and other surgical
procedures is considered responsible for variable degrees of maxillary growth inhibition which is commonly seen during subsequent growth.

When the cleft involves the alveolar process, a bone graft may be necessary to restore the alveolar anatomy. Alveolar bone grafting usually is performed prior to the eruption of the permanent maxillary canine on the side of the cleft.

Phase I of orthodontic treatment, in preparation for the alveolar bone graft, may consist of expansion of the constricted maxilla and correction of any crossbites. Following alveolar bone grafting, and when the patient is in the permanent dentition, phase II of orthodontic treatment is performed to idealize the occlusion, or if a severe skeletal discrepancy is present, to prepare the arches for orthognathic surgery.

[See Graft, Alveolar bone graft]
[See Palate, Secondary palate]
[See Palate, Primary palate]

**Cleidocranial dysplasia (Cleidocranial dysostosis, CCD)**

Inheritable disorder (autosomal dominant) affecting both intramembranous and endochondral bone formation. The clinical features include a characteristic brachycephalic skull (cephalic index commonly in excess of 81), with frontal and parietal bossing and the appearance of a small face. Paranasal sinuses and mastoids often are underdeveloped or absent. Clavicles are hypoplastic or aplastic, and closure of fontanels and cranial sutures is delayed, sometimes for life.

The palate is highly arched, and there may be a submucous or complete cleft palate. The maxilla is underdeveloped and a skeletal Class III malocclusion usually is present. The dentition often presents a chaotic appearance with multiple supernumerary teeth, multiple crown and root abnormalities, ectopic development, retention of deciduous teeth and failure of eruption of permanent teeth. Extraction of retained deciduous teeth usually does not facilitate the eruption of their permanent successors. The molecular pathology of this condition was shown to be associated with mutations of a gene called CBFA. This gene is a transcription factor essential for osteoblast differentiation and bone formation, which explains the general bone dysplasia in the condition.

**Clenching**

Parafunctional activity characterized by hyperactivity of the elevator masticatory muscles, with the teeth in contact. Clenching is considered to be stress-related and, together with bruxism, is thought to be part of the predisposing/initiating/perpetuating factors in the development of temporomandibular joint disorders.

**Clicking**
Brief, sharp sound (distinct snapping or cracking), audible with or without a stethoscope, or detectable by palpation, emanating from one or both temporomandibular joints during mandibular movements. The most common cause for clicking is anterior or antero-medial displacement of the articular disc. Clicking may or may not be associated with internal derangement of the TMJ, and it may occur only during the opening or closing movement of the mandible (single click), or during both (reciprocal click).

SUBTERMS:
Clicking
• Early closing clicking
A clicking noise that occurs at the initiation of retrusive condylar translation.

Clicking
• Early opening clicking
A clicking sound from the TMJ that occurs at the initiation of protrusive condylar translation.

Clicking
• Late closing clicking (Terminal closing clicking)
A click that occurs before the end of retrusive condylar translation.

Clicking
• Late opening clicking (Terminal opening clicking)
A click that occurs just before the end of protrusive condylar translation.

Clicking
• Mid-closing clicking
A clicking noise that occurs midway along the condylar translatory path during closing.

Clicking
• Mid-opening clicking
A clicking noise that occurs midway along the condylar translatory path during opening.

Clicking
• Reciprocal clicking
A pair of clicking noises from the temporomandibular joint, heard during the mandibular opening movement and again just before the teeth occlude during the closing movement. Reciprocal clicking is a common characteristic of disc displacement with reduction. From a closed mouth position, the temporarily misaligned disc reduces or improves its structural relation with the condyle when mandibular translation occurs, which produces the first clicking noise. The closing noise is usually of less magnitude and is thought to be produced by a displacement of the disc to its previous position.

[Compare with Clicking, Single clicking]

Clicking
  • Single clicking

An individual clicking noise, occurring either during the opening, or during the closing stage of mandibular movement.

[Compare with Clicking, Reciprocal clicking]

Closed bite

Excessive vertical overlap of the anterior teeth; extremely deep bite.

Closed lock

[See Disc displacement (Disc derangement, Disc prolapse, Disc interference disorder), Disc displacement without reduction]

Cobalt-chromium alloy (Co-Cr, Cobalt-chromium-nickel alloy, Chromium-cobalt alloy)

Highly corrosion-resistant alloys based on cobalt and chromium, used for fabrication of orthodontic wires or clasps. Cobalt-chromium orthodontic wires are very similar in appearance, mechanical properties, and joining characteristics to stainless steel wires, but have a significantly different composition and considerably greater heat treatment response.

One of the most widely known alloys, introduced to orthodontics under the trademark “Elgiloy” (Rocky Mountain Orthodontics), consists of approximately 40% cobalt, 20% chromium, 15% nickel, 15.8% iron, 7% molybdenum, 2% manganese, 0.15% carbon, and 0.04% beryllium. Concerns about the toxicity of beryllium have led to the development of beryllium-free cobalt-chromium alloys such as “Remaloy” (Dentaurum).

Cobalt-chromium wires are available in different tempers. The soft-temper wires are popular with clinicians because they are more easily formable and subsequently they can be hardened by heat treatment. Cobalt-chromium alloys have a modulus of elasticity (E) equivalent to that of stainless
steel. However, they "feel" softer in the not-hardened state, as their yield strength and elastic range are lower compared to the more resilient stainless steel alloys.

**Cohesion**

The property of a material by which its constituent molecules are attracted to each other, resisting separation.

[Compare with Adhesion]

**Collateral ligaments**

Ligaments attaching the medial and lateral borders of the articular disc of the temporomandibular joint to the respective poles of the condyle. These ligaments permit the disc to rotate anteriorly and posteriorly on the articular surface of the condyle during mandibular movements.

**Collimator**

A diaphragm, cone or tube containing a lead disk with an aperture, designed to fit on an x-ray source so as to restrict the size and shape of the primary beam, by eliminating its peripheral (more divergent) portion. The aperture of the collimator may be circular or rectangular.

**Coloboma**

A congenitally occurring lack of continuity ("cleft") in the orbital region. The defect may be restricted to the eyelids or extend into the globe from the iris to the retina. Lower lid and/or lateral canthal colobomas are commonly seen in patients with Treacher Collins syndrome.

[See Treacher Collins syndrome (Mandibulofacial dysostosis)]

**Columella**

The small fleshy column connecting the upper lip and the tip of the nose, between the nares; a continuation of the nasal septum.

**Comprehensive orthodontic treatment**

Coordinated treatment aiming at improving a patient's craniofacial dysfunction and/or dentofacial deformity, taking into account anatomical, functional and esthetic factors. Treatment may incorporate several phases, with specific objectives at various stages of dentofacial development. Adjunctive procedures such as extractions, dentofacial orthopedic treatment, orthognathic surgery, myofunctional or speech therapy, and restorative or periodontal treatment may be performed concurrently to achieve the best attainable result. Typically, at the end of active comprehensive orthodontic treatment each tooth is in its ideal position and the achievable optimum in occlusion
has been obtained. Long-term periodic reevaluation following active treatment is important for maintenance of the achieved result. [Modified from the AAO Glossary of Dentofacial Orthopedic Terms, 1993.]

[Compare with Limited orthodontic treatment]

**Compressive deformation (Compressive strain)**

The shape change of a body when it is subjected to compressive stress (e.g. the shortening of an orthodontic open coil upon compression).

**Computerized cephalometrics**

The process of entering cephalometric data in digital format into a computer for cephalometric analysis. Depending on the software and hardware available, the incorporation of data can be performed by digitizing points on a tracing, by scanning a tracing or a conventional radiograph, or by originally obtaining computerized radiographic images that are already in digital format, instead of conventional radiographs. Computerized cephalometrics offers the advantages of instant analysis; readily available race-, sex- and age-related norms for comparison; as well as ease of soft tissue change and surgical predictions.

**Concrescence**

Union of the cellular cementum of two teeth that have developed from two separate tooth buds.

[Compare with Fusion]

[Compare with Gemination]

[See Twinning]

**Condylar growth**

Proliferation of condylar cartilage, followed by endochondral ossification. The condyle, the coronoid process and the ramus are the principal sites of growth of the mandible. As condylar growth occurs, the mandible is translated inferiorly and anteriorly, which can be visualized by inspection of cephalometric superimpositions using the cranial base as a reference. The upward and backward direction of condylar growth is seen clearly by mandibular superimposition. Condylar growth normally stops shortly after that of the rest of the face, although it may continue well beyond adolescence, particularly in males.
Condylectomy

Surgical removal of the entire mandibular condyle.

Condylar guidance

The functional guidance of the mandibular excursions, as determined by the relationship between the mandibular condyles and the contours of the glenoid fossae, articular eminences and articular discs.

Condylar hyperplasia

Excessive growth of the condyle, usually unilateral, resulting in facial asymmetry and an associated malocclusion. Such malocclusions often are associated with an open bite on the affected side and/or a crossbite on the non-affected side, with a corresponding midline discrepancy. The condition typically appears in the late teens, but may begin at an earlier age. A bone scan (scintigram) with Tc99m, an isotope that is concentrated in areas of active bone deposition, can be used to distinguish between an actively growing ("hot") condyle and an enlarged condyle that has ceased growing. The treatment for severe cases of condylar hyperplasia is usually surgical.

Condylar growth

Proliferation of condylar cartilage, followed by endochondral ossification. The condyle, the coronoid process and the ramus are the principal sites of growth of the mandible. As condylar growth occurs, the mandible is translated inferiorly and anteriorly, which can be visualized by inspection of cephalometric superimpositions using the cranial base as a reference. The upward and backward direction of condylar growth is seen clearly by mandibular superimposition. Condylar growth normally stops shortly after that of the rest of the face, although it may continue well beyond adolescence, particularly in males.

Condylysis

Idiopathic resorption or dissolution of the condyle.

"Cone-funnel" mechanism
The mechanism by which it is theorized that interdigitation of posterior teeth is achieved in the late stages of their eruption. Occlusal contacts between the maxillary and mandibular posterior teeth dictate a series of adjustments in mesiodistal angulation and buccolingual inclination over a relatively short period of time, leading to their final interdigitation.

**Construction bite**

A bite registration at the desired occlusal relationship, to permit articulator mounting of the casts for fabrication of an (most commonly functional) appliance. The construction bite is sent to the orthodontic laboratory, together with the impressions (or casts) and a prescription with the required specifications of the appliance.

[See Bite registration (Wax bite)]

**Contralateral**

Referring to the side opposite to the one that is being considered.

[Compare with Ipsilateral]

**Conversion (of a tube into a bracket)**

The process of removing the buccal cap of a convertible tube of a molar attachment to transform the tube into a bracket.

[See Tube (Molar tube), Convertible tube]

[See Orthodontic instruments, Conversion instrument]

**Corrosion**

A chemical or electrochemical degrading process, through which a material is attacked by corrosive agents, such as acids (but also air and saliva, in the case of the intraoral environment), resulting in partial or complete dissolution, deterioration, or weakening. Although glasses and other nonmetals also are susceptible to environmental degradation, metals generally are more prone to such an attack because of electrochemical reactions.

**SUBTERMS:**
All bone structures have one growth principle in common, which was termed "drift" by D. H. Enlow. The cortical plate can be relocated by simultaneous apposition and resorption processes on the opposing periosteal and endosteal surfaces (cortical drift). The bony cortical plate drifts by apposition and resorption of bone substance on its outer and inner surfaces, respectively, in the direction of growth. If resorption and deposition take place at the same rate, the thickness of the bone remains constant. Should more bone be deposited than resorbed, the thickness of the structure increases, as during growth. The teeth follow the drift of the alveolar processes while the jaw is growing, and thus they maintain their position within the surrounding bony structure, despite the displacement of the entire bone.

[See Displacement, Displacement (of a bone)]

**Cortical plate**

The dense layer of cortical bone covering the buccal and lingual aspects of the alveolar process.

[See Bone, Cortical bone]

**Corticotomy (Cortical osteotomy)**

A partial osteotomy, involving only the cortical plate, to weaken the resistance of the bone to the application of forces. Such a procedure is routinely performed prior to distraction osteogenesis for elongation of the mandible or the maxilla.

[See Distraction osteogenesis (Distraction osteosynthesis, Ilizarov technique, Callus distraction, Callotasis)]

**Costen's syndrome**
Condition involving dizziness, tinnitus, earache, stuffiness of the ear, dry mouth, burning in the tongue and throat, sinus pain and headaches, described by the otolaryngologist J. B. Costen in 1934. He attributed the symptoms to overclosure of the bite and posterior displacement of the mandibular condyle. [Term formerly used for “temporomandibular joint disorders.”]

**Cortical plate**

The dense layer of cortical bone covering the buccal and lingual aspects of the alveolar process.

[See Bone, Cortical bone]

**Cranial base**

The bones of endochondral origin that form the antero-inferior aspect of the brain case. Because the bones of the cranial base stop growing relatively early, they often are used in the superimposition of serial cephalograms or tracings as reference structures to assess growth of the jaws or treatment results.

**Craniofacial clefts**

Rarely occurring clefts that are not limited to the lip and palate, but also involve the facial soft tissues and underlying bone. They result from problems in the migration of neural crest cells and failure of fusion between facial processes (swellings), or from differentiation defects of facial tissues of mesodermal origin in the first trimester of pregnancy. Some craniofacial clefts produce extensive facial defects with severe tissue deficits. There are many kinds of craniofacial clefts, commonly classified under a system described by P. Tessier, which involves numbers from 0 to 14, centered around the eye.

**Craniometry**

A branch of anthropometry dealing with the measurements of dimensions and angles of the bony skull.

**Craniosynostosis**

A birth defect that may occur as an isolated phenomenon or as part of a syndrome, consisting of premature fusion of one or more skull sutures. Craniosynostosis results in craniofacial deformity and potentially in increased intracranial pressure, which can be deleterious to brain function. For this reason, surgical release of the fused sutures sometimes is undertaken quite early in life. A number of craniofacial syndromes sharing the clinical feature of craniosynostosis (such as Crouzon syndrome, Pfeiffer syndrome and Apert syndrome) have been found to result from mutations in the genes for fibroblast growth factor receptors (FGFR gene mutations).
Crefcoeur spring
[See Appliance, Crefcoeur appliance]

Crepitus (Crepitation, Grating sound)
Rough, sandy, diffuse noise or vibration, produced by the rubbing together of irregular bone or cartilage surfaces, usually identified with osteoarthritic changes when heard in joints.

Crimpable attachments
A number of different orthodontic attachments (e.g. hooks, stops) that can be fixed on an archwire by squeezing their base with special sharp-beaked pliers or cutters.

Crossbite
An abnormal relationship of one or more teeth to one or more teeth of the opposing arch, in the buccolingual or labiolingual direction. A crossbite can be dental or skeletal in etiology. [Note: The appropriate type of crossbite can be specified by identifying the teeth or jaws that deviate the most from their ideal position (e.g. when a crossbite is mainly due to a narrow maxillary arch the correct term is "maxillary posterior lingual crossbite" as opposed to "mandibular posterior buccal crossbite").]

SUBTERMS:
Crossbite
• Anterior crossbite
  Situation in which one or more primary or permanent mandibular incisors are labial to their antagonists (or one or more maxillary incisors are lingual to their antagonists) in habitual occlusion.

Crossbite
• Buccal crossbite
  A crossbite due to buccal displacement of the affected tooth (or group of teeth) from its (their) ideal position relative to its (their) antagonist(s).

Crossbite
• Complete mandibular buccal crossbite
  A situation in which the mandibular dental arch is wide and lies entirely buccal to (contains) the maxillary dental arch. This rare situation is sometimes seen in extreme Class III anomalies associated with mandibular hyperplasia.
Crossbite
• Complete maxillary buccal crossbite (Brodie syndrome)

A situation in which the maxillary dental arch is wide and lies entirely buccal to (contains) the mandibular dental arch (named after A. G. Brodie). This rare situation sometimes is seen in extreme Class II anomalies associated with maxillary hyperplasia.

[Compare with Crossbite, Complete mandibular lingual crossbite]

Crossbite
• Complete maxillary palatal crossbite

A situation in which the maxillary dental arch is narrow and lies entirely lingual to (contained within) the mandibular dental arch. This rare situation sometimes is seen in extreme Class III anomalies associated with maxillary hypoplasia.

[Compare with Crossbite, Complete mandibular buccal crossbite]

Crossbite
• Dental crossbite

An abnormal relationship between antagonist teeth that is due to deviations in the position or inclination of one or a few teeth (i.e. the relationship between the maxilla and mandible is harmonious). Such crossbites usually are treatable by means of tooth movement alone.

[Compare with Crossbite, Skeletal crossbite]
Crossbite
• Functional crossbite (Pseudo-crossbite)

A crossbite that is due to a shift of the mandible (i.e. forced bite) into a faulty habitual occlusion (CO) because of a premature occlusal interference in centric relation (CR). The shift may occur in an anterior and/or in a lateral direction. Such crossbites often are seen in children, typically because of interferences caused by lack of wear of their deciduous canines. The treatment advocated for such problems may be enameloplasty of the deciduous canines or expansion of the maxillary dental arch.

[See Lateroclusion]

[See Mandibular shift (CR-CO shift, Mandibular slide, Forced bite, Slide in centric)]

Crossbite
• Lingual crossbite

A crossbite mainly due to lingual displacement of the affected mandibular tooth (or group of teeth) from its (their) ideal position relative to its (their) antagonist(s).

Crossbite
• Palatal crossbite

A crossbite mainly due to palatal displacement of the affected maxillary tooth (or group of teeth) from its (their) ideal position relative to its (their) antagonist(s).

Crossbite
• Posterior crossbite

A type of crossbite in which one or more deciduous or permanent posterior teeth occlude in an abnormal buccolingual relation with their antagonists. Posterior crossbites may occur unilaterally or bilaterally. They may be maxillary or mandibular, buccal or lingual, and may be accompanied by a lateral functional shift of the mandible (especially in the case of unilateral posterior crossbites).

Crossbite
• Skeletal crossbite

Anterior or posterior (unilateral or bilateral) crossbite that is due to a sagittal or transverse incoordination in the size or shape of the maxilla and/or mandible. The treatment of such crossbites usually requires a skeletal expansion by means of rapid maxillary expansion or orthognathic surgery.
Crossbite

- Telescoping bite

A term denoting either a complete mandibular lingual, or a complete maxillary buccal crossbite. The opposite (i.e. a complete maxillary palatal or a complete mandibular buccal crossbite) sometimes is called a reverse telescoping bite.

Cross-section of orthodontic wires

[See Archwire cross-section]

Curettage

Soft tissue periodontal procedure aiming at removal of necrotic tissue lining the soft tissue wall of periodontal pockets by means of a curet.

SUBTERMS:

Closed curettage
Open curettage

Curve of Monson

A three-dimensional combination of the curves of Spee and Wilson. According to G. S. Monson, who introduced this concept (1920), all cusps and incisal edges in a natural dentition are tangent to a surface of a sphere, approximately 4 inches (10.2 cm) in radius, with its center in the area of the glabella.
**Curve of Spee (Compensating curve)**

The curve displayed in the sagittal plane (or rather, in a plane parallel with the body of the mandible on either side) by the cusps and incisal edges of the mandibular teeth. The convex aspect of the curve of Spee is pointing inferiorly. The concept was first introduced by F. Graf von Spee in 1890, who theorized that the extension of this curve would be tangent to the anterior surface of the mandibular condyles, bilaterally.

**SUBTERMS:**
- Reverse curve of Spee

In many patients with a deep overbite, the curve formed by the cusps and incisal edges of the maxillary teeth is reverse to the curve of Spee, namely having its convex aspect pointing superiorly. When using continuous archwire mechanics for leveling of the mandibular arch, some clinicians incorporate a reverse curve of Spee in the mandibular archwire. Conversely, during leveling of the maxillary arch in a patient with a reverse curve of Spee, the opposite curve (i.e. accentuated curve of Spee) is incorporated into the maxillary archwire.

**Curve of Wilson**

When looking at a coronal section of the mandibular dentition one can see that the long axes of the mandibular molars and premolars converge towards the midline (i.e. they are tipped lingually). From this view the occlusal surfaces of these teeth bilaterally form a curve in a buccolingual direction. This imaginary curve that is defined by a line tangent to the buccal and lingual cusps of the mandibular posterior teeth bilaterally, is termed the curve of Wilson.
A conical-shaped, pointed or rounded eminence, on or near the occlusal surface of posterior teeth and on the lingual surface of anterior teeth, which may come into occlusal contact with a tooth of the opposing dental arch.

SUBTERMS:
Cusp
• Functional cusps (Supporting cusps)

The palatal cusps of the maxillary posterior teeth and the buccal cusps of the mandibular posterior teeth that come into occlusal contact in intercuspal position, maintaining the occlusal vertical dimension.

Cusp
• Non-functional cusps (Non-supporting cusps)

The buccal cusps of the maxillary posterior teeth and the lingual cusps of the mandibular posterior teeth that do not directly contact the opposing teeth in intercuspal position. They act like the rim of a pestle to prevent food from escaping from the occlusal table, and they protect the buccal mucosa and the tongue by keeping them away from the functional cusps.

Cusp
• Plunger cusp

A cusp that tends to forcibly wedge food into the interproximal area of two teeth of the opposing arch.

Cuspid

[See Canine guidance (Canine-protected occlusion, Canine "rise")]

[See Canine-to-canine retainer]

[See Canine rise]

[See Canine retraction]

Cyclosporine

A pharmacological substance that can cause gingival hyperplasia. It is an immunosuppressant and antifungal agent, sometimes used to prevent rejection in recipients of organ transplants.
Cytokines

A family of growth factors that mediate considerable roles in growth, differentiation and tissue damage by cellular receptors.

Deactivation

The process following the activation of an appliance (or an appliance part), during which the stored force is delivered to the dentition.

Debanding

The removal of cemented orthodontic bands.

Debonding

The removal of bonded orthodontic attachments.

Decalcification

The removal of various minerals from a bone or tooth.

[See White spot lesion (Decalcification)]

Decompensation

The process of removing the dentoalveolar compensations that may be present (by re-establishing the correct tooth position with regard to the skeletal base), usually prior to surgical correction of a skeletal malocclusion.

[See Dentoalveolar compensation]
**Decompression**

Force delivered by a component of an appliance that has been activated previously by elastically constricting its characteristic shape (e.g. the compression of an open coil spring).

[Compare with Traction]

**Decompression of a joint (Unloading of a joint)**

Removal or release of pressure (stress) from a joint.

**Deep bite**

Excessive overbite. Type of malocclusion in which the vertical overlap of the anterior teeth is increased beyond the ideal relationship; it is frequently associated with decreased vertical facial dimensions. Impingement of the mandibular incisors in the mucosa palatal to the maxillary incisors commonly is seen in malocclusions with extremely deep bite. As well, in some Class II, Division 2 malocclusions with minimal overjet the retroclined maxillary incisors may impinge in the keratinized tissue labial to the mandibular incisors, causing gingival recession.

**Deflection**

A bending type of deformation, such as the deviation from the straight line (curving or arching) of a beam under an applied load.

**Deflection (of the mandible on opening)**

Eccentric displacement of the mandible away from the midsagittal plane on mouth opening, without return to the centered position upon full opening.

[Compare with Deviation (of the mandible on opening)]

**Deformable body**

A body that changes its shape when subjected to external forces, as opposed to a rigid body (an ideal concept).

**Deformation**

A change in geometry (size and/or shape) of a body produced by the application of a mechanical force: an adaptive process of materials to stress.
SUBTERMS:

Deformation
• Elastic deformation

A temporary change of shape brought about on a body by the application of a mechanical force, within the elastic limit of the material from which the body is made. Upon removal of the deforming force there is full recovery to the original configuration, as the atoms in the crystalline structure of the body that were temporarily displaced resume their original position.

Deformation
• Permanent (Plastic, Inelastic) deformation

A permanent change of shape or dimension brought about on a body by a mechanical force that exceeds the proportional limit of the material from which the body is made. The material will not recover its original shape on removal of the deforming force, as a permanent change has occurred in its crystalline structure.

Deformable body

A body that changes its shape when subjected to external forces, as opposed to a rigid body (an ideal concept).

Degeneration

Deterioration of soft tissue, cartilage and bone into a tissue of inferior quality. When referring to a complex structure such as a joint or articulation, it describes the failure to adapt to loading forces, resulting in impaired function.

Deglutition
[See Swallow]

Degrees of freedom

The number of independent coordinates required to specify the complete position of a body. For example, a body pivoting about a fixed axis has a single degree of freedom, reflecting the fact that motion is permitted in only one plane. A rigid body in space (such as a tooth) has six degrees of freedom, corresponding to its six possible motions: linear motion along the x-, y- and z- axes and angular motion (rotation) about the three axes x-, y- and z-.

Dehiscence

An isolated vertical soft tissue and bony defect, exposing a part of the root of a tooth. It occurs more commonly on the vestibular aspect of anterior teeth, especially mandibular incisors.
Delaire face mask

[See Appliance, Face mask (Reverse-pull headgear, Protraction headgear, Face frame)]

Dens evaginatus (Leong’s premolar)
A dental anomaly characterized by a supernumerary cusp on the occlusal aspect of an otherwise normal tooth. It is thought to be the reverse of dens invaginatus and occurs in approximately 2% of the Asian and Native American population. Histologically, the extra cusp is composed of a thin pulpal extension surrounded by dentin and enamel. Dens evaginatus occurs most commonly in premolars as an extra cusp which may be large enough to cause occlusal interferences. Any attempt at occlusal equilibration, or simply occlusal wear or trauma, can result in pulpal degeneration and periapical inflammation. The teeth with the anomaly typically are caries-free, and may have an immature root. If extractions are indicated as part of the orthodontic treatment plan, the premolars with the anomaly typically are given preference, as endodontic treatment may have a poor prognosis due to the immature root or arrested root formation of these teeth.

De-impaction
Any process aiming at bringing an impacted tooth into the dental arch.

Dens invaginatus (Dens in dente)
A developmental defect resulting in invagination of a pit or fissure in the crown, before it is calcified, into the future pulp space, giving the appearance of “a tooth within a tooth”. The invagination is partially or completely lined with enamel and may extend all the way to the apex. Dens invaginatus is occasionally seen in (peg-shaped) maxillary lateral incisors. In the presence of caries an acute or chronic pulpal inflammation could rapidly occur, and thus these teeth should be preferred when extractions are indicated, especially since their crowns and/or roots typically are malformed.

Dental compensation

[See Dentoalveolar compensation]

Dental mobility

[See Tooth mobility]
**Dentinogenesis imperfecta**

A hereditary disorder that can appear in several different types, which affects the development of dentin and may be accompanied by a similar disturbance of the bones. Clinically the teeth may appear opalescent or gray with bulbous crowns; attrition is rapid and enamel chips easily. Usually, extensive prosthetic restorations are indicated.

**Dentition**

The complement of teeth.

**SUBTERMS:**

**Dentition**
• Deciduous dentition (Primary dentition)

The deciduous teeth.

**Dentition**
• Mixed dentition (Transitional dentition)

The dentition in the period spanning from the eruption of the first permanent tooth until the shedding of the last deciduous tooth, during which both permanent and deciduous teeth are present in the mouth.

**Dentition**
• Permanent dentition

The permanent teeth.

**Dentoalveolar**

Concerning the teeth and the alveolar bone. [The term often is used to indicate a correction that is achieved by adaptation of the teeth and alveolar processes, without any skeletal effect.]

**Dentoalveolar compensation**

The natural adaptive changes of the dentition, which tend to mask the severity of any skeletal discrepancy that may be present between the maxilla and mandible (e.g. proclination of the maxillary incisors and retroclination of the mandibular incisors resulting in a positive overjet in a skeletal Class III malocclusion).
Dento-periosteal fibers
[See Gingival fibers]

Depression of the mandible
[See Arthrokinetics of the TMJ]

Derotation of molars
The term usually is meant to describe the procedure aimed at correction of the mesiolingual rotation (about the large palatal root) of the maxillary first permanent molars, a common finding in Class II malocclusions. Derotation of molars can be achieved with various treatment modalities, e.g. by using a transpalatal arch.

Development
In the normal youngster, growth and development are processes that work in concert with one another and actually are inseparable. It is helpful, however in understanding the contributions that each one makes to the progress of individual change to divide them arbitrarily into their actual areas of manifestation. Therefore development is considered the area of differentiation and maturation that leads to increase in skill, more comprehensive function and sexual dimorphism in progress towards maturity.

Growth, arbitrarily separated from development, relates to the changes in physical size, which may be measured in increments of weight or linear change.

Through this artificial separation of these two elements one is able to note individual changes that may exhibit an increase in size but be lacking in maturational evolution, whereas, on the other hand, one may observe conditions in which the natural maturational processes toward adulthood take place without a significant or measurable increase in size.

[See Growth]

Developmental guidance
An orthodontic and orthopedic effort to influence changes in the dentition, growth of the jaws, and functional conditions with the objective of guiding abnormal development into a normal situation. This generally requires a combination of carefully timed interceptive procedures or appliance therapies based on supervisory examinations, involving radiographic and other diagnostic records at various stages of development. This may be required from the earliest date of detection of a developing malformation until the craniofacial skeleton is mature. [Modified from the AAO Glossary of Dentofacial Orthopedic Terms, 1993.]

Deviation (of the mandible on opening)
Eccentric displacement of the mandible on mouth opening, away from the midsagittal plane, with correction to the centered position upon full opening.

[Compare with Deflection (of the mandible on opening)]

Diagnostic setup (Kesling setup)

A laboratory procedure first described by H. D. Kesling. The teeth are cut from a duplicate study model and realigned in the desired position using wax to evaluate the predicted occlusal result of a specific orthodontic treatment plan or diagnose a tooth size discrepancy.

Diastema

A space between two adjacent teeth in the same arch.

[See Midline diastema]

Differential force theory

A theory proposed by P. R. Begg (1956), which constitutes the basic philosophy behind the Begg technique. According to this, the force applied for space closure should be light enough to exceed the "critical threshold of stress" necessary for tooth movement on the active segment of teeth, but still be below the "critical stress threshold" for movement of the anchorage segment, so that no anchorage loss occurs. The area of root surface over which the force is dissipated is a determining factor for the amount of movement that will be experienced by a specific tooth (or segment of teeth). Incorporating more teeth in the anchorage segment increases the root surface area, reducing the stress in the periodontal ligament for the same magnitude of force.

According to the same theory, it is hypothesized that there is a certain level of stress in the periodontal ligament beyond which hyalinization will occur. If a force of such a high magnitude is used during space closure, there may be no or little movement of the active segment because of hyalinization, but the resulting stress over the larger root surface area of the anchorage segment could exceed its threshold for tooth movement, resulting in anchorage loss.

[See Appliance, Begg appliance (Light-wire appliance)]

Differentiation

The change from generalized cells or tissues to more specialized ones during development. It is a change in quality or kind.

Digitization (of radiographs)
Conversion of landmarks on a radiograph or tracing to numerical values on a two- (or three-) dimensional coordinate system, usually for the purpose of computerized cephalometric analysis. The process allows for automatic measurement of landmark relationships.

[See Computerized cephalometrics]

Dilaceration

A developmental distortion of the form of a tooth, whereby the root or the apex forms an angle with the long axis of the tooth (i.e. the tooth appears sharply "curved" or "bent"). Dilacerations can occur as a result of trauma or mechanical impedance of tooth eruption. In the latter situation, the developing apical part of the erupting tooth is forced to move in a direction opposite to that of eruption, inducing resorption of bone in an area where it usually does not occur. Teeth with severe dilaceration may be impossible to align in an ideal way and in severe cases extraction may be indicated.

Dillon dimple

A latching indentation on the palatal wall of a sheath, in which the doubled end of the palatal arch fits tightly, providing a "lock" to retain the palatal arch in position. Named after its innovator, C. F. S. Dillon.

[See Sheath]

Direction (Line of action)

One of the four characteristics of vectorial quantities (the other three are point of application, sense and magnitude). Direction refers to the line on which the specific vector lies. It can be defined by specifying the angular deviation (in degrees) of the vector from a given reference line or axis.

Disc-condyle complex

The condyle and its disc articulation, which functions as a simple hinge joint.

Disc displacement (Disc derangement, Disc prolapse, Disc interference disorder)

The dislocation of the articular disc of the temporomandibular joint from its physiologic position on the head of the condyle. It most often occurs in an anteromedial direction. Disc displacements are
a common etiologic factor for joint sounds (clicks or pops) and often result in an unusual opening and closing trajectory of the mandible, or in limitation of maximal opening.

SUBTERMS:

Disc displacement (Disc derangement, Disc prolapse, Disc interference disorder)
  • Disc displacement with reduction

A situation in which the articular disc of the temporomandibular joint is displaced (usually in an anteromedial direction) when the mandible is in the intercuspal position, but resumes a normal anatomic relationship with the condyle (is "re-captured" by the condyle) on mandibular movement.

[See Clicking, Reciprocal clicking]

Disc displacement (Disc derangement, Disc prolapse, Disc interference disorder)
  • Disc displacement without reduction

A situation in which the articular disc of the temporomandibular joint is displaced when the mandible is at the intercuspal position and does not resume a physiologic anatomic relationship with the condyle upon mandibular movement.

Disc locking

[See Disc displacement (Disc derangement, Disc prolapse, Disc interference disorder), Disc displacement without reduction]

Disc perforation

A circumscribed tear in the articular disc of the TMJ, usually as a result of a degenerative thinning in its central portion, permitting communication between the superior and inferior joint spaces and direct contact between the articular surfaces of the condyle and temporal bone.

Disc-repositioning surgery

Arthrotomy of the TMJ with the purpose of reestablishing a physiologic anatomic disc-to-condyle relationship.

[See Plication]

Discectomy (Meniscectomy)
Surgical removal of the articular disc of a joint.

"Dished-in" profile

A profile with severely reduced lip prominence. The term originally referred to the side effect of early orthodontic treatment attempts to "camouflage" an underlying skeletal discrepancy (usually a Class II malocclusion) by removing premolar teeth (a routine treatment method up until the 1970's). More recently, the advancement of orthognathic surgical techniques as well as the rise in popularity of growth modification in North America have led to increased awareness of the esthetic facial changes brought upon by various orthodontic treatment options.

[See Camouflage orthodontic treatment]

Dislocation of the condyle (Luxation, Open lock)

Non-reducible displacement of the mandibular condyle in an anterior direction, past the articular eminence.

Disruption

A morphological defect of an organ, part of an organ, or a larger region of the body resulting from a breakdown of, or interference with, an originally normal developmental process. An example is an amputation of a digit in utero, or a atypical facial cleft caused by an amniotic band.

[Compare with Malformation]

[Compare with Deformity]

Dissociation, Point of

[See Burstone's geometry classes, Geometry IV]

Distal

Away from a point of reference. In the case of teeth, away from the dental midline, along the dental arch (in a right or left direction when referring to anterior teeth, or in a posterior direction when referring to posterior teeth).
[Compare with Mesial]

**Dissociation, Point of**

[See Burstone's geometry classes, Geometry IV]

**Discrepancy**

Inconsistency, incongruency or disagreement.

[See Midline discrepancy (Midline shift, Midline deviation)]

[See Tooth size discrepancy (Bolton discrepancy)]

[See Arch length discrepancy]

**Disclusion (Disocclusion, Disarticulation)**

Separation of the mandible from the maxilla through tooth-guided contacts during mandibular excursive movements.

**Distal tipping**

Tipping of the crown of a tooth in the distal direction.

**Distalization**

The movement of teeth to the distal.

**SUBTERMS:**

Distalization
- Molar distalization

A treatment procedure designed to provide space for alignment of teeth and achievement of ideal overjet and overbite, as an alternative to premolar extraction. The procedure can be performed with or without extraction of the second molars. Various appliances are designed for this purpose, including the ACCO and pendulum appliances, appliances with compressed coils or repelling magnets, and extraoral traction appliances.
Distortion
Deviation of a radiographic image from the true outline or shape of the object or structure.

Distoversion
Distal tipping (angulation) of a tooth or group of teeth.

Distraction (of the condyle)
Separation or forced downward movement of the condyle from the articular fossa.

Distraction (of the mandible)

[See Arthrokinetics of the TMJ]

Distraction osteogenesis (Distraction osteosynthesis, Ilizarov technique, Callus distraction, Callotasis)
A technique for lengthening of long bones of the extremities attributed to G. A. Ilizarov, although it was first described by A. Codivilla in 1905. Other applications of the method in orthopedics are in the treatment of fractures or malunions. It also is used in the craniofacial area for the correction of bone defects in the skull and for the treatment of hypoplasias of the maxilla or the mandible. It involves a corticotomy followed by gradual distraction of the segments, with formation of new bone ("regenerate" bone) between them. The distraction can be performed by an extraoral or an intraoral device containing some type of screw that can be wound gradually, in a manner similar to rapid maxillary expansion.

The advantage of the technique is that it allows simultaneous expansion of the surrounding soft tissue envelope and generates bone without the need for a graft. The disadvantages include the facial scars and inconvenience in the case of an extra-oral procedure, as well as the lack of adequate control of the direction of movement (mainly in the case of the proximal segments in mandibular distraction). Furthermore, little is known about the potential implications of a mandibular distraction procedure on the TMJs.

Dolichocephalic
Anthropometric term denoting an individual with a long, narrow cranial form; having a cephalic index smaller than 76. Severe dolichocephaly may result from premature synostosis of the sagittal suture.
[Compare with Brachycephalic]

**Donor site**

The area of the body from which a graft is taken.

[Compare with Recipient site (Host site)]

**Down-fracture (of the maxilla)**

An orthognathic procedure in which all or part of the maxillary alveolar and basal bone is separated from the more superior elements of the midfacial skeleton. The procedure usually involves a Le Fort I or sometimes a Le Fort II osteotomy.

**Drift (of bones)**

A term established by D. H. Enlow to signify the movement of a bony structure in relation to adjacent structures, caused by simultaneous bone apposition and resorption processes on opposing surfaces.

[See Cortical drift]

**Drift (of teeth)**

Spontaneous movement of teeth without the direct application of orthodontic forces.

**SUBTERMS:**

Drift (of teeth)

- Distal drift

1. The occasional tendency of teeth mesial to an edentulous space to move distally into it.

2. The spontaneous distal movement of teeth associated with active distalization of adjacent teeth (e.g. the distal drift of the maxillary premolars following molar distalization.)

Drift (of teeth)
Mesial drift (Mesial migration, Approximal drift)

A term applied to either a natural developmental phenomenon whereby the posterior teeth continually move in a mesial direction as a result of interproximal surface wear, or to the tendency of teeth distal to an edentulous space to move mesially into it.

[See Physiologic tooth movement, Post-eruptive tooth movement]

Dual bite

A situation in which a patient has two positions of habitual occlusion (intercuspal position) that differ by more than 2 mm.

Ductility

The ability of a material to sustain a large permanent deformation under a tensile load without rupture. A metal that can be drawn readily into a wire is said to be ductile. Ductility is heavily dependent on strength.

[Compare with Malleability]

Dynamic friction

[See Friction]

Dynamics

The branch of mechanics that considers forces on bodies which are being accelerated positively or negatively. Dynamics plays a relatively minor role in orthodontics, where accelerations or decelerations are practically negligible. Dynamics is comprised further of "kinematics" and "kinetics."

SUBTERMS:

Kinematics
Kinetics

Dysfunction

Abnormal, impaired or altered function.
**Dysostosis**
A pathological condition characterized by defective ossification, especially involving fetal cartilages.

**Dysplasia**
Abnormality of development.

**Eccentric extraoral traction**
[See Headgear, Asymmetric headgear (Eccentric headgear)]

**Ectopic eruption**
The eruption of a tooth in an abnormal position. In the permanent dentition, this condition occurs most often in maxillary first molars and maxillary or mandibular incisors and canines. A typical example is the eruption of a maxillary first permanent molar in a mesial position under the distal part of the crown of the adjacent second deciduous molar.

**Edge bevel**
Rounding of the edges of orthodontic wires with square or rectangular cross section, as part of their manufacturing process. A certain amount of edge beveling is desirable to prevent discomfort of the soft tissues and to facilitate engagement of the archwire in the bracket slot. If the amount of rounding is excessive, it can be of clinical significance for control of the buccolingual inclination of the teeth provided by the archwire-bracket combination.

**Edge-to-edge bite (End-to-end bite)**
A situation in which the maxillary and mandibular incisors meet with contact of their incisal edges. This type of occlusal relationship is most commonly seen in malocclusions with a Class III component.

**Edgewise bracket**
[See Appliance, Edgewise appliance (Standard edgewise)]
**Elastic limit**

The maximum deformation that a body (e.g. orthodontic wire or appliance part) can undergo before permanent (plastic) deformation occurs. Precise experimental distinction between the proportional limit and the elastic limit is difficult, and for all practical purposes they can be considered indistinguishable.

**Elastic material**

A material that undergoes no permanent deformation (fully recovers its original shape), after it has been subjected to a certain stress.

[See Elasticity]

**Elastic modulus (E)**

S. Modulus of elasticity.

[See Modulus of elasticity E (Young’s modulus of elasticity, E-modulus)]

**Elastic range**

The strain up to which no plastic deformation occurs. [On a stress/strain diagram, the horizontal (strain) coordinate of the elastic limit.]

**Elastic strength**

The load (stress) up to which no plastic deformation occurs. [On a stress/strain diagram, the vertical (stress) coordinate of the elastic limit.]

**Elasticity**

The property of a material to exhibit reversible deformation under load (i.e. changing its shape without undergoing permanent deformation). An elastic material regains its original shape when the load is removed.

[See Modulus of elasticity E (Young’s modulus of elasticity, E-modulus)]

**Elastomer (Elastomeric material)**

A polymer (soft, rubber-like material) containing large molecules with weak interaction among them, cross-linked at certain points to form a three-dimensional structure. Elastomers may be stretched when their chains are pulled apart and uncoiled, but on removal of the stress they snap back to their relaxed state and practically their original dimensions.
Elastomeric modules

Different configurations of elastomeric material in the shape of small circles (ligatures), chains or threads, with various orthodontic applications.

SUBTERMS:

Elastomeric modules
• Elastomeric chain

A chain of connected elastomeric rings used as a force-producing mechanism for orthodontic tooth movement. Elastomeric chains can be open or closed, depending on whether or not there is a distance between the rings at its passive state.

Elastomeric modules
• Elastomeric ligature ("Donut," "O-ring")

Small round band of elastomeric material that is stretched around the tie-wings of an orthodontic bracket for the purpose of preventing disengagement of an archwire or auxiliary from a bracket slot.

Elastomeric modules
• Elastomeric thread

A stretchable thread made of elastomeric material available in various cross-sectional thicknesses. It is used as a force-producing mechanism for tooth movement.

Electromyography (EMG)

Detection and recording of changes in the intrinsic electric potentials of skeletal muscles, by means of surface ("surface EMG") or needle electrodes ("deep EMG").

Elevation of the mandible

[See Arthrokinetics of the TMJ]

Elevator masticatory muscles

Paired masseter, medial pterygoid and temporalis muscles, the main action of which is to elevate the mandible.
Elgiloy wire

[See Cobalt-chromium alloy (Co-Cr, Cobalt-chromium-nickel alloy, Chromium-cobalt alloy)]

Elongation

Overall deformation (elastic and plastic) of a material as a result of tensile force application.

Emergence

The stage of the eruption process involving the initial penetration of the gingiva by the erupting tooth and its first appearance in the oral cavity. The term sometimes is used to signify breaking through the alveolar bone during eruption.

Eminectomy

Surgical removal of part of the articular eminence of the temporomandibular joint or recontouring of its surface. Eminectomy occasionally is contemplated as a treatment modality for some types of TMD.

Emission scintigraphy (Planar scintigraphy)

Two-dimensional imaging process in which the area of interest is scanned with a gamma camera 2 to 4 hours after the administration of a radio-labeled material. When bone is to be assessed, technetium 99m is the radioisotope of choice due to its tendency to accumulate in areas of osteoblastic activity. Increased uptake of the radioisotope in the tissue scanned is indicative of increased cellular activity (as for instance an active area of growth in children, neoplasia or inflammation).

"En masse" retraction

Retraction of a number of teeth (usually the four incisors, or all six anterior teeth) together, as a group.

"End-on"
Anteroposterior deviation of an occlusal relationship from the ideal (Angle Class I) by one half cusp (half the mesiodistal width of a premolar). The term can be used for either Class II or Class III occlusal relationships.

**Enucleation**

Surgical removal of a bone cyst together with its lining, or of a tooth that has not yet emerged into the oral cavity. Enucleation of premolars sometimes is contemplated as part of a serial extraction protocol, but depending on the technique and the situation, it carries a chance of creating a residual bony defect at the site. Enucleation of the mandibular third molars sometimes is advocated as a means to increase the available space in a severely crowded mandibular arch.

**Envelope of discrepancy**

A diagram devised by W. R. Proffit and J. L. Ackerman to illustrate graphically the amount of change that can be produced by orthodontic tooth movement alone (inner envelope), orthodontic tooth movement combined with growth modification (middle envelope), and orthognathic surgery (outer envelope) in the sagittal and vertical planes of space, based on the authors’ clinical judgment.

**Envelope of motion**

The three-dimensional space circumscribed by border mandibular movements and by the incisal and occlusal contacts of a given point of the mandible.

**Epicanthal folds**

Excess skin and subcutaneous tissue lateral to the nasal bridge, concealing the medial canthi. Epicanthal folds may be a result of racial phenotype (common in Asians), nasal bridge hypoplasia, orbital hypotelorism, surgery, or trauma.

**Epidemiology**

The science concerned with the frequency and distribution of a disease or state. Its focus is on the total population rather than the individual, and its purpose is disease classification and prevention.

**Equilibrium**
The state of a body (i.e. a tooth or dental segment) or a system when the sum of all the forces and the sum of all the moments acting on it is equal to zero. The assumption that a system is in static equilibrium at a given point is the basis for static analysis of all mechanical systems.

**Eruption path**

The path traversed by a tooth, through surrounding tissues, from the initiation of its eruptive movement until its arrival at its functional position in the mouth.

**Eruption theories**

[See Tooth eruption mechanisms]

**Etiologic factors**

Factors that may be involved in, or cause the development of a disease or condition.

**Euryprosopic**

Having a wide and short facial form.

**Excursion of the mandible**

Movement of the mandible away from the median position or the intercuspal occlusion position.

[See Arthrokinetics of the TMJ]

**SUBTERMS:**

Excursion of the mandible
• Lateral excursion

Right or left movement of the mandible away from the midsagittal plane (to the side).

[Compare with Mediotrusion]

[Compare with Laterotrusion]

Excursion of the mandible
• Protrusive excursion
Anterior movement of the mandible from the intercuspal position.

**Exfoliation (Shedding)**

Physiological loss of a deciduous tooth prior to the eruption of its successor.

**Exostosis**

A hyperplastic osseous overgrowth projecting outward from the surface of a bone (e.g. torus palatinus, torus mandibularis).

**Expansion**

Enlargement; increase in volume, surface or extent. The term often is used to refer to the process of widening of the dental arches.

**SUBTERMS:**

Expansion
- Asymmetric expansion

At the level of the dental arch, asymmetric expansion can be attempted by pitting the segment of teeth that primarily needs to be expanded against an anchorage segment of increased size. In practice this is done by incorporating more teeth or a larger palatal surface in the anchorage segment (anchorage reinforcement) and/or by expanding the teeth on the active segment one at a time. In any case, some buccal displacement of the teeth in the anchorage segment will be observed as a side effect.

Expansion
- Rapid maxillary (palatal) expansion (RME, RPE)

A method of increasing the maxillary arch width by opening the midpalatal suture, thereby achieving some degree of skeletal expansion. The method, which was popularized by A. J. Haas, involves the use of a fixed (cemented or bonded) maxillary appliance of several possible designs, using an expansion screw of the same type as in the Hyrax appliance. The screw typically is activated by at least 0.20 to 0.25 mm (one quarter turn) daily and may produce a force as high as 100 N (10 kg or 20 lb). Expansion usually is continued until the lingual cusps of the maxillary
posterior teeth come into contact with the lingual inclines of the buccal cusps of the mandibular posterior teeth. A diastema commonly appears between the central incisors as the midpalatal suture separates, which closes spontaneously in the few weeks following the procedure due to the pull of the supracrestal fibers. When active expansion has been completed, a 3- to 5-month retention period is recommended with the appliance in place. It is advocated that this type of expansion may have more of a skeletal effect and may minimize the amount of dental tipping, which is a common (usually undesirable) side effect of orthodontic arch expansion.

[See Appliance, Haas appliance (Haas rapid maxillary expansion appliance, Haas palatal separator)]

[See Appliance, Hyrax appliance (Hygienic rapid palatal expander)]

[See Appliance, Expansion appliance]

[See Expansion, Slow maxillary (palatal) expansion (SME or SPE)]

[See Expansion, Surgically assisted rapid maxillary expansion]

Expansion
• Slow maxillary (palatal) expansion (SME or SPE)

A method of increasing the maxillary dental arch width by using a maxillary removable appliance that normally carries an expansion screw in the midline. The appliance commonly is activated by 0.20 to 0.50 mm (one or two quarter turns) per week and is advocated in patients that require limited expansion, since it produces expansion mainly by dental tipping.

[See Appliance, Expansion appliance]

[See Appliance, Haas appliance (Haas rapid maxillary expansion appliance, Haas palatal separator)]
Expansion

Surgically assisted rapid maxillary expansion

In adult patients in whom the midpalatal suture is fused, the resistance to suture separation can be decreased by bilateral osteotomies of the lateral maxillary buttress, with or without a midpalatal osteotomy. After the lateral osteotomies are performed, the screw is turned a few times in the operating room to achieve separation of the suture and is subsequently turned back. The patient can begin activating the appliance the following day. If correction of a unilateral maxillary palatal crossbite is necessary, the lateral osteotomy can be made only on one side, thus creating a differential anchorage situation.

Expansion screw (Jackscrew or Glenn Ross screw)

A mechanical device incorporated in a removable or fixed appliance used to enlarge the dental arch, usually in the transverse dimension. Expansion screws also can be used as part of a removable appliance for individual tooth movement or for incisor proclination, as well as in a bone distraction device for distraction osteogenesis.

Expansion screw key

An instrument used to turn the jackscrew of an expansion appliance.

Extraction

Removal of teeth.

Extraction therapy
Orthodontic treatment requiring the extraction of one or more permanent teeth.

**Extraction vs. non-extraction debate**

A long-standing controversial issue in orthodontics, over whether or not extraction of permanent teeth is advisable and necessary as part of orthodontic treatment. This debate started in the early 1900s between E. H. Angle and his former student C. S. Case, and has been continuing, on and off, ever since. Angle’s thesis was that “there shall be a full complement of teeth and each tooth shall be made to occupy its normal position.” He believed in the universal applicability of the "normal occlusion theory" in which every tooth must have its ideal position and serve its specific function. Case, on the other hand, defended the judicious use of extraction as a practical procedure. Following his own precisely set rules, he claimed to extract in only 12% to 15% of his cases.

The climax of this conflict was a fierce debate in 1911 between Case and M. Dewey (who represented Angle’s views) at the annual meeting of the National Dental Association (former name of the ADA). It took many years after this episode for the problem to become a matter of calm and objective evaluation and respectful appreciation of various points of view, each of which has made its contribution to orthodontics.

**Extraoral traction**

The use of extraoral anchorage to apply forces to the dentition or the jaws.

**Eyelet**

A small orthodontic attachment in the shape of a closed helix soldered onto a bonding base or welded directly on an orthodontic band. Eyelets mainly are used as handles for elastic traction.

[See Attachment, Orthodontic]

**Facebow (of an articulator)**

An instrument used to enable the mounting of dental casts on an articulator. The facebow is used to record the relationship of the patient’s maxillary arch with respect to the opening axis of the temporomandibular joint and the Frankfort horizontal plane and subsequently to transfer this relationship to the articulator.

**Facebow (of a headgear)**
The rigid wire component of a headgear used to transfer extraoral forces to the maxilla (or occasionally the mandible) and the teeth. A facebow consists of two coplanar metal bows, brazed or (laser-)welded at the midline. The smaller of the two bows (inner bow) inserts intraorally into specially manufactured tubes that usually are attached to the bands of the maxillary first molars, or incorporated into the acrylic of a removable orthodontic appliance. The hooks at both ends of the larger, outer bow attach to the headgear strap, which produces an extraoral force of variable direction, depending on the type of headgear (cervical, occipital, etc.).

**Facial asymmetry**

A term denoting a dissimilarity or disproportionality between the right and left sides of the face, usually meant as an undesirable lack of balance. The asymmetry can be due to the underlying facial skeleton or to the soft tissue drape.

**Facial concavity**

A term commonly used in profile analysis. A concave facial profile is one in which an inwardly rounded curve is formed from the forehead to the lips to the chin, as often associated with a Class III malocclusion (Downs’ angle of convexity (NAPg) has a negative value). [Modified from the AAO Glossary of Dentofacial Orthopedic Terms, 1993.]

**Facial esthetics**

A term pertaining to the beauty and appeal of the face. It is an entity which carries a great deal of subjectivity and is impossible to describe and quantify accurately, but it generally is believed that symmetry, balance and proportion play a major role.

**Facial form**

The term usually refers to the configuration (shape) of the face from an anterior (frontal) view.

**Facial growth**

The physiological process of enlargement and change of the facial skeleton and overlying soft tissues over time.

**Facial pattern**

A term generally used to describe the facial configuration, or the directional tendency of facial growth, from a lateral (profile) view.

**Facial type**
1. When referring to the lateral (profile) view the facial type can be described as: retrognathic (opisthognathic), mesognathic (orthognathic) or prognathic.

2. When referring to the frontal view, the three facial type options are: brachycephalic or euryprosopic (wide and short), mesocephalic or mesoprosopic (average) and dolichocephalic or leptoprosopic (long and narrow).

**Facies**

A distinctive facial appearance characteristic of certain disorders (i.e. Down syndrome).

**Fatigue**

Degradation of materials subjected to a number of load changes. Tendency to fracture under cyclic stresses.

**Fatigue failure**

The phenomenon in which stress values well below the ultimate tensile stress of a material can produce a premature fracture because microscopic flaws grow slowly over many cycles of stress. Depending on the type of loading situation, a material can exhibit either static or dynamic fatigue failure.

**SUBTERMS:**

- Fatigue failure
  - Dynamic fatigue failure

Most prosthetic and restoration fractures develop progressively over many cycles of periodic occlusal loading after initiation of a crack from a critical flaw and subsequently by propagation of the crack until a sudden fracture occurs.

- Fatigue failure
  - Static fatigue failure

Fracture of a material attributed to the interaction of a constantly applied stress with structural flaws over time.

**Fenestration**

Round or oval perforation of the buccal or lingual cortical plate of the alveolar process over the root of a tooth, which does not involve the alveolar crest.
Ferrite

One of the three possible lattice structures of iron, on which the different classes of steels also are based.

The body-centered cubic (BCC) structure that pure iron has at room temperature. This phase is stable in temperatures as high as 912° C.

[See Martensite]
[See Austenite]

FGF

[See Growth factors]

Fibrosis

Formation of fibrous connective tissue to replace normal tissue lost through injury or infection.

Figure-eight ligature

A stainless steel ligature tied around two or more brackets on teeth of the same arch, so that its two ends cross over each other at the interproximal spaces, forming a figure of eight. It is used to prevent closed spaces from reopening and to consolidate teeth together, forming a multi-tooth anchorage segment.

[See Laceback (Lace)]

Finishing

The final stage of fixed appliance orthodontic treatment, during which final detailing takes place to idealize individual tooth position.

Finite element analysis

An engineering technique of stress analysis, the basic concept of which is the visualization of a structure as an assemblage of a finite number of discrete structural elements connected at a finite number of points. The finite elements are formed by figuratively "cutting the original structure into segments. " For two-dimensional applications, triangles of various sizes and shapes usually are
the finite elements of choice. Each element retains the mechanical characteristics of the original structure. Some characteristics of the material have to be specified (depending on whether it is isotropic or not).

Additionally, a numbering system is required to identify the elements and their connecting points, called "nodes." A coordinate system also must be established to identify uniquely the location of the nodal points. A large number of simultaneous linear equations are computer-generated, which establishes compatibility within each element.

The technique has some very distinct advantages as a research tool, among which is the ability to obtain an estimate of the stresses throughout the structure under consideration. Further, the inclusion of any type of anisotropy and inhomogeneity conceptually is possible by inserting the appropriate distribution of material properties at the nodes of the elements. However, when it is applied to structures such as a tooth, there are some practical limitations, as relatively little is known about the mechanical properties of dental and especially periodontal tissues.

**First transitional period**

The period during which the deciduous maxillary and mandibular incisors are replaced by the permanent incisors (starting from the time of exfoliation of the first deciduous incisor, or from the time of emergence of the first permanent molar in the mouth, and ending with the eruption of the last incisor).

**Fistula**

An abnormal passage or communication between two anatomical cavities, or between an anatomical cavity and the external body surface.

**SUBTERMS:**
- Fistula
  - Oronasal fistula

A fistula connecting the nasal and oral cavities, a common finding in patients with a history of cleft lip and palate.

**Fixation, Surgical**

Immobilization of bones following a fracture or a surgical procedure to facilitate and accelerate the healing process.
SUBTERMS:
Fixation, Surgical
• Intermaxillary fixation (IMF, Maxillo-mandibular fixation)

Traditional method of fixation utilizing stainless steel wires between the maxillary and mandibular teeth to immobilize the mandible. The wires can be ligated on special hooks soldered or crimped on the orthodontic archwires, or on arch bars if no fixed orthodontic appliances are present. Typical duration of IMF is between 6 and 8 weeks, during which the patient is fed liquid diet through the retromolar area. Intermaxillary fixation is sometimes combined with RIF, in which case its duration is shorter.

Fixation, Surgical
• Rigid internal fixation (RIF)

Fixation technique in which bony segments are immobilized by use of small titanium bone plates (fixation plates) and/or screws across the osteotomy or fracture line. Bone plates must be contoured carefully to adapt to the bony surfaces prior to their application. By directly and rigidly fixing bony segments together, the period of intermaxillary fixation can be reduced or completely eliminated after surgery. Rigid internal fixation occasionally is combined with IMF following orthognathic surgery.

Fixation plate

Titanium plates of various configurations that carry holes for placement of osseous screws, used for rigid internal fixation.

Fixation screws

Titanium osseous screws (2.0 to 3.5 mm in diameter or larger) used for stabilization of the bone plates in rigid internal fixation.

SUBTERMS:
Fixation screws
• Bicortical (Position) screw
Fully threaded screw that binds in both cortices of the two bony segments to which it is applied. As the screw is tightened, no compression is possible because with the screw threads engaging both segments, the distance between them is maintained.

**Fixation screws**

- **Lag screw**

  Partially threaded screw (only has threads close to its tip) that is placed so that its threads only bind the cortex of the bony segment that lies farthest away from the point of entry (i.e. the medial/distal segment in the case of a BSSO). The same size hole is drilled in both segments. As the lag screw is tightened, it engages the medial/distal cortex but is free to rotate in the lateral/proximal cortex, which eventually produces compression of the segments against each other.

[See Segment, Distal segment]

**Fixture**

A device that is firmly fastened in place in a mechanical sense, often used to secure other devices. [In implantology the term commonly is used to denote the body of an osseointegrated dental implant (i.e. the portion of the implant that is placed into the bone surgically).]

**Flange**

A projecting rim of a removable orthodontic appliance, usually consisting of an acrylic extension of its main body. Flanges commonly are used in functional appliances to dictate the desired mandibular position. Vestibular and lingual flanges also serve to remove the pressures from the surrounding soft tissues on the alveolar processes and teeth.

**Flap**

A loosened section of tissue, separated from its surrounding tissues except at its base.

**SUBTERMS:**

- **Flap**
  - Repositioned flap
A flap that is moved laterally, coronally or apically to a new position.

**Flared teeth**

A term used to indicate generalized labial tipping of the maxillary and/or mandibular anterior teeth, or generalized buccal tipping of posterior teeth.

**Flexibility**

The property of certain materials that can undergo a larger strain or deformation under the influence of a relatively small stress. The maximum flexibility is defined as the strain that occurs when the material is stressed to its proportional limit. It is desirable that orthodontic wires and springs have a high flexibility as well as a high value for the elastic limit (the stress above which a wire will not recover its original shape).

**Flexion-extension injury (Whiplash)**

Sudden, exaggerated traumatic movement of joints through the extremes of their range of motion with hyperflexion and then hyperextension, resulting in ligamentous sprain, muscular strain, inflammation and subsequent reflex muscle splinting.

**Flux**

A substance that promotes the flow of solder over two metal parts by preventing the production of oxides.

**Force**

The action of one body on another body that tends to change the state of rest or motion of the latter. Orthodontics is based on the application of forces on teeth, under the influence of which tooth movement can be achieved. Force is a vectorial quantity. This means that to adequately describe a force, its magnitude, direction (line of action), sign (sense) and point of application have to be defined. Forces are depicted in a coordinate system as vectors. The inclination of the vector (or the angle between it and a specified reference line or axis) shows the direction of the force, the length of the vector is proportional to the magnitude of the force, and the arrowhead denotes the sense of the force. Force, though defined in Newtons, commonly (but, strictly speaking, inaccurately) is reported in mass units (grams or ounces).

**SUBTERMS:**

Force
- **Component forces**

The constituent forces (two or more) of a certain force system.

**Force**
- **Concurrent forces**

Two or more forces that have the same point of application.

**Force**
- **Constant force**

A force whose magnitude remains the same as at the time of activation, for a certain time interval (e.g. from one patient visit to the next). This is a theoretical concept, as in clinical reality a true constant force cannot be generated, but only approximated.

**Force**
- **Continuous force**

A force that is maintained between certain intervals (e.g. does not drop to zero between patient visits).

**Force**
- **Coplanar forces**

Two or more forces whose vectorial direction is on the same plane of space (regardless of their sense).

**Force**
- **Extraoral force**

Force generated by (elastically) deforming an activating element of an orthodontic or orthopedic appliance, located outside the oral cavity.
[See Anchorage, Extraoral anchorage]

Force
• Heavy force

A force of high magnitude.

[Compare with Force, Light force]

Force
• Intermittent force

A force whose magnitude abruptly drops to zero, as is the case when an orthodontic appliance is removed by the patient and then resumes again, as when the appliance is re-inserted into the mouth. Intermittent forces are produced by all appliances that require patient cooperation, such as removable appliances, headgear, and elastics.

Force
• Interrupted force

A force whose magnitude declines to zero between activations. Most conventional orthodontic force-producing mechanisms (with the exception of super-elastic wires and coils) generate interrupted forces that sharply or smoothly decline as some tooth movement occurs, and require re-activation after a certain time period.

Force
• "Jiggling" forces

Interrupted forces causing the teeth to move in one and then in another direction. Occlusal forces are thought to be of the "jiggling" type, especially in cases of occlusal trauma. No clear-cut pressure and tension zones can be identified histologically in affected teeth, but rather there is a combination of pressure and tension.

[See "Jiggling" (of a tooth)]

[See Round-tripping]

Force
• Light force

A force of low magnitude. The term is used freely and arbitrarily, as there is neither universal consensus nor sound scientific evidence regarding specific numeric values of magnitude. As well, it is application-dependent: a force that is considered too high for a certain application may be ideal for another.
Force
• Normal force (FN)

Any force acting in a direction perpendicular to the plane under consideration. In the case of friction between two bodies, the force acting in a direction perpendicular to the contacting surfaces. The magnitude of the normal force is directly proportional to the magnitude of the frictional force.

[See Frictional coefficient (μ)]

Force
• Orthodontic force

Force applied to teeth for the purpose of effecting tooth movement, generally having a magnitude lower than an orthopedic force. There is no clear distinction between orthodontic and orthopedic forces in terms of magnitude, but rather many widely variable, arbitrary suggestions exist in the literature.

Force
• Orthopedic force

Force of higher magnitude in relation to an orthodontic force that, when delivered via the teeth for 12 to 16 hours a day, is supposed to produce a skeletal effect on the maxillofacial complex. Little scientific evidence exists regarding the magnitude that a force should have in order to produce a skeletal effect.

Force
• Reaction force

A force identical in magnitude and direction to the active force that is used for a certain orthodontic application, but of opposite sense.

[See Newton's laws, III. Law of action and reaction]
When two or more coplanar, non-concurrent forces is to be performed.

[See Force composition (Combination of forces)]

**Force composition (Combination of forces)**

Determination of a resultant force by combination of two or more component forces. When two component forces have a common point of application, the resultant force is determined by considering the two vectors to be sides of a parallelogram (geometric method). The resultant force then is the diagonal of the parallelogram. Its length indicates the magnitude of the resultant force on the same scale as the original forces. It is important to understand that the resultant force will have the identical effect on movement of the tooth as the two separate forces. A tooth or a set of teeth moves in response to the net effect of all forces. If the resultant force is the same, the movement will be the same, regardless of how many individual forces are applied to the tooth and regardless of their direction.

To determine the resultant of more than two forces that have a common point of application, a series of successive parallelograms is constructed. Each time, the resultant from any two forces replaces those forces and is used to construct the next parallelogram. The sequence in which forces are combined is of no consequence. However, different forces on a tooth usually are not applied at the same point, as was assumed previously. According to the law of transmissibility of force, the point of application of a force may be considered to be anywhere along its line of action. Consequently, the resultant of two forces with different points of application can be determined by extending their lines of action to construct a common point of application.

[See Law of transmissibility of force]

**Force couple**

[See Couple]

**Force delivery**

A force produced by an orthodontic wire, spring or other auxiliary against a tooth.

**Force resolution (Decomposition of forces)**

Rather than combining two or more forces into a single resultant, it often is useful to divide a single force into components at right angles to each other (in two or three dimensions). In this instance,
the parallelogram procedure for composition of forces is reversed. Every force can be considered as the diagonal of a parallelogram and its components can be drawn along the orthogonal axes.

With more than one force on a tooth, there are two methods for determining the overall component forces. First, the applied forces can be combined into a single resultant, and then this resultant can be resolved into its components. Alternatively, the components for each force can be determined separately, and these components then can be combined to determine the net component vectors.

[See Force composition (Combination of forces)]

[See Global reference frame]

**Force system**

Combination of all the forces and moments acting on a body. A 3-dimensional force system consists of three forces in the principal dimensions of space (Fx, Fy, Fz) and three moments considered about the three axes (Mx, My, Mz).

**SUBTERMS:**

- **Force system**
  - Applied force system

  The force system acting at the point of application of the forces (usually the bracket of a tooth).

  - Consistent force system
    A force system that only includes forces and moments that are desirable for the intended tooth movement.

  - Effective force system
    The combination of forces and moments considered at the center or resistance (CRes) of a body (tooth). It can be used to predict the type of movement that will occur.

  - Equivalent force systems
Two force systems are equivalent if they cause the same effect on a body. In such a case, the sum of all the forces and the sum of all the moments in system A have to be equal to those in system B in all three principal dimensions of space.

Force system
• Inconsistent force system

A force system that contains one or more components (forces or moments) which are not compatible with the intended tooth movement and thus would lead to unwanted side effects.

Force system
• Statically determinate/indeterminate force system

As stated by the first law of Newton, when a body is in static equilibrium then the sum of all the forces and the sum of all the moments acting on it must be equal to zero (SF = 0 and SM = 0). This generates a total of six equations in 3 dimensions. When the number of static equilibrium equations is larger than or equal to the number of unknowns, then the force system is determinate, which allows calculation of the applied forces and moments and prediction (to an extent) of the resulting tooth movement. This is done by considering the system at one specific instant in time and by assuming that it is, at that time, in static equilibrium.

When a wire connects two teeth (or two segments of teeth that have been joined together so that they can be assumed to be rigid bodies and their CRs can be estimated) then specific equilibrium equations may be formulated for them, which allow a description of the force system and an approximate prediction of the tooth movement that will occur (determinate force system).

Conversely, when a continuous wire engages more than two teeth, the forces and moments acting on each tooth will interact with the force systems on the adjacent teeth. The result is a situation with more unknowns than available equilibrium equations, which does not permit analysis of the resulting forces and moments. The force system then is said to be statically indeterminate.

Mandibular shift (CR-CO shift, Mandibular slide, Forced bite, Slide in centric)

A deflection of the mandible in an anterior, posterior and/or lateral direction, as a result of a premature contact occurring when the mandible is in centric relation.
Forced bite
• Anterior forced bite

A mandibular shift in an anterior direction from CR to CO. An anterior forced bite may result in an anterior functional crossbite.

[See Crossbite, Functional crossbite (Pseudo-crossbite)]

Forced bite
• Lateral forced bite

A mandibular shift in a lateral direction after an occlusal interference in CR. A lateral forced bite may be the cause a posterior functional crossbite.

[See Laterooclusion]

**Forced eruption (of a tooth)**

The application of orthodontic traction to guide an unerupted or impacted tooth into its proper position in the dental arch, usually following its surgical exposure.

[See Surgical exposure (of a tooth)]

**Formability**

The amount of permanent deformation that a material can withstand before failing. In the case of an orthodontic wire, it represents the amount of permanent bending the wire will tolerate (e.g. while being formed into a clinically useful spring or loop) before it breaks. High formability is a property that an ideal wire alloy for orthodontic purposes should possess.

**Forme fruste**

An atypically mild or incomplete manifestation of a disease or anomaly (e.g. forme fruste cleft lip).

**Fracture**
Break or discontinuity of an entity (pertaining to a fractured bone, tooth, cartilage, but also wire, appliance part, ceramic bracket etc.).

SUBTERMS:

Fracture
  • Comminuted fracture

A fracture resulting in multiple small segments, fragments or splinters.

Fracture
  • Complex fracture

A fracture involving vital structures adjacent to the fracture site.

Fracture
  • Compound (open) fracture

A fracture that has communication with the external surface (e.g. when a bony segment perforates the skin or penetrates the oral mucosa).

Fracture
  • Displaced fracture

A fracture leading to gross discontinuity of the segments involved, as compared with the normal anatomy.

Fracture
  • Greenstick fracture

An incomplete fracture, in which one side of a bone (one cortical plate) is broken and the other side is bent (usually the fracture only involves the convex side of the curve).

Fracture
  • Intracapsular fracture

A fracture occurring within the capsule of a joint. In the case of the mandibular condyle, an intracapsular fracture involves the portion of the condylar head that is enclosed by the temporomandibular joint capsule.

Fracture
  • Pathologic fracture
A fracture due to the weakening of bone structure by pathologic processes such as osteomalacia, osteomyelitis, tumors or osteogenesis imperfecta. In instances of severe destruction of bone, fractures of the jaws can occur spontaneously during chewing, yawning or talking.

Fracture line
Linear radiolucency seen on a radiograph indicating a break in a bone or tooth.

Free body diagram
A depiction of an object (e.g. a tooth) or system as a free body, upon which all the acting forces and moments can be considered, and the Newtonian laws of static equilibrium can be applied, for purposes of mechanical analysis.

Free vector
A vector whose action is not confined to or associated with a unique line in space. A free vector can produce the same effect on a body regardless of the point on the body where it is applied. The moment of a couple is an example of a free vector commonly encountered in orthodontics.

Freeway space (Interocclusal clearance, Interocclusal separation)
The distance between the occlusal surfaces of the maxillary and mandibular teeth when the mandible is in its rest position.

Fremitus
Vibration of a tooth due to a premature contact with its antagonist in centric occlusion, which can be clinically detected by palpation.

Frenectomy
The surgical repositioning or excision of a (labial) frenum in cases where it is felt that its fibers may interfere with the stability of an orthodontically corrected midline diastema, or with its spontaneous closure during and after eruption of the maxillary canines. Frenectomy also is indicated when a frenum is involved in causing localized gingival recession or in cases of ankyloglossia.

[See Ankyloglossia (Tongue-tie)]

Frenum (Frenulum)
A fold of mucous membrane and underlying fibrous tissue.
Friction

A force resisting the relative dis-placement of two contacting bodies, in a direction tangent to the plane of contact. Because of friction, part of the mechanical energy intended for movement of the two bodies relative to each other is dissipated as thermal energy.

Static friction is the component of frictional force that has to be overcome to initiate motion.

Dynamic (kinetic) friction is the component of frictional force that has to be overcome to maintain motion. The static frictional force usually is somewhat higher than the dynamic frictional force.

Frictional coefficient ($\mu$)

The law of friction theorized by Coulomb states that the magnitude of the frictional force $F$ is equal to the product of the normal force $F_N$ acting perpendicular to the contact surface, multiplied by the frictional coefficient $\mu$ ($F = F_N \times \mu$). The frictional coefficient $\mu$ depends on the surface roughness and the combination of the materials involved. It does not depend on the area of the contacting surfaces and varies only slightly with the velocity of movement. With respect to the type of friction, a static and a dynamic frictional coefficient can be distinguished.

[See Friction]

Frontal plane (Coronal plane)

Any plane passing longitudinally through the body from side to side, at right angles to the median plane and dividing the body into front and back parts.

Function
The specialized, normal or proper physiologic activity of an organ or part.

**Functional jaw orthopedics**

Treatment with functional appliances, making use of forces created by the musculature of the patient to bring about the desired dentofacial and functional changes.

**Functional matrix theory**

A hypothesis put forth by M. L. Moss to provide a theoretical explanation of the interrelationship between osteogenesis and local functional demands. According to Moss, each function in the head is controlled by a specific functional cranial component. The size, shape and spatial position of the individual cranial components are relatively independent of one another. Each cranial component consists of two parts: a "functional matrix" that actually carries out the function and a "skeletal unit," whose role is to protect and/or support its specific functional matrix.

Skeletal units may be composed of bone, cartilage or ligaments, but they are not the equivalent of the "bones" of classic osteology. Skeletal units are distinguished as microskeletal or macroskeletal units. The sum of all microskeletal units of a skull component makes up the macroskeletal unit. For example, the mandible is a macroskeletal unit consisting of the condylar, coronoid, angular, alveolar and basal microskeletal units.

The functional matrix includes the functioning spaces and the soft tissue components required for a specific function. Teeth also are a functional matrix. When a functional matrix grows, or changes in size, shape or spatial position, the related skeletal unit will respond accordingly. Movement of teeth with orthodontic treatment induces changes on the alveolar skeletal unit. In a similar fashion, the blood vessels and nerves of the mandibular canal have an effect on the mandibular basal microskeletal unit.

There are two types of functional matrices, the "periosteal" matrix and the "capsular" matrix (their designation indicates the sites of their activity). The periosteal matrices include muscles and teeth, whereas the capsular matrices are conceived of as volumes enclosed and protected by both the neurocranial and the orofacial capsules. In the neural skull the capsular matrix is the neural mass. In the facial skull this matrix consists of the functioning spaces of the oronasopharyngeal and orbital cavities.

The capsular and periosteal matrices have completely different effects on the growth process. Periosteal matrices act upon skeletal units in a direct fashion by the processes of osseous deposition and resorption (or by the processes of cartilaginous and fibrous tissue manipulation). Their net effect is to alter the form (size and shape) of their respective skeletal units. On the other hand, capsular matrices act upon functional cranial components as a whole, in a secondary and indirect manner, by altering the volume of the capsules within which the functional cranial
components are embedded. The effect of such growth changes is to cause a passive translation of these cranial components in space.

Cranial growth is a result of combined activity of both types of matrix. Growth is accomplished by both spatial translation and changes in form.

**Fusion**

Abnormality of dental morphology involving a union of the dentin (and enamel) of two teeth, from two separate tooth buds.

[Compare with Twinning]

[See Concrescence]

[See Gemination]

**Genial**

Of or pertaining to the chin.

**Gemination**

Abnormality of dental morphology due to incomplete division of a single tooth bud.

[Compare with Twinning]

[See Fusion]

[See Concrescence]
**Genioplasty**

An orthognathic surgical procedure designed to reshape the contour of the chin, giving it a more esthetic appearance. The procedure is performed intraorally by a vestibular incision and, depending on the situation, can augment or reduce the prominence of the chin in the anteroposterior, vertical or transverse plane of space. This can be performed by various approaches, such as by sliding the distal (genial) segment on the proximal (mandibular) segment and/or by removal of a wedge of bone. Alloplastic grafts to increase the prominence of the chin are no longer widely performed, due to their side effects.

**Gingiva**

The fibrous investing tissue, covered by keratinized epithelium, that immediately surrounds a tooth and is contiguous with its periodontal ligament and with the mucosal tissues of the oral cavity. Two types of gingiva can generally be distinguished, attached and free gingiva.

**SUBTERMS:**

Attached gingiva
Free gingiva
Marginal gingiva

**Gingival col**

A valley-like depression of the interdental gingiva that connects facial and lingual papillae and conforms to the shape of the interproximal contact area.

**Gingival fibers**

Collagen (predominantly), reticulin and elastic fibers, which together with the different cells (e.g. fibroblasts, macrophages) and the ground substance (proteoglycans and glucoproteins) make up the connective tissue content of the gingiva. Depending on their orientation, they are organized into five principal groupings: the dento-gingival, alveolo-gingival, dento-periosteal, circular and transseptal fibers.
SUBTERMS:

Alveolo-gingival fibers
Circular fibers
Dento-gingival fibers
Dento-periosteal fibers
Transseptal fibers

Gingival fibrotomy

[See Circumferential supracrestal fibrotomy (Edwards' procedure)]

Gingival hyperplasia

An enlargement of the gingiva owing to an increase in the number of cells.

Ginglymoid joint

Hinging joint with one convex and one concave surface, with movement in only one plane of space.

Glenoid fossa (Mandibular fossa, Temporal fossa, Articular fossa of the temporal bone)

A depression on the inferior surface of the squamous portion of the temporal bone at the base of the zygomatic process, in which the mandibular condyle is situated. Posterior to the glenoid fossa is the squamotympanic fissure, which extends mediolaterally. Medially the fossa is limited by the spine of the sphenoid and laterally by the root of the zygomatic process of the temporal bone. Anteriorly, the fossa is bounded by the articular eminence. The middle part of the glenoid fossa is separated from the middle cranial fossa and temporal lobe of the brain by a fairly thin plate of bone.

Global reference frame

A coordinate system of three mutually perpendicular, intersecting axes (x = sagittal/anteroposterior, y = vertical/occlusogingival, and z = transverse/mediolateral), used as a reference for various measurements or vector analysis within a dental arch, or in relation to the entire dentofacial complex. The x-axis is defined as the intersection of the sagittal and occlusal planes, the y-axis as the intersection of the sagittal and coronal planes and the z-axis as the intersection of the coronal and occlusal planes.

Glycosaminoglycans (GAGs)
One of the types of macromolecules that constitute the extracellular matrix. Glycosaminoglycans are long, unbranched polysaccharide chains composed of repeating disaccharide units. Examples of GAGs include hyaluronic acid, dermatan sulfate and heparin.

The major characteristic of GAGs is that they are strongly hydrophilic and have the capacity to withhold water. Thus, GAGs tend to adopt highly extended, so-called random coil conformations, which occupy a large volume relative to their mass (as their polysaccharide chains are too inflexible to fold into more compact structures), and they form gels even at very low concentrations. These gels osmotically absorb large amounts of water into the matrix, enabling the matrix to withstand compressive forces (in contrast to collagen fibrils, which resist stretching forces). Cartilage matrix, for example, resists compression by this mechanism.

**Goldenhar syndrome**

A variant of hemifacial microsomia which additionally may include epibulbar dermoids (soft tissue tumors on the cornea of the eyes), lipomas around the orbits and vertebral abnormalities.

[See Hemifacial microsomia (First and second branchial arch syndrome)]

**Graft**

Any material or tissue that is not normally part of an organ or tissue, implanted or transplanted for the purpose of reconstructing or repairing.

**SUBTERMS:**

- Allogenic graft (Allograft, Allogeneic graft)
- Alloplastic graft (Alloplast)
- Alveolar bone graft
- Autologous (Autogenous) graft
- Costochondral graft
- Free graft
- Free gingival graft (Epithelialized free soft tissue graft)
- Full thickness periodontal graft (Mucoperiosteal periodontal graft)
- Heterologous (Xenogenic, Heterogenous) graft
- Homologous (Homogenous) graft
- Isologous (Syngeneic) graft
- Split thickness periodontal graft (Partial thickness periodontal graft, Mucosal periodontal graft)
- Subepithelial connective tissue graft

**Grating joint sound**
Grinding (of teeth)

[See Crepitus (Crepitation, Grating sound)]

Growth

The age-related increase in size or mass, involving changes in amount of living substance. Growth is the quantitative aspect of biologic development and is measured in units of increase per units of time (e.g. inches per year or grams per day). Enlargement of living matter with growth may be the direct result of cellular division or the indirect product of biologic activity (e.g. bones and teeth). Although growth typically is equated with enlargement, there are instances in which it results in normal decrease in size (e.g. the thymus gland after puberty).

[See Development]

Growth center

A location at which independent (genetically controlled) growth occurs, as opposed to a growth site, which is merely a location at which growth occurs. All growth centers also are growth sites, whereas the reverse is not true. For example, as a result mainly of transplantation studies, it is now known that the sutures between the membranous bones of the cranium and the maxilla that previously were considered as primary growth centers, actually are mere sites of growth. Conversely, the epiphyseal plates of the long bones are considered to be growth centers, as they continue to grow when transplanted to a new location or even in culture, indicating an innate growth potential.

Growth factors

Highly specific serum polypeptides that are directly and specifically involved in stimulating cell division and/or differentiation. Growth factors act in complex manners in regulating a certain function: most cell types probably depend on a specific combination of growth factors rather than a
single specific growth factor. Some growth factors are present in the circulation, but most act as local chemical mediators.

Examples of growth factors include the platelet-derived growth factor (PDGF), which stimulates proliferation of connective tissue cells and is involved in wound-healing; the insulinlike growth factors I and II (IGF-I and IGF-II), which stimulate proliferation of fat cells and connective tissue cells; the transforming growth factor β (TGF-β), which potentiates or inhibits the response of most cells to other growth factors and regulates differentiation of some cell types; and the fibroblast growth factor (FGF), which stimulates proliferation of many cell types, including fibroblasts, endothelial cells and myoblasts.

**Growth potential**

The amount of growth yet to occur.

**Growth prediction**

In general, an estimation of the amount of growth to be expected. In orthodontics, the term refers to the estimation of the amount and direction of growth of the bones of the craniofacial skeleton and the overlying soft tissues. Due to the large inter-individual variation, growth prediction generally is considered a procedure with relatively low accuracy.

**Growth site**

A location at which growth occurs.

[Compare with Growth center]

**Guidance of eruption**

A planned sequence of selective, timed extraction of deciduous teeth with the objective of facilitating the eruption of the permanent successors into improved positions. Guidance of eruption involves no extractions of permanent teeth.

[Compare with Serial extraction]

**Guide plane**

An acrylic surface of a removable or functional appliance that contacts a tooth and transmits the desired intermittent forces to it. A guide plane also may be the part of the functional appliance that serves to induce the desired anterior (or posterior) mandibular position.
**Guided tissue regeneration (GTR)**

Periodontal surgical procedure attempting to regenerate lost periodontal structures through differential tissue responses. Such procedures make use of barrier techniques, where membranes made of materials such as expanded polytetrafluoroethylene, polyglactin, polylactic acid and collagen are employed to exclude the epithelial tissue from the root surface and bone, in the belief that it interferes with regeneration.

"Gummy" smile

Excessive amount of gingival exposure upon smiling.

[See Tooth-to-lip relationship]

**Gurin lock**

Adjustable archwire attachment that can be locked onto an archwire to serve as a stop, without the need for bending, welding or soldering. A Gurin lock consists of a small screw that is split along its long axis, allowing it to be positioned "riding" the archwire and is secured in place by a hexagon-head lock-nut. Its advantage is that it can be easily removed or repositioned along the archwire at any time, and with no consequences for the archwire. Gurin locks also are available with hooks, used for attachment of elastics directly on the archwire (instead of a Kobayashi hook on a certain tooth).

**Hand and wrist radiograph**

A radiograph of the carpal, metacarpal and phalangeal bones of the hand and wrist, traditionally used to determine the skeletal maturation status of children, as skeletal or developmental age does not always correspond with chronological age. The procedure involves the appraisal of the degree of development of various carpal, metacarpal and epiphyseal centers of ossification, in comparison with standards provided from growth studies. The standards are published in an atlas format, based on the average appearance of a hand and wrist radiograph at various chronological ages.

**Hardening**

A process used to increase the yield strength and resistance to indentation of a metal.
SUBTERMS:

Hardening
• Work-hardening (Cold-working)

Hardening of a wire by repetitive plastic deformation in the cold state. Placing repetitive bends on an orthodontic wire increases its strength and hardness because of work-hardening, but also makes the wire more brittle.

Hardness (of a material)

Resistance to indentation on the surface. Depending on the type of indentor used for the hardness test, one can distinguish between Brinell hardness, Rockwell hardness and Vickers hardness. Among the properties that are important to the hardness of a material are strength, proportional limit, and ductility.

Hawley wire

The labial bow of the Hawley retainer.

[See Labial bow]

[See Retainer, Hawley retainer]

Headgear

Extraoral appliance making use of cervical or cranial anchorage to apply forces to the jaws and teeth, with the purpose of growth modification or tooth movement. The choice of direction of pull of the headgear usually is based on the patient's facial pattern: the more vertically excessive growth is present, the higher the direction of pull and vice versa. It should be kept in mind, however, that considerable variation in growth response can occur. [Note: To apply Newton's laws for theoretical biomechanical consideration on use of different types of headgears, the facebow is assumed to be completely rigid.]

SUBTERMS:

Headgear
• Asymmetric headgear (Eccentric headgear)

A modification in the design of a cervical or straight-pull headgear to achieve differential magnitude of force between the two sides, when attempting asymmetric molar distalization. This is usually performed using a facebow with an asymmetric outer bow. One of the arms is kept longer
(and/or more laterally offset) on the side that requires the greater distalization to generate a higher force magnitude. The disadvantage of asymmetric headgear traction is the creation of transverse (buccolingual) forces, which are difficult to control and may have detrimental effects on the maxillary arch and the occlusion, especially if an asymmetric headgear is used for a prolonged period.

Headgear
• Cervical headgear (Kloehn-type headgear, Low-pull headgear)

A type of headgear consisting of a standard facebow inserting into the headgear tubes of the maxillary first permanent molar attachments and a cervical neckstrap. The cervical headgear, which was made popular by S. Kloehn, is used to restrict anterior growth of the maxilla and to distalize or maintain the sagittal position of the maxillary molars. Because of the cervical anchorage, the direction of the traction with this type of headgear produces an extrusive force on the maxillary first molars, in addition to the distal force. Depending on the orientation and length of the outer bow, as well as the number of teeth included, the vector of the force can be made to pass through, below or above the center of resistance of the unit, resulting in a bodily or tipping movement.

Headgear
• High-pull headgear (Occipital headgear)

This consists of a high-pull headstrap and a standard facebow, the outer arms of which are cut shorter and/or bent upwards slightly, so that the force vector is directed through, below or above the center of resistance of the maxillary first permanent molars, or that of the entire maxilla. The line of action of the force forms an angle of approximately 45° with the occlusal plane. A high-pull headgear also can be attached to a removable or functional appliance. When a high-pull headgear is used directly on the maxillary first permanent molars without any fixed appliances on the remaining teeth, the insertion of a transpalatal arch on the first molars can serve to prevent undesirable buccal tipping. The objectives of high-pull headgear treatment are restriction of anterior and downward maxillary growth and/or molar distalization, intrusion, or control of their eruption. The high-pull headgear is commonly used in the treatment of growing patients with Class II malocclusions, increased vertical dimension, minimal overbite and increased gingival exposure on smiling.

Headgear
• J-hook headgear

A type of headgear consisting of a high-pull or straight-pull headstrap, attaching to hooks or loops on the archwire by means of a J-hook assembly through the commissures (i.e. without a facebow). A J-hook headgear also may be used to provide the necessary force for distal movement of teeth (such as retraction of canines) with sliding mechanics, by attaching to a sliding jig or directly to the
archwire, mesial to the teeth that are to be retracted. Use in conjunction with a removable appliance again is feasible.

Headgear
- Mandibular headgear

A headgear directing extraoral forces to the mandibular arch by means of a standard facebow and a cervical neckstrap. Because of the mobility of the mandible, the line of action of the force produced by a mandibular headgear changes depending on the degree of opening.

Headgear
- Straight-pull headgear (Combination headgear, Horizontal-pull headgear)

A headgear with a modified headstrap designed to produce a horizontal force (approximately parallel to the occlusal plane). A similar direction of force can be produced by simultaneously attaching a high-pull headstrap and a cervical neckstrap on the same facebow. Varying the proportions of the total force derived from the two straps, as well as varying the length and inclination of the outer bow, allows the resultant vector to be altered.

Headgear
- Vertical-pull headgear

A type of headgear consisting of a standard facebow and a modified headcap, capable of generating a force vector passing at approximately 65° to the occlusal plane (force vectors passing anteriorly to that would dislodge the headcap, unless a special custom made headcap is used). This type of headgear is used when intrusion of the buccal segments is attempted. The headcap of a vertical-pull headgear is usually versatile, in that it has multiple notches allowing variation in the direction of the traction force.

Headstrap (Headcap)
The component of an extraoral traction appliance that distributes and transfers reaction forces to the cranium. The headstrap allows a posterior and upward force vector. It usually carries safety-release force modules to reduce the chance of accidental injury. Modified headstraps also are used with straight-pull (combination) headgears or with vertical-pull headgears.

Helix

A spiral bend placed in an orthodontic wire in the shape of a closed circle. Used as a stop along the archwire, or for the attachment of various modules such as elastics or J-hooks. Additionally, helices can be added in the design of various orthodontic springs to lower their force/deflection rate.

Hemifacial microsomia (First and second branchial arch syndrome)

An umbrella term denoting a family of congenital anomalies characterized by malformation, underdevelopment or absence of certain structures which are derived from the first and second branchial arches during embryological development. Variations of the condition have been named Goldenhar syndrome, oculoauriculovertebral spectrum, necrotic facial dysplasia, otomandibular dysostosis, and craniofacial microsomia.

The disorder can involve the maxilla, mandible, ears, eyes, orbits, nose, frontonasal structures, zygoma, facial soft tissue and musculature, parotid gland and the facial nerve. Unilateral or bilateral cleft lip and/or palate can be co-existing in 7% to 15% of the cases. Cardiac, renal, vertebral and central nervous system abnormalities also have been reported.

The exact mechanism of its etiology remains unknown; however, vascular abnormalities, disturbance of neural crest cell migration, chromosomal abnormalities and certain teratologic agents have been hypothesized. The frequency is approximately 1:5600 live births and there seems to be a male predominance of about 3:2 and a predominance of 3:2 of right-sided versus left-sided involvement in truly unilateral cases.

The disorder is expressed to varying degrees, ranging from a mild facial asymmetry to involvement of many facial structures, unilateral or bilateral, which can be functionally and psychologically debilitating. The clinical appearance most often involves a unilateral hypoplasia of the mandibular
condyle and ramus, leading to deviation of the chin to the affected side. Depending on the severity, a number of mandibular posterior teeth may be missing ipsilaterally. Canting of the maxillary occlusal plane (up on the affected side) is a common finding, as are preauricular tags of skin and cartilage.

Treatment of patients with hemifacial microsomia often includes multi-stage procedures such as reconstruction of the mandibular condyle and/or fossa, microvascular free-flap transfer for soft tissue augmentation, auricular reconstruction, facial reanimation, functional appliance treatment, ramus lengthening by distraction osteogenesis or bimaxillary orthognathic surgery.

**Hemisection (of a tooth)**

The surgical separation of an endodontically treated multi-rooted tooth (most commonly a mandibular molar) through the furcation.

"High-angle" patient ("Vertical" patient, Long face syndrome, Hyperdivergent face)

A general term used to describe a patient with a predominantly vertical growth pattern, a long lower face height and a steep mandibular plane. A Class II malocclusion with an anterior open bite tendency may be associated, typically with excessive gingival exposure on smiling, vertical maxillary excess and lip incompetence. (Referring to the mandibular plane angle.)

[Compare with "Low-angle" patient ("Horizontal" patient, Hypodivergent face)]

**Hinge axis**

The theoretical single horizontal axis about which the pure rotational movement of the mandible occurs, during the initial phase of jaw opening.

**Holding arch**

[See Arch, Lingual arch]
**Homeostasis of the dentition**

The state of equilibrium of the position of the teeth, as determined by their morphology, the relationship between their supporting bones, the occlusion, the periodontium and forces from muscles and other structures involved.

**Hooks**

Attachments soldered, welded or crimped onto an orthodontic archwire, to aid in placement of elastics, headgear (i.e. J-hook), elastic chains, etc., or to facilitate intermaxillary fixation during orthognathic surgery.

**Howes’ analysis**

A plaster cast analysis aimed at evaluating the relationship of the maxillary and mandibular dental arch width to the width of the respective apical bases, taking into account the existing tooth material.

According to A. E. Howes, the ratio of the premolar width (the linear distance between the tips of the buccal cusps of the first premolars bilaterally) over the existing tooth material (the sum of the mesiodistal widths of the first permanent molars, premolars, canines and incisors), in either the maxillary or the mandibular arch, should be approximately 43%. Correspondingly, the ratio of the canine fossa width (the width of the apical base measured on the plaster cast at the level of the apex of the first premolars) over the existing tooth material (the sum of the mesiodistal widths of all the teeth anterior to the second molars, as explained previously) for the same arch should be approximately 44%, whether this concerns the maxillary or the mandibular arch.

When the former ratio is much smaller than the latter, the arch can be expanded to eliminate any existing crowding. If the opposite is true, then according to Howes, extractions are indicated in the presence of crowding.

**Howship’s lacunae**

Small pits or hollow depressions in bone undergoing resorption, containing osteoclasts. Similar lacunae also can be found in cementum, in which cementoclasts may or may not be located.
**Hyalinization**

A term describing the loss of cells from an area of the PDL because of trauma, as seen by light microscopy. Hyalinization occurs often on the compression side of the PDL during tooth movement. When this happens, no remodeling of the alveolar bone can occur because no cells are present; therefore hyalinization causes tooth movement to cease. Only after the hyalinized portion of the ligament is removed by osteoclasts coming from the bone marrow on the endosteal side, does tooth movement start again.

[See Bone resorption, Undermining resorption (Indirect resorption)]

[See Bone resorption, Direct resorption (Frontal resorption)]

**Hyperdivergent**

A facial pattern that is characterized by a steep mandibular plane angle, a long anterior lower facial height with an open bite tendency, a retrognathic mandible with an associated Class II malocclusion and lip incompetence. Named so because of the cephalometrically observed excessive divergence of the skeletal planes (mandibular, occlusal and palatal) in relation to each other or to the cranial base.

[See Hypodivergent]

[See "High-angle" patient ("Vertical" patient, Long face syndrome, Hyperdivergent face)]

**Hypernasality (Rhinolalia aperta)**

The defective voice quality that is characterized by excessive nasal resonance during speech. It can result from a structural (i.e. hypomobility or shortness of the soft palate in cleft palate patients) or a functional problem of the velopharyngeal mechanism.

[Compare with Hyponasality (Rhinolalia clausa)]

**Hyperplasia**

Excessive enlargement of a tissue or structure due to increase in the number of cells.

**Hypertrophy**

Excessive enlargement of an organ or structure due to increase in the size but not the number of its individual constituent cells, as well as increase of intercellular matrix.
Hypodivergent

A facial pattern characterized by relative parallelism of the skeletal planes (mandibular, occlusal and palatal) in relation to each other or to the cranial base, as observed cephalometrically. This facial pattern often is associated with a Class II, Division 2 malocclusion typically exhibiting a decreased gonial angle, short anterior lower facial height, deep overbite, strong chin and retrusive lips.

[See "Low-angle" patient ("Horizontal" patient, Hypodivergent face)]

[See Hyperdivergent]

Hypodontia

Congenital absence of one or more, but not all teeth.

[Compare with Supernumerary teeth (Hyperodontia)]

[Compare with Anodontia]

Hyponasality (Rhinolalia clausa)

Phonation with insufficient nasal resonance, usually due to a blockage of the nasal airway.

[Compare with Hypernasality (Rhinolalia aperta)]

Hypoplasia

Incomplete or defective development of a tissue or structure. [The term implies fewer than the usual number of cells. ]

Iatrogenic

An unfavorable response or condition, caused by medical or dental personnel, diagnostic tests or treatment procedures.

Ideal occlusion

A theoretical concept of an ideal arrangement of the teeth within the dental arches, combined with an ideal interarch relationship, which concentrates optimal esthetics, function, and stability of the dentition and supporting structures.

[See Six keys of occlusion]
Idiopathic
Pain, disease or disorder of unknown etiology.

Imbrication
The overlapping of incisors and canines in the same arch, usually due to crowding.

Immobilization
[See Fixation, Surgical]
[See Splinting (of teeth)]

Impaction (of food)
The forceful wedging of food into the interproximal space during mastication.

Impaction (of the maxilla)
An orthognathic surgical procedure involving superior repositioning of the maxilla, usually by means of a Le Fort I osteotomy. A maxillary impaction is used for correction of a high smile line, associated with vertical maxillary excess. In the instance of surgical correction of a skeletal open bite, a differential maxillary impaction is performed, whereby the anterior aspect of the maxilla is moved superiorly to a lesser extent than its posterior aspect.

Implant
An alloplastic material or device that is surgically placed into the body. In dentistry, implants are placed beneath the mucosal or periosteal layer or within bone for functional, therapeutic or esthetic purposes. Root-form, endosseous, screw-threaded implants are the most commonly used implants in clinical practice.

SUBTERMS:
Endosseous implant
Orthodontic implant
Subperiosteal implant
Transosteal implant
Impression
An accurate negative imprint of the maxillary or mandibular dental arch and surrounding structures, from which a positive reproduction (cast, model) can be made. When taking an impression for orthodontic purposes the flanges of the impression tray are extended to allow maximum reproduction of the alveolar process. Alginate is by far the most commonly used impression material in orthodontics.

[See Orthodontic casts (Orthodontic models)]
[See Orthodontic impression trays]

Incidence

The number of new patients acquiring a disease or condition over a predetermined time period, as generated by an analytic epidemiological investigation of a prospective longitudinal nature.

[Compare with Prevalence]

Incisal

Pertaining to, or in the direction of, the incisal edge of the anterior teeth.

Inclination (Third order, "Torque")

Angular deviation of the long axis of a tooth from a line perpendicular to the occlusal plane, in the labiolingual, or buccolingual direction.

[Compare with Angulation (Second order, "Tip")]

Inclined plane

An oblique surface (slope) used to correct a crossbite of one or more incisors. The inclined plane can be part of a removable appliance or it can be fixed on the teeth of the opposing arch. Inclined planes also have been used as part of functional appliances to induce an anterior or posterior mandibular position.
Index

A relative or arbitrary system of measurement used to describe or quantify a condition. The purpose of an index is to reduce the multitude of variables that enter into a diagnosis and influence the assessment of the severity and prognosis of a condition, to a format (numerical or categorical) that permits direct comparison.

Many indices have been advocated in orthodontics; some have been developed to classify malocclusion into types (the Angle classification being a prime example), others to record prevalence of malocclusion in epidemiological studies. In addition, certain occlusal indices (such as the IOTN and PAR index) are meant mainly as methods of determining the need for treatment, or as indicators of the clinical outcome of treatment.

SUBTERMS:

Index

• Cephalic index

A numerical expression of the ratio between biparietal diameter and fronto-occipital diameter of a living person’s head. [Compare with Index, Cranial. ] The cephalic index is calculated by the formula "maximum head width x 100/maximum head length." It is used in anthropometry to classify skulls as dolichocephalic (cephalic index up to 75.9), mesocephalic (between 76 and 80.9) or brachycephalic (81 or larger).

[Compare with Index, Cranial index]

Index

• Cranial index

The equivalent of the cephalic index in a dry skull; a craniometric measurement.
Index

• Facial index

A numerical expression of the proportionality of the face. The facial index is calculated by the formula: \( \text{facial height} \times 100/\text{zygomatic width} \). It is used in anthropometry to classify faces as euryprosopic, mesoprosopic or leptoprosopic.

Index

• Index of orthodontic treatment need (IOTN)

An index developed by P. H. Brook and W. C. Shaw in 1989. The IOTN ranks malocclusions in terms of the significance of their various components for the individual's dental health and perceived esthetic impairment. The intention is to identify those individuals who would most likely benefit from orthodontic treatment. It incorporates a dental health and an esthetic component. The dental health component can be applied either clinically or on study casts, by categorizing each occlusal trait contributing to the malocclusion into one of five grades (grade 1 = no need for treatment, grade 5 = great need). The measurements are facilitated by a specially designed ruler. The esthetic component consists of a 10-point scale illustrated by a series of numbered photographs to which the patient's situation is compared.

Index

• Irregularity index

An index introduced by R. M. Little in 1975 for standardized assessment of mandibular anterior crowding. It involves measuring the linear displacement of the anatomic contact points (as distinguished from the clinical contact points) of each mandibular incisor from the respective points of the adjacent teeth. The sum of these five displacements represents the relative degree of anterior irregularity. Perfect alignment from the mesial aspect of the left to the right canine would yield a score of 0, with increased crowding represented by greater displacement, and thus a higher index score. The measurements are performed with a caliper, parallel to the occlusal plane. Vertical discrepancies between adjacent contact points are not taken into account, as it is assumed that correction of such discrepancies would not appreciably affect anterior arch length. Mesiodistal interdental spacing also is disregarded, provided the teeth in question are in proper arch form. If spacing as well as rotations are present, only the labiolingual displacement from the proper arch form is recorded.

Index

• Peer assessment rating (PAR) index

An index for recording the severity of a malocclusion in the mixed and permanent dentition, developed in 1987 by a group of 10 orthodontists in Great Britain (British Orthodontic Standards Working Party). The index consists of a scoring system of study casts, facilitated by a ruler. Individual scores for the components of alignment and occlusion finally are summed to calculate an overall score. Thus, a score of zero would indicate perfect alignment and occlusion, with scores
above zero (but rarely beyond 50) indicating increasing levels of irregularity. The index is applied to both the start and end of treatment study casts, and the change in the total score reflects the success of treatment with regard to the alignment and occlusion.

**Inelastic**

Deviating from a proportional relationship of stress and strain.

**Inertia**

The property of matter that causes it to resist change in motion.

**Inferior joint space (Inferior joint compartment)**

The intra-articular space between the head of the mandibular condyle and the inferior surface of the articular disc of the TMJ. During the early opening stage of mandibular movement, only the inferior joint space is involved (by rotational movement of the condyle).

[See Joint, Temporomandibular joint (TMJ, Craniomandibular articulation)]

[See Superior joint space (Superior joint compartment)]

**Informed consent**

The outline by any health professional, including the orthodontist, of the patient's problems along with the possible solutions, in a simplified fashion comprehensible to the reasonable layman, in order to obtain the patient's consent to treatment. The health professional is supposed to establish treatment priorities through discussion with the patient. Reasonable treatment alternatives and the risks and benefits of each alternative should be provided, including that of no treatment. In this way, the patient is able to make an informed decision. Informed consent is a legal requirement prior to treating patients and is encouraged by the American Association of Orthodontists.

**Infraorbital pointer**

The component of an articulator facebow that records the position of the infraorbital rim to facilitate alignment of the plane of the facebow with the Frank-fort horizontal plane.

**Infraposition (Infraocclusion)**
A situation in which a tooth or group of teeth is positioned below the occlusal plane; commonly due to a deleterious habit or to ankylosis. Infraposition is a more general term that contains undereruption.

[Compare with Undereruption (Infraeruption)]

Initiating factors

Factors that cause the onset of a disease or disorder.

Intensifying screen (Rare-earth screen)

A screen used to intensify the latent images on an x-ray film. It usually consists of a thin sheet of plastic coated with a fluorescent material, which is mounted in the cassette in close contact with the film. The x-rays cause the screen to produce visible light, which intensifies the generation of the latent images on the film, greatly reducing the exposure of the patient to radiation.

Interbracket span (Interbracket distance)

The distance between orthodontic brackets (measured between adjacent slot ends) that determines the length of a straight wire connecting them. The smaller the width of the brackets, the longer the interbracket span, the lower the load/deflection rate of the wire and vice versa.

[See Load/deflection rate (Force/deflection rate)]

Interceptive orthodontic treatment

Intervention in the incipient stages of a problem to lessen its severity or possible future adverse effects and to eliminate its cause. Such treatment may take place in the deciduous or transitional dentition and may include redirection of ectopically erupting teeth, slicing or extraction of deciduous teeth, correction of isolated dental crossbites or recovery of minor space loss. The presence of complicating factors such as skeletal disharmonies, overall space deficiency, or other conditions requiring present or future comprehensive therapy are beyond the realm of interceptive therapy. [Modified from the AAO Glossary of Dento facial Orthopedic Terms, 1993.]

Interdental spacing

Spacing between the teeth.

Interdigitation (Intercuspation)

The interlocking of the cusps of the posterior teeth in the fossae and embrasures of their antagonists.
**Interlabial gap**

The vertical separation of the lips at rest. A 2- to 3-mm interlabial gap generally is considered to be esthetically pleasing.

[See Cephalometric measurements, Interlabial gap]

**Intermaxillary**

Between the maxilla and the mandible.

[Compare with Intramaxillary]

**Intermediate splint**

[See Splint, Surgical splint (Surgical wafer)]

**Internal derangement**

Disturbed arrangement of intracapsular joint components that interferes with smooth joint movements. In the TMJ it can be associated with elongation, tear or rupture of the ligaments or capsule, causing altered disc position or morphology. Although this is not always the case, chronic dysfunction of internally deranged TMJs generally is thought to follow a progression to more severe stages of breakdown, eventually leading to degenerative joint disease.

**Interocclusal splint**

[See Splint]

Interproximal stripping (Interproximal reduction of enamel, Reproximation, Slenderizing)

Reduction of the mesiodistal width of the teeth by removal of interproximal enamel. This procedure can be achieved by means of handheld or motor-driven abrasive strips, or handpiece-mounted abrasive discs, or by means of a tapered fissure carbide bur. It most commonly is performed in the mandibular or maxillary incisor area in patients with a tooth-size discrepancy. Generalized stripping of the entire arch is advocated by J. J. Sheridan to relieve crowding without extractions. According
to him, up to 0.3 or 0.4 mm of enamel can be removed per tooth surface, depending on the size and shape of the teeth.

It has been advocated that interproximal stripping, if carried out to an extreme, may cause the mandibular incisor roots to approximate excessively, resulting in thinning of the interradicular alveolar bone, perhaps making it more prone to later periodontal bone loss. Another potential side effect is the resulting enamel roughness that may contribute to increased plaque accumulation.

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**Interpupillary line**

A line connecting the pupils of the eyes, used as a reference in the evaluation of frontal facial asymmetry.

**Intersegmental**

Between segments of teeth (usually within the same dental arch).

[Compare with Intrasegmental]

**Interstitial growth**
Growth within a tissue. Histologically, a characteristic type of growth of soft tissues and cartilage occurring by a combination of cellular hyperplasia and hypertrophy. Interstitial growth does not occur in calcified tissues such as teeth or bone.

**Intracapsular**

Located within the capsule of a joint.

**Intracoronal retainer**

[See Retainer, Bonded lingual retainer]

**Intramaxillary**

Within the same dental arch.

[Compare with Intermaxillary]

**Intrassegmental**

Within the same segment of teeth.

[Compare with Intersegmental]

**Invisible braces**

A lay term applied to lingual orthodontic appliances, or to those made of a clear material (ceramic or plastic brackets).

[See Appliance, Lingual appliance ]

**Ion implantation**

A surface modification technique involving a ballistic process through which an element is imbedded into the surface of a substrate. The main advantage of this process is that the surface properties of the substrate are improved, while the bulk properties and tolerances remain unchanged. Ion implantation is used in orthodontics to optimize the frictional characteristics of b-Ti archwires.

**Isometric contraction**

Muscle contraction without change in length.
Isotonic contraction

Muscle contraction with shortening of the muscle length, without appreciable change in magnitude of the produced force.

Jaw

Either of the two bony structures (maxilla or mandible) in most vertebrates that border the mouth and bear teeth.

SUBTERMS:
Jaw
• Lower jaw

[See Mandible]

"Jiggling" (of a tooth)

Repetitive limited movement of a tooth in one and then in the opposite direction, as is commonly thought to occur under the influence of occlusal forces. Most types of orthodontic tooth movement in reality take place as a series of minute "jiggling" movements. This translates into continuous reversal of the root surfaces that sustain compression and tension which is, at the histological level, equivalent to round-tripping.

[See Round-tripping]

Joint

The place of union between two or more bones.

SUBTERMS:

Joint
• Arthrodial joint
A joint that permits gliding movements (translation).

Joint
  • Cartilaginous joint

A joint in which cartilage is interposed between the implicated bones and the fibrous tissue (in the sequence: bone-cartilage-fibrous tissue-cartilage-bone). Examples are the costochondral joint and the pubic symphysis. Cartilaginous joints permit little if any movement of the bones involved.

Joint
  • Fibrous joint

A joint in which the bones are connected by fibrous tissue. Three types are described:

Suture, a joint that permits little or no movement. Its function also is to permit bone growth.

Gomphosis, a joint such as the one that connects a tooth to its surrounding bone by the fibrous periodontal ligament.

Syndesmosis, a joint in which the two bony components are some distance apart, but are connected by a ligament that permits limited movement (e.g. the joint between the fibula and tibia, or that between the radius and ulna).

[See Suture]

Joint
  • Ginglymoid joint

A joint that permits hinging movement (rotation) in one plane.

Joint
  • Synovial joint

A type of joint by which two bones are united and surrounded by a fibrous capsule, thus creating a joint cavity. [Note: The name comes from the latin word ova (egg) because the opposing bones of such joints are separated by an enclosed space filled with fluid which, when examined with the naked eye, resembles egg white. ] The capsule is continuous with periosteum of the bones involved in the joint and is lined on its inner surface by a synovial membrane. The synovial membrane secretes synovial fluid that fills the joint cavity. The articulating surfaces of the bones are covered with hyaline cartilage (the temporomandibular, acromioclavicular and ster-noaclavicular joints are exceptions in that their articulating surfaces are covered by fibrous tissue). The cavity may or may not possess a fibrous articular disc, separating it into two compartments. Various ligaments are associated with synovial joints to strengthen the articulation and limit excess movement.
Synovial joints are classified further by the number of axes in which the bones involved can move (uniaxial or multiaxial) and by the shapes of the articulating surfaces (planar, ginglymoid, pivot, condyloid, saddle, and ball-and-socket). Movements in a synovial joint are initiated and performed by muscles working together in a highly coordinated manner.

Joint
• Temporomandibular joint (TMJ, Craniomandibular articulation)

Paired synovial joint capable of both gliding (translation) and hinge (rotation) movements; thus considered a ginglymoarthrodial joint. The TMJ is formed by the mandibular condyle fitting into the glenoid fossa of the temporal bone. Separating these two bones from direct contact is the articular disc. In the healthy joint, the articular portion of the disc is composed of dense fibrous connective tissue, devoid of any nerves or vessels. Conversely the posterior attachment of the disc is richly vascularized and innervated.

The disc also is attached to the condyle both medially and laterally by collateral (discal) ligaments. These ligaments permit rotational movement of the disc on the condyle during opening and closing of the mouth. This so-called condyle-disc complex translates out of the fossa during over-extended mouth opening.

Surrounding the joint is a fibrous capsule (capsular ligament) that extends from the margins of the glenoid fossa, including the articular eminence anteriorly, to envelop the head of the condyle before fusing inferiorly with the periosteum of the condylar process. Other ligaments reinforcing the joint are the lateral (temporomandibular) ligament, which reinforces the lateral wall of the capsule, preventing lateral dislocation of the condyle, as well as the sphenomandibular and stylomandibular ligaments.

In the healthy joint, rotational movement occurs between the condyle and the inferior surface of the disc (the inferior joint space) during early opening. During later stages of opening, translation takes place in the space between the superior surface of the disc and the fossa (the superior joint space). The synovial fluid serves as a lubricant and also acts as a medium for transporting nutrients to and waste products away from the joint components.

Unlike most synovial joints the articulating surfaces of the TMJs are lined with dense fibrous connective tissue, not hyaline cartilage. This is an important feature because fibrous connective tissue has a greater ability to repair itself than does hyaline cartilage. Movement and stability of the TMJs is achieved by the muscles of mastication. These include the masseter, medial pterygoid and temporal muscles, which predominantly elevate the mandible; the digastric muscles, which assist in mandibular depression; the inferior lateral pterygoid muscles, which assist in protruding the mandible; and the superior lateral pterygoid muscles, which provide stabilization for the condyle and disc during function.

Joint noises
Joint symptoms

Symptoms of TMD.

"Jumping of the bite"

1. An expression credited to N. W. Kingsley in the late 1800s, referring to the avoidance of the prior intercuspal position by anterior repositioning of the mandible. Such an effect can be brought up by a functional-type appliance for the correction of mandibular retrognathism.

2. The same expression also is used to connote correction of an anterior crossbite by movement of the affected tooth over the opposing dental arch.

Junctional epithelium (Epithelial attachment)

A single or multiple layer of non-keratinized cells adhering to the tooth surface at the base of the gingival crevice.

Key ridge

The radiographic image of the zygomatic process of the maxilla as commonly seen on a lateral cephalometric radiograph.

"Keystoning"

The reshaping of the interproximal aspects of the mandibular incisors to provide an interlocking pattern to resist rotational relapse. "Keystoning" is done by oblique interproximal
stripping, so that rotational tendency of one tooth would be counteracted by the reverse rotational relapse tendency of its adjacent tooth.

Kinesiograph

Instrument used to record and provide graphic representation of mandibular movements.

Kinetic friction

[See Friction]

Kobayashi hook (Kobayashi tie, Kobayashi ligature)

A ligature fabricated from 0.012-inch (0.30-mm) or 0.014-inch (0.35-mm) annealed stainless steel wire, whose legs are welded onto each other, forming a helical "hook" at its end. It is placed on a bracket below the archwire or in the same way as a regular stainless steel ligature and it is used for the attachment of orthodontic elastics.

Labial

Of or pertaining to the lips, or in a direction towards the lips. Also identifies a surface facing the lips.

[Compare with Lingual]

Labial bow

A part of a removable orthodontic appliance, typically consisting of a stainless steel wire that lies on (or at a distance from) the labial surface of the maxillary or mandibular anterior teeth, usually at the mid-crown level. A labial bow may be embedded in the acrylic of the appliance and cross the occlusal table at the embrasures mesial or distal to the first premolars, or it may be soldered directly onto the molar clasps. It is used to enhance retention of the appliance, to relieve pressure
from the lips as well as (when activated) to tip the incisors lingually and close spaces. A labial bow can be covered with clear acrylic in the case of some retainers.

[See Retainer, Hawley retainer]

[See Retainer, Spring retainer (Barrer retainer)]

**Labiolingual tipping**

Tipping of a tooth in a labiolingual direction.

[See Inclination (Third order, "Torque")]

**Labioversion**

Labial inclination of one or more teeth.

**Laceback (Lace)**

Stainless steel ligature placed passively in a figure-eight mode (usually from the terminal molar to the canine of the same quadrant), as part of the leveling and alignment stage of treatment with the straight-wire appliance. For example, when a canine is slightly upright at the time of insertion of the initial archwire, a laceback serves to maintain the sagittal position of its crown, so that the angulation of the tooth is improved by distal movement of the root.

[See Figure-eight ligature]

**Lacunae**

Small pits or hollow cavities.

[See Howship’s lacunae]

**Lateroclusion**

A functional posterior cross-bite associated with a lateral shift of the mandible that occurs only in centric occlusion (CO or ICP). In centric relation (CR) the mandible is centered in the midsagittal plane. This type of crossbite is caused by dental interferences and can be treated by maxillary expansion and/or by occlusal equilibration.
Laterognathia

A posterior crossbite in CO, associated with a lateral shift of the mandible that does not improve when the mandible is in CR (a true skeletal asymmetry). In severe situations the only treatment option is orthognathic surgery.

[Compare with Laterooclusion]

Laterotrusion

The movement away from the median of the ipsilateral (working) half of the mandible and the respective condyle, during a lateral mandibular excursion.

[Compare with Mediotrusion]

Lavage

The process of washing out or irrigating a cavity or an organ.

Law of transmissibility of force

According to this law, the point of application of any force applied to a rigid body can be considered to lie anywhere along the line of action of the force.

For example, a single retraction force on the crown of a maxillary incisor will have the same effect on the tooth whether it is applied on the labial or on the palatal aspect of the crown, provided the line of action is the same. Similarly, the outer arms of a facebow used with a high-pull headgear can be cut short or bent upwards without changing the force system "felt" by the molars, provided the line of force from the headstrap is the same.

The law of transmissibility of force is applied when combining two or more forces with different points of application to construct their resultant force.

Leeway space

The difference between the combined width of the deciduous canine, first and second molars in each quadrant, and their successors (permanent
canine, first and second premolars). The term was introduced by H. N. Nance (1947). The average value is approximately 1.0 mm for each maxillary quadrant and 1.7 mm for each mandibular quadrant, although there are large individual variations. These "spaces" normally are closed by mesial drift of the first permanent molars as the deciduous teeth are replaced.

**Le Fort I, II and III surgical procedures**

[See Osteotomy, Complete maxillary osteotomy]

**Leptoprospic**

Having a narrow and long facial form.

**Leveling**

The phase of comprehensive orthodontic treatment aiming at flattening the curve of Spee until the marginal ridges of all the teeth in the arch lie more or less in the same horizontal plane. Thus, leveling refers to correction in the vertical plane.

**Leveling wire**

Any archwire used for leveling.

**Ligament**

Flexible band of fibrous tissue composed of parallel collagenous bundles, binding joints together, as well as connecting various bones and cartilages.

**Ligature**

A tie that secures an archwire or other auxiliary in the bracket slot, by being placed under the tie-wings of the bracket. Ligatures are typically made of stainless steel wire, rubber, or elastomeric material.
SUBTERMS:

Stainless steel ligature

**Limited orthodontic treatment**

Orthodontic treatment with a limited objective, not involving the entire dentition. It may be directed at the only existing problem, or at only one aspect of a larger problem in which a decision is made to defer or forego more comprehensive therapy. Examples of this type of treatment would be single-arch treatment to improve alignment, partial treatment to close or to open space, or to upright a tooth in preparation for prosthodontic treatment. [Modified from the AAO Glossary of Dentofacial Orthopedic Terms, 1993.]

**Lingual**

Of or pertaining to the tongue; or in a direction towards the tongue. Also identifies a surface facing the tongue.

[Compare with Labial]

**Lingual cleat**

A low-profile attachment that can be bonded directly to a tooth or welded on a band. Its functions are to accommodate the attachment of elastics, to aid as a seating lug during band fitting, and to facilitate band removal.

**Lingual crown torque**

[See Torque, Root torque]

[See Torque, Crown torque]
Linguoversion
Lingual inclination of one or more teeth.

Lip exercises
Exercises aiming at stimulating the musculature of the lips, with the objective of achieving a competent lip seal. A key component of functional appliance treatment, stressed by R. Fränkel.

Lip incompetence (Incompetent lip seal)
Excessive separation of the lips at rest.

Lip interposition
The habit of placing the lower lip between the maxillary and mandibular anterior teeth, or between the mandibular anterior teeth and the palate (often seen in patients with an increased overjet).

Lisping
Incorrect pronunciation of a sibilant or affricate sound, most commonly heard on /s/ and /z/.

Load/deflection rate (Force/deflection rate)
A mechanical characteristic of orthodontic springs or wires, describing the dependence of the magnitude of the generated force on the amount of deflection (deformation, activation). It expresses force per unit displacement of the spring, and is measured in cN/mm (g/mm). A spring with a low load/deflection rate is capable of generating forces that approximate constancy and do not depend very much on the amount of activation. The five major parameters available to the clinician for varying the load/deflection rate are:

1. Wire cross-section

The load/deflection rate varies directly with the fourth power of the diameter of a round wire and with the third power of the width (large dimension) of a rectangular wire. Therefore, reducing the cross-section of the wire can reduce the load/deflection characteristics of an orthodontic appliance significantly.

2. Wire length
The load/deflection rate varies inversely with the third power of the length of a wire segment (or cantilever); thus small increases in wire length can reduce the load/deflection rate dramatically. In continuous archwire multi-attachment appliances, the wire length is, to a great extent, dictated by the interbracket span between adjacent teeth. The addition of loops to the wire can serve in increasing the length, lowering the load/deflection rate.

3. Wire material

The load/deflection rate is proportional to the modulus of elasticity (E) of the material. For the same size and cross-sectional shape, a wire material with a low E will deliver less force for an equal deflection, than a wire with a high E.

4. Wire configuration

Bending loops of various shapes into an archwire reduces its load/deflection rate by increasing the wire length.

5. Constraint conditions

The load/deflection rate of a wire segment depends on its mode of ligation between two teeth. A wire segment tightly ligated in two edgewise brackets delivers a much higher load, for a standard deflection, than a cantilever of the same material, length and cross-section ligated in only one of the brackets (one fixed end).

[See Orthodontic springs, Cantilever spring]

[See Archwire cross-section]

[See Loop]

[See Interbracket span (Interbracket distance)]

[See Archwire (Arch wire), Multiloop archwire]

[See Modulus of elasticity E (Young's modulus of elasticity, E-modulus)]

**Lock, Archwire**

[See Gurin lock]
Locking of a joint

[See Disc displacement (Disc derangement, Disc prolapse, Disc interference disorder), Disc displacement without reduction]

Long-axis rotation

[See Orthodontic tooth movement, Pure rotation]

Long face syndrome

[See "High-angle" patient ("Vertical" patient, Long face syndrome, Hyperdivergent face)]

Loop

Orthodontic spring of various shapes and configurations. Loops are used for a number of purposes, such as to lower the load/deflection rate by addition of more wire, to achieve frictionless tooth movement, to avoid the inconsistency of the force system delivered by a straight wire, and to achieve dissociation of forces and moments in the created force system (i.e. changes in forces do not automatically alter the moments)

[See Archwire (Arch wire), Multiloop archwire]

[See Load/deflection rate (Force/deflection rate)]

SUBTERMS:

Loop
- Box loop

A rectangular or square-shaped loop bent into a continuous archwire (the loop has no free end). It is used to increase the flexibility of the wire at a certain localized point where this is necessary (e.g. when there is only one tooth that is not well aligned within the arch), while maintaining rigidity of the archwire in the remainder of the arch for anchorage purposes. A box loop offers flexibility in both the horizontal and vertical plane.

[Compare with Loop, Rectangular loop]
**Closed loop (Reverse loop)**

A loop bent in such a way that the separation between its vertical legs is reduced when activated by traction (the base of the loop remains closed—"safety-pin" principle), in contrast to an open loop.

**Closing loop**

Any loop which, upon mesiodistal-pulling activation, is capable of generating a force in the direction of the activation. A closing loop can be open or closed and can have various configurations. Closing loops are used for space closure, either by movement of an individual tooth (e.g. canine retraction), or as part of a closing loop arch for "en masse" movement of teeth.

[See Loop, Closed loop (Reverse loop)]

[See Loop, Box loop]

[See Arch, Closing-loop arch]
Loop
• L-loop (Boot loop)

An orthodontic loop in the shape of an "L" (or a "boot"). It combines flexibility in both horizontal (mesiodistal and buccolingual) and vertical dimension. The L-loop delivers a force system that is different at the two sides of the loop. As a simple rule, the smaller moment is developed at the bracket that faces the L-loop.

Loop
• Omega loop

An W-shaped loop used primarily for space closure, or for attachment of intermaxillary elastics.

Loop
• Open loop

A loop whose vertical leg separation increases when activated by traction (the base of the loop is open), in contrast to a closed loop.

[Compare with Loop, Closed loop (Reverse loop)]
[See Loop, Vertical loop]

Loop
• Opening loop

A loop used to create space, in a fashion comparable to an open coil spring. The loop is compressed to engage the archwire in the brackets, so deactivation of the loop will tend to increase the arch length.
Loop
- Rectangular loop

A rectangular-shaped loop bent into a segmental wire (the posteriorly directed, horizontal end of the loop is free). The rectangular loop is used to overcome problems of inconsistency of force system delivered by a straight wire, where either the forces or the moments are in an undesirable direction. The desired combination of forces and moments can be reached by varying the point of ligation along the horizontal free end of the loop, and by controlling the horizontal dimension of the loop.

[Compare with Loop, Vertical loop]
[Compare with Loop, Box loop]

Loop
- T-loop

Orthodontic loop in the shape of a "T. " A T-loop is basically a double L-loop, but is more flexible in the vertical plane than an L-loop of the same dimensions that is made from the same orthodontic wire. Used primarily as a force-producing mechanism for space closure or alignment.

[See Loop, L-loop (Boot loop)]
[See Loop, Rectangular loop]
[See Loop, Closing loop]

Loop
- Teardrop loop

A modified version of a vertical loop with its legs touching each other at its base, giving it the shape of an inverted teardrop. Its advantage is that it required less interbracket space than a regular closed or open loop of the same dimensions.

[See Loop, Open loop]
Loop
• Vertical loop

A simple U-shaped loop that can be bent into a continuous archwire or used as a segmental spring. The greatest degree of flexibility of a vertical loop is in the mesiodistal dimension, somewhat less in the buccolingual, and very little in the vertical dimension. When preactivation bends are placed in the wire on either side of a vertical loop, it behaves according to the V-bend principle. Although it does reduce the force/deflection rate, when placed between two misaligned brackets a vertical loop produces a force system corresponding to that of a straight wire.

[Compare with Loop, Rectangular loop]

[See Loop, Closing loop]

[See Loop, Teardrop loop]

[See Loop, Open loop]

Loop
• Wilson loop

A U-shaped loop, similar in shape, but smaller than a Coffin spring, often incorporated in a transpalatal arch (midway between the maxillary first molars), or in a lingual arch (mesial to the mandibular first molars, bilaterally), to facilitate adjustment in the transverse or sagittal direction, respectively.
"Low-angle" patient ("Horizontal" patient, Hypodivergent face)

A general term used to describe a patient with a predominantly horizontal growth pattern, a short lower face height and a flat mandibular plane. A Class II malocclusion with a deep, occasionally impinging overbite may be associated. (Referring to the mandibular plane angle.)

[Compare with "High-angle" patient ("Vertical" patient, Long face syndrome, Hyperdivergent face)]

Luxation (of a tooth)

Partial or complete detachment of a tooth from its socket.

[See Subluxation (of a tooth)]

Macrodontia

A term denoting larger than normal tooth size. Although no standardization is agreed upon, two standard deviations above the mean of the general population can be considered a cut-off point beyond which a diagnosis of macrodontia can be established.

[Compare with Microdontia]

Macroglossia
Abnormally large tongue, commonly associated with the presence of an open bite and spacing of teeth. Indentations may be evident on the side of the tongue. Macroglossia is a common finding in certain pathologic conditions such as Down syndrome, Beckwith-Wiedemann syndrome, myxedema, cretinism, or hypophyseal gigantism. A partial glossectomy is advocated by some clinicians as a means of treatment in severe situations.

**Magnetic resonance imaging (MRI)**

Non-invasive, non-ionizing imaging technique that uses a combination of magnetic fields and radiofrequency waves. As with computerized tomography, the images can be restricted to narrow planes and in this way multisectional views of the body can be obtained.

Human tissues consist of molecules contain hydrogen nuclei (protons). Each proton has an axial spin and because of its charge, behaves like a small magnet. Normally the protons are arranged randomly; however, when the patient is placed in a strong magnetic field the direction of the spin of the protons aligns with that of the field. In addition, the protons precess or wobble with a frequency determined by the strength of the magnetic field, but out of phase with each other. The application of a pulsed, resonant radiofrequency causes the protons to be deflected from their alignment and to precess in phase. With cessation of the radiofrequency, the protons realign with the applied magnetic field by transferring their acquired energy to their surroundings and revert to precessing out of phase. The rate at which the protons realign is referred to as the "T1 relaxation time"; the "T2 relaxation time" is the period in which protons remain in phase before returning to a random pattern. The energy released by the relaxation of the hydrogen nuclei is converted by a computer into a visual image.

Diagnostic MRI allows multiplanar imaging and offers better soft tissue contrast compared with CT. Additionally, it has no known harmful effects to the tissues. On the other hand, it does not display bone as well, since bone has a low signal intensity. Magnetic resonance imaging may be contraindicated in patients with ferromagnetic surgical clips and cardiac pacemakers.

**Magnification**

The enlargement of the image of an object on a radiograph in relation to the actual object due to divergence of the x-ray beam (depending on the object-film distance).

**Magnitude**

A characteristic of both scalar and vectorial quantities, denoting size or amount, in physical units of measurement.

**Main archwire**
Malar midfacial augmentation

Augmentation of the malar and of the infraorbital and paranasal areas, which may be accomplished by a modified Le Fort I or II osteotomy, or with alloplastic materials or onlay cortical bone grafts placed simultaneously with a Le Fort I osteotomy.

Malformation

A morphological structural defect of an organ, part of an organ, or a larger area of the body resulting from an intrinsically abnormal developmental process (e.g. cleft lip, or polydactyly). Malformations may be relatively simple or complex. The later the defect is initiated, the simpler the malformation. Malformations initiated earlier during organogenesis tend to have more far-reaching consequences.

Malformation syndromes

Recognized patterns of malformation presumably having the same etiology and currently not interpreted as the consequence of a single localized error in morphogenesis (e.g. Down syndrome).

Malleability

The ability of a material to sustain considerable permanent deformation without rupture, under compression (as in hammering, or rolling into a sheet). Malleability is not as dependent on strength of the material as ductility is. Gold is the most ductile and malleable pure metal and silver is second.

Malocclusion

Any deviation from the normal or ideal occlusion.
Mandible

The lower jaw, consisting of a curved, horizontal portion, the body, and two perpendicular portions, the rami. Each of the rami carries a coronoid and a condylar process. The condyles articulate with the temporal fossae by means of the temporomandibular joint. Fifteen pairs of muscles attach on the mandible. Its embryological development is guided by Meckel's cartilage. At birth, the bone consists of two halves united by a synchondrosis (mandibular symphysis), which ossifies during the first postnatal year.

Mandibular rotation

To visualize the following concepts, one has to imagine the core of the mandible as the bone that surrounds the inferior alveolar nerve. The rest of the mandible consists of its various functional processes. If implants are placed in areas of stable bone away from the functional processes, it can be observed that in most individuals the core of the mandible rotates during growth, in a sense that would tend to decrease the mandibular plane angle (i.e. counterclockwise, with the standard head orientation toward the right side). The concept of mandibular rotation during growth was elucidated mainly by the metallic implant experiments of A. Björk in the 1960s. Following are the most commonly encountered terms on components of mandibular rotation (the terminology varies greatly depending on the source):

SUBTERMS:

Mandibular rotation
- Clockwise rotation (Backward rotation, Posterior rotation)

Displacement of the mandible in the direction of mouth opening (clockwise, with the patient facing to the right), due to increased posterior vertical growth. Clockwise mandibular rotation also can occur as a consequence of orthodontic treatment, when posterior teeth are extruded in a non-growing patient. Clockwise rotation of the mandible usually is accompanied by an increase of the anterior lower face height and a reduction of the overbite.
Mandibular rotation

- Counterclockwise rotation (Forward rotation, Anterior rotation)

Rotation of the mandible in the direction of mouth closing (counterclockwise, with the patient facing to the right), due to increased posterior, compared to anterior growth. Counter-clockwise rotation of the mandible would tend to cause a relative reduction in the anterior lower face height and a deepening of the overbite.

- Intramatrix rotation (External rotation)

Rotation within the body of the mandible, due to angular remodeling of the inferior border relative to the core of the mandible (which affects the orientation of the mandibular plane with regard to the cranial base).

- Matrix rotation (Apparent rotation)

Rotation of the entire mandible around its condylar axis (which affects the orientation of the mandible as a whole relative to the cranial base).

- Total rotation (True rotation, Internal rotation)

The actual rotation of the core of the mandible (the part of the bone that surrounds the inferior alveolar nerve) relative to the cranial base, which is a combination of the intramatrix and matrix rotation.

Mandibular shift (CR-CO shift, Mandibular slide, Forced bite, Slide in centric)

A deflection of the mandible in an anterior, posterior and/or lateral direction, as a result of a premature contact occurring when the mandible is in centric relation.
Mandibular symphysis (Mental sym-physis)

The line of fusion of the lateral halves of the anterior portion of the mandible at the median plane. It is wide open during fetal life and ossifies by intramembranous ossification in the first year of life, usually before the emergence of the mandibular deciduous central incisors.

Marking pencil (Arch marker)

Wax pencil usually in white or red for marking archwires intraorally to indicate the desired location for adjustment bends or loops.

Martensite

A body-centered cubic phase in stainless steels, or a monoclinic, triclinic or hexagonal crystalline structure of nickel-titanium alloys. The martensitic phase of nickel-titanium exists at lower temperatures and is characterized by high ductility. It is formed as a result of quenching (rapid cooling) or cold working the austenite phase. [See also Austenite; Martensitic transformation. ]

Mandibular shift (CR-CO shift, Mandibular slide, Forced bite, Slide in centric)

A deflection of the mandible in an anterior, posterior and/or lateral direction, as a result of a premature contact occurring when the mandible is in centric relation.

Masticatory muscles

A group of skeletal muscles providing movement of the mandible and safeguarding the stability of the TMJs. The masticatory muscles involve the masseter, medial pterygoid and temporal muscles, which predominantly elevate the mandible (mouth closing); the digastric muscles, which assist in mandibular depression (mouth opening); the inferior lateral pterygoid muscles, which assist in protrusion and in contralateral movements of the mandible; and the superior lateral pterygoid muscles, which provide stability for the condyle and disc during function. The masticatory muscles are recruited during talking, swallowing and masticating, as well as during nonfunctional
(parafunctional) actions such as grinding and clenching. Motor innervation of the muscles of mastication is supplied by the trigeminal nerve (CV).

[See Muscle]

**Materia alba**

White accumulation or aggregation of microorganisms, desquamated epithelial cells, blood cells and food debris, loosely adhered to surfaces of teeth, soft tissues, dental restorations and orthodontic appliances.

**Maturation**

The qualitative changes that occur with ripening or aging. Rapid maturation as well as accelerated physical growth occurs during puberty.

**Maxilla (Upper jaw)**

An irregularly shaped paired bone that makes up a major part of the bony framework of the facial skeleton. It consists of the body of the maxilla and the zygomatic, nasal, palatine and alveolar processes. The suture between the right and left portions of the maxilla persists into adulthood.

**Maxillary**

Of or pertaining to the upper jaw.

**Maxillary incisor-lip line relationship**

See Tooth-to-lip relationship.

[See Tooth-to-lip relationship]

**Mechanics**

The physical science that deals with the state of rest or motion of bodies under the action of forces. Mechanics includes two sub-disciplines, statics and dynamics, and is also associated very closely with materials science. In orthodontics the term often is used as a synonym for mechanotherapy.

**SUBTERMS:**
Orthodontic mechanotherapy using cantilever springs to generate the appropriate force systems for specific types of tooth movement. Because full bracket engagement is allowed only at the fixed end of the cantilever with one-point contact at the other end, a statically determinate force system is achieved. This allows determination of the produced forces and moments at both ends of the cantilever by simple measurements and calculations. Moreover, the cantilever offers the possibility of a low load/deflection rate and a relatively long range of deactivation, generating an almost continuous force that generally is considered desirable for tooth movement.

[See Orthodontic springs, Cantilever spring]

Orthodontic mechanotherapy utilizing intramaxillary anchorage for tooth movement.

Orthodontic mechanotherapy making use of intermaxillary anchorage (e.g. elastics) between the anterior aspect of the maxillary and the posterior aspect of the mandibular arch.

Orthodontic mechanotherapy utilizing intermaxillary anchorage (e.g. elastics) between the anterior aspect of the mandibular and the posterior aspect of the maxillary arch.

Orthodontic mechanotherapy using continuous archwire mechanics.
Orthodontic mechanotherapy utilizing continuous archwires in the entire dental arch (as opposed to segments of archwires encompassing segments of teeth).

Mechanics
• Frictionless mechanics

The use of strategies or appliances that do not involve friction between archwire and bracket during tooth movement (e.g. retraction of a tooth by means of a segmental spring).

Mechanics
• Intermaxillary mechanics

The application of forces and/or moments from one arch to the other.

Mechanics
• Intersegmental mechanics

The application of forces and/or moments from one segment of teeth to another.

Mechanics
• Intrasegmental mechanics

The application of forces and moments between teeth that belong to the same segment of an arch.

Mechanics
• Segmental arch mechanics (Sectional mechanics)

Orthodontic mechanotherapy in which not all teeth within an arch are included in the same archwire, but rather anchorage and active segments are created by consolidating teeth together using wire segments. Various orthodontic loops and springs (e.g. cantilever springs) and different types of arches (e.g. intrusive arches) are used to generate the force systems required for movement of the active segments. Advantages of segmental arch mechanics include the avoidance of friction and the ability to design statically determinate force systems.

Mechanics
• Sliding mechanics

Mechanotherapy involving sliding of brackets along the archwire during tooth movement (i.e. the classic "pearls on a chain" example). The archwire generates the counter-moment necessary for bodily movement of the teeth. Frictional forces are present when tooth movement is performed by sliding mechanics.
Mechanotherapy

Collective term encompassing all procedures, appliances, and strategies adopted in specific phases of orthodontic treatment.

[See Mechanics]

Meckel's cartilage

A curved cylindrical rod of cartilage derived from the first branchial arch that embryologically has a close positional relationship and guides the development of the mandible. The greater part of Meckel’s cartilage disappears without contributing directly to the formation of the bone of the mandible. Only a small part of the cartilage between the future mental foramen and the midline contributes to the mandible by endochondral ossification. The cartilage at the mandibular symphysis is not derived from Meckel’s cartilage but differentiates from the connective tissue in the midline. After the 10th embryonic week, by which time the rudimentary mandible is formed (almost entirely by intramembranous ossification), Meckel’s cartilage forms the malleus and incus of the inner ear, the anterior ligament of the malleus, and the sphenomandibular ligament.

[Compare with Reichert's cartilage]

Median plane (Midsagittal plane)

The imaginary plane passing longitudinally through the middle of the body, dividing it into left and right halves.

[See Sagittal plane (Parasagittal plane)]

Mediolaterally

In a direction perpendicular to the sagittal plane of the dentofacial complex (along the z-axis). For incisor teeth this coincides with the mesiodistal direction. For all other teeth, it signifies a buccolingual direction.

[See Global reference frame]

Mediotrusion

Movement in a medial direction of the contralateral (non-working) half of the mandible and the respective condyle during a lateral mandibular excursion.

[Compare with Laterotrusion]
Mentolabial fold (Labiomental sulcus)

The shallow groove created where the curvature of the lower lip merges with that of the chin.

Mesial

Toward the midline, following the dental arch. The term is used to describe surfaces of teeth as well as direction.

[Compare with Distal]

Mesial tipping

Tipping of the crown of a tooth in the mesial direction.

Mesiodens

A supernumerary tooth in the midline of the maxillary alveolar process. A mesiodens often is unerupted, and it may interfere with the eruption and position of the maxillary permanent central incisors.

Mesiodistally

In a direction along the dental arch. For incisor teeth this term signifies a direction approximately perpendicular to the sagittal plane (along the z-axis), whereas for all other teeth it actually indicates a direction approximately parallel to the sagittal plane (along the x-axis).

[See Global reference frame]
Mesocephalic

Anthropometric term used to denote a cranial form of average proportions (cephalic index between 76.0 and 80.9).

Michigan Growth Study (University of Michigan Growth Study)

The University of Michigan Elementary and Secondary School Growth Study was founded by Dean W. Olsen in 1935. It consists of 714 subjects, primarily of Northern European ancestry, on whom anthropometric, psychometric and craniofacial growth data were obtained on an annual basis while they were enrolled as students in the University School, a laboratory school located within the School of Education on the Ann Arbor campus. Collection of cephalometric and other data of orthodontic interest started in 1953 under the direction of R. E. Moyers. The number of annual records was variable among subjects and depended on the number of years that each student attended the University School. Major data collection ended in 1970, but several long-term recall studies have been conducted since that time. The Michigan Growth Study material is currently housed at the Schools of Education and Dentistry, University of Michigan in Ann Arbor.

Microdontia

A term denoting smaller than normal tooth size.

[Compare with Macrodontia]

Micrognathia

Abnormally small jaw size.

Midline

A central reference line of a structure about which symmetry between the right and left halves can be evaluated.

SUBTERMS:

Midline
  • Facial midline

An imaginary line splitting the face in two approximately equal right and left halves. In the ideal situation of absolute symmetry, the facial midline can be considered as a perpendicular to the interpupillary line from glabella, passing through the tip of the nose, the midpoint of the philtrum of the upper lip and the midline of the chin.
Midline
• Mandibular dental midline

A line perpendicular to the mandibular occlusal plane, passing through the interproximal contact point between the mandibular central incisors (or, in absence of contact, the midpoint of the diastema between them).

Midline
• Maxillary dental midline

A line perpendicular to the maxillary occlusal plane, passing through the interproximal contact point between the maxillary central incisors (or, in absence of contact, the midpoint of the diastema between them).

Midline
• Midline of the chin

A line drawn perpendicular to the mandibular plane, dividing the chin in two (right and left) halves.

**Midline diastema**

A space between the central incisors of the maxillary (common) or mandibular arch (relatively rare), which may be associated with the presence of a hyperplastic labial frenum, or tongue frenum in the case of a mandibular diastema.

**Midline discrepancy (Midline shift, Midline deviation)**

Incongruency between the midlines of the maxillary and mandibular dental arch and/or between them and the facial midline.

**Migration, Pathologic**

Spontaneous movement of a tooth out of its natural position, usually as a result of periodontal disease.

**Miller classification**

A classification of gingival recession, widely used in periodontology, introduced by P. D. Miller (1985) as follows:

Class I
Gingival recession in which the marginal tissues have not receded beyond the mucogingival junction and there is no loss of interproximal soft tissue or bone. In such recessions 100% root coverage is possible.

Class II

Gingival recession in which the marginal tissues have receded beyond the mucogingival junction, still with no loss of the interproximal soft tissue or bone. Again, 100% root coverage is possible in such recessions.

Class III

Class I or Class II gingival recession, combined with loss of interproximal bone, such that the soft tissue now is apical to the cementoenamel interproximal junction but coronal to the marginal tissue. 100% root coverage is not possible.

Class IV

Gingival recession combined with loss of interproximal bone that is such that one or both of the adjacent interdental areas is level with the marginal gingiva. No root coverage is possible in Class IV recessions.

Mixed dentition analysis

The analysis of space available for alignment of the permanent teeth, when the patient is in the mixed dentition (which involves estimation of the size of the unerupted permanent teeth). There are three basic approaches to this:

1. Measurement of the size of the unerupted teeth on radiographs. This method is best performed with individual periapical films, but the accuracy is still limited by the inevitable presence of distortion, especially in the case of the canines. In addition appropriate compensation for enlargement is required, which dictates the use of a proportionality ratio (e.g. true width of deciduous molar/radiographically measured width of deciduous molar = true width of unerupted premolar/radiographically measured width of unerupted premolar).

2. Estimation from proportionality tables, without the use of radiographs. These data have been tabulated for white American children by R. E. Moyers based on the combined mesiodistal width of the mandibular permanent incisors, which is used to predict the size of both the mandibular and maxillary unerupted canines and premolars. The size of the mandibular incisors correlates better with the size of the maxillary canines and premolars than does the size of the maxillary incisors, because maxillary lateral incisors show great variability in size and shape. This method shows a tendency to overestimate the size of unerupted teeth. An alternative method for predicting the size of the unerupted canines and premolars by using the width of the mandibular incisors is the method developed by M. M. Tanaka and L. E. Johnston, Jr. According to that, the width of the
mandibular canine and premolars in one quadrant can be calculated by adding 10.5 mm to half of the measured mesiodistal width of the four mandibular incisors. Similarly, the width of the maxillary canine and premolars in one quadrant can be determined by adding 11.0 mm to half of the measured mesiodistal width of the four mandibular incisors. The method shows a small tendency toward overestimating the unerupted tooth sizes. Its advantage is that it does not require radiographs or reference tables.

3. Combination of the radiographic and prediction table methods. Since the major problem with using radiographic images comes in evaluating the canine teeth, another option is to use the size of the permanent incisors measured from the dental casts and the size of the permanent premolars measured from the films to predict the size of the unerupted canines. Graphs are available (such as that by R. N. Staley and R. E. Kerber) that allow determination of the mandibular canine from the sum of incisor and premolar widths. The technique is limited to the mandibular arch and requires periapical radiographs.

Mode of force application (Force regime)

The time-related aspect of orthodontic force application: the magnitude of a continuous force is more or less maintained between activations, that of an intermittent force declines with time until a reactivation is performed, whereas that of an interrupted force drops to zero between activations (the force is removed temporarily).

[See Force]

Model surgery

A simulation of the actual surgical procedure using the patient’s presurgical casts, which are mounted on an articulator. The purposes of this simulation are to verify that the movements planned by the surgical prediction tracing actually can be performed and to relate the casts in the position where the surgical splints will be fabricated. If both jaws are to be repositioned, the maxillary cast is moved first and fixed on the articulator. In this position, the first surgical splint (intermediate splint) is made. Then the mandibular cast is repositioned to simulate the occlusion at the completion of surgery. The final surgical splint is made with the casts in this position. The model surgery is based on a combination of the surgical prediction and the presurgical clinical diagnostic information.

[See Splint, Surgical splint (Surgical wafer)]

Model trimmer
A device used for trimming plaster and stone casts. Its main component is a large rotating grinding wheel, which is kept wet by a stream of water to reduce dust and keep the cutting wheel clean.

**Modeling (of bone)**

A process involving independent sites of resorption and formation that change the intrinsic form (shape and/or size) of a bone, in contrast to the term "remodeling," which signifies a specific coupled sequence of resorption and formation events to replace previously existing bone. Bone modeling is the dominant process in growth as well as in adaptation to applied loads such as those produced with headgear, rapid palatal expansion, functional appliances, etc. Traumatic or surgical wounding usually results in intense but localized modeling and remodeling responses. Following fractures, osteotomies or placement of endosseous implants, the processes of callus formation and resorption of necrotic osseous margins are modeling processes. In contrast, replacement of the devitalized cortical bone surrounding these sites is a remodeling activity.

[See Remodeling (of bone)]

**Models, Plaster**

[See Orthodontic casts (Orthodontic models)]

**Modulus of elasticity E (Young’s modulus of elasticity, E-modulus)**

The slope of the stress/strain curve in its linear portion (below the elastic limit) (E = s/e). It is an inherent property of the material, which measures its stiffness. A material with a high modulus of elasticity deforms less than a material with a low modulus, when subjected to identical loads. The modulus of elasticity of a certain material is not influenced by its geometrical shape (length and cross-sectional area) and it cannot be altered appreciably by heat treatment, work-hardening, or any other type of conditioning. The modulus of elasticity of an orthodontic wire determines its load/deflection rate, and it can be changed only by changing the wire material.

[See Stress/strain diagram (Stress/strain curve)]

[See Load/deflection rate (Force/deflection rate)]

**Moment**

Rotational tendency.

**SUBTERMS:**

Moment
• **Counter-moment**

When a single force is applied at the bracket of a tooth, uncontrolled tipping probably will result, due to generation of a moment (since the force is applied at a distance from the center of resistance of the tooth). This will tend to move the crown in the direction of the force and the apex in the opposite direction. If bodily movement of the tooth is desired, a reverse moment (counter-moment) must be applied simultaneously to prevent the unwanted movement of the apex.

This counter-moment can be generated either by a second force or, more commonly, by a couple. When sliding mechanics is used for retraction of a canine, the counter-moment is generated by a couple, formed by contact of the archwire with the mesial-gingival and distal-occlusal wings of the canine bracket, following a small initial unopposed distal tipping movement. When a segmental spring (loop) is used for canine retraction, the counter-moment is generated by the spring itself.

[See Canine retraction]

[See Moment-to-force ratio]

**Moment of a couple**

Unlike the curvilinear motion produced by a moment of a force, the moment of a couple produces a tendency to pure rotation around the center of mass (when applied on a free body), or around the center of resistance (when a partially constrained body, e.g. a tooth, is involved).

The moment produced by a couple is a vectorial quantity. It has a magnitude equal to the product of the magnitude of one of the two forces $F$, times the perpendicular distance $d$ between the two forces ($M_{\text{couple}} = F \times d$); thus it is measured in units of force x distance (i.e. N mm, or g mm). Its direction is perpendicular to the plane of the pair of the forces, and its sense is either clockwise or counterclockwise, as viewed looking into the plane of the couple. A couple can be applied anywhere on a rigid object, creating the same rotational effect. This is why the moment of a couple is said to be a free vector.

[See Couple]
The moment of a force about a specified point or line is a measure of the potential of that force to rotate the body, upon which the force acts, about the particular point or line.

The moment $M$ of a force $F$ about a point is also a vectorial quantity. Its magnitude is given by the formula $M = F \times d$ (where $d$ is the "moment arm"). A moment of a force is also measured in units of force x distance (i.e. N mm, or g mm). The direction of the moment vector is perpendicular to the plane defined by the force vector and the point about which the moment is considered. The sense of the vector is determined by a rule associated with the rotational tendency, as viewed from above the plane of the force vector and the point about which the moment is considered. By convention, counterclockwise moments (out of the plane) are said to be positive, whereas clockwise moments (into the plane) are considered negative.

The shorter the moment arm, the smaller the moment of a force. A moment of a force acting on a body can be considered about any specific point on the body; in orthodontics the center of resistance is commonly used. A force passing through an arbitrary point obviously produces no moment about it.

### Moment arm

The perpendicular distance ($d$) of the point about which the moment is determined to the line of action of the force producing the moment.

### Moment-to-force ratio

The ratio of magnitudes of the uprighting (counter-)moment applied at the bracket of a tooth to control the location of the center of rotation, to the tooth-moving force that is applied at the same point (the bracket).

The counter-moment usually is the moment of a couple. In terms of sense, the counter-moment always is opposite to that of the moment of the force, relative to the center of resistance. Since moments are measured in gram millimeters and forces in grams, the ratio of the two has units of millimeters; this represents the distance away from the bracket that a single force will produce the same effect. [However, it has become conventional in orthodontics to ignore these units and just speak of the moment-to-force ratio as a pure number.]
The moment-to-force ratio is used in two-dimensional analysis as an indicator of the type of tooth movement that will occur. C. J. Burstone and R. J. Pryputniewicz estimated the different moment-to-force ratios required for various types of tooth movement for a 3-D model of an ideal maxillary central incisor with intact periodontium. When only a force is applied at the bracket of a tooth (M/F ratio of zero), the center of rotation is at, or just apical to, its center of resistance. The resulting tooth movement is uncontrolled tipping. The more the counter-moment increases, the more the center of rotation moves in an apical direction. With a distance from the bracket to the center of resistance of 10 mm, the center of rotation approaches infinity as the M/F ratio approaches 10:1. As soon as the M/F ratio exceeds 10:1, the net moment at the center of resistance changes direction, since the magnitude of the counter-moment is now greater than that of the moment produced by the applied force. The center of rotation is slightly incisal to the center of resistance. When the M/F ratio becomes 12:1 or 13:1, the center of rotation is displaced at the incisal edge, resulting in pure root movement. Further increase of the M/F ratio up to about 20:1 causes the center of rotation to gradually move to a location just incisal to the center of resistance. It is obvious that small changes in the M/F ratio have major effects on the clinically observed tooth movement.

As mentioned previously, it is the ratio between the applied counter-moment and force (and not their absolute magnitudes) that determines the type of tooth movement. However, this mechanical principle does not take into account the fact that the magnitudes of forces and couples are important in determining the biologic response to an orthodontic force system.

[See Orthodontic tooth movement]

Mouth breathing

The habit of breathing primarily through the oral cavity, which traditionally has been associated with some detrimental dentofacial changes and associated malocclusion. Specifically, the theory is that breathing through the mouth, rather than the nose, could bring about some postural changes, namely tipping of the head back and lowering of the mandible and tongue, in order to facilitate respiration. If these postural changes are maintained, face height may increase and the posterior teeth may overerupt, with resulting downward and backward rotation of the mandible, steep mandibular plane and open bite tendency. As well, the change in equilibrium between the soft tissues and the jaws and teeth could result in compensatory dental changes, such as a constricted maxillary arch, tendency to a crossbite and upright mandibular incisors. In addition, mouth breathing creates xerostomia, which can predispose to gingival hyperplasia and inflammation, as well as caries, at least in the anterior aspect of the dental arches.

The possible association of mouth breathing and the above described craniofacial pattern, as well as its relationship to nasal airway obstruction, is yet another controversial issue, which has led to many referrals of orthodontic patients for adenoidectomy over the years.

[See "Adenoid facies"]
**Mucogingival junction (MGJ)**

The junction between the keratinized gingiva and the non-keratinized oral mucosa.

**Mucosa**

The epithelial lining of body cavities opening to the outside, consisting of a mucous membrane.

**SUBTERMS:**
- Alveolar mucosa
- Masticatory mucosa
- Oral mucosa

**Multidisciplinary treatment**

Coordinated collaboration of multiple specialties in the treatment of a single individual.

**Multifactorial**

Resulting from the combined action of several factors.

**Muscle**

Tissue composed of contractile fibers that effect movements of an organ or body part. Muscle types include striated (skeletal and cardiac) muscles and non-striated, smooth (visceral) muscles.

**SUBTERMS:**
- Buccinator muscle
- Digastric muscle
- Lateral (External) pterygoid muscle
- Masseter muscle
- Medial (Internal) pterygoid muscle
- Orbicularis oris
- Scalene muscles
- Sternocleidomastoid muscle
- Suprahyoid muscles
- Temporalis muscle
Trapezius muscle

**Muscle contraction**

The development of tension or shortening of a muscle.

**Muscle spasm (Myospasm, Muscle cramp)**

Spasmodic continuous involuntary contraction of a muscle or group of muscles, typically associated with acute pain and dysfunction.

[Compare with Protective muscle splinting (Reflex muscle splinting)]

**Myalgia**

Muscle pain.

**Myofascial**

Pertaining to the muscle and its attaching fascia.

**Myofascial pain (Myofascial pain dysfunction syndrome, MPDS)**

Regional pain referred from or emanating around active myofascial trigger points.

**Myofascial trigger point**

Hyperirritable spot, usually within a taut band of skeletal muscle or in the muscle fascia that is painful on compression and can give rise to characteristic referred pain, tenderness and autonomic phenomena. Myofascial trigger points are subdivided into active and latent.

SUBTERMS:

Myofascial trigger point
  • Active myofascial trigger point

Myofascial trigger point responsible for local or referred current pain, or symptoms without stimulation through palpation.

Myofascial trigger point
  • Latent myofascial trigger point
Myofascial trigger point with all the characteristics of an active myofascial trigger point, including referred pain with palpation, but not currently causing spontaneous clinical pain or symptoms.

**Myofunctional therapy (Muscle exercises)**

Therapy aiming at improvement of muscle function and the habitual position of soft tissues (e.g. therapy for correction of a tongue-thrust habit) to prevent or maintain the correction of any occlusal or dental abnormalities associated with them. The concept was introduced to orthodontics by A. Rogers in 1918.

**Nasal obstruction**

Inhibition of normal nasal breathing due to a mechanical impediment of the nasopharyngeal airway. Nasal obstruction generally induces mouth breathing, but the reverse is not always true (i.e. the presence of mouth breathing does not necessarily suggest nasal obstruction), as mouth breathing could be habitual.

[See "Adenoid facies"]

**Natural head position**

A standardized orientation of the head that is reproducible for each individual and is used as a means of standardization during analysis of dentofacial morphology. The concept of natural head position was introduced by C. F. A. Moorrees and M. R Kean in 1958 and now is a common method of head orientation for cephalometric radiography.

To accomplish natural head position, the patient is asked to look into a mirror placed in front of him/her at eye level (as if he/she were looking at the horizon), with the interpupillary line parallel to the floor. Advocates of this method maintain that registration of the head in its natural position while obtaining a cephalogram has the advantage that an extracranial line (the true vertical or a line perpendicular to that) can be used as a reference line for cephalometric analysis, thus bypassing the difficulties imposed by the biologic variation of intracranial reference lines.

[Compare with Natural head posture]

**Neckstrap**

The component of an extraoral appliance (e.g. cervical headgear) that distributes and transfers reaction forces to the cervical area.

**Neuralgia**

Paroxysmal or constant pain, typically with sharp, stabbing, itching or burning character, in the distribution of a nerve.
Newton's laws

All principles of mechanics are based on three physical laws presented in 1686 by Sir I. Newton in his "Philosophia Naturalis Mathematica." The laws of Newton are:

SUBTERMS:
Newton's laws
  • I. Law of inertia

When the sum of all the external forces acting on a body is zero, the motion of the body is unchanged (the body either remains at rest, or continues its motion at a straight line with a constant velocity).

Newton's laws
  • II. Law of acceleration

If the sum of all the forces acting on a body is not equal to zero, the motion of the body is accelerated along the line of action of the resultant force. The acceleration is proportional to the resultant force and inversely proportional to the mass of the body.

Newton's laws
  • III. Law of action and reaction

To every force (action) in a given system, there is an equal and opposite reaction force, so that the sum of all the forces (SF) and the sum of all the moments (SM) in the system always is equal to zero.

Neurotrophism

The hypothesis that skeletal growth is under control of the nervous system, assumedly by transmission of substances through the axons of the nerves, much like neural activity controls muscle growth and activity.

Neutral position

During the activation process of an orthodontic spring, the position of the spring with only the activation moments placed on it (but with zero force).

Nickel-titanium alloy (Ni-Ti)
Family of alloys primarily consisting of nickel (approximately 55%), titanium (approximately 45%) and optionally of third elements such as cobalt or copper. Nickel-titanium alloys were first reported in the orthodontic literature by G. F. Andreasen in 1971. The name of the first commercially available product was Nitinol. Nitinol was developed originally for the U. S. Navy, in the early 1960s, by W. F. Buehler, a research metallurgist at the Naval Ordnance Laboratory in Maryland. [The name "nitinol" is an acronym derived from nickel and titanium composition, along with the suffix -nol which stands for Naval Ordnance Laboratory.] Although the original nitinol wire (Unitek/3M) did not exhibit superelastic behavior, it possessed two features of considerable importance for clinical orthodontics:

1. A very low elastic modulus (E), corresponding to about one-fifth of the force delivery of stainless steel wires, and half the force delivery of beta-titanium archwires of the same length and cross-sectional dimensions.

2. An extremely wide working range. A "second generation" superelastic Chinese nickel-titanium alloy (marketed as "Ni-Ti" by Ormco/Sybron) exhibits non-linear loading and unloading characteristics more pronounced than those of the original nitinol wire.

A "third generation" Japanese nickel-titanium alloy (marketed as "Sentalloy" by GAC International) was subsequently introduced, which also exhibits superelastic behavior. [The name Sentalloy is an acronym of the words superelastic nickel titanium alloy.] The unloading characteristics of this type of Ni-Ti alloys exhibit initial and final regions of relatively steep slope, along with an extensive intermediate region where there is little or no change in stress.

The superelastic behavior and shape memory characteristics of nickel-titanium alloys are based on a reversible transformation between the austenitic and martensitic Ni-Ti phases. Some of the available nickel-titanium wires are termed "thermally activated" wires due to the fact that their transition temperature is close to the level of body temperature.

Nickel-titanium alloys have characteristic properties that are very useful in orthodontics, namely superelasticity, excellent springback, large working range and low stiffness. However, Ni-Ti wires cannot be soldered or welded without losing their properties, and their friction coefficient is higher than that of stainless steel (although still lower than that of beta-titanium). Ion-implantation may aid in reducing the frictional resistance of nickel-titanium wires.

[See Martensitic transformation]

[See Shape memory]

**Nickel-titanium wire**

[See Nickel-titanium alloy (Ni-Ti)]

**Nightguard (Bruxism appliance)**
A removable acrylic interocclusal appliance worn at night to prevent or reduce dental wear resulting from bruxism.

**Nitinol**
[See Nickel-titanium alloy (Ni-Ti)]

**Nociception**

Stimulation of specialized nerve endings designed to transmit information to the central nervous system concerning potential or actual tissue damage (painful sensation).

**Non-extraction therapy**

Orthodontic treatment without any extractions of permanent teeth (wisdom teeth generally excluded).

**Non-invasive**

Denoting any diagnostic or therapeutic procedure that does not require penetration of the skin or entrance into a cavity or organ of the body.

**Non-occlusion**

Any situation in which teeth do not have maximal contact with their antagonists in habitual occlusion. Non-occlusion may be caused by disturbances in tooth eruption (e.g. ankylosis) or by factors that inhibit further eruption, such as digit-sucking or tongue interposition. According to its localization, non-occlusion can be classified as anterior, posterior or total non-occlusion.

[Compare with Open bite (Negative overbite)]

**SUBTERMS:**

Non-occlusion
  - Anterior non-occlusion

Non-occlusion in the incisor area, which may be combined with some degree of vertical overlap of the incisors, as frequently seen in Class II, Division 1 malocclusions.

Non-occlusion
  - Posterior non-occlusion
Non-occlusion in the premolar or molar area, with great variation in the number of teeth and in the occlusal surfaces involved.

Non-occlusion
• Total non-occlusion

A situation characterized by absence of maximal occlusal contact of all posterior teeth, combined with an anterior non-occlusion. In total non-occlusions the tongue usually is positioned between all opposing teeth most of the time.

Non-steroidal anti-inflammatory drug (NSAID)

Class of anti-inflammatory medications that also provide analgesia, but lack the detrimental side effects associated with steroid use.

Non-working side (Mediotrusive side, Non-functioning side, Balancing side)

The side opposite to the functioning (working) side on a lateral excursion of the mandible. The side the mandible is moving away from, during a lateral excursion.

Normal occlusion theory of Angle
[See Extraction vs. non-extraction debate]

Obstructive sleep apnea (OSA, Obstructive sleep apnea syndrome, OSAS)

Breathing abnormality occurring during sleep, characterized by repeated collapse of the upper airway, producing hypopnea, apnea and, ultimately, desaturation of hemoglobin. The hypopneic and apneic episodes produce frequent arousal from sleep patterns. The effects of repeated desaturation significantly alter normal cardiovascular and pulmonary function, resulting in pulmonary and systemic hypertension as well as arrhythmias, which if untreated can lead to death.

The etiology of OSA appears to be neurogenic failure to preserve the patency of the pharyngeal airway during sleep. The condition often is combined with airway obstruction at various anatomic locations, such as the nasal cavity, adenoids, soft palate, tonsils or base of the tongue. Obesity is considered a predisposing factor in the etiology. In the adult OSA population, males are affected 10 to 20 times more often than females. Almost all apneic patients snore loudly at night. The diagnosis of OSA is made by polysomnography (multiphysiologic sleep recording).

Various treatment modalities advocated include weight loss (if patient is obese), nasal continuous positive air pressure (nasal CPAP), or surgical uvulo-palato-pharyngoplasty (UPPP). Removable intra-oral appliances that advance the mandible sometimes are used to re-establish the patency of the airway, as well as to determine whether an orthognathic surgical correction is indicated.

Obturator
A dental prosthesis or appliance used to close a congenital or acquired opening. Sometimes used to cover a remaining oronasal fistula or to facilitate the velopharyngeal mechanism in a patient with a history of cleft lip and palate.

**Occlusal**

Pertaining to the masticatory surfaces of the posterior teeth. (Also may be used to identify a coronal direction.)

**Occlusal contact**

A contact between maxillary and mandibular teeth during occlusion.

**SUBTERMS:**

- **Occlusal contact**
  - Non-working side contact (Mediotrusive contact, Balancing contact)

  A contact between maxillary and mandibular teeth on the side opposite to the working side during a lateral mandibular excursion. [Note: The term "non-working contact" is used when there is at least one simultaneous contact on the working side. If the occlusal contact on the non-working side causes disclusion of the teeth on the working side, the term "non-working interference" is used.]

  [See Occlusal interference (Premature occlusal contact, Supracontact, Deflective occlusal contact, "Prematurity"), Non-working side interference (Mediotrusive side interference, Balancing interference)]

  - Working side contact (Laterotrusive occlusal contact)

  A contact between maxillary and mandibular teeth on the ipsilateral side during guided lateral excursive movement of the mandible.

**Occlusal dysfunction**

A malocclusion with impaired function.

**Occlusal equilibration (Occlusal adjustment)**

Selective grinding of occlusal surfaces of the teeth in an effort to eliminate premature contacts and occlusal interferences, to achieve balancing of the functional occlusal load on the teeth, to
eliminate occlusal trauma, to address muscle tension and associated pain, to improve functional relations or to aid in the stabilization of orthodontic results.

**Occlusal equilibrium**

The stage of eruptive tooth movement starting at the point that a tooth reaches the occlusal level and is in complete function. Occlusal equilibrium is divided into juvenile and adult phases.

**SUBTERMS:**

Occlusal equilibrium
- Adult occlusal equilibrium

The final phase of tooth eruption after the end of the pubertal growth spurt. During this phase the rate of tooth eruption is extremely slow.

[See Physiologic tooth movement]

[See Post-emergent spurt]

Occlusal guidance

The contact pattern between teeth during dentally guided mandibular movement away from or toward maximum intercuspation.

**Occlusal interference (Premature occlusal contact, Supracontact, Deflective occlusal contact, "Prematurity")**

Undesirable occlusal contact that may produce mandibular deviation during closure to maximum intercuspation or may hinder smooth passage to and from the intercuspal position.
SUBTERMS:
Occlusal interference (Premature occlusal contact, Supracontact, Deflective occlusal contact, "Prematurity")
  • Centric interference

A premature contact occurring when the mandible closes with the condyles in their optimum position in the glenoid fossae (centric relation), which causes a deflection (shift) of the mandible in an anterior, posterior and/or lateral direction.

Occlusal interference (Premature occlusal contact, Supracontact, Deflective occlusal contact, "Prematurity")
  • Non-working side interference (Mediotrusive side interference, Balancing interference)

A contact between maxillary and mandibular teeth on the non-working side that causes disclusion of the teeth on the working side during a lateral mandibular excursion.

[Compare with Occlusal contact, Non-working side contact (Mediotrusive contact, Balancing contact)]

Occlusal interference (Premature occlusal contact, Supracontact, Deflective occlusal contact, "Prematurity")
  • Protrusive interference

An occlusal contact between maxillary and mandibular posterior teeth discluding the incisors during a protrusive mandibular excursion.

Occlusal plane (OP)

An imaginary surface that passes through the occlusion of the teeth. This surface usually is curved and is, strictly speaking, not a plane, but commonly is approximated by one (straight line in the lateral view), based on specific reference points within the dental arches. The maxillary occlusal plane passes through the occlusal cusps of the posterior teeth and the incisal edges of the maxillary incisors. The mandibular occlusal plane is tangent to the occlusal cusps of the posterior teeth and the incisal edges of the mandibular incisors.

[See Cephalometric lines (planes), Occlusal plane (OP)]

Occlusal rest (Occlusal lug, Occlusal stop)

The part of a removable appliance that rests on the occlusal surface of a tooth and prevents movement of the appliance toward the soft tissue. Occlusal rests sometimes are soldered on fixed
appliances, such as a "band and loop" space maintainer, to resist dislodgment of the appliance as a result of the forces of mastication.

**Occlusal trauma (Traumatic occlusion, Trauma from occlusion, Periodontal trauma)**

1. Injury to the periodontium resulting from occlusal forces in excess of the reparative capacity of the periodontal attachment. The affected teeth usually exhibit widening of the PDL space, wear facets and some degree of hypermobility.

2. The same term sometimes is used to denote a palatally impinging overbite.

[See Tooth mobility, Increased mobility (Hypermobility)]

[See Impinging overbite]

**SUBTERMS:**

Primary occlusal trauma
Secondary occlusal trauma

**Occlusion**

The relationship of the maxillary and mandibular teeth, as they are brought into functional contact.

**SUBTERMS:**

Occlusion

- Centric occlusion (CO, Intercuspal position, ICP, Habitual occlusion)

Mandibular position dictated by maximum and habitual intercuspation of the maxillary and mandibular teeth. It is a dentally determined position, independent of condylar position.

Occlusion

- Functional occlusion (Physiological occlusion)

A static and dynamic relationship of the teeth combining minimum stress on the temporomandibular joint, optimal function of the orofacial complex, stability and esthetics of the dentition and protection and health of the periodontium.

Occlusion
• Optimal occlusion (Ideal occlusion)

An ideal relationship of maxillary and mandibular teeth combining a functional occlusion with the absence of malocclusion (as described by the six keys of occlusion).

[See Ideal occlusion]

[See Occlusion, Functional occlusion (Physiological occlusion)]

**Occlusal trauma (Traumatic occlusion, Trauma from occlusion, Periodontal trauma)**

1. Injury to the periodontium resulting from occlusal forces in excess of the reparative capacity of the periodontal attachment. The affected teeth usually exhibit widening of the PDL space, wear facets and some degree of hypermobility.

2. The same term sometimes is used to denote a palatally impinging overbite.

[See Tooth mobility, Increased mobility (Hypermobility)]

[See Impinging overbite]

**SUBTERMS:**

Primary occlusal trauma
Secondary occlusal trauma

**Occlusogingivally (Occlusoapically)**

In a direction perpendicular to the occlusal plane, along the y-axis.

[See Global reference frame]

**Occlusogram**

A graphic representation of the arches from the occlusal view. Occlusograms are mainly used as treatment planning aids to assist in defining the specific tooth movements required within and between arches (in the sagittal and transverse planes) to achieve treatment goals. An occlusogram is essentially a two-dimensional diagnostic setup and is directly correlated with the Visual Treatment Objective (VTO). It can be constructed from tracings of photographic or photostatic copies of the occlusal aspects of the maxillary and mandibular study casts. The tracings of the teeth of both arches are superimposed on each other to reproduce the existing occlusal relationship, using index points that are marked on the models and subsequently transferred to the
tracings. Anticipated movements of individual teeth as well as the need for extractions then can be determined, to simulate the desired treatment goal.

[See Visual treatment objective (VTO)]

[See Diagnostic setup (Kesling setup)]

**Occult cleft**

[See Submucous cleft palate]

**Oculoauriculovertebral spectrum**

[See Hemifacial microsomia (First and second branchial arch syndrome)]

**Oligodontia**

The congenital absence of multiple teeth (a severe form of hypodontia). In many such patients, the existing teeth are smaller than normal and can be shaped atypically.

[Compare with Anodontia]

**Open bite (Negative overbite)**

Inherited, developmental or acquired malocclusion whereby no vertical overlap exists between maxillary and mandibular anterior teeth (anterior open bite), or no vertical contact is exhibited between maxillary and mandibular posterior teeth (posterior open bite). An open bite may be localized and thus involve only a few teeth due to a digit-sucking habit or other local factors (dental open bite), or it may be caused by divergence of the skeletal planes (skeletal open bite or apertognathia).

[Compare with Non-occlusion]

**Opening of the bite**

The correction of a deep bite. This can be performed by extrusion of posterior teeth, often resulting in clockwise rotation of the mandible (increased separation between the mandibular and palatal planes); by intrusion of the anterior teeth; or by a combination of the two methods (relative intrusion of the anterior teeth).
Optimal force theory

The hypothesis that there exists a force of certain magnitude and temporal characteristics (continuous vs. intermittent, constant vs. declining, etc.) that is capable of producing a maximum rate of tooth movement with no tissue damage and maximum patient comfort. The optimal force for tooth movement may differ for each tooth, or for each individual patient.

Orbital hypertelorism

The increased distance between the medial orbital walls, reflecting an increased distance between the orbits (greater than 2 standard deviations from the norm). The anatomic landmarks used commonly for the measurement of interorbital distance are the dacryon points (bilaterally). Hypertelorism is described on the basis of skeletal measurements, because the presence of epicanthal folds or strabismus (exotropia), or other soft-tissue variations such as increased distance between the medial canthi (telecanthus) clinically may give a false impression of hypertelorism. Orbital hypertelorism is common in a number of craniofacial malformations such as Crouzon syndrome and frontonasal dysplasia.

Orbital hypotelorism

The decreased distance between the medial orbital walls, a common finding in patients born with malformations such as a median cleft. A patient with orbital hypotelorism has a much greater chance of severe brain abnormality than does one with hypertelorism.

Orofacial

Pertaining to the mouth and face.

Oronasal communication

Orthodontic attachment
Orthodontic band

A ring, usually made of a thin strip of stainless steel, that serves to secure orthodontic attachments to a tooth. Bands are prefabricated in varying shapes to fit closely around the crowns of specific teeth. Each shape comes in different sizes to accommodate individual tooth size variation. Most bands have an occluso-gingival taper to fit the tooth, with the incisal edge straight and the cervical edge contoured, similar to the cementoenamel junction. Orthodontic bands can be plain or have buccal (brackets or tubes) or lingual (buttons, sheaths, cleats, seating lugs) attachments welded or brazed on them. The inner surface of the band can be conditioned by various methods such as pattern rolling, sandblasting, photo- or laser-etching to increase retention.

Orthodontic cement

Dental cement used for fixation of orthodontic bands to the teeth.

SUBTERMS:

Glass-ionomer cement
Resin-modified glass-ionomer cement (Dual-cured glass-ionomer cement)
Zinc oxide-eugenol (ZOE) cement
Zinc phosphate cement

Orthodontic elastics (Rubber bands)

Flexible bands, usually made of elastomeric material, used to produce forces for tooth movement.
Orthodontic elastics (Rubber bands)
• Anterior diagonal elastics (Anterior oblique elastics)

Anterior intermaxillary elastics crossing the midline (e.g. extending from the maxillary right canine to the mandibular left lateral incisor), often used to facilitate the correction of non-coinciding maxillary and mandibular dental midlines.

Orthodontic elastics (Rubber bands)
• Asymmetric elastics

Various combinations of intermaxillary elastics (e.g. Class III elastics on one side and Class II elastics on the other) used to correct an asymmetry in the buccal segment occlusion, with or without an associated midline discrepancy.

Orthodontic elastics (Rubber bands)
• Class II elastics

Intermaxillary elastics extending unilaterally or bilaterally from the anterior aspect of the maxillary dental arch to the posterior aspect of the mandibular one (e.g. from the maxillary canines to the mandibular first molars). They are used to aid in Class II correction, to reduce the overjet, to minimize anchorage loss during maxillary incisor retraction by taking advantage of intermaxillary anchorage, etc. In addition to the desired sagittal force, Class II elastics create vertical forces (especially when the patient opens their mouth) as well as certain transverse forces, both of which often are undesirable.

Orthodontic elastics (Rubber bands)
• Class III elastics

Intermaxillary elastics with the opposite orientation to Class II elastics (from the anterior aspect of the mandibular dental arch to the posterior aspect of the maxillary one). As in the instance of Class II elastics, Class III elastics can be used unilaterally or bilaterally. They have various applications: to facilitate protraction of maxillary posterior teeth, to improve the incisor
relationship in an edge-to-edge or anterior crossbite situation, or to make use of intermaxillary anchorage during mandibular incisor retraction. In addition to the desired sagittal force, Class III elastics create vertical forces (especially when the patient opens their mouth), as well as certain transverse forces, both of which often are undesirable.

Orthodontic elastics (Rubber bands)
- Crossbite elastics (Criss-cross elastics, Through-the-bite elastics)

Elastics extending from the palatal (lingual) aspect of one or more maxillary teeth, to the buccal aspect of one or more mandibular teeth (or the reverse), to aid in correction of a crossbite. Crossbite elastics create vertical forces in addition to the desirable trans-verse or anteroposterior forces; they therefore should be used with caution, especially in patients with minimal overbite and long anterior lower facial height.

Orthodontic elastics (Rubber bands)
- Intermaxillary elastics (Intermaxillary traction)

Elastics running between maxillary and mandibular teeth for sagittal, transverse or vertical coordination of the arches, or a combination of the above. Class II, Class III and crossbite elastics are all examples of intermaxillary traction. Intermaxillary elastics generate forces in all three planes of space, only some of which are usually desirable. They therefore should be used with caution, especially in patients with minimal overbite and long anterior lower facial height.

Orthodontic elastics (Rubber bands)
- Intramaxillary elastics (Class I elastics, Intramaxillary traction)

Elastic traction between teeth or groups of teeth of the same arch. For example, patients sometimes are requested to wear such elastics during canine retraction using sliding mechanics.

Orthodontic elastics (Rubber bands)
- Transpalatal elastics

Intramaxillary form of elastic traction extending across the palatal vault (e.g. between two lingual cleats on the second molar bands) in an attempt to constrict the maxillary arch form, or to reciprocally move buccally displaced teeth into the arch.
Intermaxillary elastics in various configurations, aiming at extrusion of teeth. They are used to aid in settling (improve the interdigitation) in the final stages of active treatment, to achieve closure of a localized open bite, or to aid in postsurgical leveling of the mandibular curve of Spee by premolar extrusion (e.g. in Class II, Division 2 patients with short lower facial height).

Orthodontic impression trays

Stainless steel, aluminum or plastic trays used to receive the impression material (usually alginate) during orthodontic impression taking. An orthodontic impression tray consists of a main body and a handle, which is either welded or riveted to the body. The maxillary tray allows for coverage of the maxillary alveolar process and the palate, whereas the mandibular tray allows for coverage of the mandibular alveolar process. Some tray bodies are perforated to increase retention of the impression material. Trays are available in various sizes and shapes. The flanges of the tray are usually extended with rope wax to achieve representation of the full depth of the vestibule during taking of impressions for orthodontic study models.

Orthodontic instruments

Orthodontic procedures demand the use of many specialized instruments, along with several also used in other areas of dentistry.

SUBTERMS:

Orthodontic instruments
• Adams pliers (Universal pliers)

Heavy wire pliers with sharply tapered beaks forming a four-sided pyramid when closed. Used for bending heavy-gauge wires and adjusting removable appliances.

Orthodontic instruments
• Arch-forming pliers (Arch-contouring pliers, De la Rossa pliers)

Pliers with straight, thick, parallel beaks; the concave beak fits around the opposing cylindrical one. The cylindrical beak may have grooves of varying sizes or may be non-grooved. Used to form and contour archwires, either round or
rectangular, as well as to incorporate (reverse) curve of Spee into an archwire.

Orthodontic instruments
• Band burnisher (Beaver-tail burnisher)

Stainless steel instrument with a heavy, hollow handle for palm grip, similar to a Mershon band pusher. The shank ends in an angled beaver-tail-shaped tip that can be smooth or serrated and flattened for easier access to band margins under buccal tubes or bracket wings. Used for burnishing and adapting margins of bands to the tooth contour.

Orthodontic instruments
• Band-contouring pliers

Pliers with two long, tapering and slightly bowed beaks. The convex tip at the end of the one beak fits into the opposing concave tip in a ball- and-socket manner. The diameter and shape of the tips vary with the manufacturer. Used for adaptation and contouring of stainless steel orthodontic bands.

Orthodontic instruments
• Band pusher (Mershon band pusher)

Stainless steel instrument with a large, tapering handle for palm grip and a long shank with an angled tip. The tip is rectangular and serrated to prevent slippage of the instrument during use. Used for positioning and seating the band properly, as well as for burnishing or adapting the edges of the band around the tooth.

Orthodontic instruments
• Band-removing (Debanding) pliers, Anterior

Pliers with a longer, flat-sided curved beak placed on the incisal edge of teeth, opposing a shorter, sharper beak positioned under the gingival aspect of the band or
Orthodontic instruments
• Band-removing (Debanding) pliers, Posterior

Pliers with two beaks, one longer than the other. The longer beak, which carries a replaceable plastic cap, is placed on the occlusal surface of a tooth, while the shorter, sharpened beak engages and lifts the gingival margin of the band. Anterior and posterior band removing pliers can be combined in a "Universal" design.

Orthodontic instruments
• Band seater (Band biter)

Plastic or metal instrument consisting of a handle and a bite stick that makes use of the patient’s biting force to aid the clinician in seating a band. The tip of the bite stick has two sides. The one that is placed on the occlusal margin of the band is made of stainless steel and is available in several sizes and shapes. As well, it usually is serrated to minimize slippage of the instrument during use. The opposite side of the tip, which comes in contact with the patient’s teeth during biting, usually consists of a plastic bite shelf.

Orthodontic instruments
• Bird-beak (no. 139) pliers

Pliers with two short beaks (one of which is conical and the other pyramidal in shape) used for bending small wires and springs.
Orthodontic instruments
• Bracket-positioning instrument (Bracket-height gauge)

Device of various designs used to facilitate the placement of brackets at standard distances from the incisal edges or occlusal surfaces of specific teeth. It usually has a ledge that rests on the incisal edge (occlusal surface) of the tooth, while a shorter arm is inserted into the bracket slot.

Orthodontic instruments
• Bracket-removing pliers (Debonding pliers)

Pliers used to remove brackets bonded to teeth. There are various designs depending on the type of bracket (e.g. stainless steel, ceramic, plastic). The standard design for stainless steel brackets has two mirror-image jaws with the sharp cutting tips formed around a cylindrical opening. The cutting tips generally do not make contact when the handles are closed fully. The bracket is removed by peel and shear forces by placing the cutting tips at the bracket-adhesive junction and squeezing.

Orthodontic instruments
• Conversion instrument

An orthodontic instrument that is inserted into the mesial opening of a convertible tube and functions in a “can-opener” fashion to remove its convertible cap and thus turn it into a bracket.

[See Tube (Molar tube), Convertible tube]
[See Conversion (of a tube into a bracket)]
Orthodontic instruments

• Coon ligature-tying pliers

Reverse-action pliers (squeezing the handles increases the separation of the tips), consisting of two opposing mirror-image parts (handle, shank and tip, all one piece) joined just below the shank by a round metal cylinder with a channel. The opposing handles are attached by a spring that holds them apart, causing the tips to touch when the instrument is passive. It is used for tying metal ligatures. The opposing tips are blunted and forked to facilitate retention of the ligature wire. As the handles are compressed, spreading the tips, the channel locks the ligature wire automatically. Because of the reverse action, the initial twist and the pressure are exerted at the bracket-archwire junction and then twisted away from the bracket. This gives the ligature a tighter fit around the bracket, forcing the archwire further into the slot.

Orthodontic instruments

• Distal-end cutter

A special wire cutter with the juxtaposed cutting edges set at right angles to the long axis of the instrument to facilitate cutting of the distal end of the archwire, intraorally. May have a safety hold mechanism provided either by a thick wire running parallel to the cutting edges, or by a rectangular shoulder immediately below the cutting edges. This mechanism serves to grip the loose end of the cut archwire and prevent it from being lost in the mouth, so that it can be discarded easily. It can be used to cut round wires up to 0.020 inch or 0.51 mm in diameter and rectangular wires up to 0.022 x 0.028 inch or 0.56 x 0.70 mm.

Orthodontic instruments
• Elastic separator pliers (Separator pliers)

Reverse-action pliers (squeezing the handles increases the separation of the beaks) with two long beaks that are angled for better access. The beaks are connected with a circular hinge and carry tapered, grooved, blunted tips, which can retain elastic separators (modules). They are used to stretch, hold and place elastic separators.

Orthodontic instruments
• Facebow-adjusting pliers

Heavy-duty pliers with a box-jointed pivot construction, having two parallel beaks and an opposing one that fits between the former when the pliers are closed. Each beak has a rounded notch at a right angle to the beak near the tip on the opposing surfaces. Used for adjusting the inner and outer arches of facebows, or for contouring wires of large diameter (up to 0.062 inch or 1.55 mm).

Orthodontic instruments
• Hard wire cutter

Cutter of design similar to a pin and ligature wire cutter, only larger, and capable of cutting full-dimension archwires.

Orthodontic instruments
• Hemostat (Mosquito pliers)

Small and light pliers with scissor-like design, provided with a mechanical locking mechanism located between the handles. The handles are available in various lengths. The serrated beaks
ligatures. Used for placement of elastomeric ligatures (donuts).

**Orthodontic instruments**

- **Howes utility pliers**

  Pliers with two long, round beaks tapered to a pyramid shape and bowed, terminating in juxtaposed flat round serrated pads. The pads are positioned at right angles to the long axis of the beaks; their diameter varies with the manufacturer. The beaks may be straight or offset at a 45° angle. Used mainly for gripping and handling archwires and stainless steel ligatures during placement in the mouth.

- **Ligature director (Pitchfork instrument)**

Stainless steel instrument carrying a straight or angled tip with a notch capable of engaging wires. Available in double-ended versions or in combination with amalgam-pluggers, scalers or other tips. Used to tuck and direct stainless steel ligatures under the archwire or bracket wings, or to push archwires or auxiliaries into position.

**Orthodontic instruments**

- **Light-wire pliers**

Essentially identical to bird-beak pliers, only with longer and more slender beaks. Some designs have one or more grooves at the tip of the pyramidal beak to aid in making reproducible loops and helices. Used mainly to form various loop designs in orthodontic wires (generally light, round wires), to make minor adjustment bends in archwires or to place metal spring separators.

  [See Orthodontic wire, Australian wire]

- **Mathieu-style ligature-tying pliers**

  Pliers with long, thin handles equipped with a positive-
locking ratchet and spring for instant opening and closing. The opposing tips are serrated and may have tungsten carbide inserts for longer instrument life. The tips vary in length and taper by the manufacturer. The pliers are available in various sizes. Used mainly for tying stainless steel ligatures as well as for placing elastomeric ligatures (donuts).

Orthodontic instruments
• Parallel-action pliers with cutter (Sargent’s heavy-duty pliers)

Heavy-duty pliers with parallel, flat, serrated opposing beaks. One of the beaks carries a wire cutter on its non-serrated side. Used mainly for bending, cutting or holding large-diameter wires in laboratory procedures.

Orthodontic instruments
• Pin and ligature wire cutter

Cutter with two tapered and pointed opposing beaks, terminating in delicate and sharp cutting edges. The cutting edges may have carbide inserts that can be sharpened or replaced when dull or damaged, without replacing the entire instrument. It is available in various angles, the straight and 15° to the long axis being the most common. The tape and size of the tips vary with the manufacturer. Used to cut soft ligature wires (generally up to 0.016 inch or 0.41 mm) and arch-retaining pins.

Orthodontic instruments
• Serrated amalgam-plugger

A single-ended or double-ended (in combination with a ligature director or other tip) stainless steel instrument, sometimes used to seat and position bands or to tuck steel ligatures. The tip is available in various lengths, angles and diameters and usually is serrated for better control in pushing motion.
Orthodontic instruments
• Steiner ligature-tying pliers

Identical to the Coon ligature-tying pliers, differing only in that the round metal cylinder at the shank of the instrument does not carry the special channel to engage the end of the ligature wire. The ligature wire is retained on the instrument by manually wrapping its free ends around the round metal cylinder.

Orthodontic instruments
• Torquing key

Usually a cross-shaped stainless steel instrument, each of the four ends of which carries a milled slot to engage the wire for placement of torque. Each slot is a different size to accommodate various gauge wires. Used to place torque in an archwire or to assist full engagement of a wire into a bracket slot. Various other kinds of torquing keys are used in combination with special pliers to place torque for an individual tooth.

Orthodontic instruments
• Triple-beaked pliers (Three-jaw pliers, Clasp-adjusting pliers)

Pliers similar to but smaller than the facebow-adjusting pliers, with a box-jointed pivot construction. The double-sectioned beak is opposed by a single beak, so that a squeezing motion can produce a sharp bend in the wire. Used for adjusting wires, particularly labial
bows or clasps on retainers, as well as for placing a curve on flexible or heavier wires, or stainless steel tubing.

Orthodontic instruments
- Turret

Tubular metal device of various circumferences carrying grooves of various calibrated sizes, used to shape straight lengths of orthodontic wire into an arch form. Some turrets are equipped with angulated grooves to place torque into rectangular wire during shaping of the arch form.

Orthodontic instruments
- Tweed arch-adjusting (no. 142) pliers

Pliers used exclusively for handling or adjusting square or rectangular wires. The beaks are symmetrically flattened blades that are parallel at a separation of 0.020 inch (0.51 mm).

Orthodontic instruments
- Tweed loop-forming pliers (Omega pliers, Optical pliers)

Pliers with two opposed parallel beaks, one with concave and one with round cross-section. The round beak generally is stepped, having three sections of different diameters (most commonly 0.045, 0.060, and 0.075 inch or 1.12, 1.50 and 1.90 mm). The tip of the round beak may be replaceable. Used to form various loops or short curved sections in orthodontic wire.

Orthodontic instruments
- Weingart utility pliers
Pliers with two long, slender beaks with opposing, serrated tips. The tips are oblong and pointed and can be straight or curved from the long axis of the pliers to provide a better working angle for intraoral adjustments. Used for holding or gripping the archwire to place it and remove it from the mouth, or to make adjustment bends.

Orthodontic magnets

Magnets have had various applications in medicine (mainly to aid in fracture healing) and in dentistry (mainly for retention of prostheses). The miniaturization of magnets as a result of the introduction of rare-earth or lanthanide elements facilitated their intraoral applications. In orthodontics, magnetic forces from repelling or attracting poles have been utilized to achieve palatal expansion, intrusion of posterior teeth, molar distalization, forced eruption of unerupted teeth, anterior repositioning of the mandible during treatment with some functional appliances, retraction or alignment of teeth, as well as retention of diastema closure. Neodymium-iron-boron (Nd2Fe14B) and samarium-cobalt (SmCo5) are the types of rare-earth magnets most commonly used. The greatest disadvantage of magnets is their low corrosion resistance in the presence of saliva. Corrosion products are toxic to the tissues, for which reason magnets must be coated with appropriate materials (usually parylene or acrylic), or be enclosed in a stainless steel casing, when intended for intraoral use. The possibility of adverse effects of magnetic fields on cells and tissues is an issue of controversy.

Orthodontic springs

Force-producing modules or appliance components, made of metal.

SUBTERMS:
Orthodontic springs
• Cantilever spring
In principle, any piece of wire, one end of which is inserted fully into a bracket or tube, while the other end is ligated to another unit with only a one-point contact. The advantage of using cantilever mechanics is that the created force system can be estimated easily at both units (statically determinate force system) by knowing the length of the cantilever and by measuring the force exerted at its ligated end with a force gauge. Moreover, the relatively long range of deactivation of the spring results in a low magnitude continuous force (low load/deflection ratio) that generally is considered desirable for tooth movement.

[See Mechanics, Cantilever mechanics]

Orthodontic springs
• Closed spring

A spring (usually part of a removable appliance) having both ends attached.

Orthodontic springs
• Coffin spring

An omega-shaped (_) spring made of heavy-gauge wire, spanning across the palate as part of some removable orthodontic appliances (e.g. the Bimler or the Crozat appliance). The function of a Coffin spring is to offer the possibility of expansion or constriction of the maxillary dental arch.

Orthodontic springs
• Coil spring, Closed
Spring made of fine (typically 0.010 to 0.012 inch, or 0.25 to 0.30 mm) orthodontic wire wound into a coil whose helices tightly contact each other; thus it cannot be compressed. A closed coil spring usually comes in a spool and is cut to the appropriate length according to the intended application. It most commonly is used to maintain a space during fixed appliance orthodontic treatment (e.g. the space of a missing tooth that eventually will be replaced prosthetically).

Orthodontic springs
• Coil spring, Open

Spring made of fine (typically 0.010 to 0.012 inch, or 0.25 to 0.30 mm) orthodontic wire wound into a coil whose helices are spaced, so it can be compressed along its long axis. An open coil spring comes in a spool and usually is cut to a length larger than the interbracket distance between the teeth that are intended to be moved away from each other. It is compressed prior to insertion, generating equal and opposite forces on either end.

Orthodontic springs
• Coil spring, Retraction (Pletcher spring, Closing coil spring)

Orthodontic springs
• Finger spring

A free-end spring usually incorporated in removable orthodontic appliances to produce various tipping movements of teeth. Finger springs can contain helices to increase the effective wire length for added flexibility.

Orthodontic springs
• Free-end spring (Open spring)

A broad category of springs (usually part of a removable appliance) having only one end embedded in acrylic.

Orthodontic springs
• PG spring (Gjessing spring)
A universal retraction spring made of 0.016 x 0.022-inch stainless steel wire, introduced by P. Gjessing. The spring consists of a 10 mm-long, double, ovoid-shaped, closed loop extending gingivally, continuing with a small (2 mm in diameter) occlusal helix. This configuration was designed to reduce the load/deflection rate to approximately 45 g per millimeter of activation. The spring also has an anti-tip moment-to-force ratio of approximately 11:1 and an anti-rotation moment-to-force ratio of approximately 7:1.

It is meant to be used as a segmental spring for frictionless segmental canine retraction by translation, or for "en masse" retraction of the maxillary incisors without undesirable lingual tipping. The spring is supposed to be activated every 4 to 6 weeks, to the point where the double loop is separated, which is calibrated to produce approximately 100 g of force.

Orthodontic springs
  • Root spring

An orthodontic spring that can cause movement of the root of a tooth with relatively little movement of the crown. Uprighting springs and torquing springs both are subcategories of root springs.

Orthodontic springs
  • Rotation spring

Auxiliary orthodontic spring, commonly used with single brackets (usually inserted into the vertical slot) to generate the moment required for rotation of a tooth around its long axis.

Orthodontic springs
  • Torquing spring

Auxiliary orthodontic spring used to move the root of a tooth in the labiobuccal or buccolingual direction.
Orthodontic springs
• Uprighting spring

Auxiliary orthodontic spring used to move the root of a tooth in the mesiodistal direction. Uprighting springs commonly are used in the bracket vertical slot with the Begg technique and its modifications (e.g. the side-winder springs of the Tip-Edge appliance).

Orthodontic springs
• Z-spring (Recurved spring)

A spring bent in the form of a "Z," commonly incorporated into a removable appliance to tip an individual tooth or groups of teeth buccally or labially.

Orthodontic tooth movement

Movement of a tooth under the influence of a mechanical force. Orthodontic tooth movement is possible because of the regenerative and remodeling capacity of the alveolar bone and the periodontal ligament. The mechanism regulating the transduction of a mechanical stimulus into specific cellular activity is not yet entirely understood.

SUBTERMS:
Orthodontic tooth movement
• Extrusion

A translational type of tooth movement parallel to the long axis of the tooth in the direction of the occlusal plane.

Orthodontic tooth movement
• Intrusion

A translational type of tooth movement parallel to the long axis of the tooth in an apical direction.

Orthodontic tooth movement
• Pure crown movement

The type of tooth movement for which the center of rotation is at the apex of a tooth. [Note: the term is somewhat misleading, as this type of movement also affects part of the root. ]

[See Orthodontic tooth movement, Tipping, Controlled]

Orthodontic tooth movement
• Pure root movement

The type of tooth movement for which the center of rotation is at the incisal edge (or for all practical purposes, at the bracket) of a tooth. For an average maxillary central incisor with intact periodontium the M/F ratio for this type of movement is estimated to be 12:1 to 13:1. Pure root movement is the intended type of movement when "torquing" incisor teeth, when uprighting canine roots following extraction space closure, or when uprighting mesially tipped molars. [Note: the term is somewhat misleading, as this type of movement also affects part of the crown. ]

Orthodontic tooth movement
• Pure rotation

Rotation of a tooth about its long axis, most evident when viewing the tooth from an occlusal perspective. To achieve this type of tooth movement, the application of a couple is required.

Orthodontic tooth movement
• Tipping, Controlled
A type of tooth movement consisting of rotation about the apex of the tooth. It is achieved clinically by the application of a force at the level of the bracket (as in uncontrolled tipping) as well as a counter-moment to prevent movement of the root apex in the opposite direction. For an average maxillary central incisor with no periodontal loss, the M/F ratio for controlled tipping is estimated to be between 7:1 and 8:1.

[See Orthodontic tooth movement, Pure crown movement]

Orthodontic tooth movement
* Tipping, Uncontrolled (Simple)

A single horizontal force applied to the crown of the tooth at the level of the bracket will cause movement of the crown and the apex of a tooth in opposite directions. The center of rotation for this movement is approximately at (or slightly apical to) the center of resistance of the tooth. This is the simplest type of tooth movement, but it often is undesirable. The moment-to-force ratio for uncontrolled tipping is 0:1 (no counter-moment is applied, but only a single force).

Orthodontic tooth movement
* Translation (Bodily movement)

The type of tooth movement during which all points on a tooth move in the same direction by the same amount. During bodily movement, the center of rotation can be assumed to lie at infinity. A single force passing through the center of resistance can produce translation of a tooth along its line of action. Alternatively, a force and a (counter-)moment have to be applied at the bracket of a tooth. For an average maxillary central incisor tooth with intact periodontium, a moment-to-force ratio of approximately 10:1 at the level of the bracket is typical of translation.

Orthodontic wire

In orthodontics, wires of various alloys having various cross-sectional shapes and dimensions are used.

SUBTERMS:
Orthodontic wire
* Australian wire

A round austenitic stainless steel wire, introduced by the A. J. Wilcock Co. in Australia, and selected by P. R. Begg as the main material from which archwires were made for his light-wire technique. The wire is heat-treated and cold-drawn down to its proper diameter from round wire of larger diameter. It exhibits high toughness and tensile strength, combined with increased
resilience, but low corrosion resistance because of the presence of copper as an alloying element of the steel. There are various grades of Australian wire, but Begg mainly used the 0.016-inch (0.41-mm), so-called "Special Plus" wire. Another characteristic of the wire is its brittleness. It is recommended that when bending Australian wire, the flat rather than the round beak of the pliers be used and that the bend be placed very slowly, to avoid breakage. Following bending, the archwire can be heat-treated, which makes it harder and more resistant to permanent deformation.

[See Appliance, Begg appliance (Light-wire appliance)]

Orthodontic wire
• Multistrand wire (Braided wire, Coaxial wire)

Orthodontic wire fabricated by braiding multiple strands of wire of the same material and usually of the same diameter. This method of combining a number of strands of wire that individually would not be strong enough for a particular application is used to achieve a wire with high flexibility and adequate strength. Multistrand archwires can be round or rectangular and commonly are used for initial alignment.

Orthodontic wire
• Nickel-titanium wire

[See Nickel-titanium alloy (Ni-Ti)]

Orthodontic wire
• Rectangular wire

An orthodontic wire with rectangular cross-section.

[See Archwire cross-section]

Orthodontic wire
• Round wire

An orthodontic wire with round cross-section.

[See Archwire cross-section]

Orthodontic wire
• Square wire

An orthodontic wire with square cross-section.
Orthodontic wire
• TMA wire

[See Beta-titanium alloy (TMA, b-Ti, Titanium-molybdenum alloy)]

Orthognathic (Mesognathic)
A facial type with normal anteroposterior relationship of the maxilla and mandible in relation to each other and to the cranial base.

[See Facial type]

Orthognathic surgery
Surgical reposition-ing of all or parts of the maxilla and/or mandible to correct malpositions or deformities. Usually accomplished in conjunction with orthodontic treatment.

[See Osteotomy]

SUBTERMS:

Orthognathic surgery
• Bimaxillary surgery (Two-jaw surgery)

Orthognathic surgical procedure involving repositioning of both the maxilla and the mandible.

Orthognathic surgery
• Single-jaw surgery (One-jaw surgery)

Orthognathic surgical procedure during which either the mandible or the maxilla are surgically repositioned.

Osseointegration
A direct structural connection between bone and the surface of an implant. The host bone responds in a safe, predictable and versatile manner to the placement of an implant, with a healing cascade leading to interfacial osteogenesis and immobility of the implant.

Ossification
Formation and development of bone. Histologically two types of ossification are distinguished: endochondral and intramembranous.

**SUBTERMS:**

**Ossification**

- **Endochondral ossification**
  
  Bone formation taking place on a cartilage matrix; the cartilage immediately preceding bone in development. This type of ossification occurs embryologically as the chondrocranium ossifies at the epiphyses of all long bones, vertebrae and ribs, at the head of the mandibular condyle, and at the synchondroses of the base of the skull.

- **Intramembranous ossification**
  
  Bone formation directly within a connective tissue membrane, without any intermediate formation of cartilage. This type of ossification occurs embryonically at many sites, such as the cranial vault, the maxilla, the body of the mandible, and at the diaphyses (midshaft) of long bones, initially by proliferation and condensation of mesenchymal cells. As vascularity increases at these sites of condensed mesenchyme, osteoblasts differentiate and begin to produce bone matrix de novo.

**Ostectomy**

Surgical removal of a bone, or part of a bone.

**Osteoarthritis (Degenerative joint disease, DJD, Degenerative arthritis)**

Chronic disease resulting in joint deformity caused by degenerative changes in the articular cartilage, fibrous connective tissue and/or disc. In its late stage it is accompanied by proliferation of new bony tissue at the margins of the joint surface, known as marginal osteophytes, lipping, spurs, or ridges. The fibrillation and breakdown of cartilage is not an inflammatory process, but the breakdown is accompanied by inflammation. The most common etiologic factor that either causes or contributes to osteoarthritis is overloading of the joint structures. In the case of the TMJ it often is painful, and symptoms are accentuated by jaw movement. Crepitation is a common finding.

**Osteoarthrosis**

Chronic non-inflammatory joint disorder characterized by progressive deterioration and loss of articular cartilage and subchondral bone.
Osteoblast

Uninucleated cell that synthesizes both collagenous and noncollagenous bone proteins (the organic matrix, osteoid). Osteoblasts are responsible for mineralization and are thought to derive from multipotent mesenchymal cells or, alternatively, from perivascular cells. The osteoblast generally is considered to differentiate through a precursor cell, the preosteoblast. Osteoblasts secrete, in addition to Type I and Type V collagen, small amounts of several noncollagenous proteins and a variety of cytokines. Under physiologic conditions supporting resorption rather than formation of bone, osteoblasts can be stimulated by lymphokines and by prostaglandins to produce interleukin 6, a factor that increases the resorbing activity of the osteoclast.

Osteoclast

Large multinucleated type of cell involved in the degradation and removal of hard tissue. Osteoclasts are derived from monocytes and typically are found against the bone surface, occupying shallow depressions called "Howship's lacunae." To break down hard tissue, osteoclasts attach to mineralized tissue and create a sealed environment that is first acidified to cause demineralization. Following that, the organic matrix is broken down through the secretion of proteolytic enzymes.

Osteoconductive material

A material that acts as a scaffold for new bone formation.

[Compare with Osteoinductive material]

Osteocyte

As osteoblasts secrete bone matrix, some of them become entrapped in bone and are then called osteocytes. The number of osteoblasts that become osteocytes depends on the rate of bone formation: the more rapid the formation, the more osteocytes are present per unit volume. As a general rule, embryonic (woven) bone has more osteocytes than does lamellar bone.

Osteogenesis imperfecta

As a diagnostic term, osteogenesis imperfecta represents a heterogeneous group of inherited disorders characterized by defects in both mineralized and non-mineralized connective tissues, resulting from mutations in Type I collagen. Males and females are affected equally, and the incidence is between 1 in 5,000 and 1 in 14,000 live births. The classification of the clinical features of the various types of osteogenesis imperfecta according to D. O. Sillence is as follows:

Type I:
Normal stature, increased frequency of fractures prior to puberty and after menopause, little or no deformity following fracture repair, hearing loss in about 50% of families, blue sclerae, dentinogenesis imperfecta is uncommon.

Type II:

Death in the perinatal period due to extreme bone fragility, poor mineralization of the calvarium, intrauterine fractures of endochondral and membranous bones, blue/black sclerae in virtually all affected individuals, long bone and rib deformities.

Type III:

Short stature, characteristic facies, long bone deformity following fracture repair, scoliosis, dentinogenesis imperfecta common, hearing loss common, scleral discoloration variable, reduced lifespan.

Type IV:

Mild to moderate short stature, mild to moderate long bone deformity following fracture repair, normal scleral hue, dentinogenesis imperfecta is common, hearing loss occurs in some families.

**Osteoinductive material**

A material that causes the conversion of mesenchymal cells into bone progenitor cells.

[Compare with Osteoconductive material]

**Osteomyelitis**

Inflammation of bone, especially of the marrow, caused by pathogenic organisms.

**Osteophyte**

Bony outgrowth. Marginal adaptation of a joint, formed by bony tissue. In the case of the TMJ, the anterior aspect of the mandibular condyle (in the region of the attachment of the lateral pterygoid muscle) is a relatively common location where osteophytes can be found.

**Osteotomy**

Surgical procedure involving the cutting of bone.
Osteotomy
- Anterior maxillary segmental (subapical) osteotomy

Osteotomy of the anterior maxillary segment, usually from canine to canine, with displacement in a posterior, inferior, superior or rotational manner. Most commonly a combination of posterior and inferior repositioning of the anterior segment is performed, into the space created by simultaneous extraction of the maxillary first premolars. Anterior repositioning of the segment is almost impossible because of difficulties in stabilization and fixation, even with bone grafting, and because the soft tissue pedicles often are insufficient to cover the surgical defects. The most popular techniques for this type of osteotomy are the Wassmund and Wunderer techniques.

Wassmund technique

An approach to anterior maxillary segmental osteotomy described by M. Wassmund (1927), which relies on maintaining both the labial and palatal pedicles for vascular supply to the anterior maxillary segment. The osteotomies are carried out through mucosal tunnels created on the vestibular side by vertical incisions at the midline and at the level of the first premolar and through palatal tunnels created by connecting the extraction sockets of the first premolars to a midpalatal incision.

Wunderer technique

An alternative approach to anterior maxillary segmental osteotomy described by S. Wunderer (1963). The technique relies on the vestibular pedicle for vascular supply to the anterior maxillary segment, together with some blood supply from the incisive canal. Bilateral vertical incisions are performed on the vestibular side at the level of the first premolars. These are connected by a transpalatal horizontal incision, allowing reflection of the palatal flap posteriorly.

Osteotomy
- Bilateral sagittal split osteotomy (BSSO)

A mandibular orthognathic surgical procedure first reported in the English literature by R. Trauner and H. L. Obwegeser (1957), and subsequently modified by others. In this procedure the rami of the mandible are split parallel with the sagittal plane to allow repositioning of the mandibular body into a more favorable relationship with the maxilla and the face. The procedure currently is routinely performed through an intraoral approach and can be used for advancement, setback and rotation of the distal (mandibular) segment.

When the distal segment is advanced, a gap is created in the buccal plate. When it is set back, a section of the buccal plate is removed to allow good approximation of the buccal cortex of the proximal segment against the lingual cortex of the distal segment on each side. The osteotomy design spares the mandibular nerve and provides a broad interface of the bony segments to aid
with fixation and healing. Fixation is achieved by bone screws or bone plates, or through circumosseous fixation wires in combination with IMF.

[See Segment, Proximal segment]

[See Segment, Distal segment]

Osteotomy

• Complete maxillary osteotomy

Maxillary osteotomies traditionally are described in comparison with the common fracture patterns of the midfacial skeleton, named after the work of R. Le Fort (1900). The Le Fort I, II and III fractures indicate the general levels at which the maxilla may be sectioned selectively from the rest of the skull, although the osteotomies are tailored to the individual patients and may deviate from the known fracture patterns.

Le Fort I osteotomy

The most frequently performed of all midfacial osteotomies. It sections the midface through the walls of the maxillary sinuses, the lateral nasal walls and the nasal septum, at a level just superior to the apices of the maxillary teeth. Starting at the inferior-lateral margin of the pyriform aperture of the nose, the osteotomy line traverses the lateral walls of the maxillary sinus approximately 3 to 4 mm above the apices of the canine, premolars and molars. It passes across the canine fossa to the base of the zygomatic buttress and curves around and above the maxillary tuberosity to the lowest part of the pterygomaxillary fissure, where it crosses the posterior wall of the sinus at the same level. It then turns anteriorly through the lateral wall of the nose below the superior turbinate to join the point of origin. The cut is made bilaterally. Following this, the pterygomaxillary plates are separated from the posterior aspects of the maxillary tuberosities, and the nasal septum is detached from the superior aspect of the hard palate by dividing it along its length with a chisel, so that the maxillary segment is freed. The Le Fort I osteotomy offers a great number of options as the freed maxilla can be reoriented in all spatial planes. Further segmentation of the maxilla can be performed to correct transverse, anteroposterior and vertical discrepancies between the maxilla and the mandible.

Le Fort II osteotomy

A pyramid-shaped osteotomy that is identical to the Le Fort I procedure from the pterygoid column to the zygomatic buttress. From that point, instead of continuing anteriorly to the pyriform aperture of the nose, the cut is directed superiorly, towards the orbit. The cut is kept anteromedial to the infraorbital foramen and crosses the inferior orbital margin at a point halfway between the lacrimal duct medially and the infraorbital canal laterally. It then is continued posteriorly along the floor of the orbit and at right angles to the orbital rim until past the lacrimal groove and its contained
lacral sac. The cut then is turned medially and anteriorly across the apex of the lacrimal groove and emerges medially to the orbit, just below the midpoint of the medial canthal attachment. The frontal process of the maxilla then is crossed and the cut becomes continuous with the osteotomy of the other side across the nasal bones. The nasal septum is divided at a higher level than during the Le Fort I osteotomy, passing from the nasal bones anteriorly in a downward and backward direction to the posterior part of the septum just above the posterior nasal spine. The lateral nasal walls are fractured during mobilization of the maxilla at levels corresponding to the septal cut.

Le Fort III osteotomy

The basic Le Fort III osteotomy, as originally described by P. Tessier (1971), was designed to achieve anteroposterior movement of the whole facial mass, establishing normal dental occlusion and increasing orbital capacity, enlarging both the height and the depth of the orbits. The aim is to separate the facial mass from the cranial base along the inter-frontofacial and the inter-pterygomaxillary planes. To do this, the osteotomy traverses, on each side, the medial orbital wall, the orbital floor and the lateral orbital wall to reach the region of the frontozygomatic suture. The frontal process of the zygomatic bone then is split sagittally (effectively splitting the lateral wall of the orbit) and the cut is continued inferiorly to complete division of the zygoma. The two sides are connected centrally through the frontonasal area, as in the Le Fort II osteotomy. Pterygomaillary and septal separation then are completed as in the Le Fort II operation and the central facial block is mobilized. Many variants of Le Fort III procedures exist that can be applied in the treatment of a variety of craniofacial problems and can be combined with surgery of the cranial vault.

Kыфнер osteotomy

A modification of the Le Fort II osteotomy originally described by J. Kыфнер (1971). It is intended for patients with good nasal bridge and projection, but exhibiting retrusion of the infraorbital region and maxillary dentoalveolar area, with zygomatic flatness. The difference is that the osteotomy does not involve the nasal bridge, but is extended laterally to include the infraorbital rim and zygomatic process.

Osteotomy
• Multiple-piece maxillary osteotomy

When a severe transverse discrepancy between the maxillary and mandibular arches exists, a two- or a three- and sometimes even a four-piece maxillary procedure is performed, following a Le Fort I osteotomy, to reposition each segment separately to an ideal relationship with the mandibular arch. Due to the increased risks entailed in the segmental procedures, most clinicians prefer to limit the number of segments into which they divide the maxilla.

[Compare with Osteotomy, One-piece maxillary osteotomy (Single-piece maxillary osteotomy, Total maxillary osteotomy)]
Osteotomy
• One-piece maxillary osteotomy (Single-piece maxillary osteotomy, Total maxillary osteotomy)

Any osteotomy that mobilizes the maxilla as a whole.

[Compare with Osteotomy, Multiple-piece maxillary osteotomy]

Osteotomy
• Transoral vertical ramus osteotomy (TOVRO, Intraoral vertical ramus Osteotomy, IVRO)

A vertical osteotomy of the mandibular ramus performed via a transoral approach for correction of mandibular prognathism. It commonly is carried out in conjunction with a coronoidectomy. The coronoid fragment with attached temporalis tendon is allowed to retract. The line of the osteotomy extends from an area in front of the condyle to a point at or near the angle of the mandible.

This osteotomy is reserved for patients who require a mandibular setback, as it necessitates full-thickness overlap between the mandibular segments. After the setback the condylar segment lies laterally to the distal mandibular segment. Stabilization can be provided by a circumramus suture or wire, by rigid fixation screws, or alternatively no stabilization is used. In the latter case, patients are left in intermaxillary fixation for 4 to 6 weeks. The TOVRO is advocated to be less likely than the BSSO to produce neurosensory changes.

Overbite (Vertical overbite)

The degree of vertical overlap of the mandibular incisors by their maxillary antagonists, usually measured perpendicular to the occlusal plane. It is reported either in millimeters, or as a percentage of the total crown length of the mandibular incisors that is overlapped by the maxillary incisors.

[Compare with Overjet (Sagittal overbite)]

SUBTERMS:

Overbite (Vertical overbite)
• Impinging overbite

Extremely deep bite with impingement of the mandibular incisors in the mucosa palatal to the maxillary incisors; commonly seen in patients with severe Class II, Division 2 malocclusions.

Overbite (Vertical overbite)
• Positive overbite
A term indicating the presence of vertical overlap between the maxillary and mandibular anterior teeth. Positive overbite is a characteristic of the ideal occlusion, but also of deep bite malocclusions.

**Overclosure**

Reduced vertical dimension with the teeth in occlusion.

**Overcorrection**

The notion of continuing a certain type of treatment even after an ideal relationship has been achieved, in anticipation of some degree of relapse after the end of active treatment. For example, the overcorrection of a typical Class II deep bite malocclusion to an end-to-end anterior relationship sometimes is advocated.

**Overeruption (Supraeruption, Supraposition, Supraocclusion)**

The situation whereby an unopposed or non-occluding tooth extends beyond the occlusal plane.

**Overjet (Sagittal overbite)**

The distance between the labial surface of the mandibular incisors and the labial aspect of the incisal edge of the maxillary incisors, usually measured parallel to the occlusal plane. When not otherwise specified, the term is generally assumed to refer to the most prominent central incisors.

The extent of overjet is determined primarily by the differences of labiolingual position and inclination of the maxillary and mandibular central incisors. Only in a minority of cases is the anteroposterior skeletal relationship reflected directly in the amount of overjet.

[Compare with Overbite (Vertical overbite)]

**SUBTERMS:**

Overjet (Sagittal overbite)
• Buccal overjet

The distance between the buccal surfaces of the maxillary posterior teeth and the buccal surfaces of their mandibular antagonists. An unofficial term sometimes used to indicate whether or not there is a tendency for a posterior crossbite.

Overjet (Sagittal overbite)
• Negative overjet (Reverse overjet)

A situation usually associated with Class III malocclusions in which the maxillary incisors occlude lingually to the mandibular incisors.

Overjet (Sagittal overbite)
• Positive overjet

A term denoting that the maxillary incisors occlude labially to the mandibular incisors, as is seen commonly in Class I or Class II malocclusions.

Palatal rugae

The irregular ridges in the masticatory mucosa covering the anterior hard palate.

Palate

The structure that serves as the roof of the oral cavity and the floor of the nasal cavity, consisting anteriorly of the hard palate and posteriorly of the soft palate.

SUBTERMS:
Palate
• Hard palate

The anterior part of the palate, the osseous framework of which consists of the palatine processes of the maxilla and the horizontal parts of the palatine bones.

Palate
• Primary palate

The embryological structure that forms during the 5th to 7th weeks of human intrauterine life, originating from the fused medial nasal and maxillary processes. The primary palate eventually
forms the upper lip, the anterior portion of the maxillary alveolar process and the hard palate anterior to the incisive canal.

[See Premaxilla]

Palate
- Secondary palate

The embryological structure that forms during the 6th-9th weeks of human intrauterine life by fusion of the palatine processes (of the maxillary process) at the midline. The anterior parts of the palatine processes (palatal shelves) also unite with the nasal septum, eventually forming the hard palate. In the posterior region, where there is no attachment to the nasal septum, the soft palate and uvula eventually develop.

Palate
- Soft palate (Velum)

The posterior mobile part of the palate, which is suspended anteriorly from the hard palate. Its sides blend with the pharynx and its posterior portion forms the uvula. In its relaxed position the soft palate is continuous with the roof of the mouth. During the process of deglutition or sucking, as well as during production of certain speech sounds, it is elevated, thus separating the nasal cavity and nasopharynx from the posterior part of the oral cavity and the oral portion of the pharynx.

**Palate-splitting appliance**

[See Appliance, Expansion appliance]

[See Appliance, Hyrax appliance (Hygienic rapid palatal expander)]

[See Appliance, Haas appliance (Haas rapid maxillary expansion appliance, Haas palatal separator)]

**Pantograph**

A tracking device attached to the mandible and maxilla that enables recording of mandibular movements in three planes of space.

**Parafuction (Parafunctional activity, Parafunctional habit)**

Non-physiological activity, including clenching and bruxing, nail-biting, and lip- or cheek-chewing.
Paresthesia

Diminished or abnormal sensation, such as burning, prickling, tingling, or numbness; a common finding following orthognathic surgery. Almost all patients have some degree of paresthesia of the lower lip over the distribution of the mental nerve immediately following mandibular ramus surgery (e.g. bilateral sagittal split osteotomy). Return of sensation may be rapid, may occur over a few weeks, or may occur gradually over 12 to 18 months. In some instances a permanent degree of paresthesia remains.

Pathognomonic

Specifically distinctive characteristic (sign or symptom) of a disease or pathologic condition, on the basis of which a diagnosis of the disease can be made.

"Peg-shaped" lateral incisors

Atypical, undersized, pointed and tapered crown form of the maxillary permanent lateral incisors.

Perikymata

The numerous small transverse ridges and grooves on the surface of the enamel of permanent teeth, representing the rhythmic deposition of enamel. With continued abrasion the surface of the enamel becomes eroded and the perikymata eventually disappear.

Periodontal ligament (PDL)

A dense, highly specialized connective tissue situated between the root of a tooth and the alveolar bone. Its principal function is to connect the tooth to the bone while resisting the stress created by the various forces exerted on the teeth. This is achieved by the masses of collagen fiber bundles that follow an undulated course between the bone and the tooth, and by an incompressible gel-like matrix consisting of 70% water (ground substance). The second function of the PDL is to provide sensory input (proprioception) on the level and type of strain that it experiences, partially through specialized sensory receptors. Other than fibers and ground substance, the PDL contains many cells (mainly fibroblasts, epithelial cells and undifferentiated mesenchymal cells), blood vessels and nerves.

Fibers of the PDL
The majority of fibers of the periodontal ligament are collagen fibers, mainly a mixture of Type I and Type III. The greatest proportion of the collagen fibers in the PDL are arranged in definite and distinct fiber bundles. The principal groups of bundles are as follows:

1. The alveolar crest group, attached to the cementum just below the cementoenamel junction and running downward to insert into the rim of the alveolus.

2. The horizontal group, occurring just apical to the alveolar crest group and running at right angles to the long axis of the tooth from cementum to bone just below the alveolar crest.

3. The oblique group, by far the most numerous in the PDL, running from the cementum in an oblique direction, to insert into bone coronally.

4. The apical group, radiating from the cementum around the apex of the root to the bone, forming the base of the socket.

5. The interradicular group, found only between the roots of mult root ed teeth and running from the cementum into the bone, forming the crest of the interradicular septum.

At each end, all the principal fibers of the PDL are embedded in cementum or bone. The embedded portion is called a Sharpey's fiber. Other than collagen, the PDL also contains some elastic fibers, consisting of two types of immature elastin, namely oxytalan and eluanin.

Width of the PDL

In humans, the width of the PDL ranges from 0.15 to 0.38 mm, with its narrowest aspect at the middle third of the root and its widest aspect cervically. Occlusal loading in function affects the width of the PDL. If occlusal forces are within physiologic limits, increased function leads to an increase in width through a thickening of the fiber bundles and an increase in diameter and number of Sharpey's fibers. Unphysiologic situations such as traumatic occlusion typically cause widening of the PDL. Conversely, when function is diminished or absent, the width of the PDL decreases. The fibers are reduced in number and density and they show a tendency to become oriented parallel to the root surface. A widening of the PDL also typically is associated with active orthodontic tooth movement.

Perpetuating factors

Factors that interfere with resolution of, or enhance the progression of, a disease or disorder.

Pharyngeal flap operation
A surgical procedure for lengthening the soft palate by attaching a flap from the posterior pharyngeal wall to it. Depending on the way that the pharyngeal flap is raised, a superiorly-based and an inferiorly-based pharyngeal flap can be distinguished.

[See Velopharyngeal insufficiency (Velopharyngeal incompetence, VPI)]

[See Hypernasality (Rhinolalia aperta)]

Philtral columns

Normal ridges in the skin of the central portion of the upper lip, extending bilaterally from the vermilion border of the upper lip to the columella of the nose, and containing the philtrum.

Photoelasticity

Engineering technique of stress analysis based on the property of some transparent materials to exhibit patterns of color when viewed with polarized light. These patterns occur as the result of alteration of the polarized light by the internal stresses into waves that travel at different velocities. The patterns that develop consequently are related to the distribution of internal stresses and are called the photoelastic effect. A research technique with many orthodontic applications.

Physiologic migration

[See Drift (of teeth)]

Physiologic rest position (of the mandible)

The mandibular position assumed when the head is in an upright position and the involved muscles, particularly the elevator and depressor groups, are in equilibrium in tonic contraction, and the condyles are in a neutral, unstrained position.

Physiologic tooth movement

Movement of the teeth taking place as part of the natural process from their early stages of development until they become functional at the level of the occlusal plane, and extending to the end of their lifespan in the mouth. The movements teeth make are complex and may be distinguished as "pre-eruptive," "eruptive" and "post-eruptive." Superimposed on these is a progression from deciduous to permanent dentition, involving the exfoliation of the deciduous dentition. This categorization of tooth movement merely serves descriptive purposes; it must be recognized that what is being described is a continuous series of events.

SUBTERMS:

Physiologic tooth movement
  • Eruptive tooth movement
This includes "pre-emergent" and "post-emergent" tooth movement. The mechanism of eruption of deciduous and permanent teeth is thought to be similar, bringing about the axial and occlusal movement of the tooth from its developmental position within the jaw to its final functional position within the occlusal plane. Pre-emergent tooth movement seems to be controlled by a different mechanism than post-emergent tooth movement.

Eruptive movement begins soon after the root begins to form. The PDL also develops only after root formation has been initiated, and once established, it must be remodel-ed to permit eruptive tooth movement. The remodeling of the PDL fiber bundles is achieved by fibroblasts, which simultaneously degrade and synthesize the collagen fibers as required across the entire extent of the ligament. As the tooth moves occlusally, bone is resorbed occlusal to it and new bone is formed apical to the tooth.

At the time of emergence of the tooth into the oral cavity, its dental follicle fuses with the oral epithelium. Following emergence the tooth erupts rapidly until it approaches the occlusal level (post-emergent spurt). Environmental factors such as muscle forces from the tongue, cheeks and lips, as well as forces of contact of the erupting tooth with other erupted teeth, help determine the final position of the tooth in the dental arch. The effect of thumbsucking on the dentition is an obvious example of environmental determination of tooth position.

[See Post-emergent spurt]

[See "Cone-funnel" mechanism]

Physiologic tooth movement

• Post-eruptive tooth movement

Movement of the teeth after they have reached their functional position in the occlusal plane. The same mechanisms that control post-emergent tooth movement seem to regulate post-eruptive tooth movement in the vertical plane. Post-eruptive tooth movement can be divided into three categories:

1. Vertical movement occurring in concert with jaw growth ("juvenile occlusal equilibrium"). This movement is completed toward the end of the second decade, when jaw growth ceases, and it occurs earlier in girls than in boys. It is related to the growth of the mandibular ramus, which causes the maxilla and mandible to grow apart from each other, permitting further eruptive movement of the teeth.

2. Movement to compensate for the continuous occlusal wear of the teeth ("adult occlusal equilibrium"). This axial post-eruptive movement occurs even after the apices of the teeth are fully formed. It is demonstrable by the tendency of teeth to overerupt when their antagonist is lost, at any age.
3. Movement to compensate for interproximal wear. Wear also occurs at the contact points between teeth on their proximal surfaces, and its extent can be considerable (more than 7 mm in the mandibular dental arch). This interproximal wear is compensated for by a process known as "mesial drift." The mechanism of this mesial drift is multifactorial and is attributed to the anterior component of the occlusal force, to contraction of the transseptal fibers and/or pressure from the perioral and intraoral soft tissues (cheeks and tongue).

[See Drift (of teeth), Mesial drift (Mesial migration, Approximal drift)]

[See Occlusal equilibrium, Juvenile occlusal equilibrium]

[See Occlusal equilibrium, Adult occlusal equilibrium]

Physiologic tooth movement
• Pre-eruptive tooth movement

Movement of the deciduous and permanent tooth germs within the tissues of the jaw before they begin to erupt. As the deciduous tooth germs grow, the space for them in the developing jaw becomes less, and initially they are "crowded" in the anterior region. This "crowding" usually is alleviated before emergence by growth of the jaws, mainly in the midline, which permits mesial movement of the anterior tooth germs.

The deciduous molar germs gradually increase in size and become displaced distally in association with sagittal growth of the jaws. At the same time, the tooth germs are moving occlusally with the increase in height of the jaws. The permanent anterior tooth germs initially develop on the lingual aspect of their predecessors. From this position they shift considerably as the jaws develop (e.g. the incisors eventually come to occupy a position on the lingual aspect of the roots of their predecessors, and the premolar germs are positioned between the divergent roots of the deciduous molars). In the maxilla, the permanent molar germs initially develop with their occlusal surfaces facing distally, and swing into position only when the maxilla has grown sufficiently to provide space for such movement. In the mandible, the permanent molars develop with their axes showing a mesial inclination, which gradually becomes more vertical.

"Pigtail"

The twisted, cut end of a stainless steel ligature or brass separator that is tucked under the archwire, under a bracket wing, or in the interproximal area for patient comfort.

"Pigtail" attachment (Coil eyelet)

A small orthodontic attachment consisting of a pigtail-shaped wire soldered onto a bonding base. "Pigtail" attachments are used mainly as handles for elastic traction.

[See Attachment, Orthodontic]
**Pin**

T-shaped orthodontic auxiliary, used mainly in the Begg technique and its modifications. The pins are inserted in the vertical slots of the brackets, and their primary purpose is to retain the archwire in the main slot.

**SUBTERMS:**

- Pin
  - Bi-level pin

  Used to create an additional slot for a second archwire, which can be inserted between the bi-level pin and the gingival tie-wing of the bracket.

- Pin
  - Power pin

  Used as an attachment to anchor orthodontic elastic bands for the application of traction.

**Placebo**

Inactive substance, device or measure that is believed by the patient to have an active therapeutic value, but in fact, does not. Placebos sometimes are used in controlled studies to determine the effect of drugs without the influence of bias.

**Plagiocephalic**

An individual with an asymmetric skull shape. Plagiocephaly may be produced by unilateral synostosis of the coronal or the lambdoidal suture.

[Compare with Trigonocephalic]

**Plate**

A non-specific term implying a removable orthodontic appliance constructed at least partially of acrylic.

**Platybasia**

A term denoting a more obtuse than normal cranial base angle (saddle angle, BaSN).
"Play" of an orthodontic wire in the bracket slot

The amount of freedom allowed at the bracket-to-wire interface due to the difference in size between the wire and the bracket slot. The amount of "play" varies depending on the relative size of the bracket and wire and refers to the type of individual movement intended (usually a distinction is made between second-order and third-order clearance). For example, to achieve a certain amount of torquing movement of an individual tooth, more activation (in degrees) is necessary when using a 0.016 x 0.022-inch (0.41 x 0.56-mm) archwire, compared to using an 0.018 x 0.025-inch (0.46 x 0.64-mm) archwire, because of the increased torsional play in the former case.

[See Second-order clearance]
[See Third-order clearance]

Plication

The stitching of folds or tucks in a tissue to reduce its size, as in the retrodiscal tissue of the temporomandibular joint, in an attempt to reposition an anteriorly displaced articular disc and re-establish a physiologic anatomic disc-to-condyle relationship. A type of disc-repositioning surgery.

Point of application

One of the four characteristics of vectorial quantities (the other three are line of action, sense and magnitude). The point on a body where the vector is applied.

Point of dissociation

[See Burstone's geometry classes, Geometry IV]

Pontic

The part of a restoration that replaces a missing natural tooth.

Post-emergence eruption
[See Physiologic tooth movement, Eruptive tooth movement]

**Post-emergent spurt**

The phase of relatively rapid eruptive movement, from the time a tooth first penetrates the gingiva until it reaches the occlusal level.

[See Occlusal equilibration (Occlusal adjustment)]

**Postural**

Related to position.

**Post-emergence eruption**

[See Physiologic tooth movement, Eruptive tooth movement]

**Predisposing factors**

Factors that increase the risk of developing a disease or condition.

**Preferred provider organization (PPO)**

A formal agreement between a purchaser of a health benefits program and a defined group of health care practitioners for the delivery of services to a specific patient population, usually as an adjunct to a traditional plan, using discounted fees for cost savings. Preferred provider organizations provide a reduced fee for each service, rather than a fixed fee for all services. Preferred provider organizations allow treatment by a non-PPO physician or dentist, for a higher fee. [Modified from the AAO Glossary of Dentofacial Orthopedic Terms, 1993.]

[Compare with Health maintenance organization (HMO)]

**Premature loss**

Loss of a deciduous tooth prior to its normal time of exfoliation, due to extraction or undue resorption of its root. An example of the latter is the situation in which there is severe lack of space in the dental arch for eruption of a permanent incisor, which sometimes results in resorption of the root of not only its predecessor, but also of that of the adjacent deciduous tooth.

**Premaxilla**
The triangular part of the hard palate anterior to the incisive foramen, including the four maxillary incisor teeth, extending in the midline up to the piriform rim. The premaxilla is derived embryologically from the primary palate. It is a separate bone in most animals; however, in humans it generally is not independent of the maxilla, even in the early developmental stages.

[See Segment, Premaxillary segment]

Presurgical infant orthopedics (PSIO, Presurgical orthopedic treatment, PSOT, Neonatal maxillary orthopedics)

Any orthopedic manipulation of the segments of the clefted maxilla in a newborn with complete unilateral or bilateral CLP aiming at establishing a more normal maxillary alveolar arch form or at retracting a protruding premaxilla to facilitate the surgical repair of the lip. This procedure, the value of which is under investigation, usually involves the use of plates (of various designs) in combination with tapes and/or elastics and is either discontinued at the time of lip repair, or in some centers, continued up until the repair of the palate.

Presurgical orthodontic treatment

Orthodontic treatment in preparation for an orthognathic surgical procedure. The main aims of this treatment are to harmonize the dental arches in size and form, to level the curve of Spee and most importantly to remove the dentoalveolar compensations, so that the discrepancy at the level of the teeth matches the underlying skeletal discrepancy (thus, the occlusion is made "worse" than in the start of treatment). This decompensation gives the surgeon optimal space for the surgical repositioning of the skeletal segments, which should result in the best correction from the standpoint of facial esthetics.

[See Decompensation]

[See Dentoalveolar compensation]

Pretreatment records

Any records made for the purpose of diagnosis, recording of the patient’s history, or treatment planning in advance of therapy.

Primary cartilage

Cartilages such as Meckel’s cartilage (the cartilage of the first branchial arch) and Reichert’s cartilage (that of the second branchial arch) that precede secondary cartilage in embryological development and have a different histological structure in comparison to the latter.

[Compare with Secondary cartilage]
Primate spaces

Spaces between the maxillary lateral incisors and canines and the mandibular canines and first deciduous molars. The primate spaces, as other spaces in the deciduous dentition, normally are present from the time that the teeth erupt. [Note: The name comes from the fact that in most non-human primates these spaces are present throughout life to accommodate the characteristically large canines of the opposing arch when the teeth come into occlusion. ]

Proclination

Anterior (labial) inclination or tipping of anterior teeth.

[Compare with Protrusion]

Profile type

A classification of the profile into convex, straight or concave, depending on the relative anteroposterior position of the soft tissue glabella, subnasale and soft tissue pogonion points.

Prognathism

Skeletal protrusion.

SUBTERMS:

Bimaxillary prognathism
Mandibular prognathism
Maxillary prognathism

Prolabium

The central portion of the upper lip, beneath the columella of the nose and between the philtral columns. The portion of the upper lip that is developed from the primary palate and is part of the premaxillary segment in a complete bilateral cleft.

[See Segment, Premaxillary segment]

Prophylaxis (Polishing of enamel, "Prophy")

The use of various abrasive materials such as pumice, silica or zirconium silicate on the enamel to remove plaque, debris and minor exogenous stains from teeth and to produce a smooth, lustrous surface.
Proprioception

A sense providing knowledge of the position of those parts and regions of the body containing skeletal muscles, bones and joints. Proprioception also applies to the case of the PDL.

[See Periodontal ligament (PDL)]

Proteoglycans

A large group of extracellular and cell surface macromolecules that function in regulating cell adhesion, growth, extracellular matrix formation, collagen fibril formation and the binding of growth factors. They are composed of a protein core in which serine-glucine sequences serve as attachment sites for one or more glycosaminoglycan chains.

Protraction (of the maxilla)

Orthopedic anterior repositioning of the entire maxillary bone, attempted by extraoral traction appliances such as a face mask. It is reported to be most successful when performed early, and when it is combined with rapid maxillary expansion. Maxillary protraction by distraction osteogenesis also is possible, using intraoral or extraoral devices.

Protraction (of teeth)

Anterior (mesial) movement of teeth [usually referring to bodily movement].

Protrusion

The state of being thrust forward, or being anteriorly positioned.

SUBTERMS:

Protrusion
• Bimaxillary dentoalveolar (Bialveolar) protrusion

Anterior position and labial inclination of the maxillary and mandibular incisors with respect to their supporting bones and the facial profile.
• Dental protrusion

Anterior position of a tooth or group of teeth. [Note: The term protrusion does not refer to the inclination of the long axis of the tooth. A tooth can be protrusive but not proclined, if it is positioned too far anteriorly but has a normal inclination. ]

Protrusion
• Lip protrusion

Anterior position of one or both lips relative to the nose and chin or other facial structures.

Protraction (of the maxilla)

Orthopedic anterior repositioning of the entire maxillary bone, attempted by extraoral traction appliances such as a face mask. It is reported to be most successful when performed early, and when it is combined with rapid maxillary expansion. Maxillary protraction by distraction osteogenesis also is possible, using intraoral or extraoral devices.

Proximal

Closer to a point of reference.

Pseudo-Class III malocclusion

An Angle Class III malocclusion caused by an anterior mandibular shift (progenic forced bite) commonly due to an occlusal interference in CO. A functional crossbite also may be present. Treatment usually consists of elimination of the interference by tooth movement or occlusal equilibration.

[See Forced bite, Anterior forced bite]

[See Crossbite, Functional crossbite (Pseudo-crossbite)]

[See Mandibular shift (CR-CO shift, Mandibular slide, Forced bite, Slide in centric)]

Pseudoelasticity

A non-linear stress-strain behavior of a material during loading and unloading. Often a synonym for superelasticity.

Pterygomasseteric sling
A structure formed by the combined fibers from the medial pterygoid and masseter muscles, at their attachment on the posterior aspect of the inferior border of the mandible, bilaterally. The pterygomasseteric sling often is stripped away during a BSSO or a TOVRO to increase the potential for stability of the surgical correction, especially in situations where the proximal end of the distal segment is repositioned inferiorly.

**Pterygomaxillary disjunction**

The separation of the maxilla from the pterygoid column (the medial and lateral pterygoid plates) by means of a curved chisel—an important part of all total maxillary osteotomies as well as posterior segmental subapical maxillary procedures.

**Pubertal growth spurt (Adolescent growth spurt)**

The increased velocity of physical growth around puberty.

**Pumice**

A highly siliceous material of light gray color, produced by volcanic activity. It is used mainly in grit form to polish the tooth enamel prior to placement and after removal of fixed orthodontic appliances.

**"Rail" mechanism**

A theoretical explanation of the transverse expansion of the maxillary dental arch as an adaptation to advancement of the mandibular arch during physiological development or appliance treatment. The mandibular dental arch acts as a rail that through occlusal contacts dictates the buccal movement of the maxillary posterior teeth.

**Ramus**

One of the two posterior vertical portions of the mandible that are continuous with the mandibular body. Each ramus presents two processes at its superior border, the "coronoid" (anterior) and the "condyle" (posterior), that are separated by a deep concavity, the "sigmoid notch." The rami serve
as attachment areas for the muscles of mastication and also function to articulate the mandible with the skull.

**Range of motion (ROM)**

The range, typically measured in degrees of a circle, through which a joint can be extended or flexed. In the case of the TMJ, the range of motion commonly is reported in millimeters rather than in degrees.

**Rate of orthodontic tooth movement**

The velocity of tooth movement under the influence of orthodontic force (usually measured in millimeters per month). The factors that may influence the rate of orthodontic tooth movement are largely unknown. It generally is agreed that the type of desired tooth movement (e.g. tipping versus translation, intrusion versus extrusion) is an important parameter. As well, a large inter-individual variation is recognized.

**Reactive member**

The part of an orthodontic appliance that is involved directly with anchorage, utilizing teeth that are not to be displaced or to be displaced minimally.

[Compare with Active member]

**Rebonding**

Replacement of a lost or incorrectly placed bracket or other orthodontic attachment.

**Recipient site (Host site)**

The site into which a graft or transplant material is placed.

[Compare with Donor site]

**Reciprocal tooth movement**

The situation in which both the active and the reactive segment of teeth move toward each other following application of force. In the ideal situation that two segments of equal size are balanced against each other (e.g. closure of a maxillary midline diastema by means of an elastic chain between the central incisors), movement by the same amount should theoretically be observed.

[See Anchorage, Reciprocal anchorage]
Recovery

Change in shape of a material, resulting from the release of internal stresses.

Referred pain

Pain perceived in an area distant to and unrelated to the true site of origin.

Reichert’s cartilage

The cartilage of the second branchial arch, the dorsal end of which is closely related to the developing ear, and ossifies eventually to form the stapes of the middle ear and the styloid process of the temporal bone. The portion of cartilage between the styloid process and the hyoid bone regresses, and its perichondrium forms the stylohyoid ligament. The ventral end of Reichert’s cartilage ossifies to form the lesser cornu and superior part of the body of the hyoid bone.

[Compare with Meckel’s cartilage]

Relapse

The partial or full return of certain characteristics of the pretreatment situation following active treatment. The tendency to relapse after an orthodontic correction is the reason why a retention phase routinely follows the active phase of orthodontic treatment. Factors that may be involved in relapse are craniofacial growth; forces acting on the dentition from the orofacial musculature, periodontal tissues and occlusal contacts; the nature and modality by which correction was achieved and the form of retention used. Examples of individual characteristics of malocclusion that are known to be more prone to relapse are rotations of teeth around their long axis, maxillary midline diastemas with frenal involvement and mandibular incisor crowding.

Relocation

A relative movement in space of a bony structure, due to bone apposition on one of its surfaces and bone resorption in another. For example, during maxillary growth the palate becomes relocated inferiorly by periosteal resorption on the nasal side and periosteal deposition on the oral side. Relocation and remodeling are bone growth mechanisms that are closely related to one another.
Remodeling (of bone)

A reshaping of the outline of a bone by selective resorption of bone in some areas of its surface and apposition in other areas. Remodeling of cortical bone involves resorption on one side and apposition on the other, so that its thickness generally is maintained. The term "remodeling" signifies the turnover of already existing bone (usually superficially) and strictly speaking should be distinguished from "modeling," which means the internal change in shape and form of a bone. Remodeling is an essential component of the growth process.

[Compare with Modeling (of bone)]

[Compare with Relocation]

Replantation

The replacement of a tooth that has been avulsed, or intentionally luxated, back into its alveolus. Ankylosis is common in replanted teeth, owing to injury to the periodontal ligament.

Resilience

The property of a material that represents its ability to store mechanical energy without permanent deformation. [In the everyday practice of orthodontics the term generally is associated with "springiness." ] The resilience of two or more orthodontic wires can be compared by observing the areas under the elastic region of their stress/strain diagrams (provided they are plotted on the same scale). The wire with the larger elastic area under the stress/strain curve has the higher resilience.

Resin-bonded prosthesis

A prosthesis that is luted to tooth structure (primarily to the enamel) that has been etched previously to provide micromechanical retention for the resin cement (e.g. a Maryland bridge).

Resorption

A loss of substance from tissues that normally are mineralized (e.g. dentin, cementum, bone). The process may be physiologic or pathologic.
SUBTERMS:

Resorption
  • External resorption

Resorption of mineralized dental tissue beginning on the external surface, as is usually observed at the apex or lateral surface of the root. Principal causative factors include periapical inflammation, tooth reimplantation, orthodontic tooth movement, tumors and cysts, and tooth impaction. Spontaneous resorption sometimes may occur in conjunction with endocrine disorders. External resorption that affects the dentin sometimes is radiographically misdiagnosed as internal resorption.

Resorption
  • Internal resorption

An unusual form of resorption of dental tissues beginning centrally in a tooth, and apparently initiated by an inflammatory process in the pulp. It usually is symptom-free in its early stages. Histologically, the condition presents a variable degree of resorption of the inner or pulpal surface of the dentin filled by hyperplastic pulp tissue. When it extends to the crown, a pink-hued area representing the hyperplastic pulpal tissue may be visible clinically.

Resorption
  • Root resorption

Resorption of the roots of the deciduous teeth is a normal, essential and physiologic process. Root resorption of permanent teeth is a common iatrogenic side effect of orthodontic treatment.

Orthodontic tooth movement is possible because of the greater resistance of cementum than bone to resorption. However, even when radiographs show no visible changes in the root surface, most teeth moved orthodontically undergo some degree of loss of cementum or even dentin of their root. This resorption is seen histologically as small lacunae that are repaired rapidly by the formation of new cementum during the period that no active orthodontic force is present. In other words, root remodeling is a constant feature of orthodontic tooth movement at the histological level. When the initially resorbed cementum is not repaired, permanent loss of root structure occurs. Repair of the damaged root does not occur when the attack on the root surface produces large defects, as is usually the case in the area of the root apex.

Careful radiographic examination of post-orthodontic individuals shows some loss of root length in nearly every patient. Some teeth are more prone to root resorption than others: maxillary lateral incisors, maxillary central incisors, mandibular incisors, distal root of mandibular first molars, mandibular second premolars and maxillary second premolars (listed in order of severity). In the great majority of patients the amount of root resorption is minimal and clinically insignificant. Occasionally, however, severe root resorption (up to one half of the root length or more) is observed in patients who underwent routine orthodontic therapy.
The factors influencing root resorption after orthodontic treatment still are unclear. Individual susceptibility is considered to play a major role, and some studies suggest that genetic, metabolic, hormonal or other systemic factors may be implicated. Root resorption has been attributed to biomechanical factors such as type of tooth movement, orthodontic force regime and magnitude, distance that a tooth is moved, duration of treatment, type of appliance, contact of apices with cortical bone, intermaxillary elastics, jiggling or round-tripping, but with no conclusive evidence. Finally, factors such as age, sex, occlusal trauma, or type of malocclusion also have yielded equivocal results in the literature.

Pretreatment characteristics considered to be indicators of susceptibility to root resorption are the presence of conical (pipette-shaped) roots with pointed apices, distorted root form (dilaceration), history of trauma, as well as any evidence of root resorption already present prior to orthodontic treatment. However, it is not certain that these factors necessarily are risk factors for severe resorption in all patients.

**Retainer**

Any orthodontic appliance, fixed or removable, used to maintain the position of the teeth and stabilize them following orthodontic treatment.

**SUBTERMS:**

Retainer
  • Bonded lingual retainer

A wire that is bonded on the lingual surface of the teeth just prior to or after removal of the orthodontic appliances to retain their corrected positions. Bonded lingual retainers are very popular in the mandibular anterior area to provide long-term retention in an attempt to prevent late mandibular incisor crowding. The type of wire used for this purpose ranges from a flexible round multistrand wire to a rigid rectangular stainless steel one. The wire can be bonded on all six mandibular anterior teeth individually, or only on the lingual surface of the canines. Occasionally, the wire can extend to more posterior teeth. The use of maxillary bonded lingual retainers is dependent on the clearance provided by the overbite. One way to overcome this problem is by using "intracoronal retention." This requires the preparation of cavities within the enamel to receive the retaining wires prior to bonding. Bonded lingual retainers occasionally are used on the maxillary central incisors to prevent relapse of a pre-existing midline diastema.

Retainer
  • Canine-to-canine retainer
Retainer
• Essix retainer

A removable vacuum-formed clear retainer made of thermoplastic copolyester, covering the teeth of one or both arches, from canine to canine. According to J. J. Sheridan, who introduced the appliance, a sheet of the material 0.030 inch (0.75 mm) thick is preferred, for a good combination of flexibility and strength. During the thermoforming process the thickness of the material is reduced from 0.030 inch (0.75 mm) to 0.015 inch (0.38 mm). Despite its limited thickness, the Essix retainer may not be recommended for patients with an open bite tendency, as it only covers the anterior teeth. The risk of swallowing or aspirating the appliance also should be considered.

Retainer
• Fixed retainer (Permanent retainer)

A type of retainer that is cemented or bonded to the teeth and thus cannot be removed by the patient. Fixed retainers are a popular choice for long-term retention, as they eliminate the patient cooperation factor.

Retainer
• Hawley retainer

One of the most frequently used retaining devices, introduced by C. A. Hawley (1919). It is a removable appliance made of acrylic covering the entire mucosa of the hard palate, or only part of it (“horseshoe” design). In the original design there were no molar clasps. Today, Adams clasps or sometimes circumferential clasps on the first molars are used to provide retention. A labial bow of 0.020-inch (0.51-mm) to 0.036-inch (0.90-mm) stainless steel wire (Hawley wire) is made to contact the labial surfaces of the four incisors or the six anterior teeth. The labial bow has a U-loop where it crosses the occlusion, usually distal to the canines. When there is interference with the occlusion at this point, the labial bow may alternatively be soldered on the Adams clasps.

Retainer
• Removable retainer
A retainer that is not fixed to the teeth, but can be removed by the patient.

Retainer
• Spring retainer (Barrer retainer)

A maxillary or mandibular removable appliance, introduced by H. G. Barrer in 1975. The mandibular appliance is mainly used today. It consists of a single piece of stainless steel wire 0.022 inch (0.56 mm) to 0.029 inch (0.72 mm) in diameter, bent around the six anterior teeth. The wire lies parallel to the incisal edges on the labial side and crosses the occlusion between the canines and premolars, bilaterally. It is bent downward on the labial and lingual surfaces of the canines in the form of U-loops, so that it follows the curvature of the gingiva on these teeth, but without actually contacting it. The ends of the wire overlap in the midline at the lingual aspect of the incisors. The wire does not touch the surfaces of the teeth and is covered by acrylic on the labial and lingual sides. This forms two bands approximately 4 mm wide, engaging the incisors across the middle third of their crowns. The wire surrounding the canine is free of acrylic and functions as a spring, which can be appropriately adjusted to activate the appliance.

The greatest disadvantage of the Barrer retainer is its small size. Various modifications to increase its size have been reported, to avoid accidental swallowing or aspiration. The most common modification includes bilateral extensions of the lingual acrylic, terminating with two occlusal rests on the mandibular first molars.

[See Spring aligner]

Retainer
• Vacuum-formed retainer

A type of removable retainer made of soft or hard clear thermoplastic material that is heated and formed on the patient's plaster model in a vacuum machine. The appliance may cover the entire arch or part of it, and it may also be used for some minor individual tooth corrections, if the teeth are reset prior to its fabrication. Susceptibility of the appliance to fracture (or tear) is a common concern, which is counterbalanced by its esthetic, unobtrusive appearance.

[See Retainer, Essix retainer]

Retainer
• Van der Linden retainer

A Hawley-type retainer introduced by F. P. G. M. van der Linden, with a modified labial bow made of stainless steel wire 0.028 inch (0.70 mm) in diameter. This labial bow contacts the labial surfaces of the six anterior teeth and is bent back upon itself at the distal aspect of the canines, embracing them in a C-clasp fashion at their cervical regions. When there is inadequate clearance for the labial bow to cross the occlusion mesial to the canines, the crossover wire can be placed
distal to them and the recurved C-clasp can be made on the first premolars. These canine clasps provide adequate retention and do not deform by repetitive removal and replacement of the appliance by the patient. Additional C-clasps coming from the distal of the terminal molars are used to enhance retention. The acrylic is relieved from the palatal aspect of the posterior teeth, allowing them to settle in their natural position, as determined by the occlusion. Only the mandibular anterior teeth are contacting the acrylic of the appliance in habitual occlusion. This retainer does not allow adjustment of the anterior tooth position during the retention period due to the design of the labial bow.

Retainer
- Wrap-around (Circumferential) retainer

A type of removable retainer sometimes preferred to the Hawley, especially for the maxillary arch, in cases with tight occlusion where there is no space for crossover of the labial bow. It has a Hawley-type acrylic construction and a continuous labial bow that inserts into the acrylic posteriorly to the terminal molars bilaterally, to avoid interference with the occlusion.

Retention
The phase following active orthodontic treatment, aimed at stabilization of the achieved orthodontic correction.

Retraction (of a tooth)
Posterior (lingual) or distal movement (usually referring to bodily movement).

Retroclination
Lingual inclination or tipping of anterior teeth.

Retrodiscal tissue (Retrodiscal lamina, Posterior attachment, Retrodiscal pad)
The region of loose, highly vascularized and innervated connective tissue that is attached to the posterior aspect of the fibrous portion of the articular disc of the temporomandibular joint. This tissue, which extends to and fills the posterior capsule, is rich in interstitial collagen fibers, adipose tissue, arteries, and elastin, and possesses a venous plexus. The retrodiscal tissue often is stretched and interposed between the condyle and the fossa in patients with anterior or anteromedial disc displacement.

Retrodiscitis
The retrodiscal tissues are highly vascularized and innervated, and as such are unable to tolerate much force. If the condyle encroaches on the tissues, breakdown and inflammation are likely. Inflammation of the retrodiscal tissues is characterized by constant dull aching pain that often is increased by clenching. If swelling occurs, the condyle may be forced slightly forward, down the
posterior slope of the articular eminence. This shift can cause an acute malocclusion, clinically seen as disengagement of the ipsilateral posterior teeth and heavy contact on the contralateral canines. Trauma is the major etiologic factor with retrodiscitis.

**Retrognathism (Retrognathia)**

A condition of facial disharmony in which one or both jaws are posterior to normal, in their craniofacial relationships. When the term is mentioned without further clarification, it usually refers to the mandible.

**SUBTERMS:**

- Retrognathism (Retrognathia)
  - Bimaxillary retrognathism

  Retrusion of both jaws beyond normal limits in relation to the cranial base and other facial structures.

- Retrognathism (Retrognathia)
  - Mandibular retrognathism

  Retrusion of the mandible relative to the cranial base and other facial structures, due to a hypoplastic and/or posteriorly positioned mandible.

- Retrognathism (Retrognathia)
  - Maxillary retrognathism

  Retrusion of the maxilla relative to the cranial base and other facial structures due to a hypoplastic and/or posteriorly positioned maxilla.

**Retrusion**

Posterior location. The term commonly is used to express a posterior position of teeth with regard to a certain reference plane. [When referring to jaws the term "retrognathism" is more appropriate. ]

**SUBTERMS:**

- Retrusion
  - Bimaxillary dentoalveolar (Bialveolar) retraction
Posterior position of the maxillary and mandibular incisors with respect to their supporting bones and the facial profile.

Retrusion
  • Dental retraction

Posterior position of a tooth or group of teeth. [Note: The term "retrusion" does not refer to the inclination of the long axis of the tooth. A tooth can be retrusive without being retroclined, if it is positioned too far posteriorly but has a normal inclination.]

Retrusion
  • Lip retraction

Posterior position ("flatness") of one or both lips relative to the nose and chin or other facial structures.

Retrusion of the mandible

[See Arthrokinetics of the TMJ]

Reversal lines (of bone)

Approximately half of the cortical plate of the facial and cranial bones is formed by the outer surface (i.e. the periosteum) and the remaining half by the inner surface (i.e. the endosteum). Reversal lines are lines that represent the interface between endosteally and periosteally produced bone layers. They also indicate the demarcation between resorptive and depository growth fields, and can be used to identify the layers of bone that were produced first on one side and then on the other, as the direction of growth turned about (reversal of growth).

Reversible treatment

Any therapy that does not cause permanent change.

Rheumatoid factor (RhF)

Antigamma globulin antibodies found in the serum of most patients with rheumatoid arthritis, but also occurring in a small percentage of apparently normal individuals and in individuals with other collagen vascular diseases, chronic infections and noninfectious diseases.

"Ribbonwise"
A rectangular archwire fitting in the bracket slot with its large dimension perpendicular to the occlusal plane (rotated 90° about its long axis, compared to the regular edgewise wire).

[See Appliance, Ribbon-arch appliance]

**Ridge**

A projecting structure; a long, narrow, raised crest.

**SUBTERMS:**

- **Ridge**
  - **Alveolar ridge**

The part of the maxilla or mandible that contains the alveolar processes.

- **Ridge**
  - **Key ridge**

A radiographic anatomical landmark commonly appearing on a lateral cephalometric radiograph. It represents the lower contour of the zygomatic bony ridge, situated between the maxillary tuberosity and the canine fossa.

- **Ridge**
  - **Marginal ridges**

Elevated convex crests that form the mesial and distal occlusal margins of posterior teeth and the lingual surface margins of anterior teeth.

- **Ridge**
  - **Residual ridge (Edentulous ridge)**

The bony ridge remaining after disappearance of the alveoli from the alveolar process, following removal or loss of the teeth.

**Ridge augmentation**

Any procedure designed to increase the height or thickness of the residual alveolar ridge, usually by grafting bone or other bone substitutes.

**Rigid body**
A body that does not change its shape or size under the action of forces. This is a theoretical concept, as all real bodies experience some degree of deformation when subjected to forces. When such changes in size or shape are negligible compared with the overall dimensions of a body, then rigidity can be assumed.

**Robin sequence (Robin anomalad, Pierre Robin syndrome)**

A condition described by the well-recognized triad of mandibular micrognathia, glossoptosis and cleft of the secondary palate, often accompanied by severe nasorespiratory distress in the neonatal period. Named after the French oral pathologist P. Robin, although many earlier reports on the same anomaly were published by others. Birth prevalence estimates range from 1:2,000 to 1:30,000.

It is advocated that the term "Robin sequence" is not really a diagnostic entity, but rather a nonspecific complex of symptoms that can occur sui generis, as a component of various syndromes (e.g. Stickler syndrome, velocardiofacial syndrome, fetal alcohol syndrome) or in association with various anomalies that are not currently recognized as specific syndromes.

It is not clear whether the mandibular micrognathia plays a role in the pathogenesis of the cleft palate, as has been suggested, nor is there agreement on the etiology of the micrognathia. Theories range from a positional mechanical compression of the mandible against the sternum in utero restricting normal mandibular growth to metabolic or genetic etiology. If the respiratory obstruction and feeding difficulty of the infants is marked, tracheostomy, nasotracheal intubation or tongue-lip adhesion maybe necessary. The severe mandibular micrognathia may improve somewhat in the first months of life (what has been termed "catch-up growth") but the mandible does not reach normal dimensions. Early treatment with distraction osteogenesis may assist in early removal of the tracheostomy.

**Root amputation**

The removal of a root from a multirooted tooth.

**Root parallelism**

One of the objectives of orthodontic treatment, achieved mainly by controlling the angulation (second-order, tip) of teeth.

**Root planing**

Smoothing of the rough and infected root surface of a tooth following subgingival scaling or curettage.

**Root proximity**
Close approximation of roots of adjacent teeth.

**Root resection**

Surgical removal of a portion of the root of a tooth. It usually is performed in teeth with incomplete endodontic treatment, in conjunction with a retrograde apical seal procedure, to eliminate infection.

**Rostral**

In the direction of the back.

[Compare with Ventral]

**Rotation (of the condyle)**

The initial phase of condylar movement, which does not involve translation. Rotation occurs primarily between the condyle and the inferior surface of the disc (inferior joint space).

**Orthodontic tooth movement**

- Pure rotation

Rotation of a tooth about its long axis, most evident when viewing the tooth from an occlusal perspective. To achieve this type of tooth movement, the application of a couple is required.

**Rotation (of a tooth)**

- First-order rotation

Rotation of a tooth around its long axis; rotation in the x-z plane, around the y-axis.

[See Orthodontic tooth movement, Pure rotation]

**Rotation (of a tooth)**

- Second-order rotation (Mesiodistal tipping)

Rotation of a tooth around the labiolingual (x-)axis (when referring to an incisor), or around the buccolingual (z-)axis (when referring to a posterior tooth), thereby causing a change in its angulation.

**Rotation (of a tooth)**

- Third-order rotation (Labiolingual or buccolingual tipping)
Rotation of a tooth around its mesiodistal axis (i.e. around the z-axis when referring to an incisor, or around the x-axis when referring to a posterior tooth), thereby causing a change in its inclination.

**Rotation wedge**

An orthodontic auxiliary made of rubber or stainless steel (Steiner rotation wedge), which is used when a small degree of rotation of a tooth still is necessary, but there is no more activation left in the wire (e.g. when bracket placement is not ideal), and the clinician wants to avoid placing a bend. The wedge is attached on the side of the bracket that needs to be moved in a lingual direction, and subsequently the archwire is ligated tightly on the opposite aspect of the bracket with a stainless steel ligature, so that the wedge is squeezed between the archwire and the tooth. Because of their mode of action, wedges require a rigid archwire and are not effective with flexible wires.

**Round-tripping**

Movement of teeth in a direction opposite to that in which they were moved in an earlier stage of orthodontic treatment. It is thought to increase the risk of root resorption significantly and thus should be avoided, if possible. However, strictly speaking, round-tripping of teeth is an almost inevitable phenomenon in everyday clinical orthodontics, irrespective of force regimen and appliance used. All tooth movements actually consist of a series of minute opposite tipping movements ("jiggling"). This translates into continuous reversal of the root surfaces that sustain compression and tension, which at the histological level is equivalent to round-tripping. The same also may occur due to the relapse tendency of teeth during the intervals in which the intermittent force of, e.g. a headgear, is not active.

[See "Jiggling" (of a tooth)]

**Safety release module**

Component of a headstrap, of various designs, allowing immediate release if pulled by excessive force, to reduce the risk of injury.

**Sagittal plane (Parasagittal plane)**

Any vertical plane that passes through the body parallel to the median plane and divides the body into left and right parts.

[See Median plane (Midsagittal plane)]
Scalar

A physical quantity consisting only of a number (magnitude) and a physical unit of measurement (e.g. temperature).

[Compare with Vectorial]

Scaling

Removal of plaque and calculus from the surface of a tooth by means of a scaler.

SUBTERMS:

Subgingival scaling
Supragingival scaling

Seating lug

A small strip of stainless steel welded on the palatal or lingual aspect of orthodontic bands to facilitate their seating and/or removal. They sometimes can have extensions that are used as hooks for orthodontic elastics. Seating lugs occasionally are removed after the band is fitted, for reasons of patient comfort.

Second-order clearance

The angle through which an engaged archwire may be tipped within the bracket slot (with reference to the long axis of the slot) before making contact with the occlusal and gingival slot walls at its mesialmost and distalmost aspects.

[See Third-order clearance]

Second transitional period

The period during which the deciduous canines and molars are replaced by their successors.

Secondary cartilage

Cartilages like those of the mandibular condyle and symphysis (which contribute to the development of the mandible) and the zygomatic (malar) cartilage (which contributes to the development of the maxilla). These cartilages are distinguished from the primary cartilages histologically (as their cells are larger, with less intercellular matrix) and embryologically (as they
develop at a later stage). Secondary cartilages generally are more responsive to changes in mechanical stress than primary cartilages.

[Compare with Primary cartilage]

**Segment**

A portion of a larger body or structure.

**SUBTERMS:**
- **Segment**
  - Active segment

The segment of teeth that is to be moved.

[See Mechanics, Segmental arch mechanics (Sectional mechanics)]

- **Segment**
  - Anchorage segment (Reactive segment)

The segment of teeth that provides anchorage for the movement of the active segment.

[See Mechanics, Segmental arch mechanics (Sectional mechanics)]

- **Segment**
  - Buccal stabilizing segment

An anchorage segment set up by connecting a number of posterior teeth with a passively engaged rigid rectangular wire.

- **Segment**
  - Distal segment

1. When referring to teeth, the more distally (posteriorly) lying dental segment.

2. When referring to segments after an osteotomy such as a BSSO, the segment farther away from the head (bearing the teeth and alveolar process), as opposed to the proximal segments (bearing the rami and the condyles).

- **Segment**
  - Greater segment

In a unilateral cleft, the maxillary alveolar segment on the non-cleft side.
Segment
• Lesser segment

In a unilateral cleft, the maxillary alveolar segment on the side of the cleft.

Segment
• Premaxillary segment

In a complete bilateral cleft, the anterior segment that is separated from the maxilla (encompassing the median part of the maxillary alveolar process and teeth and the prolabium) and is attached to the nasal septum.

[See Premaxilla]

Segment
• Proximal segment

When referring to segments after an osteotomy such as a bilateral sagittal split osteotomy (BSSO), the segments closer to the head (bearing the rami and condyles), as opposed to the distal segment (bearing the teeth and alveolar process).

Segmental surgery

Surgical mobilization and repositioning of one or more alveolar segments of either the maxilla or mandible containing the respective teeth.

Sense

One of the four characteristics of vectorial quantities. The sense of a vector shows the orientation to which the vector acts and is connoted by an arrowhead. [Not to be confused with the direction of the vector, which is the line along which it is active irrespective of orientation.]

Sensitivity (of a test)

An indication of the capability of a test to accurately yield positive results when applied to patients known to have a disease. Sensitivity is calculated by the following formula:

\[ \text{Sensitivity} = \frac{\text{TP}}{\text{TP} + \text{FN}} \times 100\% \]

where:

\( \text{TP} = \) True positives (the number of subjects with the disease, correctly identified by the test)

\( \text{FN} = \) False negatives (the number of subjects with the disease, incorrectly classified by the test as disease-free).
Separation

An orthodontic procedure aiming at slightly loosening the tight interproximal contacts between teeth to create space for the fitting of orthodontic bands. This is achieved by the use of various kinds of separators.

Separator

A device used to create separation between adjacent teeth. There are different kinds, but the principle is the same with any type of separator used: the separator is inserted so it can force or wedge the teeth apart, and it is left in place long enough for initial tooth movement to occur (usually for a week) so banding can be performed by the next patient visit. Separators also can be used to create space in which clasps or crossover wires of removable appliances (e.g. Fränkel appliance) will fit.

SUBTERMS:
Separator
• Brass separator

A piece of soft 0.020-inch (0.51-mm) brass wire, bent in the shape of a hook. The flattened edge of the hook is passed beneath the interproximal contact and slid around it. The two free ends of the separator wire then are grasped with a pair of Mathieu pliers or a hemostat and twisted tightly, so a separating force is created. The twisted end of the separator ("pigtail") is cut to a length of approximately 3 mm and tucked in the interproximal area.

Separator
• Elastic separator ("Donut")

Elastomeric ring of varying thickness that is placed around the interproximal contact point to create the necessary separation over time. The elastomeric ring is stretched with the help of special pliers or by pulling apart two pieces of dental floss threaded through it, while it is forced through the contact. An elastic separator (as any separator) can cause problems if lost into the interproximal space because they usually are radiolucent, so their position and number should be noted in the chart at the time of placement and the area thoroughly inspected in case of a missing separator at the banding appointment.

Separator
• Maxian elastic separator
This type of separator resembles a wide rubber band with thick, rolled edges. They are obtained in strips and cut to size by the operator, to accommodate the various teeth. The two rolled edges are stretched apart, making the interconnecting rubber thin enough to be forced into the interproximal space. Maxian separators are capable of producing rapid separation (they are recommended to be placed 30 minutes before band fitting) but can be quite painful for the patient.

Separator
• Spring-clip separator

A spring made of 0.020-inch (0.51-mm) stainless steel wire that carries a small helix. The spring is grasped with a plier next to the helix, at the base of its shorter leg. The bent-over end of the longer leg is placed in the lingual embrasure between the two teeth to be separated and the spring is pulled open so the shorter leg can slip beneath the contact, with the helix on the vestibular side. Stainless steel spring separators are tolerated easily by the patient, but they tend to come loose and may fall out as separation of the teeth occurs.

Serial extraction

A planned sequence of selective, timed extraction of deciduous and subsequently permanent teeth, with the objective of relieving severe crowding early and facilitating the eruption of remaining teeth into improved positions. Close supervision and control of ensuing eruption are essential to avoid unfavorable sequelae, such as closure of the spaces by mere mesial migration or tipping of the posterior teeth. Comprehensive orthodontic treatment is almost always required for space management, control of the tipping and increase of overbite usually induced by the procedure, and for other malrelationships that may be present. Serial extraction is preferably performed on patients with minimal overbite, symmetrical buccal segments and a Class I molar relationship. It is often indicated in patients with large tooth size rather than small bony bases. [Modified from the AAO Glossary of Dentofacial Orthopedic Terms, 1993.]

[Compare with Guidance of eruption]

Setback (of the mandible)

An orthognathic surgical procedure aiming at sagittal (anteroposterior) reduction of the mandible. A mandibular setback most often is performed through a bilateral sagittal split ramus osteotomy (BSSO) or a transoral vertical ramus osteotomy (TOVRO), but a variety of different osteotomy procedures also are available for certain situations.

[Compare with Advancement (of the mandible)]

Settling
Even with the most meticulous and precise positioning, it is very likely that some teeth will not be in their most stable position during the finishing stage of treatment with a rectangular archwire. Shortly after the appliances have been removed, the teeth "settle" into position by re-establishing occlusal contacts with their antagonist and adjacent teeth until an equilibrium is reached.

Settling can be facilitated during the finishing stages of treatment by replacing the heavy rectangular archwires with light round ones that provide some freedom for movement of the teeth, possibly with the added use of some light posterior vertical elastics. Some clinicians prefer to remove part of the fixed appliances (usually from the posterior teeth) a few weeks prior to the insertion of retainers, to allow for some spontaneous settling of the teeth into their final occlusion.

**Shape memory**

A property of certain alloys (such as some nickel-titanium alloys) that will permit shaping at a higher temperature, followed by a deformation at a lower temperature and return to the original shape by reheating.

**Sharpey's fibers**

[See Periodontal ligament (PDL)]

**Shear**

The internal resistance to a force trying to slide one portion of a body over another.

[See Stress (s), Shear stress]

**Shear deformation**

A change in shape as a result of shear stress. (In the finite element example, shear deformation of a rectangular element would cause it to assume the shape of a parallelogram.)

**Sheath**

An orthodontic attachment in the form of a tube, usually welded to the lingual or palatal surface of molar bands for insertion of fixed/removable palatal arches (e.g. TPA, Quad-helix) or mandibular lingual arches. A sheath is designed to accept a 0.030-inch (0.76-mm) or 0.036-inch (0.90-mm) round wire doubled upon itself. Sheaths sometimes carry gingivally directed ball hooks to allow ligation of the wire in place and/or latch indents ("Dillon dimples") to increase retention of the wire in the sheath.

[See Dillon dimple]
Side-winder spring

[See Appliance, Tip-Edge appliance]

Sign (of a disease or disorder)

Objective evidence of the disease or disorder, as perceived by an examiner.

[Compare with Symptom (of a disease or disorder)]

Sintering

A process by which a preformed body is densified, through diffusion of its particles into each other, usually at high temperatures. The process is very common in the manufacturing of ceramic brackets, rare earth magnets and also some metal brackets.

Six keys of occlusion

The six morphological characteristics of an optimal occlusion, as determined by L. F. Andrews in a study of 120 casts of non-orthodontic individuals with excellent occlusion, which constituted the basis for the development of the straight-wire appliance. The six keys are:

1. Molar relationship

The distal surface of the distobuccal cusp of the maxillary first permanent molars occludes (makes contact) with the mesial surface of the mesiobuccal cusps of the mandibular second permanent molars. The mesiobuccal cusp of the maxillary first permanent molars falls within the groove between the mesial and middle cusps of the mandibular first permanent molars.

2. Crown angulation (Mesiodistal "tip")

The gingival portion of the long axis of the crown of each tooth is distal to the incisal (or occlusal) portion. The degree of this "mesial tip" depends on the type of tooth. [The angulation of the long axis of the crown of the tooth is considered, rather than that of the long axis of the entire tooth. ]

3. Crown inclination (Labiolingual or buccolingual inclination)

[The inclination of the long axis of the crown of the tooth is considered, rather that of the long axis of the entire tooth. ] The long axes of the crowns of the maxillary and mandibular incisors are labially inclined to a degree sufficient to resist overeruption of their antagonists. This labial inclination allows proper distal positioning of the contact points of the maxillary teeth in relation to
the respective contact points of their mandibular antagonists, permitting ideal occlusion of the posterior crowns. In the case of the maxillary canines and posterior teeth a lingual crown inclination exists, which is relatively constant and similar from the canines through the second premolars, and is slightly more pronounced in the molars. The mandibular posterior teeth have a similar lingual crown inclination that increases progressively from the canines through the second molars.

4. Rotations

No rotations are present.

5. Spaces

No interdental spaces exist, but rather tight contacts between the teeth.

6. Occlusal plane

The plane of occlusion is either flat, or a mild curve of Spee is present.

**Skeletal**

Pertaining to the osseous framework of the body.

**Skeletal malocclusion**

A malocclusion that is due to a discrepancy between the maxilla and mandible, or between them and the cranial base.

**Slicing (of teeth)**

The removal of tooth material from the mesial and/or distal aspect of deciduous canines and molars to allow the adjacent permanent teeth to attain better positions in the dental arch during or after emergence. With this procedure, the use of the available leeway space to relieve crowding in the anterior region can be maximized.

**Smile line**

[See Tooth-to-lip relationship]

**Soft tissue shield (Vestibular shield, Buccal shield)**

Component of a removable or functional orthodontic appliance aimed at keeping the lips or cheeks away from the alveolar process and teeth. In this way a stretching of the periosteum is created in
the area of the apical base that is supposed to stimulate its growth. In addition, the dental arches are free of the forces from the surrounding soft tissues.

[See Appliance, Fränkel appliance (Function Regulator)]

Soldering

An operation in which metallic parts are joined by means of a filler metal having a melting temperature below that of the parts to be joined (in general lower than 450°C), which wets the parent metals. [When a filler metal (braze) with a melting temperature above 450°C is used, the process is termed "brazing." ] The parent metals do not participate by fusion in making the joint.

Somatic

Pertaining to the body, as a distinction from the mind or psyche. Pertaining to the structures of the body wall (e.g. skeletal tissue) in contrast to visceral structures.

Space maintainer (Space-retaining appliance)

An orthodontic appliance, fixed or removable, used to control the arch length, usually following the early loss of a deciduous tooth (most commonly a second or first deciduous molar) until the eruption of its successor.

SUBTERMS:
Space maintainer (Space-retaining appliance)
• "Band and bar" space maintainer

A fixed space maintainer consisting of a bar across the edentulous space. The bar is soldered onto bands on both or one of the teeth adjacent to the space.

Space maintainer (Space-retaining appliance)
• "Band and loop" space maintainer

A cantilever-type of fixed space maintainer that consists of a band cemented to (usually) the tooth posterior to the edentulous space and a loop of wire across the edentulous space abutting the anterior tooth. An occlusal rest also can be soldered on the anterior end of the loop to avoid gingival dislodgment of the appliance due to the forces of mastication and subsequent mesial tipping of the posterior tooth, which would result in loss of space.

Space maintainer (Space-retaining appliance)
• "Distal shoe" space maintainer
A type of fixed band and loop space maintainer, indicated especially when a second deciduous molar (usually mandibular) is lost before eruption of the first permanent molar. The appliance consists of a metal or plastic guide plane ("blade" or "distal shoe") that is meant to guide the permanent molar eruption. The loop carrying the intra-alveolar distal shoe is soldered on a band on the first primary molar. To be effective, the distal shoe must extend into the alveolar process so that it contacts the permanent first molar approximately 1 mm below its mesial marginal ridge, at or before its emergence from the bone.

Space maintainer (Space-retaining appliance)
- Lingual arch space maintainer

A lingual arch is indicated for space maintenance when multiple deciduous posterior teeth are missing and the mandibular permanent incisors have erupted. A conventional lingual arch, contacting the cingula of the mandibular incisors while staying approximately 1 to 1.5 mm away from the soft tissue laterally, can prevent anterior movement of the posterior teeth and posterior movement of the anterior teeth. It can be soldered to bands on the primary second or permanent first molars, or it can be of a fixed/removable design.

[See Arch, Lingual arch]

Space regainer (Space-regaining appliance)

Orthodontic appliance used to regain space lost by the premature reduction of arch circumference via extraction, exfoliation or caries. Space regaining is more effective when the space loss is recent and small and may be accomplished with varying types of appliances.

SUBTERMS:

Coil-spring space regainer

Specificity (of a test)

An indication of the capability of a test to yield negative results accurately, when applied to subjects known to be free of disease. Specificity is calculated by the following formula:

$$\text{Specificity} = \frac{\text{TN}}{\text{TN} + \text{FP}} \times 100\%$$

where:

- \( \text{TN} \) = True negatives (the number of healthy subjects correctly identified by the test)
- \( \text{FP} \) = False positives (the number of healthy subjects incorrectly classified by the test as having the disease).

[Compare with Sensitivity (of a test)]
Splint

Any apparatus, appliance or device employed to provide stabilization or sup-port of teeth or bones, or generally to resist motion or displacement of fractured or injured structures.

SUBTERMS:

Splint
  • Anterior repositioning splint (Anterior repositioning appliance)

An interocclusal device that encourages the mandible to assume a position more anterior than the intercuspal position, in an attempt to eliminate the signs and symptoms (e.g. clicking) associated with disc derangement disorders.

The alteration of the mandibular position is not permanent, but only temporary, so as to give the retrodisca tissues a chance to adapt to the re-established condyle-disc relationship. Once tissue adaptation has occurred, the appliance is discontinued.

The appliance typically is made of hard acrylic and can be used in either arch (more commonly in the maxilla). A guiding ramp in the anterior aspect of the appliance dictates the new mandibular position. The appliance provides even contacts with all the teeth of the opposing arch.

Splint
  • Bruxism splint

[See Nightguard (Bruxism appliance)]

Splint
  • Diagnostic splint (De-programming splint, Flat occlusal splint)

An appliance used to "de-program" the neuromuscular reflex system from its adaptation to the existing occlusal conditions. This is performed to diagnose the true centric relation position in patients where a CR-CO discrepancy is suspected, due to mandibular posturing, muscle splinting etc.

The appliance typically is fabricated from hard acrylic, and the surface that is meant to contact the teeth of the opposing arch usually is flat.

Splint
• Gelb splint

A type of anterior repositioning, partial coverage mandibular splint. The splint consists of two acrylic parts covering the occlusal surface of the mandibular posterior teeth, connected by a metal bar on the lingual aspect of the mandibular incisors. Slight indexing of the occlusal surfaces of the maxillary teeth is used to maintain the anterior position of the mandible. The standard mode of retention is two ball clasps mesial to the mandibular first permanent molars.

Splint
• Relaxation splint (Stabilization splint, Muscle relaxation splint)

An interocclusal device that usually is fabricated for the maxillary arch and provides an occlusal relationship that is considered optimal for the patient. The treatment goal with such an appliance is to eliminate any orthopedic instability or incoordination between the occlusion and the joints. It is advocated for patients with parafunction (bruxism) or stress-related muscle hyperactivity. The use of such an appliance also is advocated in patients with retrodiscitis secondary to trauma.

A maxillary appliance design usually is preferred. The appliance is constructed so that there are full occlusal contacts in centric relation. It also is adjusted carefully, so as to allow smooth and gentle anterior guidance on protrusion and canine guidance on lateral mandibular excursions. The occlusal surface of the appliance should be as flat as possible, with no imprints of the mandibular teeth.

The patient is instructed to wear the appliance according to the disorder that is being treated. When bruxism is the problem, night-time wear is essential, whereas daytime use may not be as important. When the disorder is retrodiscitis, the appliance may need to be worn full-time.

Splint
• Surgical splint (Surgical wafer)

The surgical splint is a thin, horseshoe-shaped, interocclusal acrylic wafer that is constructed on the basis of the occlusion established from the model surgery. It is used during the operation to provide positive indexing between the teeth, specifying the desired maxillomandibular occlusal relationship. Without such a splint, it may be difficult to make a judgment in the operating room about the precision of the intended final jaw position and occlusion. Splints also are thought to increase the potential for stability of the surgical correction, especially in the case of a multiple-piece maxillary procedure.

Surgical splints are about 1 to 2 mm thick and usually carry small holes bilaterally through which ligatures can be threaded to fixate the splint to the maxillary dental arch (or to both arches, if IMF is used).

When a single-jaw procedure is performed, only one surgical splint is necessary, which will determine the final relationship between the teeth of the two jaws ("final" splint). However, when a
2-jaw procedure is to be performed, an extra splint ("intermediate" splint) is necessary. The intermediate splint is used after the maxillary osteotomy but prior to the mandibular procedure, in order to provide a reference for the final maxillary position, based on the centric relation of the mandible. After the maxilla has been fixated in its final position, the mandibular osteotomy is performed and the final splint is used to determine the final position of the mandibular distal segment.

[See Segment, Distal segment]

Splinting (of teeth)

The joining together of two or more teeth to immobilize them (e.g. after trauma or considerable periodontal attachment loss) and to increase resistance to applied force, by enlarging the effective root surface area. Splinting may be temporary or permanent.

Spring aligner

An active form of the spring retainer used to correct mild mandibular incisor crowding in untreated individuals or in patients with post-orthodontic relapse. The spring aligner is made on a model on which the teeth (usually the incisors) have been cut out and reset in an ideal position.

Interproximal mandibular incisor stripping is recommended at the time of insertion of the appliance to facilitate achievement of the desired correction. The creation of artificial undercuts, by adding composite at the mesial half of the lingual surface of the mandibular canines, can enhance retention.

[See Retainer, Spring retainer (Barrer retainer)]

[See Undercuts, Artificial undercuts]

Springback

The recovery exhibited by an orthodontic wire, loop, or spring upon its unloading (deactivation) from a state at or beyond its elastic limit. The springback is given by the ratio $Y_S/E$, which is approximately equal to the maximum elastic strain, or working range of the wire. (The formal expression from materials science for springback is $PL/E$. ) Because the unloading curve from the permanent deformation range for typically behaving orthodontic wire alloys (i.e. other than nickel-titanium alloys) is parallel to the elastic loading curve, the value of $Y_S/E$ represents the approximate amount of elastic strain released by the archwire upon unloading (clinically useful springback).

Stainless steel
The most popular wire alloy for clinical orthodontics because of its outstanding combination of mechanical properties, corrosion resistance in the oral environment, and cost. The wires used in orthodontics are composed principally of iron (approximately 70%), 17% to 20% chromium, 8% to 12% nickel and 0.08% maximum carbon. These are the "18-8" stainless steels, so designated because of the respective percentages of chromium and nickel in the alloys. Chromium is the element that gives stainless steel its corrosion resistance, whereas nickel enhances its ductility.

Heat treatment can be used to eliminate residual stresses that might cause fracture during manipulation of stainless steel wires.

Statics

The branch of mechanics that considers forces on bodies that are either at rest or have a constant velocity along a straight line.

Steep mandibular plane

A high value of the mandibular plane angle.

Steiner rotation wedge

[See Rotation wedge]

Stiffness (Rate of elastic force delivery)

The ratio of change in load to accompanying change in deformation of an orthodontic wire, when it is activated within its elastic limit. The inverse of the property of flexibility. Stiffness of a material is expressed by the modulus of elasticity (the slope of the initial linear part of the load/deformation diagram). Wire stiffness is dependent on two fundamental factors: 1) the composition and structure of the wire alloy (which determines its modulus of elasticity) and 2) the wire segment geometry, i.e. the size and shape of the cross-section and the length of the particular segment.

Stomatognathic system

The complex of all the structures of the mouth and jaws, involved in a variety of functions such as speech, respiration, deglutition and mastication.
Strain (e)

The consequence of stress, expressing the internal distortion of a body produced by a load on it. Relative deformation of a body subjected to external load, defined as dimensional change (deformation, Dd) divided by the original dimension d \((e = \frac{Dd}{d})\). Commonly expressed as a percentage (%).

Strength (of a material)

The stress that is necessary to cause fracture (fracture strength) or a specified amount of deformation (yield strength, ultimate tensile strength).

Stress (s)

The internal response of a body to the application of external forces to it, defined as force (load) per unit area \((s = \frac{F}{A})\).

SUBTERMS:

Stress (s)
• Compressive stress (s)

Stress created by two sets of forces with the same line of action and senses towards each other.

Stress (s)
• Residual stress (s)

Internal stress remaining between parts of a solid body after the applied stress is removed.

Stress (s)
• Shear stress (s)

Stress created by two sets of non-coplanar forces with parallel lines of action and opposite sense. Equal to shearing force per unit of shearing area.

[See Shear]

Stress (s)
• Tensile stress (s)
Stress created by two sets of forces with the same line of action and senses away from each other.

**Stress raiser**

An irregularity on the surface or in the interior of an object that causes applied stress to concentrate at a localized area of the object. Other things being equal, the sharper the stress raiser, the greater the localized stress around it.

**Stress relief**

A heat-treatment process intended to reduce the magnitudes of residual stresses that are "locked in" an orthodontic wire due to plastic deformation.

**Stress/strain diagram (Stress/strain curve)**

A common means by which materials can be compared. The information usually is obtained by subjecting a specimen of the material to tension in special testing machines that can monitor the applied load and change in length continuously. By plotting stress along the vertical axis and strain along the horizontal axis, a stress/strain diagram can be constructed that is characteristic of the material. Initially, there often is a straight linear portion on the curve. If the stress is removed from the material while in this portion of the curve, complete recovery of the initial shape of the specimen will result. This part of the curve is called the "elastic region of behavior" (elastic range). When the specimen is stressed beyond the elastic range, permanent deformation will take place. In other words, removal of the stress while in this portion of the curve will not cause recovery of the initial shape of the specimen. This part of the curve is called the "plastic region of behavior" (plastic range). Continued tensile load on the specimen will eventually cause it to fracture.

**Subluxation (of the TMJ)**

Incomplete condylar dislocation during wide jaw opening (usually accompanied by a joint sound), during which the joint surfaces remain in partial contact.
Subluxation (of a tooth)

1. The intentional movement of a tooth within its alveolus by means of forceps, sometimes performed in an effort to release the ankylosis of a tooth.

2. The traumatic injury to a tooth that does not result in complete removal from its alveolus but increases its mobility beyond physiologically observed levels.

Submucous cleft palate

A congenital cleft in the bone or soft tissue underlying the mucous membrane of the palate. In the case of a submucous cleft of the soft palate, the defect is a lack of continuity in the musculature of the soft palate. In submucous clefts of the hard palate, the posterior nasal spine characteristically is absent. Submucous clefts also are called occult clefts, because they are not readily seen on cursory examination.

Subtraction radiography

A technique of eliminating background anatomical structures from an image to bring out the differences between the pre- and post-procedure radiographic images.

SUBTERMS:

Digital subtraction radiography
Photographic subtraction radiography

Succedaneous teeth (Successional teeth)

Those permanent teeth that have predecessors, which includes all permanent teeth except the molars.

"Sunday" bite

A situation in which patients with a skeletal Class II jaw relationship habitually position their mandible in a more anterior position, making the occlusion appear "better" than it really is.

Superelasticity
A remarkable property of some alloys that exhibit a reversible elastic deformation characterized by a distinct non-linear relationship between load and deflection. This is seen as a characteristic plateau-like appearance of the stress/strain curve during loading and unloading. In superelastic alloys, such as certain nickel-titanium alloys, martensitic transformation can be induced by the application of mechanical stress (e.g. bending).

[See Martensitic transformation]
[See Nickel-titanium alloy (Ni-Ti)]

**Superimposition**

The process of placing two images upon each other, registering on structures that remain relatively stable during the time period separating the two images, to evaluate the changes brought about by growth and/or treatment. In orthodontics, most commonly applies to cephalometric tracings or occlusograms.

**Superior joint space (Superior joint compartment)**

The intra-articular space between the head of the superior surface of the articular disc of the TMJ and the mandibular fossa of the temporal bone that is involved in the translational movement of the condyle during the later stages of opening movement.

[See Joint, Temporomandibular joint (TMJ, Craniomandibular articulation)]

**Supernumerary teeth (Hyperodontia)**

Teeth in excess of 20 in the deciduous dentition, or 32 in the permanent dentition. Supernumerary teeth often have abnormal or atypical shape and may interfere with the eruption of adjacent unerupted permanent teeth.

[Compare with Hypodontia]
Superoinferior

The global direction perpendicular to the transverse plane of the dentofacial complex or the occlusal plane of one dental arch; the superior direction/sense is upward, and the inferior direction/sense is downward.

Surface roughness

A parameter influencing the coefficient of friction ($\mu$) between bracket and archwire during orthodontic tooth movement by sliding mechanics. It may also influence plaque accumulation on the orthodontic appliances and teeth, as well as the degree of corrosion of metallic appliances. Surface roughness of various brackets and wires can be estimated by using methods such as specular reflectance, which involves quantification of the amount of light that is reflected back from a surface. A very smooth surface reflects much of the light shone on it in a narrow pattern, whereas a rough surface scatters the light and reflects it back in a more dispersed pattern.

Surgical exposure (of a tooth)

Surgical uncovering of an unerupted or impacted tooth, which may involve a mucosal flap with or without removal of alveolar bone to access the tooth. Following exposure, and depending on its location, the tooth either is left to erupt spontaneously, or an attachment is bonded on it and traction is applied to guide it into the arch.

[See Forced eruption (of a tooth)]

Surgical prediction tracing (Surgical treatment objective, STO)

A visual projection of the changes in osseous, dental and soft tissue relationships, as a result of an orthognathic surgical procedure in combination with orthodontic treatment. An STO is constructed by specific manipulation of a lateral cephalometric tracing to relocate the underlying structures into a more favorable position, based on clinical assessment and cephalometric analysis. The same principles applying to the lateral cephalometric prediction tracing may be employed with posteroanterior (P-A) cephalometrics.

[See Visual treatment objective (VTO)]

Suture

Fibrous joint between those bones of the cranium that are formed by intramembranous ossification. These periosteum-lined areas do not contain cartilage but fibrous connective tissue and in the mature state they allow no movement of the joined parts.

At birth, the sutures between the flat bones of the skull as well as their points of intersection, the fontanels, are rather wide and contain loose connective tissue. This contributes to increased
flexibility that allows a considerable amount of deformation of the head as it passes through the birth canal.

Sutures also play an important role in postnatal craniofacial growth and development. Their function is to permit the skull and face to accommodate growing organs such as the eyes and brain. When two bones are separated (e.g. the skull bones are forced apart by the growing brain) bone forms at the sutural margins with successive waves of new bone cells differentiating from the suture’s osteogenic layer.

Continuous apposition of bone along the edges of the cranial bones gradually reduces the sutural spaces, which eventually fuse in adult life. Mature sutures show a variety of intricate interdigitating patterns and contain minimal connective tissue.

Swallow

The act of deglutition. It begins with the swallow-preparatory positioning of the bolus within the mouth, followed by its passage from the mouth to the pharynx and through the hypopharyngeal sphincter. In the first (voluntary) phase, the chewed food or liquid is placed between the tongue and the anterior palate, the circumoral and tongue muscles being most active.

The preliminary phase is followed by the bolus being propelled posteriorly by the tongue against the palate and into the pharynx and opening of the pharynx, while the hyoid bone is raised by the mylohyoid muscles and the soft palate is elevated to allow the palatopharyngeal muscles to constrict so that the passage of the nasal cavity may be closed. While the tongue propels the bolus, the maxillary and mandibular teeth come in contact and the larynx is raised, with the glottis being closed to interrupt respiration. The bolus is forced over and around the epiglottis, through the hypopharynx and into the esophagus.

The entire process is accomplished within approximately 1 second. The center for swallowing is situated in the floor of the fourth ventricle.

SUBTERMS:
Swallow
• Infantile swallow (Visceral swallow)

The swallowing pattern of infants, which is closely related to their mode of feeding. Reflex suckling (small nibbling movements of the lips) action of the facial and circumoral muscles of the infant aid in stimulating the smooth muscle of the breast to squirt milk into the mouth. Following that, the tongue is grooved and placed anteriorly, in contact with the lower lip and between the gum pads, to allow the milk to flow posteriorly into the pharynx and esophagus. This sequence of events determines the characteristics of infantile swallowing pattern, which are: active contractions of the musculature of the lips, a tongue tip brought forward into contact with the lower lip, and little activity
of the posterior tongue or pharyngeal musculature. The suckling reflex and the infantile mode of swallowing normally disappear after the first year of life.

**Swallow**

- **Somatic swallow (Mature swallow, Teeth-together swallow)**

  The adult pattern of deglutition, characterized by a cessation of lip activity (i.e. relaxed lips), the placement of the tongue tip against the palatal aspect of the alveolar process behind the maxillary incisors, and the posterior teeth brought into occlusion during swallowing. The transition from an infantile to a mature swallowing pattern is made difficult, as long as sucking habits persist.

- **Tongue-thrust swallow (Reverse swallow, Teeth-apart swallow)**

  A swallowing pattern normally in the transition between infantile and mature swallow. It is characterized by various degrees of lip activity and an anterior placement of the tongue behind the maxillary anterior teeth, or between the maxillary and mandibular teeth. It is considered to be closely related to sucking habits. When a tongue-thrust swallow is retained for a long period, it may play a role in the creation or maintenance of an anterior open bite.

**Tarnish**

The process by which a metal surface is dulled in brightness or discolored through the formation of a chemical film (such as the formation of black oxides and sulfides on silver). Tarnish should be differentiated from corrosion, as it is observable as a surface discoloration on a metal, or even as a slight loss of the surface finish (luster). In the oral cavity tarnish often occurs from the formation of hard and soft deposits on the surface of a restoration (e.g. plaque, calculus). As well, surface discoloration may arise on a metal in the oral cavity, from the formation of thin films such as oxides, sulfides and chlorides. Thus, it usually is an early indication of corrosion.

**Taurodontism**

A dental shape anomaly (observed mainly in molars) in which the furcation is displaced apically. This results in relative elongation of the body and pulp chamber, and in shortening of the roots. Affected teeth may lack the usual constriction at the cementoenamel junction found in normal teeth.

The term comes from the Greek words "tauros" (bull) and "odous" (tooth). It was developed by A. Keith in 1913 to describe the apparent similarity in form and structure between these teeth and those of cud-chewing ungulates. Taurodontism can occur in both deciduous and permanent dentitions, although it is more common in the latter. It has been found to occur either as an isolated, singular trait or in association with syndromes and anomalies including amelogenesis imperfecta, Down syndrome, Klinefelter syndrome, ectodermal dysplasia and hypodontia.
**Teflon (PTFE, Polytetrafluoroethylene)**

The material with the lowest coefficient of friction. Teflon-coated stainless steel ligatures and archwires are available as a means for reducing frictional resistance to tooth movement with sliding mechanics.

**Telecanthus**

A soft tissue measurement reflecting increased distance between the medial canthi of the eyelids, a common finding in patients born with conditions such as Waardenburg syndrome or Down syndrome.

[Compare with Orbital hypertelorism]

**Temporomandibular disorders (TMD, Craniomandibular disorders, CMD)**

A collective term embracing a number of clinical problems that involve the masticatory musculature, the temporomandibular joint (TMJ) and associated structures, or both. Temporomandibular disorders have been identified as a major cause of nondental pain in the orofacial region and are considered to be a subclassification of musculoskeletal disorders.

Although TMD traditionally were considered as one syndrome [see Costen’s syndrome], current research supports the view that TMD are a cluster of related disorders in the masticatory system that have many common symptoms. The most common presenting symptom is pain, usually localized in the muscles of mastication, the preauricular area, and/or the TMJ. The pain usually is aggravated by chewing or other jaw function. In addition to complaints of pain, patients with these disorders frequently have limited or asymmetric mandibular movement and TMJ sounds that are most frequently described as clicking, popping, grating or crepitus. Other common patient complaints include jaw ache, earache, headache and facial pain. Non-painful masticatory muscle hypertrophy and abnormal occlusal wear associated with oral parafunction, such as bruxism (jaw clenching and tooth grinding), may be related problems. Pain or dysfunction due to non-musculoskeletal causes such as otolaryngologic, neurologic, vascular, neoplastic or infectious disease in the orofacial region is not considered a primary temporomandibular disorder, even though musculoskeletal pain may be present. However, TMD often coexist with other craniofacial and orofacial pain disorders.

[See Costen’s syndrome]

**Tendon**

Strong, flexible and inelastic band of fibrous tissue attaching muscle to bone.

**Tension**
The deformation experienced by a body that is subjected to two sets of forces applied along the same line of action and with opposite sense, tending to increase the characteristic length of that body.

**Tension-type headache**

Dull, aching, pressing, usually bilateral headache of mild to moderate intensity. When severe, it may include photophobia or rarely nausea. It may be intermittent, lasting from minutes to days, or chronic without remission.

**Terminal attachments**

The orthodontic attachments (brackets or tubes) on the distal-most teeth in the arch, bilaterally.

**Terminal molars**

The distalmost erupted molars in the arch.

**Terminal plane**

The distal proximal surface of the maxillary and mandibular second deciduous molars (being the distal terminal plane of the deciduous dentition). The relationship between the maxillary and mandibular terminal planes in the early mixed dentition is thought to determine, to a degree, the eventual relationship between the (at the time still unerupted) maxillary and mandibular first permanent molars.

**SUBTERMS:**

*Terminal plane*

- **Distal step**

A situation in which the terminal plane of the mandibular second deciduous molar is situated posteriorly to that of the maxillary second deciduous molar. This situation is thought to be predisposing to, but not necessarily predictive of, a Class II relationship of the (at the time, still unerupted) first permanent molars.

[See Terminal plane, Flush terminal plane]

[See Terminal plane, Mesial step]
Terminal plane  
* Flush terminal plane

An end-to-end relationship between the distal proximal surfaces of the maxillary and mandibular second deciduous molars, usually leading to a Class I or Class II relationship between the (at the time, still unerupted) maxillary and mandibular first permanent molars.

[See Terminal plane, Distal step]  
[See Terminal plane, Mesial step]

Terminal plane  
* Mesial step

A situation in which the terminal plane of the mandibular second deciduous molar is situated anteriorly to that of the maxillary second deciduous molar. Depending on the severity of the mesial step, this relationship is thought to predispose to (but is, strictly speaking, not predictive of) either a Class I or a Class III relationship of the (at the time, still unerupted) maxillary and mandibular first permanent molars.

[See Terminal plane, Distal step]  
[See Terminal plane, Flush terminal plane]  
TGF-b

[See Growth factors]

**Third-order clearance**

The angle through which an engaged rectangular archwire may be rotated about its longitudinal axis (placed in torsion) before the edges of the wire make diagonal contacts with the occlusal and gingival walls of the bracket slot.

[See "Play" of an orthodontic wire in the bracket slot]
Threshold

The minimum level of stimulus required to produce a result.

Threshold of force required for tooth movement

The minimum magnitude of force necessary to produce orthodontic tooth movement (a theoretical concept).

Thumbsucking appliance

[See Appliance, Crib ]

Thumbsucking habit (Finger-sucking habit)

A habit that is considered normal during infancy, but if prolonged can lead to malocclusion. As a general rule, sucking habits during the deciduous dentition have little if any long-term effect. However, if these habits persist beyond that time, they are likely to affect the position of the teeth, creating or aggravating existing malocclusion.

The typical characteristic changes associated with sucking habits include flaring or spacing of the maxillary incisors, anterior open bite, forward maxillary position and narrow maxillary arch. The above presumably are caused by a combination of direct pressure on the teeth by the thumb or finger, as well as an alteration in the pattern of resting cheek and lip pressures.

Tie

Term used to indicate fastening of a ligature around a bracket, or placement and ligation of an archwire in place.

[See Ligature]

Tie-back

A stop, hook or loop, soldered, crimped or bent into an archwire, usually at some point anterior to the molar tubes, so that the archwire can be tied to the molar attachments by means of stainless steel or elastic ligatures.
Tinnitus

Subjective ringing, buzzing, or roaring sound in the ear.

Tongue crib

[See Appliance, Crib]

Tongue interposition

Habitual placement of the tongue between the maxillary and mandibular teeth.

Tooth eruption

The movement of a tooth during the final stages of odontogenesis in an axial and occlusal direction, from its developmental position within the jaw (crypt) to its final functional position in the occlusal plane. Eruptive movement of a tooth starts soon after its root begins to form. In the stage of eruption prior to emergence into the oral cavity, the bone overlying the crown of the erupting tooth is resorbed, as are the roots of its deciduous predecessor (if applicable) and the tooth moves in the direction where the path has been cleared.

After its emergence into the mouth the tooth erupts rapidly until it approaches the occlusal plane and is subjected to the occlusal forces. At that point, its eruption slows down and eventually a dynamic equilibrium is reached once the tooth is in complete function. Subsequently, the teeth continue to erupt at a rate that parallels the rate of vertical growth of the mandibular ramus.

Tooth eruption continues throughout adult life at a slow rate, to compensate for the loss of tooth material due to wear and to maintain the vertical dimension of the face to a reasonable degree, unless wear is excessive.

[See Post-emergent spurt]

[See Physiologic tooth movement]

[See Occlusal equilibrium, Juvenile occlusal equilibrium]

Tooth eruption mechanisms

The mechanism of tooth eruption is not clearly understood; most investigations have concluded that eruption is a multifactorial process in which cause and effect are difficult to separate. Some theories attempting to explain the mechanisms of tooth eruption are:
1. The root elongation theory, which supports the idea that root growth is responsible for occlusal movement of the crown.

2. The hydrostatic pressure theory (vascular theory), according to which local increases in tissue fluid pressure in periapical tissues push the tooth occlusally.

3. The alveolar bone growth theory, according to which apposition of bone to the crypt beneath the erupting tooth, and resorption of bone occlusal to it, is what causes the tooth to rise into functional occlusion.

4. The pulp theory, which states that the pulp produces a propulsive force generated by extrusion of pulp due to growth of dentin, by interstitial pulp growth, or by hydraulic effects within the pulpal vasculature. This results in an eruptive force because of pressure gradients that are greater below the tooth than above it.

5. The periodontal ligament theory, according to which the mechanism for tooth eruption lies within the periodontal ligament, possibly related to the contractility of collagen fibers.

6. The dental follicle theory, which states that tooth eruption largely is a function of bone resorption above the erupting tooth (forming its eruption pathway), in combination with intense osteoblastic activity below it, both of which are controlled by the dental follicle.

The above listed theories are not necessarily mutually exclusive; in fact there is reasonable evidence that tooth eruption is regulated by a different mechanism in the pre-emergent and post-emergent stages. Physiological factors such as hormonal fluctuations also seem to play an important role.

**Tooth mobility**

Visually perceptible movement of a tooth within its alveolar socket upon application of a force on its crown.

**SUBTERMS:**

- Increased mobility (Hypermobility)
- Physiologic (Normal) mobility
- Reduced mobility (Hypomobility)

**Tooth size discrepancy (Bolton discrepancy)**
Incongruity between the sums of the mesiodistal tooth sizes of sets of corresponding maxillary and mandibular teeth, as determined by the Bolton analysis.

A discrepancy could involve the "overall ratio" (which encompasses all permanent teeth except the second and third molars) or the "anterior ratio" (which includes the six anterior teeth of each jaw) and is identified as a maxillary or mandibular excess or deficiency. Only deviations that are larger than two standard deviations are considered to be of potential clinical significance.

A tooth size discrepancy may cause difficulties in achieving an ideal overjet and overbite or arriving at a good intercuspation during the final stages of orthodontic treatment. Different ways to address such a problem include extraction of teeth in the arch with the excess tooth material (usually one mandibular incisor), interproximal stripping, compromising the angulation of some teeth so they can occupy a larger or a smaller space in the arch, or increasing the mesiodistal tooth size in the arch with the deficiency in tooth material (build-ups).

[See Bolton analysis]

**Tooth-to-lip relationship**

For optimal esthetics, it is considered desirable that approximately 2 to 4 mm of the maxillary central incisors be uncovered by the upper lip at rest (in other words, the upper lip should cover roughly 2/3 of the maxillary central incisor crown length at rest). Similarly, in an esthetically pleasing smile, the upper lip is raised approximately to the level of the cementoenamel junction of the incisors, so that the full crowns of the maxillary incisors are shown.

Excessive gingival exposure on smiling ("gummy" smile) is considered unesthetic, as is inadequate maxillary incisor exposure on smiling ("edentulous" smile). The tooth-to-lip relationship is an important parameter in orthodontic treatment planning, which to a great extent determines the type of incisor movement desired.

**Torque**

Type of activation placed into a rectangular (or square) orthodontic archwire by twisting it around its long axis, with the purpose of achieving a rotation of the tooth (or group of teeth) around the x-(mesiodistal) axis. The intended type of torquing movement is accomplished largely by movement of the root of the tooth in the labiobuccal or buccocolingual direction (e.g. buccal root torque, labial crown torque), with no or minimal movement of the crown in the opposite direction. The type of bends placed in an archwire to produce torque are classified in Tweed's coordinate system as "third-order" bends.

The term "torque" often (though strictly speaking, incorrectly) is used as a substitute for the term "inclination."

[See Orthodontic springs, Torquing spring]
SUBTERMS:
Torque
• Active torque

Activation for labiolingual or buccolingual root movement of a tooth or group of teeth, brought about by actively placing a torsional bend into an archwire with rectangular or square cross-section.

[Compare with Torque, Passive torque]

Torque
• Continuous posterior torque

A torquing activation placed unilaterally or bilaterally at one point on the archwire for the entire buccal segment, as described by C. H. Tweed. This can be performed by holding the archwire with two pairs of pliers very close to each other, and by twisting appropriately so that a torquing bend is placed at a specific point on the archwire.

The choice of term is somewhat unfortunate, as in this case the torquing activation is mainly "felt" by the tooth immediately distal to the bend. The teeth lying more posteriorly along the archwire will probably "feel" minimal torquing activation, until the inclination of the tooth distal to the bend has actually changed as a result of the torque.

[Compare with Torque, Progressive posterior torque]

Torque
• Crown torque

Change of inclination by movement of the crown, with relatively little movement of the root (termed "buccal" or "lingual/palatal" crown torque, depending on the direction of movement).

Torque
• Passive torque

Activation for labiolingual or buccolingual root movement of a tooth or group of teeth without actively placing twisting bends on the archwire. Passive torque is a consequence of tooth inclination and the resulting corresponding orientation of the bracket slot in relation to the rectangular (or square) archwire.

[Compare with Torque, Active torque]
• Progressive posterior torque

A torquing activation placed unilaterally or bilaterally over the entire buccal segment, as described by C. H. Tweed. This can be performed by holding the archwire with one pair of pliers (or with the fingers), e.g. distal to the canine bracket and with another pair of pliers close to the end of the wire, and by twisting appropriately. In this way the torquing activation is distributed over all the teeth engaged on that part of the archwire.

[Compare with Torque, Continuous posterior torque]

Torque
• Root torque

Change of inclination of a tooth by movement of the root, with relatively little movement of the crown (termed "buccal" or "lingual/palatal" root torque, depending on the direction of movement).

Torsional mechanical couples

A combination of two mechanical couples with opposite senses applied at a certain distance from each other along the length of a wire to place torsional deformation (torque) in it. In practice, this is accomplished by holding a wire with two pliers (or a plier and a torquing key) and twisting in opposite directions.

Torsiversion

A type of malposition of a tooth that is rotated about its long axis (not related to torque as described above).

Torticollis

Contracted state of cervical muscles producing twisting of the neck and an unnatural head posture.

Torus

A bulging bony prominence occurring at the midline of the hard palate (torus palatinus) or on the lingual aspect of the mandible in the canine-premolar area, bilaterally (torus mandibularis).

Toughness
The total amount of energy required to fracture a material. It is a measure of resistance to fracture. Toughness can be measured by calculating the total area under the stress/strain curve from zero stress to the fracture stress. Toughness depends on strength and ductility. The higher the strength and the higher the ductility (total plastic strain) the greater the toughness. Thus, a tough material is generally strong, whereas a strong material is not necessarily tough.

**Towne’s projection**

Fronto-occipital, plain film radiographic projection of the skull, obtained with the patient in the supine position and with the chin depressed. It allows visualization of the occipital and petrous bones, as well as the mandibular condyles.

**Traction**

Force delivered by a component of an appliance that previously has been activated by elastically extending its characteristic length (e.g. the stretching of an elastic module).

[Compare with Decompression]

**Transcranial radiograph**

Plain film projection of the contralateral temporomandibular joint from a superior-posterior angulation. This technique demonstrates oblique views of the glenoid fossa and the mandibular condylar head.

**Transcutaneous electric nerve stimulation (TENS)**

Low-voltage electrical stimulation used as a form of therapy.

**Transfer tray**

A template usually made of silicone or vinyl material, used for transferring the exact position of orthodontic attachments from a plaster cast to the patient's mouth.

[See Bonding, Indirect bonding]

**Transition**

The replacement of the deciduous teeth by the permanent ones.

**Transition temperature**
The temperature at which a transformation occurs between different crystalline structures of a material. In the case of nickel-titanium alloys, it is the temperature at which a transformation occurs between the martensite and austenite crystalline structures. This temperature varies between products and depends on the proportion of nickel to titanium as well as the addition of other metals, such as cobalt or copper.

[See Nickel-titanium alloy (Ni-Ti)]

[See Martensitic transformation]

**Translation (of the condyle)**

Condylar movement occurring during protrusion or lateral excursion of the mandible, or mouth opening beyond the initial phase. It involves primarily the superior aspect of the disc and the articular fossa and eminence (superior joint space).

**Transverse plane (Horizontal plane)**

Any plane passing through the body at right angles to both the median and the frontal plane, dividing the body into upper and lower parts.

**Treacher Collins syndrome (Mandibulofacial dysostosis)**

An autosomal dominant condition, generally characterized by bilateral and (usually) symmetrical abnormalities of structures of the first and second branchial arches and the nasal placode. The birth prevalence is in the range of 1 in 25,000 to 1 in 50,000 live births.

The clinical characteristics include a severely convex facial profile with a prominent dorsum of the nose and a markedly retrognathic mandible and chin. The face is narrow, with hypoplastic supraorbital rims and zygomas. The lateral canthi of the eyes are positioned inferiorly ("antimongoloid slant" of the palpebral fissures). The most characteristic finding is marked hypoplasia of the cheekbones, accompanied by deficiency of the overlying soft tissues. There often is (75%) a coloboma in the outer third of the lower eyelid, the inner aspect of which (medial to the coloboma) has few eyelashes. The external ears can be absent, malformed or malposed, and hearing is impaired as a result of variable degrees of hypoplasia of the external auditory canals and middle ear ossicles. Intelligence is not inherently affected.

The maxilla and mandible also are characteristically hypoplastic, with variable effects on the TMJs and the muscles of mastication. The mandible is retrognathic, with deep antegonial notching, and the rami often are deficient, with malformed condyles. This typically results in a Class II anterior open bite malocclusion and a steep (clockwise rotated) occlusal plane.
Multiple surgical procedures are necessary for the correction of the above deformities, including zygomatic, orbital and TMJ reconstruction with bone grafts; ear and nose reconstruction; as well as bimaxillary orthognathic surgery or distraction osteogenesis.

[See Coloboma]

[See Antegonial notch]

**Tribology**

The study of friction and of the variables associated with it.

**Trigger point**

Any cutaneous or muscular area that when stimulated brings about an acute neuralgic or referred musculoskeletal pain, respectively.

[See Myofascial trigger point]

**Trigonocephalic**

An individual with a triangular skull shape. Trigonocephaly may be produced by premature synostosis of the metopic (interfrontal) suture.

[Compare with Plagiocephalic]

**Trismus (Mandibular trismus)**

Muscle spasm of the masticatory muscles specifically causing limited mouth opening.

**Tube (Molar tube)**

The part of a molar attachment that receives an orthodontic wire, being either directly bonded to the tooth or welded to a band. Tubes are in essence "closed" brackets, into which the archwire is threaded (usually from the mesial), without the need for ligation. They typically are made of stainless steel.

SUBTERMS:

Auxiliary tube
Convertible tube
Headgear tube
Main tube

**Tuberosity**

The most distal aspect of the maxillary alveolar process, bilaterally.

**Tweed orthodontic coordinate system**

[See Bends (Archwire bends)]

**Twinning**

Complete division of a single tooth bud to create two separate teeth.

[Compare with Fusion]

[Compare with Gemination]

[Compare with Concrescence]

"V" principle (of growth)

The "V" principle is an important facial growth mechanism, since many facial and cranial bones have a "V" configuration or "V"-shaped regions. According to this concept, which was described by D. H. Enlow, a "V"-shaped bone grows by resorption on the outer surface of the "V" and apposition on its inner side. Thus, the "V" moves away from its narrow end and enlarges in overall size simultaneously.
**Vectorial**

A physical quantity characterized by a point of application, direction (line of action), sense (orientation) and magnitude in terms of physical units of measurement. A typical example of a vectorial quantity is force.

[Compare with Scalar]

**Velopharyngeal insufficiency (Velopharyngeal incompetence, VPI)**

Anatomic (structural) or functional deficiency of the soft palate or superior pharyngeal constrictor muscle, resulting in inability to provide adequate velopharyngeal closure during speech, with a consequent hypernasal voice quality. Velopharyngeal insufficiency is a frequent finding in patients with a history of cleft palate, for which a pharyngeal flap operation often is performed.

[See Pharyngeal flap operation]

[See Hypernasality (Rhinolalia aperta)]

**Ventral**

Towards the front.

[Compare with Rostral]

**Vertical dimension**

A term commonly employed referring to facial height.

[See Cephalometric measurements, Facial height, Anterior; Posterior; and Total]

**Vertical growth pattern**

Craniofacial growth in a predominantly downward direction. Usually associated with long anterior face height, steep mandibular plane and minimal overbite.

**Vertical maxillary excess (VME)**

Excessive development of the maxilla in the vertical dimension, most commonly associated with Class II skeletal malocclusions. Unesthetic gingival exposure during smiling ("gummy smile") is a
common sign that, however, must be differentiated from that occurring because of an absolutely short upper lip. The treatment for VME is maxillary impaction by orthognathic surgery.

**Vertical plane**

Any plane perpendicular to the transverse plane (sagittal or frontal plane).

**Vestibule**

The part of the oral cavity bounded by the oral surfaces of the cheeks and lips and the labial and buccal aspects of the alveolar processes and teeth.

**Videofluoroscopy**

A cineradiographic diagnostic method with various applications, e.g. for examination of the velopharyngeal area during speech. After the x-rays pass through the subject, they are projected onto a fluorescent screen instead of a film, so the immediate image of the subject in motion can be viewed. The image is electronically intensified and recorded by a video camera.

**Viscoelastic material**

Having both elastic and viscous properties.

**Viscoelastic behavior (Viscoelasticity)**

The characteristic property of some materials to exhibit time-dependent behavior during loading. This means that the strain developed within the material is dependent on the rate of application of stress on it. More generally, the response of a viscoelastic material depends on the rate of load application and on how long the load is applied. Viscoelasticity does not occur in materials with elastic behavior in which the response to load application is both independent of time and completely reversible. Two aspects of the time-dependent behavior of viscoelastic materials are creep and relaxation.

**SUBTERMS:**
Viscoelastic behavior (Viscoelasticity)
• Creep

Gradual increase in strain (permanent deformation) of a material as a result of long-term constant load at stresses in the elastic region below the yield stress.

Viscoelastic behavior (Viscoelasticity)
• Relaxation
The decay (relief) of stress within a material after it has been subjected to permanent deformation. The result of it is change in shape or contour of the material due to rearrangement of its atomic or molecular positions. The state of relaxation increases with an increase in temperature. For example, after a stainless steel wire has been bent, it may tend to straighten out if it is heated to a high temperature.

**Viscous**

Resistant to flow (referring to a fluid).

**Visual treatment objective (VTO)**

A treatment planning and communication aid that may be used to define the tooth movements and/or surgical changes required to achieve the desired facial goals. Essentially it consists of the patient’s pretreatment lateral cephalometric tracing, modified to demonstrate the changes that are anticipated in the course of treatment. This can be accomplished either manually, or with the help of a computer program. Since growth prediction and the effects of treatment on growth are relatively inaccurate, a VTO of a growing child often is only a rough estimate of the actual outcome, nevertheless it can be a helpful tool in arriving at a final treatment plan. Visual treatment objectives performed for orthognathic surgical treatment planning are sometimes referred to as STOs (Surgical Treatment Objectives).

The construction of a VTO is somewhat abstract and requires a trial and error process. It can be very helpful in exploring various treatment options, but it is important, once a plan is determined, that the clinician goes back and makes sure that it is the product of a logical and practical approach to the problem. The VTO is linked directly to, and evaluated in conjunction with, the occlusogram.

[See Occlusogram]

[See Surgical prediction tracing (Surgical treatment objective, STO)]

**Wear facet**

A flat polished or concave area on the surface of a tooth produced by repeated physiologic or parafunctional occlusal contact or prematurity.

[See Attrition (Dental wear, Occlusal wear)]

"Wedge" theory
A concept based on the notions that the mandible is a class III lever and that the vertical position of the mandible and the face height are determined by the occlusion. According to this theory, any pure distal movement of posterior teeth will result in rocking the mandible open (clockwise rotation), whereas when the distalmost occlusal contacts are moved forward (e.g. by mesial movement of the posterior teeth) this may have the opposite effect of decreasing the facial height by allowing the mandible to rotate in a counterclockwise direction. Extraction of the maxillary and mandibular second molars aiming at reduction or correction of an anterior open bite is based on the same theory. The validity of the theory is questionable, as is the long-term stability of any such changes in the orientation of the mandibular plane.

**Weldability**

Having the capability of being joined by the passage of a strong electric current or by the use of laser energy.

**Welding**

An operation by which two or more metal surfaces are united, by means of heat and/or high compressive forces, in such a way that there is continuity of the nature of the material between these parts. The use of a filler material, the melting temperature of which is of the same order as that of the parent material, is optional.

**White spot lesion (Decalcification)**

Initial symptom of a carious lesion representing a subsurface demineralization. A common side effect of orthodontic treatment in patients with compromised oral hygiene. White spot lesions also may occur in areas where there is inadequate bonding material between the bracket base and the enamel creating a space, or in instances of badly fitted bands where there is space between the band and the tooth surface. Such defects can be repaired, at least partially, by fluoride treatment.

**Wolff’s law of bone remodeling**

A book published in 1892 by J. Wolff [original title: "Das Gesetz der Transformation der Knochen"] presenting his observation that bone reacts to mechanical functional stress through an adaptive process resulting in a change of its external and internal architecture to better withstand this stress. According to Wolff, the trabecular pattern of a bone is related to stress trajectories and thus can be correlated with its function in a mathematical way.
**Working range (Range, Maximum elastic strain)**

The maximum deformation (deflection) of an orthodontic wire or spring within its elastic range.

**Working side (Functioning side, Laterotrusive side)**

The side toward which the mandible moves during a lateral excursion.

**X-bite**

Abbreviation for crossbite.

[See Crossbite]

**Yield point**

The point on a stress/strain curve at which 0.1% or 0.2% permanent deformation has occurred to a body (e.g. an orthodontic wire) under the influence of a load. (In other words, the point on a stress/strain curve where there is appreciable plastic deformation [0.1% or 0.2% is arbitrarily selected].)

[See Stress/strain diagram (Stress/strain curve)]

**Yield strength (YS)**

A property that represents the stress value at which a small amount of permanent deformation has occurred. A value of either 0.1% or 0.2% of permanent deformation is usually selected and is referred to as the percent offset. The yield strength of a material always is slightly higher than the elastic limit. A material with a high yield strength is more resistant to permanent deformation than a material with a low yield strength. The yield strength of a material increases proportionally to the amount of work-hardening that it is subjected to.

**Zygomatic bone (Malar bone, Cheek bone)**

A roughly diamond-shaped bone on either side of the face that forms the prominence of the cheek, the lateral wall and floor of the orbit and parts of the temporal and infratemporal fossae. It articulates with the frontal bone, maxilla, zygomatic process of the temporal bone and greater wing of the sphenoid bone. At birth, the bone may be divided by a horizontal suture into a superior and an inferior part.