牙體形態學 Dental morphology

Basic Terminology for Understanding Tooth Morphology

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學習目標

- 能辨識及敘述牙齒之形態、特徵與功能意義，並能應用於臨床診斷與治療
  1. 牙齒形態相關名辭術語之定義與敘述
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  10. 牙科人類學與演化發育之探討

參考資料

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Summary

The course of Dental Morphology provides the student with knowledge in the morphological characteristics of the teeth and related oral structures upon which a functional concept of intra-arch relationships may be based for the clinical application to patient assessment, diagnosis, treatment planning, and oral rehabilitation.

When we enter into any new field of study, it is necessary to learn at once the particular language of that field. Without an adequate vocabulary, we can neither understand nor make ourselves understood. Definitions and explanations of terms used in descriptive tooth morphology are the basic foundation for understanding subject matter in subsequent chapters.

Tooth Identification Systems

The making and storage of accurate dental records is an important task in any dental practice. To do so expeditiously, it is necessary to adopt a type of code or numbering system for teeth. Otherwise, one must write for each tooth being charted something like, "maxillary right second molar mesio-occlusodistal amalgam restoration with a buccal extension" (11 words or 81 letters). Simplified by using the Universal Numbering System (Figure 3.1), this same information would be "2MODBA" (only six symbols). As can be seen in Table 3.1, this same tooth by the Palmer Notation System would be 7」or, using the International System, 17.

Universal Numbering System

The Universal Numbering System, first suggested by Parreidt in 1882, was officially adopted by the American Dental Association in 1975. It is accepted by third party providers and is endorsed by the American Society of Forensic Odontology. Basically, it uses numbers 1 through 32 for the permanent dentition starting with 1 for the maxillary right third molar, going around the arch to the upper left third molar as 16; dropping down on the same side, the left mandibular third molar becomes 17, and then the numbers increase clockwise around the lower arch to 32, which is the lower right third molar. For the deciduous dentition, letters of the alphabet are used from A through T. A is the maxillary right second molar, sequentially through the alphabet to J for the upper left second molar, then dropping down on the same side to K for the mandibular left second molar, and then clockwise around the lower arch to T for the lower right second molar.

Palmer Notation System

The Palmer Notation System utilizes simple brackets to represent the four quadrants of the dentition as if you are facing the patient: 」 is Upper right, └ is upper left, ┐is lower right,

and 「 is lower left. The permanent teeth are numbered from 1 to 8 on each side from the midline, so 1 is a central incisor, 3 is a canine, and 8 is a third molar. The number is placed within the bracket; so, for example, lower left central incisor, lower left second premolar, and upper right canine would be shown as 「 1, 「 5, and 3 」, respectively. On deciduous teeth, the same four brackets are used, but letters of the alphabet A through E represent the primary teeth, central incisors becoming A, lateral incisors B, canines C, etc. If you are confused, refer to Table 3.1.

International Numbering System

The International Numbering System (Federation Dentaire Internationale) uses two digits for each tooth, permanent or primary. The first digit always denotes the dentition, arch, and side, and the second digit denotes the tooth (1 to 8 for permanent and 1 to 5 for deciduous teeth from the midline posteriorly). The first digit of the two digits used in this system is designated as follows:

1 Permanent dentition maxillary, right side.
2 Permanent dentition, maxillary, left side.
3 Permanent dentition, mandibular, left side.
4 Permanent dentition, mandibular, right side.
5 Deciduous dentition maxillary, right side.
6 Deciduous dentition maxillary, left side.
7 Deciduous dentition mandibular, left side.
8 Deciduous dentition mandibular, right side.

International Numbering System

Thus, with the FDI system, numbers 11 through 48 represent permanent teeth (maxillary right central incisor, and mandibular right third molar), and numbers 51 through 85 represent deciduous teeth (maxillary right central incisor and mandibular right second molar). All of the tooth numbers are shown in Table 3.1. You will find it easy to become familiar with any system by first learning (memorizing) the number of letters for key teeth, possibly the central incisors, canines, and first molars.

Trait categories in describing tooth similarities and differences

A trait is distinguishing characteristic, quality, peculiarity, or attribute.

A. Set Traits
Set traits (dentition traits) distinguish teeth in the primary (deciduous) from secondary (permanent) dentition.

B. Arch Traits
Arch traits distinguish maxillary from mandibular teeth.

Trait categories in describing tooth similarities and differences

C. Class Traits

Class traits distinguish the four categories (or classes) of teeth described in the introduction: namely incisors, canines, premolars, and molars. Examples of class traits: incisors have crowns compressed labiolingually for efficient cutting; canines have single pointed cusps for piercing food; premolars have two or three cusps for shearing and grinding; molars have three to five somewhat flattened cusps, ideally suited for grinding food morsels.

D. Type Traits

Type traits differentiate teeth within one class (such as differences between central and lateral incisors, or between first and second premolars, or between first, second, and third molars).

Terminology used to describe the parts of an individual tooth

A. Tissues of a Tooth

1. FOUR TISSUES OF A TOOTH

a. Enamel

Enamel (mostly inorganic, calcified) is the hard, white shiny surface of the anatomic crown. It develops from the enamel organ (from ectoderm).

Composition: 95% Calcium hydroxyapatite (inorganic calcified)
4% Water
1% Enamel matrix (organic matter)

Terminology used to describe the parts of an individual tooth

b. Dentin

Dentin (mostly inorganic, calcified) is the hard yellowish tissue underlying the enamel and cementum making up the major bulk of the tooth. It develops from the dental papilla (from mesoderm).

Composition: 70% Calcium hydroxyapatite (inorganic calcified)
18% Organic matter (collagen fibers)
12% Water

Terminology used to describe the parts of an individual tooth

c. Cementum

Cementum (mostly inorganic, calcified) is the dull yellow external surface of the anatomic root (covering the dentin). It develops from the dental sac (mesoderm).

Composition: 65% Calcium hydroxyapatite (inorganic calcified)
23% Organic matter (collagen fibers)
12% Water

Terminology used to describe the parts of an individual tooth

d. Pulp

Pulp is the soft (not calcified) tissue in the pulp chamber (the cavity or space in the center of the crown and root). It develops from the dental papilla (mesoderm).

Composition: Loose connective tissue
Fibroblasts, blood vessels, and nerves (collagen and reticulum)
Ground substance (water and long carbohydrate chains attached to protein backbones)
Undifferentiated mesenchymal cells that serve to replace injured or destroyed odontoblasts (a reparative function)

Terminology used to describe the parts of an individual tooth

2. LOCATION OF THESE TISSUES (FIG. 3.2)

a. Enamel

Enamel makes up the protective outer surface of the anatomic crown.

b. Cementum

Cementum makes up the surface of the anatomic root. The cementum is very thin next to the cervical line (only 50-100 micrometers thick), no thicker than this page.

Terminology used to describe the parts of an individual tooth

c. Dentin

Dentin is found in the crown and the root making up the main bulk of each tooth, beneath the enamel and the cementum, and extending to the lining surrounding the pulp cavity. Dentin is not normally visible except on a dental radiograph, a sectioned tooth, or on a badly worn one.

Terminology used to describe the parts of an individual tooth

d. Pulp

Pulp is found in the center part of the tooth. The pulp cavity is surrounded by dentin except at a hole or holes near the root apex (apices or apical foramen). Like dentin, the pulp is normally not visible except on a dental radiograph, or sectioned tooth.

Terminology used to describe the parts of an individual tooth

It has a coronal portion (pulp chamber) and a root portion (pulp canal[s]).
The functions of the dental pulp are:

1. Formative---dentin producing cells (odontoblasts) produce dentin through out the life of a tooth. This is called secondary dentin.
2. Sensory--nerve endings permit the sense of pain from heat, cold, drilling, sweet, decay, trauma, or infection.
3. Nutritive--nutrient transport from blood stream to extensions of the pulp that reach into dentin. Blood in the tooth pulp passed through the heart six seconds previously.
4. Defensive or protective--responds to injury or decay by forming reparative dentin (by the odontoblasts).

Terminology used to describe the parts of an individual tooth

3. JUNCTIONS OF TOOTH TISSUES (VISIBLE IN DIAGRAM IN FIG. 3.2)

a. Cementoenamel Junction

The cementoenamel junction (cervical line) separates the enamel of the anatomic crown from the cementum of the anatomic root. This is also known as the cervical line. Refer to Table 3.3 for differences in the amount of curvature of these cervical lines when moving from anterior teeth to posterior teeth.

b. Dentinoenamel Junction

Dentinoenameljunction is the inner surface of the enamel cap (only visible on a cross-section or when preparing a tooth for a restoration).

c. Cementodentinal Junction

Cementodentinal (dentinocemental) junction is the inner surface of cementum lining the root (only visible on cross-section).

Terminology used to describe the parts of an individual tooth

B. Anatomic Versus Clinical Crown

1. ANATOMIC CROWN AND ROOT DEFINITION (CAN BE OBSERVED ON AN EXTRACTED TOOTH)

As stated earlier, the anatomic crown is the part of a tooth that has an enamel surface, (Figs. 3.2 and 3.5B) and the anatomic root is the part of a tooth that has a cementum surface. A cervical line separates the anatomic crown from anatomic root. This relationship does not change over a patient's lifetime.

Terminology used to describe the parts of an individual tooth

2. CLINICAL CROWN AND ROOT DEFINITION (ONLY APPLIES WHEN THE TOOTH IS IN THE MOUTH AND AT LEAST PARTIALLY ERUPTED)

Clinically, the relationship of the gingival (gum) margin to the cervical line in a 25-year-old patient with healthy gingiva is as follows: The gingival margin approximately follows the curvature of the cervical line. However, it is not always at the level of the cervical line because of the eruption process or recession of the gingiva. In a 10-year-old with a healthy mouth, the gingival margin may cover some of the anatomic crown of the tooth enamel; in older persons who have had periodontal dis ease or periodontal therapy resulting in gingival recession, the gingiva may not cover all of the anatomic root (cementum).

Terminology used to describe the parts of an individual tooth

a. Clinical Crown

The clinical crown is the part of a tooth that is visible in the oral cavity. The clinical crown may be larger or smaller than the anatomic crown. It may include all of the anatomic crown and some of the anatomic root if there has been recession of the gingiva, or it may include only part of the anatomic crown if the cervical part of the crown is still covered by gingiva (especially on newly erupted teeth).

You will find an example of a short clinical crown if you look at the maxillary central incisors of a 9- or 10-year-old child--the cervical part of the anatomic crown will be covered by gingiva.

You probably will find an example of a long clinical crown if you look at the teeth of a 60-year-old person--the cervical cementum of the anatomic root will probably be exposed (as with tooth #11 in Fig. 3.10B).

Terminology used to describe the parts of an individual tooth

b. Clinical Root

The clinical root is that part of a tooth which is under the gingiva and is not exposed to the oral cavity. It may be longer than the anatomic root. On newly erupted teeth, any part of the crown not erupted is considered to be part of the clinical root. In an elderly person with considerable recession of the gingiva, the clinical root would be shorter than the anatomic root because the portion of the root that is exposed to saliva is considered to be a part of the clinical crown.

Terminology used to distinguish tooth surfaces

A. Terms That Identify Outer Surfaces of Anterior Versus Posterior Teeth

Facial Surface--the surface next to the face; the outer surface of a tooth in the mouth resting against or next to the cheeks or lips. Facial may be used to designate this portion of any tooth, anterior or posterior.

Terminology used to distinguish tooth surfaces

1. Buccal surface (pronounced like "buckle") meaning cheek. Another name for the facial surface of the posterior teeth (next to the cheek). It is incorrect to use this term when speaking about the incisors or canines (see tooth #3 in Fig. 3.3).

2. Labial surface (meaning lip) is another name for the facial surface of anterior teeth (next to the lip). This term should not be used when referring to the premolars or the molars (see tooth #6 in Fig. 3.3).

Terminology used to distinguish tooth surfaces

B. Terms That Differentiate Approximating Surfaces of Teeth

Proximal surface is the surface or side of a tooth that is next to an adjacent tooth (either the mesial or the distal surface). Proximal surfaces are generally not considered to be self-cleansing when compared to the facial, lingual, and occlusal surfaces which are more self-cleansing (see Fig. 3.3 labeled on third molar).

1. Mesial surface is the surface of the tooth nearest the midline of the dental arch, i.e., toward the plane between the right and left central incisors.

2. Distal surface is the surface of the tooth farthest from the midline of the dental arch.

Note: The mesial surface of all teeth approximate (face) the distal of the adjacent tooth except between the central incisors where mesial surface faces another mesial surface.

Terminology used to distinguish tooth surfaces

C. Terms That Identify Inner or Medial Side Surfaces (Toward the Middle of the Mouth) of Maxillary Versus Mandibular Teeth

Lingual surface is the surface of maxillary and mandibular teeth nearest the tongue.

Palatal surface is the surface of maxillary teeth nearest the palate. This surface is more commonly called the lingual surface (labeled on tooth #5 in Fig. 3.3).

Terminology used to distinguish tooth surfaces

D. Terms That Differentiate Biting Surfaces of Anterior Versus Posterior Teeth

Occlusal surface is the chewing surface of posterior teeth consisting of cusps, ridges, and grooves, and bounded anteroposteriorly by the marginal ridges and buccolingually by the cusp ridges. Incisors and canines do not have an occlusal surface (labeled on tooth #2 in Fig. 3.3).

Incisal edge is the cutting edge, ridge, or surface of anterior teeth (labeled on tooth #8 on Fig. 3.3).

Terminology used to distinguish tooth surfaces

E. Points of Reference (General) Which Should Not Be Confused with Tooth Surface Terminology

Medial--toward the center line of the body.

Lateral--toward the sides of the body, i.e., toward the right or left (away from the midline).

Terminology used to distinguish tooth surfaces

F. Divisions of the Crown of a Tooth (for Purposes of Description) (Fig. 3.4)

1. DIVISIONS CERVICO-OCCLUSALLY (CERVICOINCISALLY)

Divisions cervico-occlusaUy (cervicoincisally) are demonstrated by arbitrary lines drawn horizontally on the tooth crown to divide the crown into the following three parts:

Cervical third
Middle third
Occlusal (incisal) third

Terminology used to distinguish tooth surfaces

2. DIVISIONS MESIODISTALLY

Divisions mesiodistally are demonstrated by similar equally spaced lines drawn vertically on the facial or lingual surface of the crown:

Mesial third
Middle third
Distal third

Terminology used to distinguish tooth surfaces

3. DIVISIONS FACIOLINGUALLY

Divisions faciolingually are demonstrated by lines drawn vertically on the mesial or distal surface of the crown:

Facial third (labial or buccal third)
Middle third
Lingual third

Terminology used to distinguish tooth surfaces

G. Divisions of the Root of a Tooth

Mesiodistally and faciolingually, the divisions are exactly the same as for the crown.

Divisions cervicoapically are:
Cervical third
Middle third
Apical third

Terminology used to distinguish tooth surfaces

H. Combined Terms

Combined terms (notice spelling) to denote the junction (area) where two surfaces meet (left column) or a dimension between the surfaces (right column). The "al" ending in the first term is changed to an "o" when combining these terms.

Mesio-occlusal	Labiolingual
Mesioincisal	Buccolingual
Mesiolingual	Faciolingual
Mesiobuccal	Cervicoincisal
Distolingual	Cervico-occlusal
Disto-occlusal	
Distoincisal	
Distobuccal	

Morphology of the tooth

A. Morphology of an Anatomic Crown

To identify the following anatomic structures, reference will be made primarily to drawings of a canine (Fig. 3.5) and a premolar (Fig. 3.6). These drawings are being used as representative examples.

Morphology of the tooth

1. BUMPS AND RIDGES

a. Cusp

Cusp (Figs. 3.5 and 3.6) is a point, or peak, on the chewing surface of molar and premolar teeth, and on the incisal edge of canines. Cusp slopes are the inclined surfaces or ridges that form an angle at the cusp tip when viewed from the facial or lingual aspect (Fig. 3.5A). These cusp slopes may also be called cusp ridges or cusp arms (Fig. 3.7).

Morphology of the tooth

b. Cingulum

Cingulum (the c and g are pronounced as in singular) is the enlargement or bulge on the cervical third of the lingual surface of the crown on anterior teeth (incisors and canines). (See Fig. 3.5B.)

Morphology of the tooth

c. Ridges--Longitudinal Convexities of Enamel

(1) Labial Ridge

The labial ridge (Fig. 3.5A) is a ridge running cervicoincisally in approximately the center of the labial surface of the canines (similar to the buccal ridge on premolars).

(2) Buccal (Cusp) Ridge

The buccal (cusp) ridge (Fig. 3.7) is a ridge running cervico-occlusally in approximately the center of the buccal surface of premolars, more pronounced on the first premolars than on the second premolars.

Morphology of the tooth

(3) Cervical Ridge

The cervical ridge is a ridge running mesiodistally on the cervical one-third of the buccal surface of the crown, found on all deciduous teeth but only on the permanent molars.

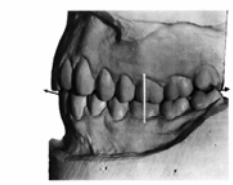


Figure 3.10. A Dental stone casts fitting together in the maximum intercuspal position (centric occlusion). Notice that each tooth contacts two opposing teeth except the mandibular central incisor and the maxillary third molar. (Further information in Chapter 10.) The vertical white line marks the relationship of first molars in Class I occlusion; the mesiobuccal cusp of the maxillary first molar occludes in the mesial buccal groove of the mandibular first molar. The curved arrows denote the curve of Spee.

Morphology of the tooth

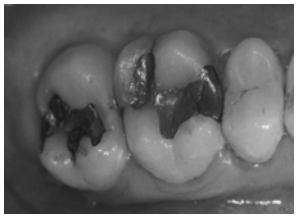
(4) Marginal Ridge

On incisor and canine teeth (Fig. 3.5B), a marginal ridge is located on the mesial and distal border of the lingual surface; on posterior teeth, it is located on the mesial and distal border of the occlusal surface (Fig. 3.6A).

Morphology of the tooth

(5) Oblique Ridge

The oblique ridge is a ridge found only on maxillary molars that crosses the occlusal surface obliquely and is made up of the triangular ridges of the mesiolingual and the distobuccal cusps.



Morphology of the tooth

(6) Triangular Ridge

The triangular ridge, on the occlusal surface of posterior teeth, is the ridge from any cusp tip to the center of the occlusal surface (Fig. 3.6A). All posterior tooth cusps have a triangular ridge except the mesiolingual cusp on maxillary molars, which has two triangular ridges.

Morphology of the tooth

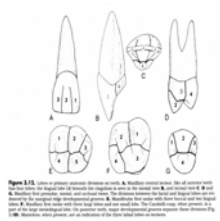
(7) Transverse Ridge

The transverse ridge (Fig. 3.6A) is a ridge crossing the occlusal surface of most posterior teeth in a buccolingual direction and made up of connecting triangular ridges (e.g., between the mesiolingual and mesiobuccal or between the distolingual and distobuccal cusps on molars or running between buccal and lingual cusps on premolars).

Morphology of the tooth

d. Mamelon

Mamelon is one of three tubercles sometimes present on the incisal edge of an incisor tooth that has not been subjected to wear (attrition)



Morphology of the tooth

2. DEPRESSIONS AND GROOVES

a. Sulcus

Sulcus is a broad depression or valley on the occlusal surfaces of posterior teeth, the inclines of which meet in a developmental groove and extend outward to the cusp tips (see Fig. 3.6B).

Morphology of the tooth

b. Developmental Groove

The developmental groove is a sharply defined, narrow and linear depression, short or long, formed during tooth development and usually separating lobes or major portions of a tooth (Fig. 3.11). The major grooves are named according to their location (Fig. 3.6A). Grooves are important escape ways for cusps during lateral and protrusive jaw motions, and for food morsels during mastication. (Food squirts out toward the tongue and cheeks.)

A fissure is a narrow channel, cleft, ditch, or crevice, sometimes deep, formed at the depth of a developmental groove, caused or formed during the development of a tooth and extending inward toward the pulp from the groove.

Decay (dental caries) often begins in a deep fissure.

Morphology of the tooth

c. Supplemental Grooves

Supplemental Grooves are small, irregularly placed grooves, not at the junction of lobes or major portions of a tooth, found usually on occlusal surfaces.

These can be named for the part of the tooth on which they are found (mesiobuccal supplemental groove, distolingual supplemental groove) (Figs. 3.6A, 3.8).

Morphology of the tooth

d. Fossa

Fossa (plural, fossae) (Fig. 3.6A) is a depression, or hollow, found on the lingual surfaces of some anterior teeth (particularly maxillary incisors) and on the occlusal surfaces of all posterior teeth.

Morphology of the tooth

e. Pits

Pits (Fig. 3.6A) often occur at the depth of a fossa where two or more grooves join. Like fissures at the depth of grooves, pits are areas where dental decay may begin.

Terminology related to the ideal alignment of teeth in the dental arches

When viewed from the occlusal aspect, each dental arch is U-shaped (Fig. 3.1). The incisal edges and the buccal cusp tips follow a curved line around the outer edge of the dental arch; the lingual cusp tips of the posterior teeth follow a curved line nearly parallel to the buccal cusp tips. Between the buccal and lingual cusps is the sulcular groove, which runs anteroposteriorly the length of the posterior teeth.

Terminology related to the ideal alignment of teeth in the dental arches

Curve of Spee (Fig. 3.10) (anteroposterior curve of the curve occlusal plane) — When viewed from the buccal aspect, the cusp tips of posterior teeth follow a gradual concave curve anteroposteriorly. The curve of the maxillary arch is convex; that of the mandibular arch is concave.

Terminology related to the ideal alignment of teeth in the dental arches

Curve of Wilson (side-to-side curve) (Fig. 10.B) — When viewed from the anterior aspect with the mouth slightly open, the cusp tips of the posterior teeth follow a gradual curve from the left side to the right side. The curve of the maxillary arch is convex; that of the mandibular arch concave. Thus, the lingual cusps of the posterior teeth are aligned at a lower level than the buccal cusps on both sides and in both arches.

Terminology related to the ideal alignment of teeth in the dental arches

A. Crest of Curvature (Fig. 3.5)

The form of the curvature or convex bulges on teeth determines the direction of food as it is pushed cervically over the tooth surface during mastication. During chewing, these convexities divert food away from the collar of tissue (gingiva) that surrounds the neck of the tooth, and toward the buccal vestibule and toward the palate or tongue, thus preventing trauma to the gingiva. If teeth were flat in their middle and cervical thirds, much food would lodge and remain near the gingival margin and sulcus until removed by a toothpick or toothbrush or by dental floss.

Terminology related to the ideal alignment of teeth in the dental arches

The crest of curvature is the highest point of a curve or greatest convexity or bulge. The crest of curvature on the facial and lingual surfaces of the crown is where this greatest bulge would be touched by a tangent line drawn parallel to the root axis (Fig. 3.5B). The location of the crest of curvature on the facial and lingual surfaces of the crowns of teeth can be seen from the mesial and distal aspects, and are usually in one of two places:

Terminology related to the ideal alignment of teeth in the dental arches

1. In the cervical third of the crown on:
   a. Facial surfaces of all anterior and posterior teeth (maxillary and mandibular).
   b. Lingual surfaces of all anterior teeth (maxillary and mandibular) on the Lingulum.
2. In the middle third of the crown on:
   a. Lingual surface of maxillary and mandibular posterior teeth.
   b. Lingual surface of all mandibular posterior teeth.

Terminology related to the ideal alignment of teeth in the dental arches

Refer to Table 3.4 for the changes in relative position of the facial and lingual crests of curvature when moving from anterior teeth to posterior teeth. The mesial and distal crest of curvatures (seen from the facial or lingual) are normally the same as contact areas (Fig. 3.5A).

Terminology related to the ideal alignment of teeth in the dental arches

B. Contact Areas (Refer to Fig. 3.1)

Contact areas are the crests of curvature on the proximal surfaces of tooth crowns where a tooth touches the tooth adjacent to it in the same arch when the teeth are in proper alignment (also called contact points). Floss must pass through contact points to clean the spaces between teeth (their proximal surfaces).

Terminology related to the ideal alignment of teeth in the dental arches

On different teeth, contact areas characteristically may be in the incisal third, the middle third, or at the junction of the incisal or middle third. Contact points are never located more cervically than in the middle of tooth crowns.

The contact of each tooth with the adjacent teeth has important functions:

1. It stabilizes the tooth within its alveolus (bony tooth socket) which thereby stabilizes the dental arches (the combined anchorage of all teeth in both arches making positive contact with each other).
2. It helps prevent food impaction, which can lead to decay and periodontal problems.
3. It protects the interdental papillae of the gingiva by shunting food toward the buccal and lingual areas.

Terminology related to the ideal alignment of teeth in the dental arches

The contact areas on teeth are at first contact points. Then, as the teeth rub together in function, these points become somewhat flattened and are truly contact areas. It has been shown by careful measurements that, by age 40 in a healthy mouth with a complete dentition, 10 mm of enamel has been worn off the contact areas of the teeth in each arch. This averages 0.38 mm per contact area on each tooth, and certainly emphasizes the amount of proximal attrition that occurs. Therefore, we would expect contact areas on teeth of older people to be large and somewhat flattened.

Refer to Table 3.4 for the relative position of proximal contacts when moving from anterior teeth to posterior teeth.

Terminology related to the ideal alignment of teeth in the dental arches

Diastema is a space between two adjacent teeth that do not contact each other (Fig. 3.10 B). When teeth contact, there are four continuous spaces that surround the contact area: an interproximal space gingivally, as well as a facial (buccal or labial), lingual and occlusal or incisal embrasure:

Terminology related to the ideal alignment of teeth in the dental arches

1. INTERPROXIMAL SPACE

The interproximal space is the triangular space between adjacent teeth cervical to their contact. The sides of the triangle are the proximal surfaces of the adjacent teeth, and the apex of the triangle is the area of contact of two teeth. This space is occupied in periodontally healthy persons by the interdental papilla, tissue which fills the base of the triangle. (See Figs. 3.1, 3.10B and C.) Sometimes this interproximal space is referred to as the cervical embrasure or the gingival embrasure.

2. EMBRASURES

An embrasure (see Fig. 3. I) is the V-shaped spillway space or triangular shaped space adjacent to the contact area on adjacent teeth, narrowest at contact and widening facially (buccal or labial embrasure), lingually (lingual embrasure), and occlusally (occlusal or incisal embrasure). As just stated, the fourth triangular space, cervical to the contact area is properly called the interproximal space.

The lingual embrasures are ordinarily larger than the facial embrasures, since most teeth are narrower on the lingual side than on the facial side and because their contact points are located in the facial third of the crowns. These contact area locations and the buccal and lingual embrasures are seen when the dental arch is examined from the occlusal view (Fig. 3.1).

Terminology related to the ideal alignment of teeth in the dental arches

The occlusal or incisal embrasure is usually shallow from the occlusal surface or incisal edge to the contact areas and is narrow faciolingually on anterior teeth but broad on posterior teeth. The occlusal embrasure is the area between and occlusal to the marginal ridges on two adjacent teeth (occlusal to their contact area). This is where we place the dental floss before passing it through the contact area to clean tooth surfaces in the interproximal space.

Embrasures act as spillways to direct food away from the gingiva. When the occlusal embrasure is incorrectly shaped in a dental restoration (amalgam, composite, or gold), food will readily lodge in the interproximal spaces and can be removed only with dental floss.

Terminology related to the ideal alignment of teeth in the dental arches

C. Root Axis Line

The root axis line is an imaginary line on the facial and lingual surface that divides the root at the cervix into mesial and distal halves (Fig. 3.5A). On the mesial and distal surfaces, it divides the root at the cervix into facial and lingual halves (Fig. 3.5B).

Ideal occlusion: Inter (between) arch relationships of teeth

Ideal relationships between maxillary and mandibular teeth are discussed here. It is important to learn the concepts and relationships of ideal occlusion in order to identify malocclusions that could contribute to dental problems. Occlusion is contact of the chewing (masticating) and incising surfaces of opposing maxillary and mandibular teeth. To occlude means to close, as in shutting your mouth and clenching your teeth together forcibly. The importance of good occlusion cannot be overestimated. It is essential to both general and dental health and to a patient's comfort and ability to enjoy food and to effectively reduce it for consumption. In dentistry, the study of occlusion includes a study of the anatomy, physiology, and pathology of the teeth, bones, craniomandibular joints, and soft tissues of the oral cavity during function.

Ideal occlusion: Inter (between) arch relationships of teeth

Understanding occlusion requires a knowledge of:

1. The arrangement of teeth within the dental arches (alignment, plane, rotation, and spaces)
2. The relation of the mandibular dental arch of teeth to the maxillary dental arch..
3. The relation of the mandible to the maxilla (centric relation and eccentric relations).
4. The craniomandibularjoints and their complexities.
5. The muscles, nerves, ligaments, and soft tissues that affect the position of the mandible.
6. Abnormalities that may be detrimental to dental health (malaligned teeth, biting or bruxing habits, tongue thrust, mouth breathing, deflective tooth contacts, balancing side interferences, and improperly designed dental restorations).

Ideal occlusion: Inter (between) arch relationships of teeth

A. Ideal Tooth Relationships Between Arches (Interarch)

Ideal tooth relationships were described and classified in the early 1900s by Edward H. Angle. He classified ideal occlusion as Class I, and defined it based on the relationship between the maxillary and mandibular dental arches. When closed together the teeth are in centric occlusion (maximum intercuspation), as shown in Figure 3.10A. Centric occlusion is achieved on hand-held models when the maxillary teeth fit as tightly as possible against the mandibular teeth, i.e., are most stable (Fig. 3.10A). The following relationships are seen:

Ideal occlusion: Inter (between) arch relationships of teeth

1. Relationship of anterior teeth:

THE MAXILLARY ANTERIOR TEETH overlap the mandibular teeth

a. Horizontal overlap: The incisal edges of maxillary anterior teeth are labial to the incisal edges of the mandibular teeth (Fig. 3.10A).

b. Vertical overlap: The incisal edges of the maxillary anterior teeth extend below the incisal edges of the mandibular teeth (Figs. 3.10A, and B).

Ideal occlusion: Inter (between) arch relationships of teeth

2. Relationship of posterior teeth

THE MAXILLARY POSTERIOR TEETH are slightly buccal to the mandibular posterior teeth (Figs. 3.10B and C) so that:

a. The buccal cusps and buccal surfaces of the maxillary teeth are buccal to those in the mandibular arch.

b. The lingual cusps of maxillary teeth rest in occlusal fossae of the mandibular teeth.

c. The buccal cusps of the mandibular teeth rest in the occlusal fossae of the maxillary teeth.

d. The lingual cusps and lingual surfaces of the mandibular teeth are lingual to those in the maxillary arch.

Ideal occlusion: Inter (between) arch relationships of teeth

3. Relative Alignment

THE VERTICAL (LONG) AXIS MIDLINE OF EACH MAXILLARY TOOTH is slightly distal to the vertical axis of the corresponding mandibular tooth (Figs. 3.10A and B) so that:

a. The tip of the mesiobuccal cusp of the maxillary first molar is aligned directly over the mesiobuccal groove on the mandibular first molar (Fig. 3.10A). This relationship of first molars (the first permanent teeth to erupt) is a key factor in the definition of Class I occlusion.

b. The distal surface of the maxillary first molar is posterior to the distal surface of the mandibular first molar (Fig. 3.10A).

Ideal occlusion: Inter (between) arch relationships of teeth

4. Opposing teeth

EACH TOOTH IN A DENTAL ARCH occludes with two teeth in the opposing arch except the mandibular central incisor (which is narrower than the maxillary central incisor) and the maxillary last molar (Fig. 3.10).

Ideal occlusion: Inter (between) arch relationships of teeth

To summarize, normal occlusion involves a Class I relationship between the maxillary andmandibular first molars in centric occlusion. Ideally, only the canines touch when the mandible moves to either side, without molar and premolar contacts. There should not be facets, bone loss, closed vertical dimension, crooked teeth, bruxing habits, loose teeth, or joint pain.

Ideal occlusion: Inter (between) arch relationships of teeth

For the deciduous dentition, the crowns of all 20 teeth begin to calcify between 4 to 6 months in utero (Fig. 3.11) and on the average take 10 months for completion (range 61/2 months for maxillary central incisor to 13 months crown calcification time for the canines and mandibular second molar). It is about 6 months later, on average, before the mandibular crowns emerge, and 9 months after crown completion before the maxillary teeth reach the oral cavity (range: 31/2 months for mandibular central incisor to 13 months delay for the maxillary second molar). The deciduous roots are completed on average of 14 months after emergence for the mandibular dentition and 15 months after emergence for the maxillary teeth (range 8 months for the mandibular lateral incisor to 22 months later for the upper and lower canines). Only 3 years after the roots are complete, they begin to resorb as the permanent teeth begin their occlusal migration. All of this information is derived from Table 3.4.

Ideal occlusion: Inter (between) arch relationships of teeth

Root formation for permanent and deciduous teeth begins immediately after the enamel on the crown is completely formed, and at this time the tooth starts its occlusal movement toward the oral cavity. This tooth movement is called eruption. In the process of eruption, the tooth crown emerges into the oral cavity. The eruptive movement continues after the incident of emergence, and eventually the tooth comes into occlusion with teeth in the opposite arch. Even then it continues to erupt to compensate for wear (attrition) on its incisal or occlusal surface.

Ideal occlusion: Inter (between) arch relationships of teeth

Each deciduous tooth is lost prior to being replaced by its succeeding permanent tooth. Exfoliation is the process of shedding the deciduous teeth usually caused by forces of the permanent teeth which will replace them. Sometimes severely diseased permanent teeth will become exfoliated if disease destroys the bony support of the teeth (alveolar bone). On average for the permanent dentition, there is a 4-year span from completion of the crown calcification until the tooth emerges into the mouth, with a time range of from 2.7 years for the lower anterior teeth to 4.7 years for the lower posterior teeth.

Ideal occlusion: Inter (between) arch relationships of teeth

In Table 3.4, the figures below Eruption indicate the approximate age of the individual at the time the tip of the tooth crown emerges through the oral mucosa into the mouth. There is a considerable normal range in emergence time for any given tooth (+/- 9 months). The permanent dentition is also called the succedaneous dentition or that which succeeds the primary dentition. In the strict sense, succedaneous teeth would exclude the permanent molars because they have no predecessors or precursors as they erupt posterior to the deciduous molars. It has been estimated that a person 70 years of age will have spent 91% of this time chewing on permanent teeth (bridges, etc.) and only 6% of this time masticating with his or her deciduous dentition (1). The early years are important, and proper maintenance of the primary teeth will assure better tooth relationships and health long after the deciduous teeth have been shed.

Ideal occlusion: Inter (between) arch relationships of teeth

In general, females' teeth emerge into the mouth a few months earlier than for males. Teeth of the same type usually come in the lower arch earlier than their maxillary counterparts. EXCEPTIONS include the permanent premolars. The roots on permanent teeth are not usually completely formed until about 2.5 years after the crowns have become visible in the mouth. In Table 3.4, the figures below Root Completed indicate the age of the individual at the time the root apex is completed. The tip of the root or apex is the last part to develop. On average, the root formation is completed 2.4 years after emergence, with an average time span range of from 2.3 years for the lower posterior teeth to 2.8 years for the lower anterior teeth.

Ideal occlusion: Inter (between) arch relationships of teeth

Dental students and dental hygiene students should become quite familiar with the emergence dates in order to adequately and correctly inform worried parents and patients concerning the normal times at which teeth emerge. If the time is within 12-18 months (early or late) of the dates given in Table 3.4, there should be no real concern for permanent teeth. On the expected emergence times for deciduous teeth, a variation of 4-5 months (early or late) can be considered normal. Dental radiographs (x-ray films) are the best means for determining what is covered up or missing in a dentition when the expected teeth have not emerged, particularly when they are considerably overdue. Early emergence of teeth usually presents no problems other than a concern about instituting oral hygiene measures.

Evolution of teeth and lobes

In terms of the evolution of the dentition, tooth crowns are said to have developed from lobes or primary centers (Fig. 3.12). For example, the mandibular first molar supposedly develops from five lobes: it has five cusps--three buccal and two lingual. Incisors develop from four lobes: three facial lobes that form three mamelons, and one lingual lobe forming the cingulum. Most canines and premolars develop from four (or five) lobes. The facial tooth surface develops from three lobes, usually evidenced by three subtle longitudinal ridges separated by two depressions. One lingual lobe forms the cingulum on canines and one (or two) lobes form the lingual cusps on premolars. All normal teeth show evidence of having developed from three or more lobes. Only some maxillary third molars have as few as three lobes. Peg-shaped maxillary lateral incisors and some supernumerary teeth have less than three lobes.