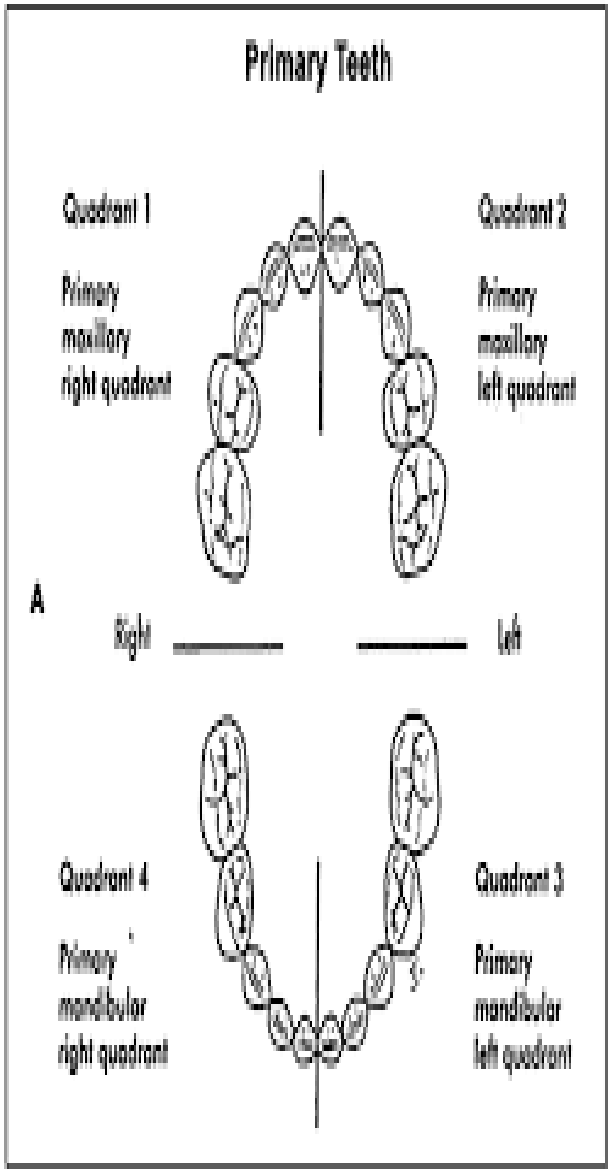
Systems for Numbering Teeth For data recording in clinical practice, a shorthand "tooth notation" technique is required. There are several systems in use worldwide, but only a few are taken into consideration here.

Zsigmondy and Palmer System : In the United States, the symbolic system is more usually referred to as the Palmer notation system than as the Zsigmondy/Palmer notation system. The four quadrants of the dentition are represented using simple brackets in this system, which divides the arches into four sections as if you were facing the patient:



Is upper right

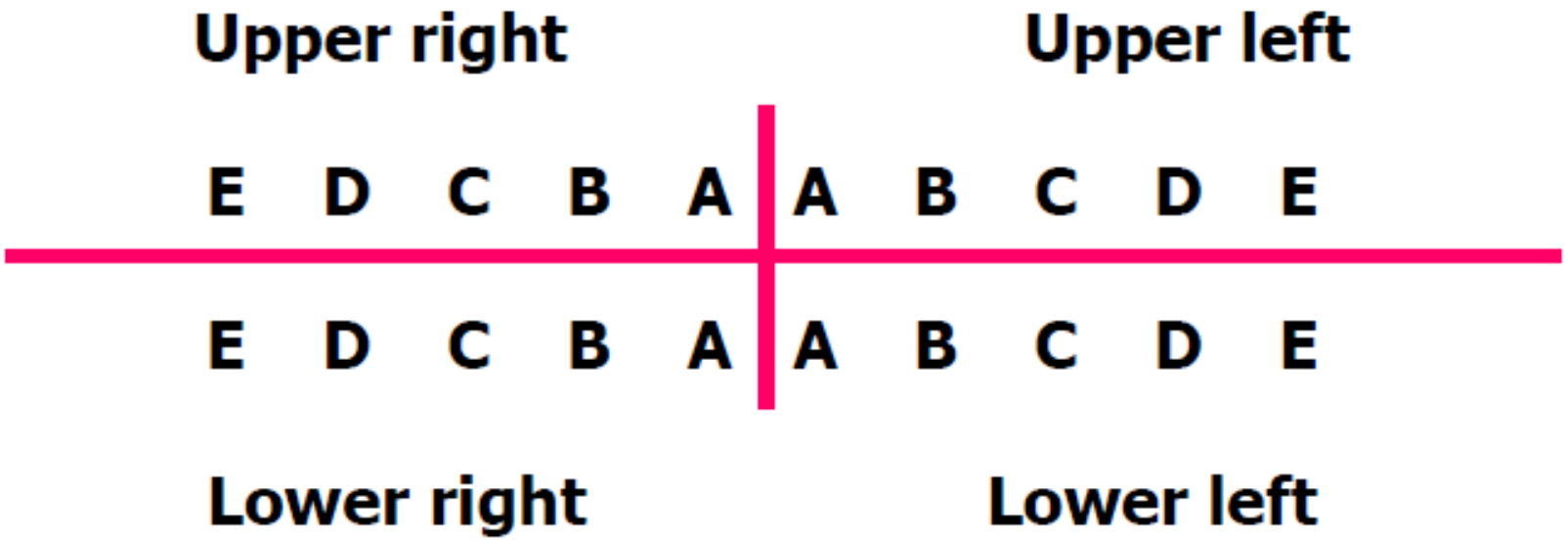
upper left

Zsigmondy/Palmer system:

Is lower right

Is lower left

In **deciduous** teeth letters of alphabet A through E represent the teeth in each quadrant beginning with central incisor. The palmer notation for the entire primary dentition is:

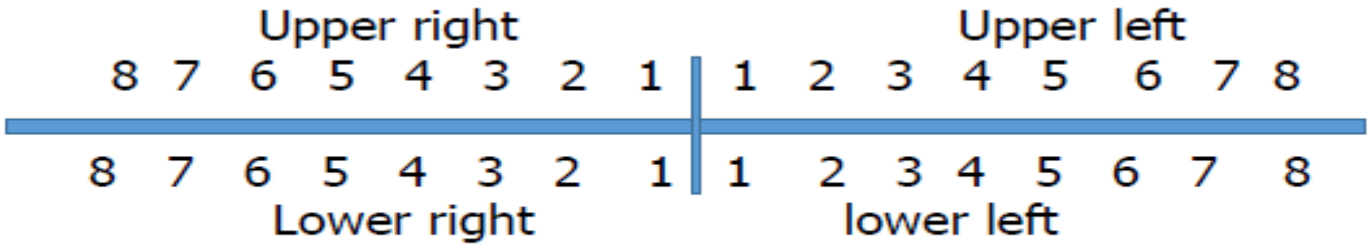


Thus, the designation for a single tooth, such as the maxillary right central incisor or the mandibular left central incisor, is $\underline{A|}$ $\overline{|A|}$

Give examples

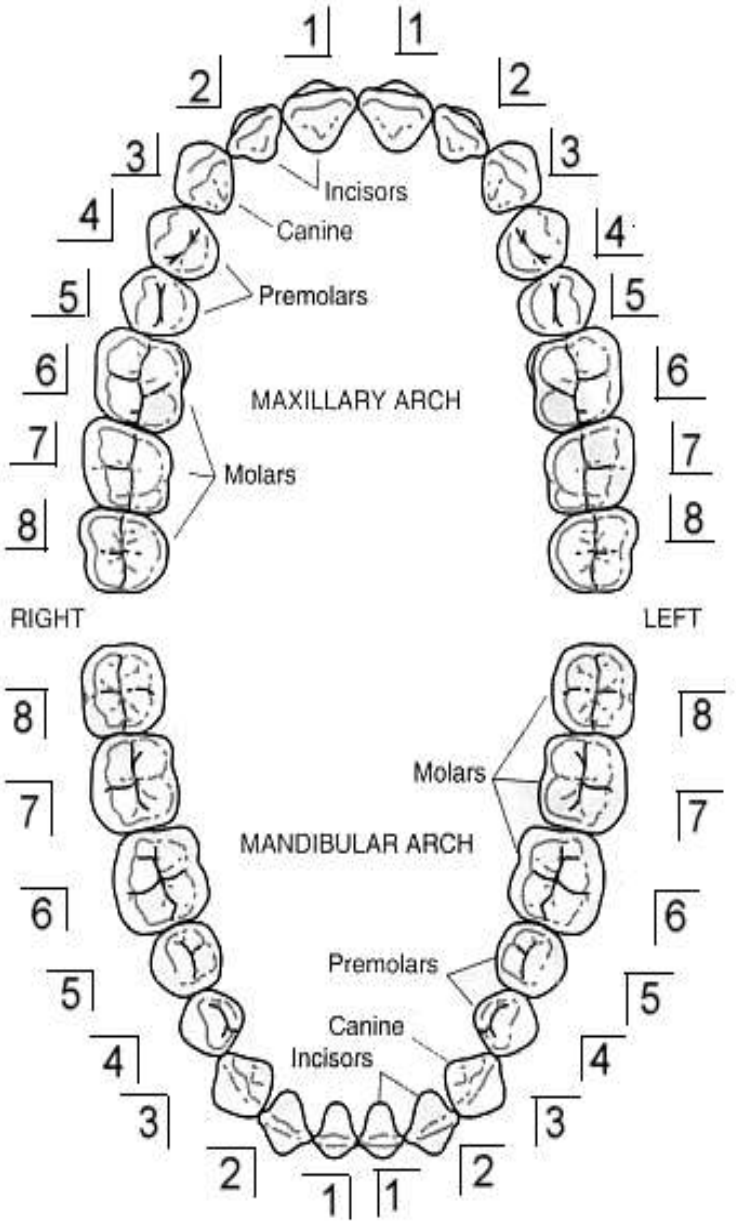
Permanent teeth:

Starting with the central incisor, the permanent teeth are numbered from 1 to 8 on either side of the midline. For the full permanent dentition, the palmer notation is:

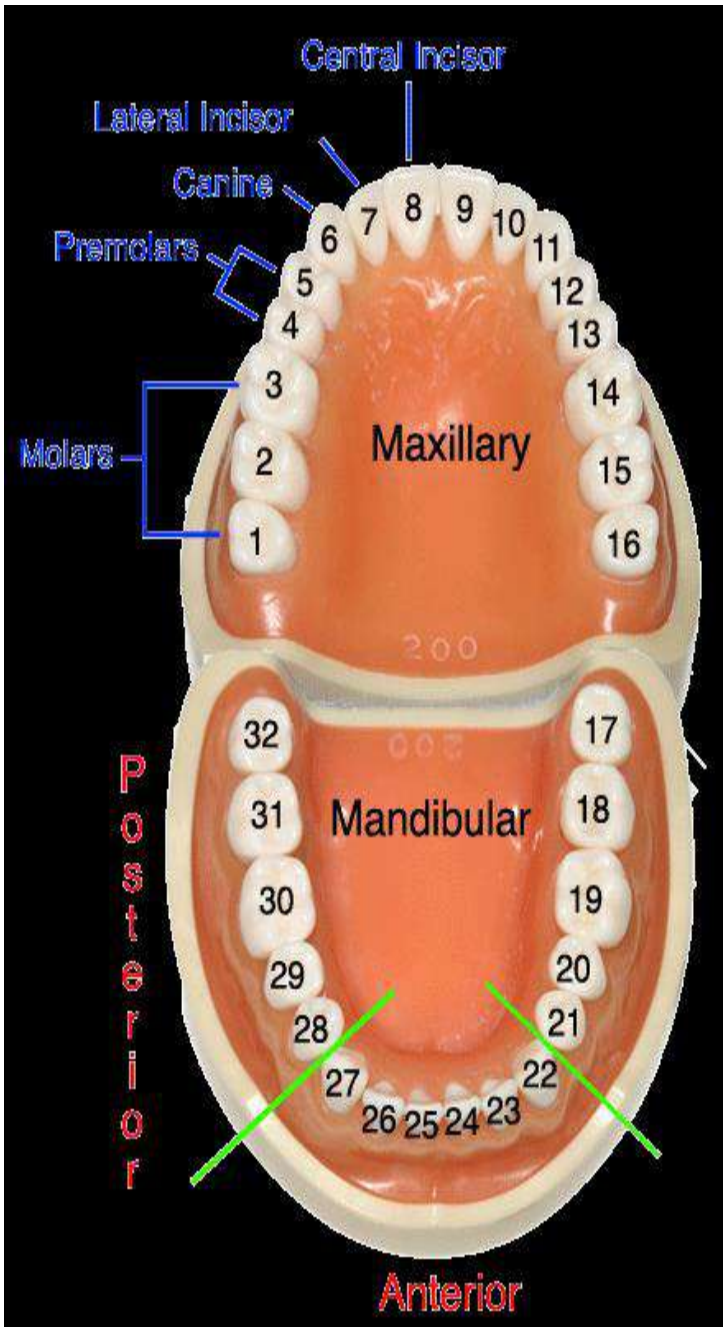


problems are associated with the symbolic notation system's keyboard notation.

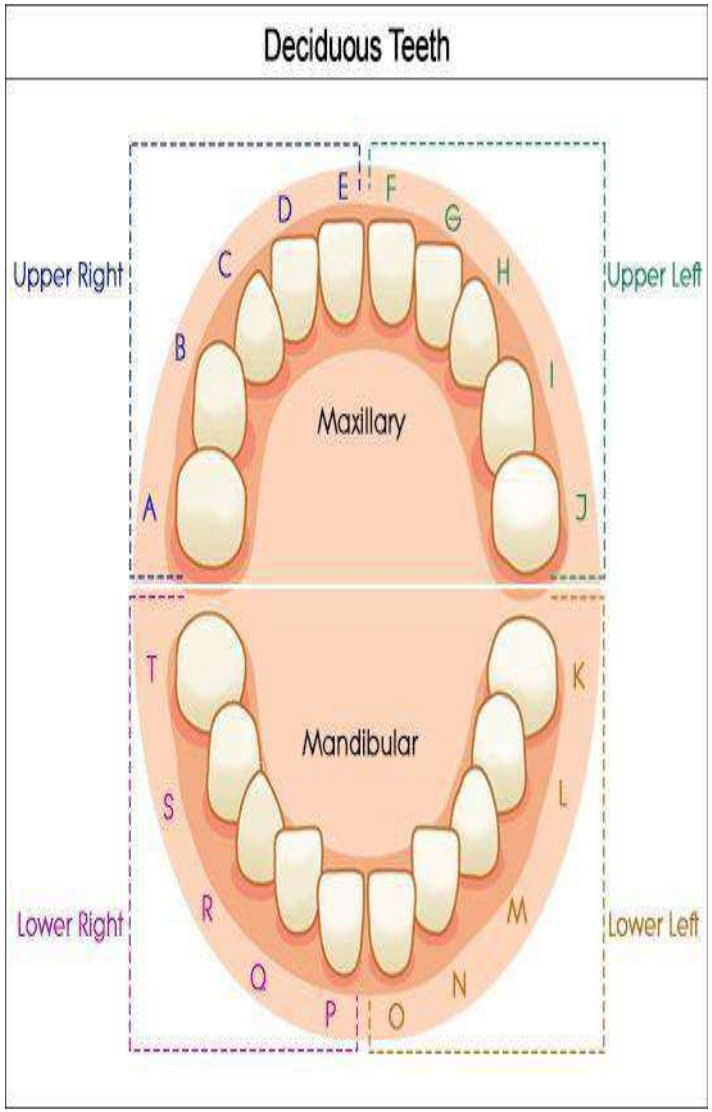
Give examples:



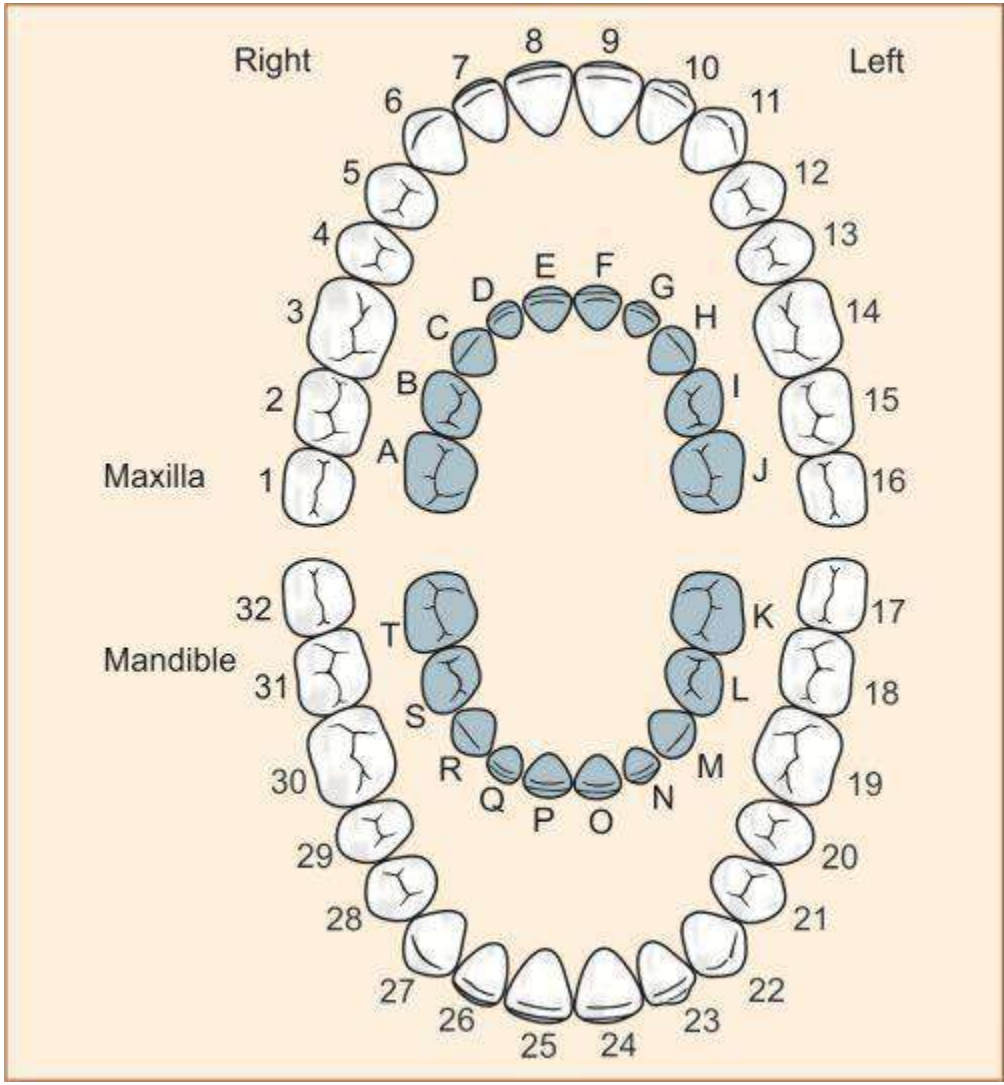
In the universal notation system for the permanent dentition, the maxillary teeth are numbered from 1 through16, beginning with the upper right third molar, for the lower arch beginning with the mandibular left third molar, the teeth are numbered 17 through 32. Thus, the right maxillary first molar is designated as 3, the maxillary left central incisor as 9, and the right mandibular first molar as 30. The following universal notation designates the entire permanent dentition.



Each of the primary teeth is represented by an uppercase letter in the standard notation for the primary dentition: for the maxillary teeth, letters A through J, starting with the right second molar. For the mandibular teeth, letters K through T, starting with the left mandibular second molar, and The entire primary dentition is represented by the following universal system notation:



Give examples:



The Palmer notation is typically incompatible with computers and word processing systems, whereas the universal system is amenable to computer language.

International System (Two Digit System)"FDI" Federation Dentaire International

The World Health Organization has accepted the Internationale (FDI) for both the primary and permanent dentitions. This system uses two numbers for each tooth, whether it is permanent or primary. The first number is always used to indicate the dentition, arch, and side. The second number is used to indicate the tooth, ranging from 1 to 8 for permanent teeth and 1 to 5 for deciduous teeth that erupt posteriorly from the midline.

The first number of the two numbers 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.

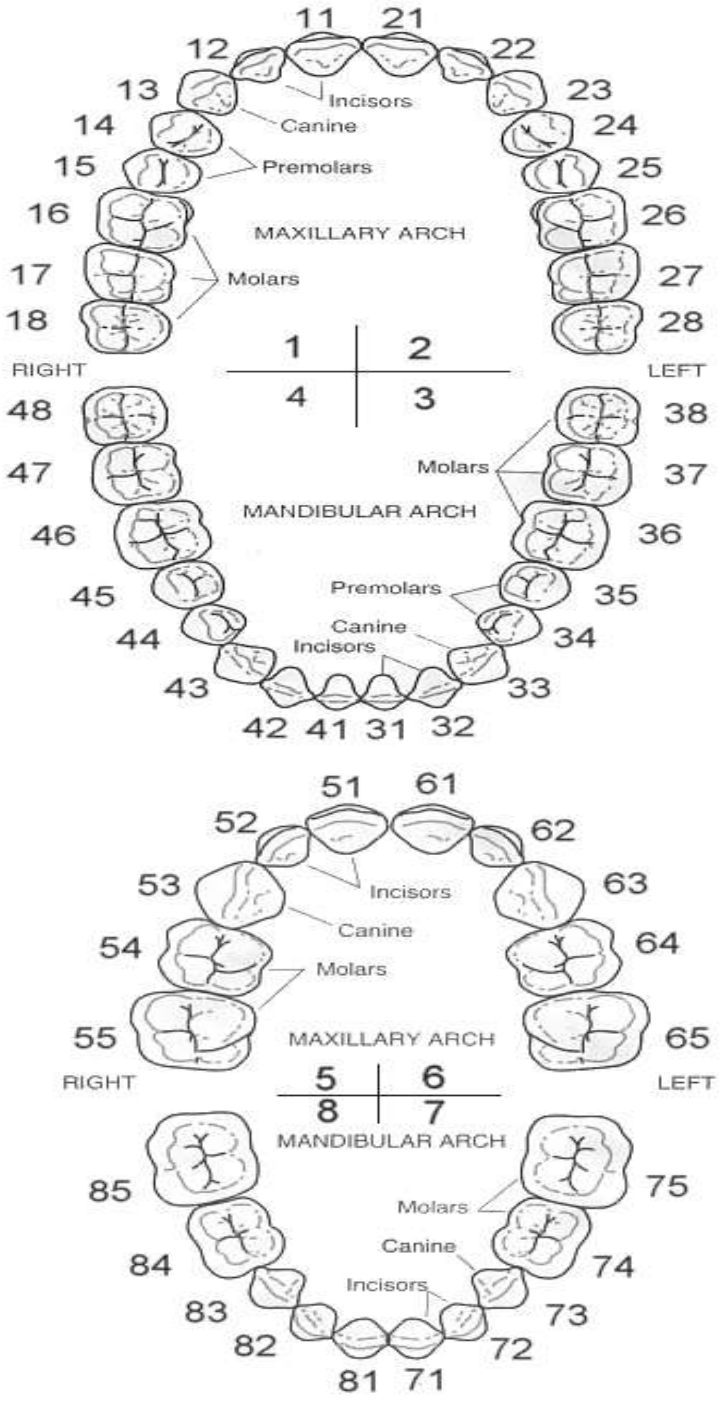
4: Permanent dentition, Mandibular, Right side.

5: Deciduous dentition, Maxillary, Right side.

6: Deciduous dentition, Maxillary,Left side.

7: Deciduous dentition, Mandibular, Left side.

8: Deciduous dentition, Mandibular,Right side.

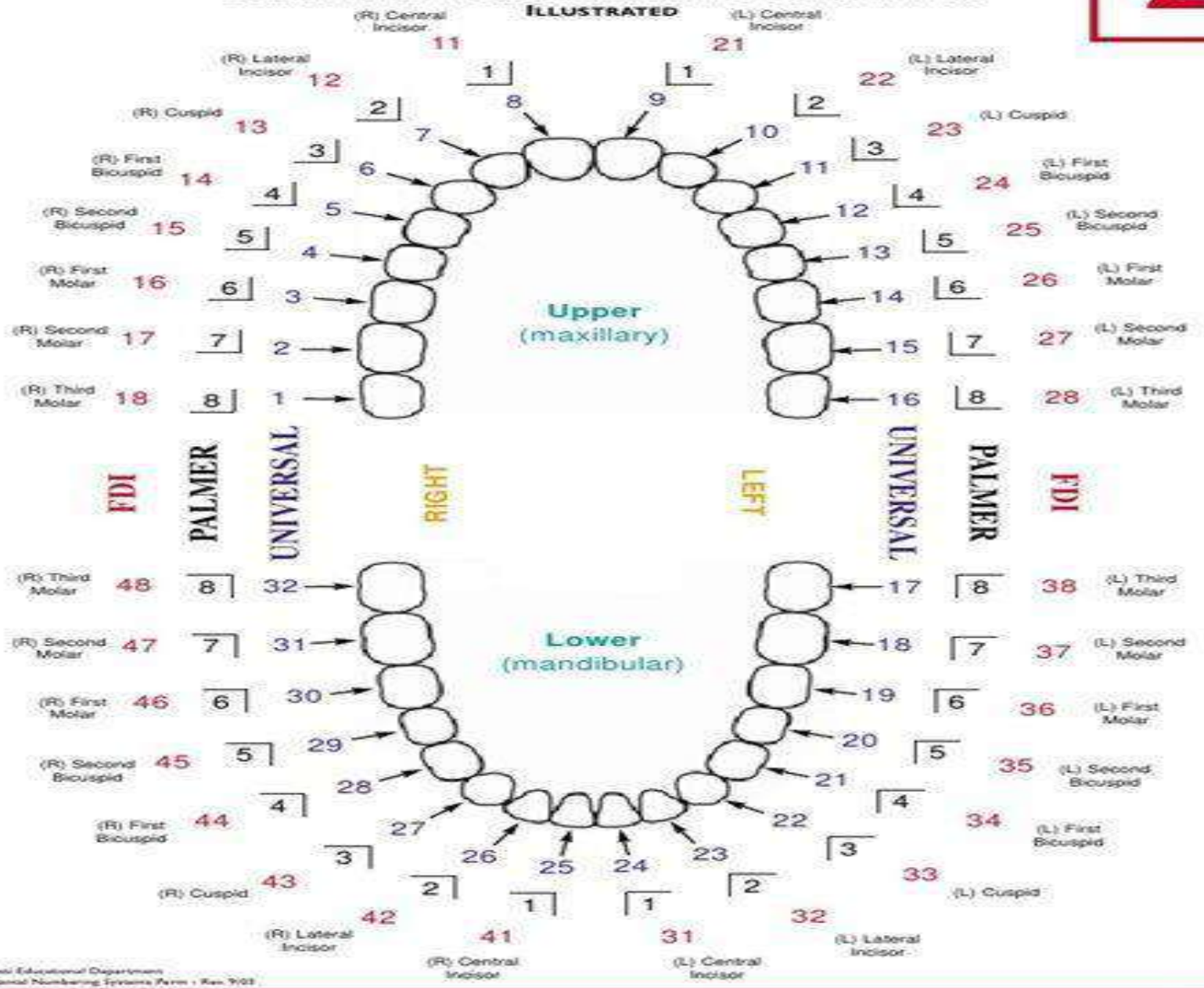


PERMANENT TEETH

DENTAL NUMBERING SYSTEMS

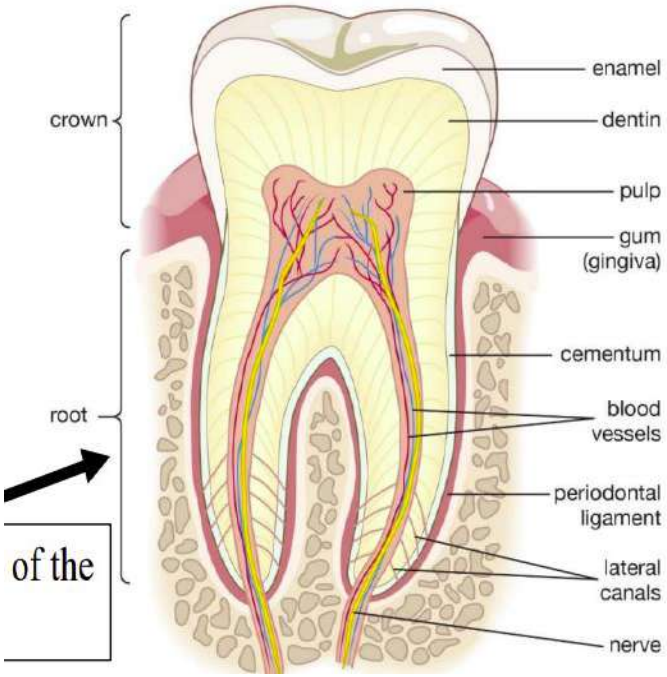
ILLUSTRATED

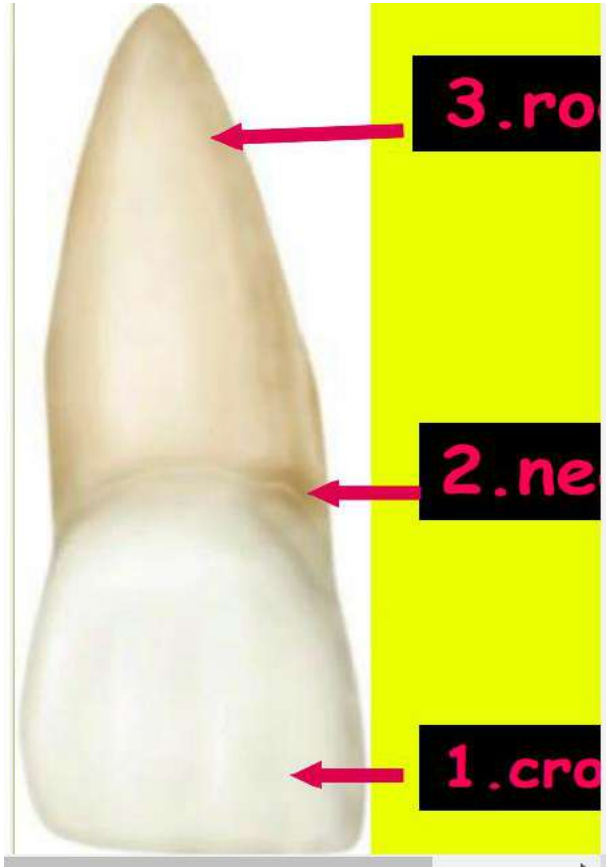
2



Joint Educational Department
Dental Numbering Systems Poster - Rev. 9/03

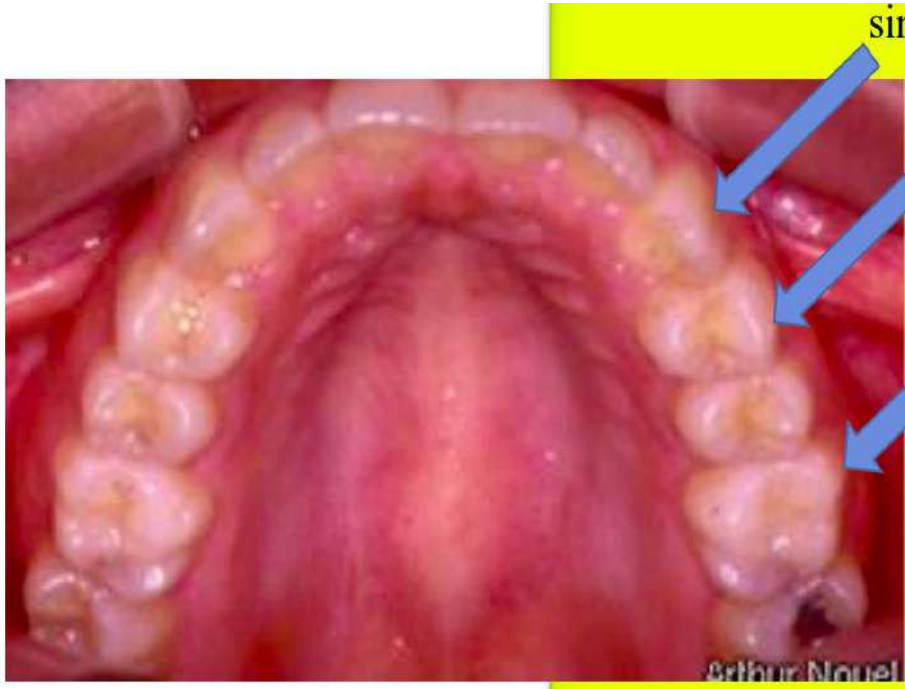
There is a crown and a root on every tooth. The root portion is covered with cementum, while the crown is enamel-coated. At the cementoenamel junction (CEJ). On a single tooth, this junction also known as the cervical line—is highly noticeable. Dentin, which is visible in the tooth's cross section, makes up the majority of the tooth's mass.



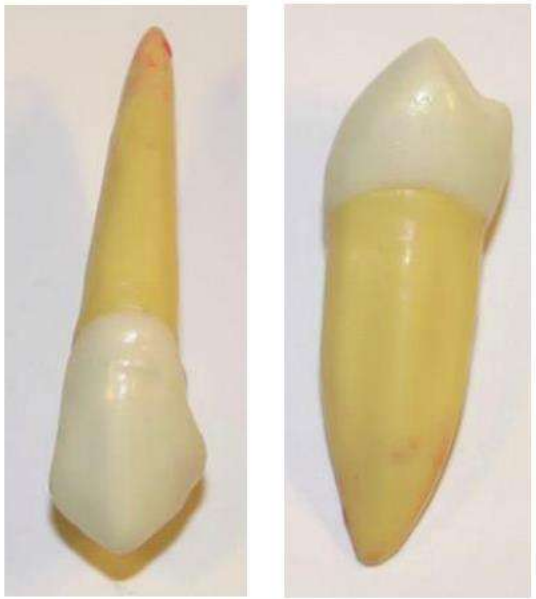


The tooth's tissues enamel, cementum, dentin, and pulp are the four tooth tissues. The first three are referred to as hard tissues, whereas the final is referred to as soft tissue. The pulp tissue provides the tooth with blood and nerve supplies. Enamel is the body's hardest tissue.

An incisor tooth's crown have an incisal ridge or edge, as in central and lateral incisors; a single cusp, as in canines; or two or more cusps, as in premolars and molars. The cutting surfaces of tooth crowns are formed by incisal ridges and cusps.



The root portion of the tooth can be single, with one apex or terminal end, as seen in anterior teeth and some premolars, or multiple, with a bifurcation or trifurcation dividing the root portion into two or more extensions or roots, each with its own apex or terminal end, as seen in all molars and some premolars.



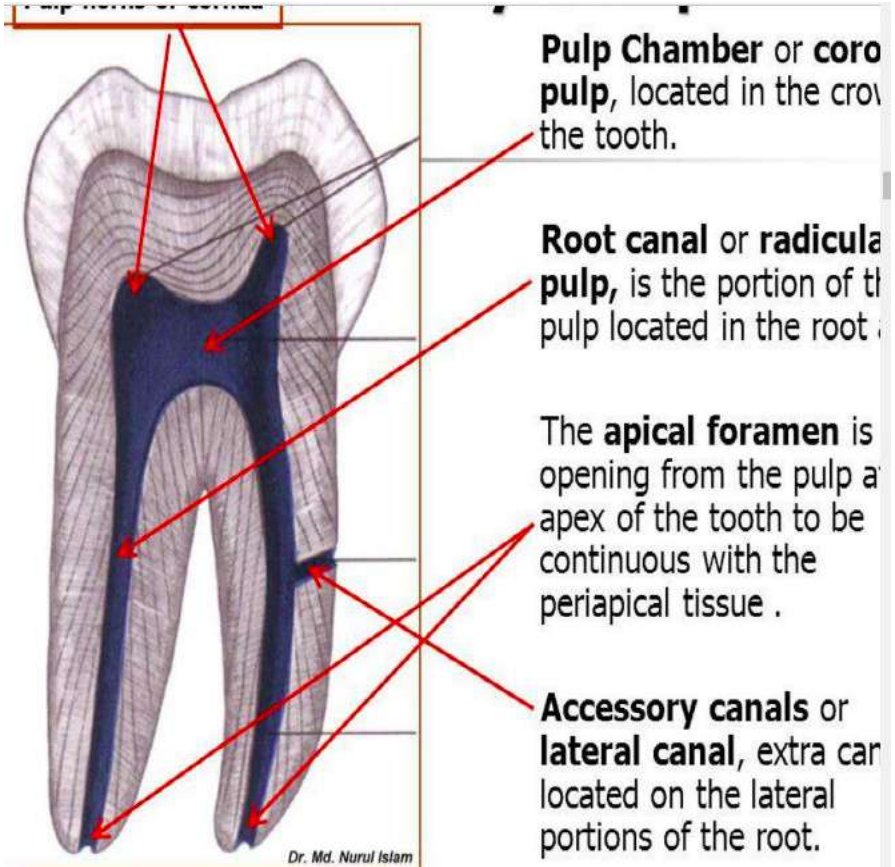
Single-rooted

Multi-rooted

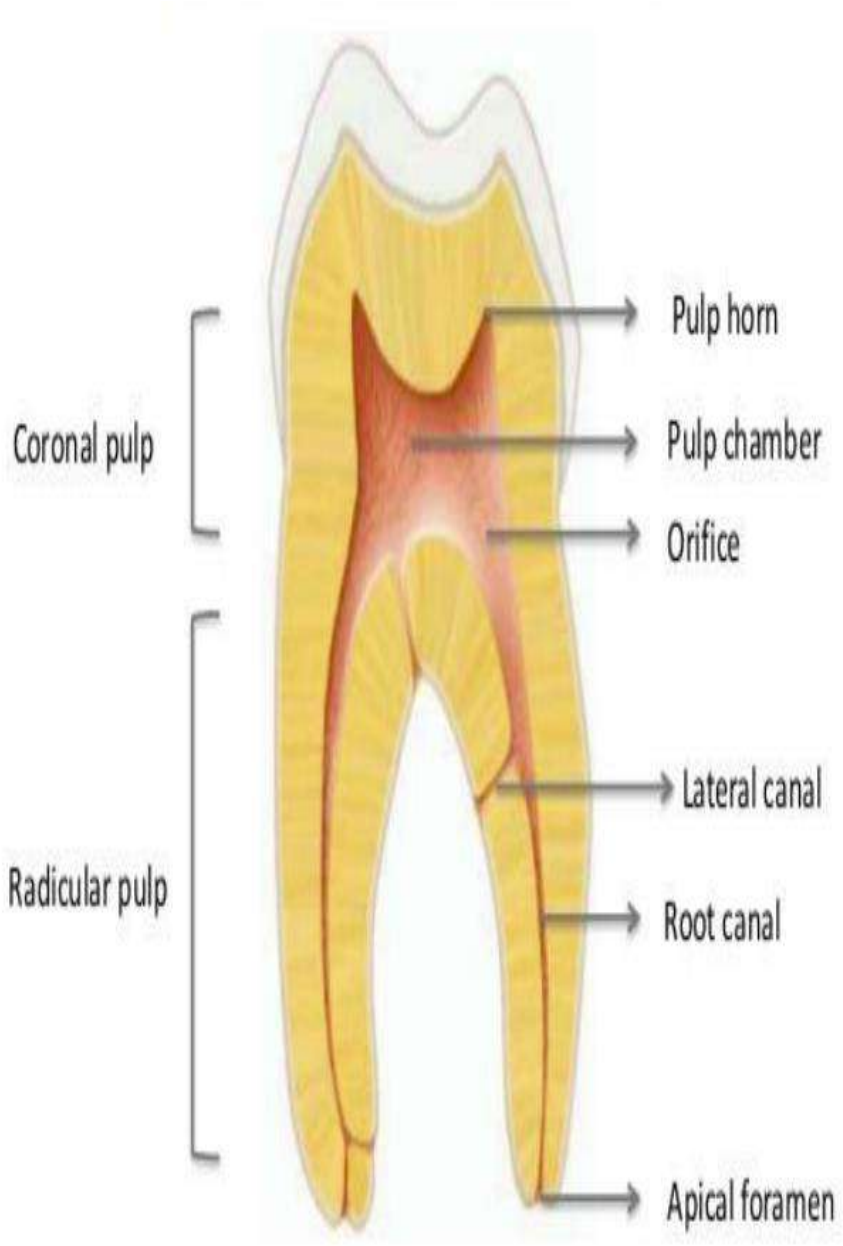
The root portion of the tooth is securely attached in the bony process of the jaw, so that each tooth in the dental arch is retained in its place relative to the others. The alveolar process refers to the region of the jaw that serves as support for the tooth. The alveolus is the bone in the tooth socket (plural, alveoli).

After it has fully erupted, the crown section is never covered by bone tissue, but it is partially covered at the cervical third in young people by soft tissue of the mouth called as gingiva or gingival tissue, or "gums."

A pulp chamber and a pulp canal are seen in the cross section of the tooth, which ordinarily contain the pulp tissue. The pulp chamber is mostly located in the crown, whereas the pulp canal is located in the root. The spaces are continuous and are referred to collectively as the pulp cavity.



1-Coronal pulp:
-Pulp chamber
-Pulp horns
2-Radicular pulp:
-Root canal
-Apical foramen



SURFACES AND RIDGES

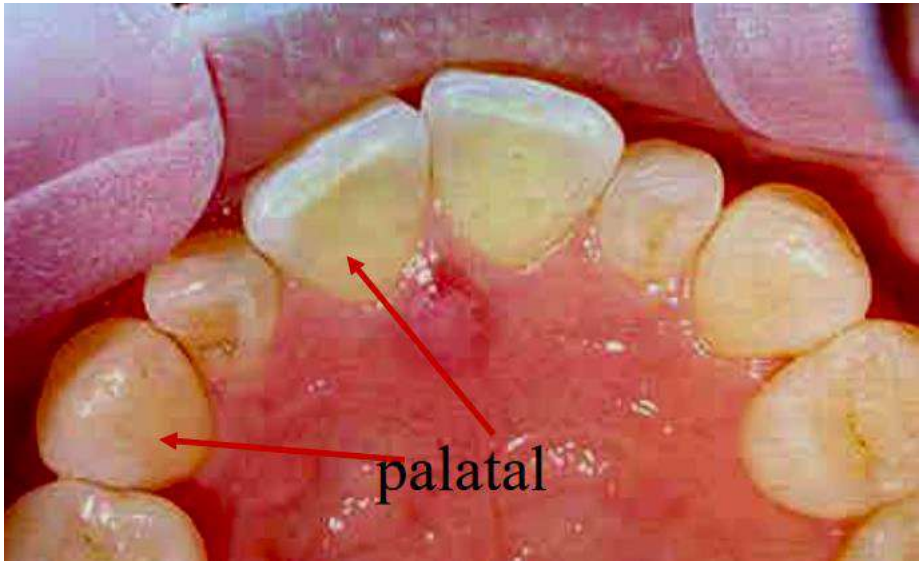
The crowns of the incisors and canines have four surfaces and a ridge, and the crowns of the premolars and molars have five surfaces. The surfaces are named according to their positions and uses .

Facial – lingual – mesial – distal and functioning surface (incisal or occlusal)

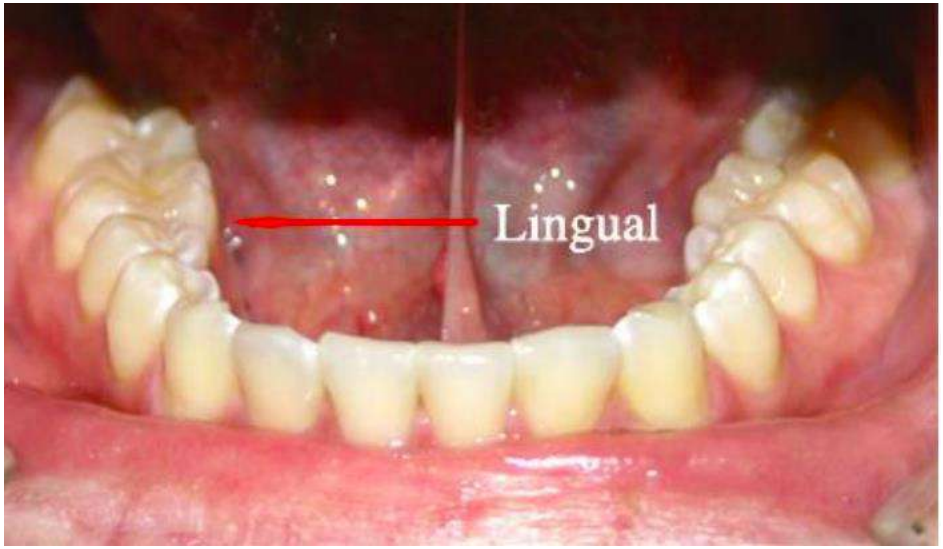
FACIAL SURFACE :

Any surface on the outside (towards the face) In the incisors and canines, the surfaces toward the lips are called labial surfaces; in the premolars and molars, those facing the cheek are the buccal surfaces. When labial and buccal surfaces are spoken of collectively, they are called facial surfaces.

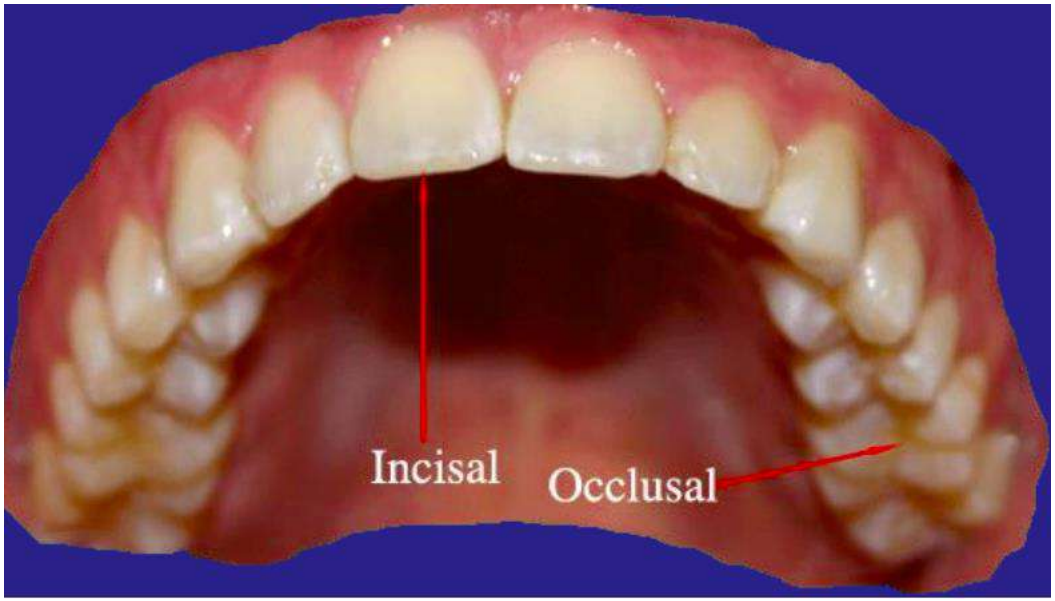
PALATAL surface
Any surface facing the palate.



LINGUAL surface
All surfaces facing toward the tongue are called lingual surfaces.



Functioning Surfaces: chewing/biting surfaces of teeth
The surfaces of the premolars and molars that come in contact (occlusion) with those in the opposite jaw during the act of closure are called occlusal surfaces.
In the anterior teeth those surfaces are called incisal surface with respect to incisors and canines.



Inter-proximal surfaces

The surfaces of the teeth facing toward adjoining teeth in the same dental arch are called proximal surfaces. The proximal surfaces may be called either mesial or distal according to the midline.

The area of the mesial or distal surface of a tooth that touches its neighbor in the arch is called the contact area.

Functions of Teeth

Mastication

teeth are designed to perform this function.

Incisors

Chisel like

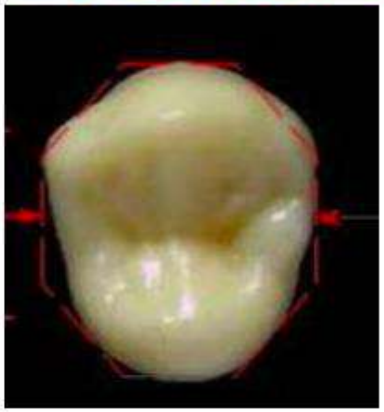
Cutting or incising

Canine

Wedge like

Cutting and tearing

Premolars



At least two projections (cusps). Tearing and grinding

Molars

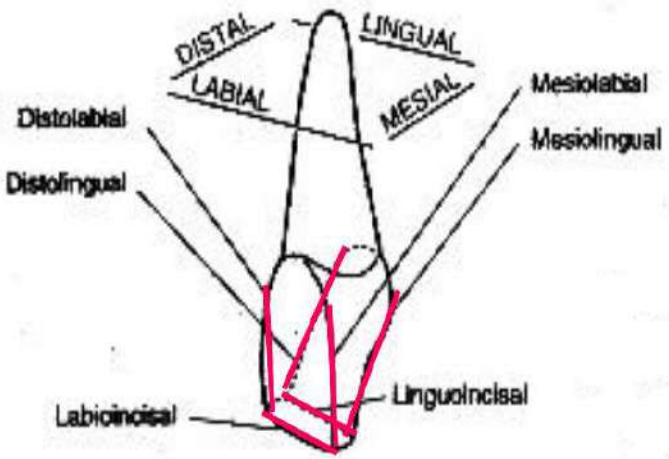
Multiple projections (cusps) Grinding

Line and Point Angles

Line angle: It is formed by the junction of two surfaces and its name is derived from both surfaces.

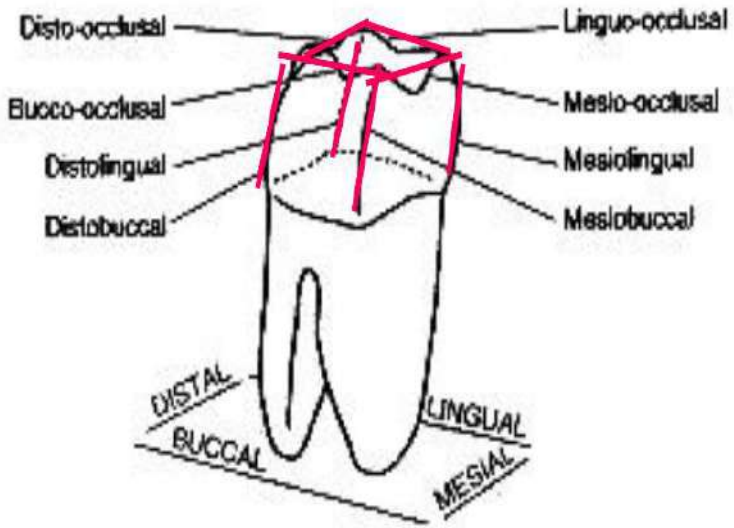
Line Angles of Anterior Teeth

6 line angles

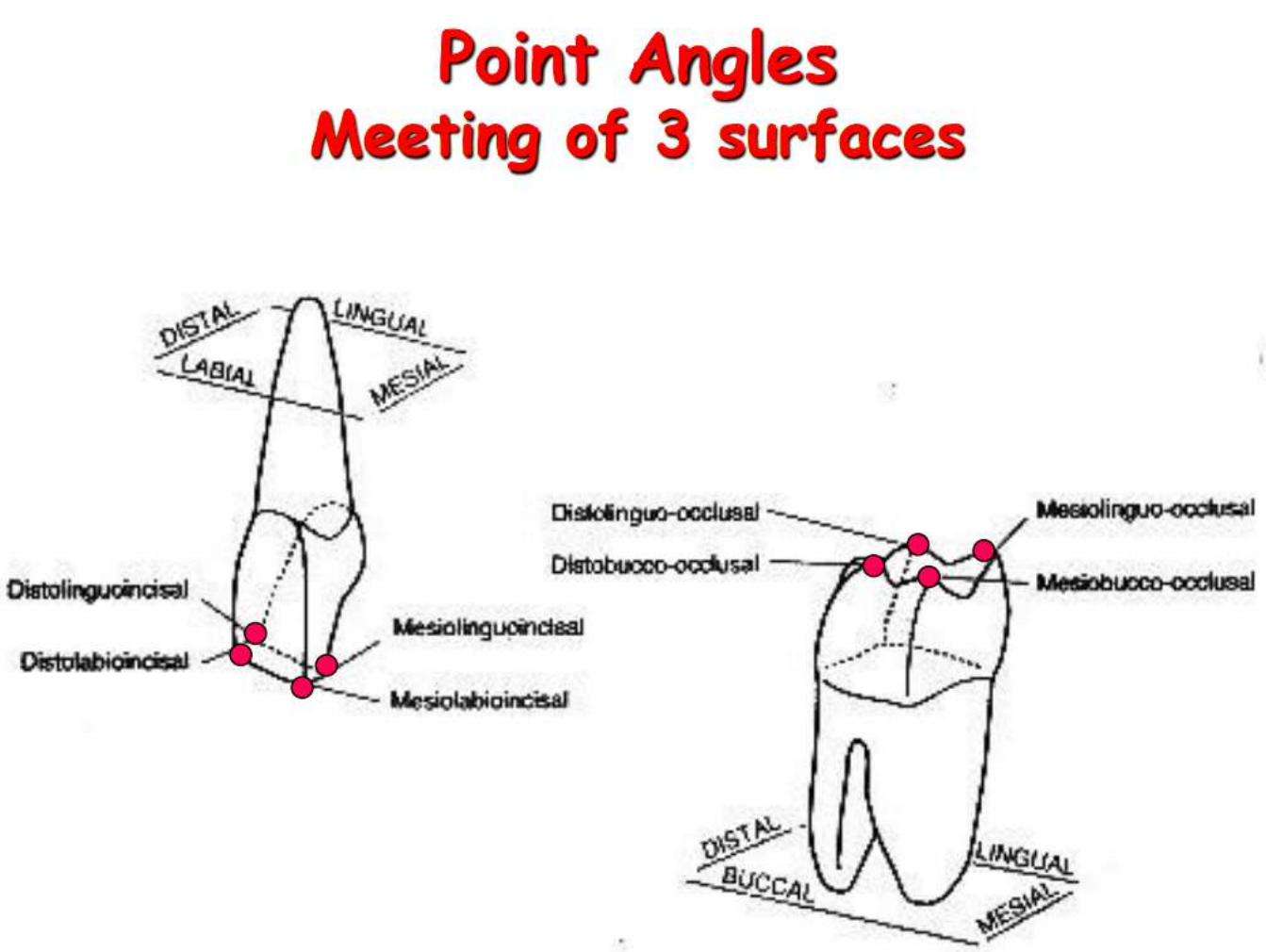


Line Angles of Posterior Teeth

8 line angles

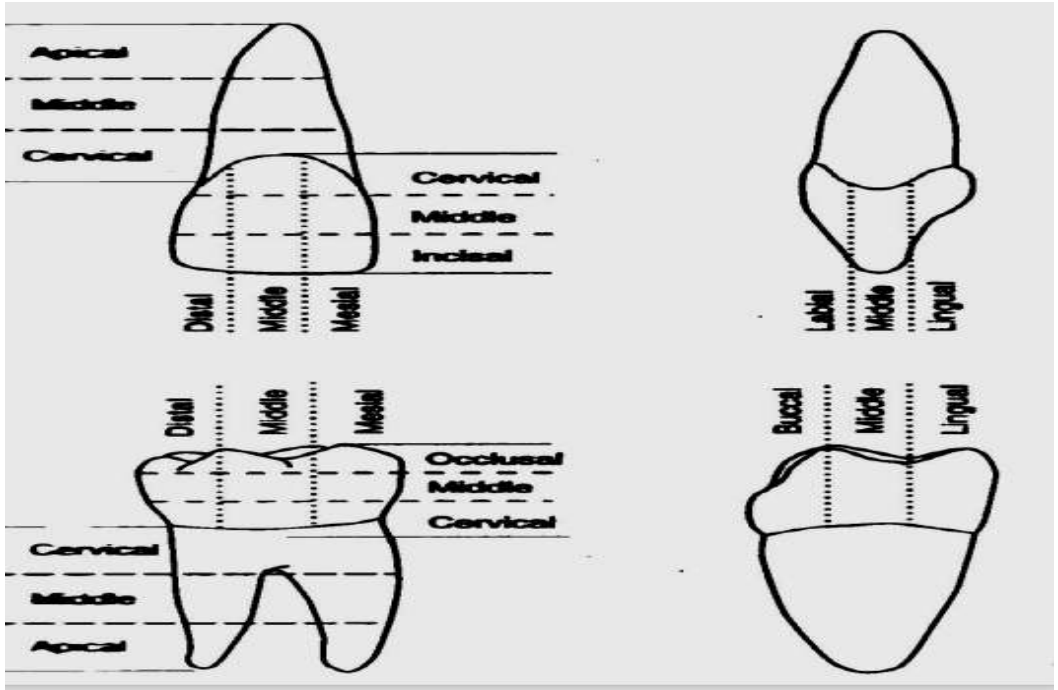


Point angle: It is formed by the junction of three surfaces and its name is derived from these surfaces.



Dividision into thirds.

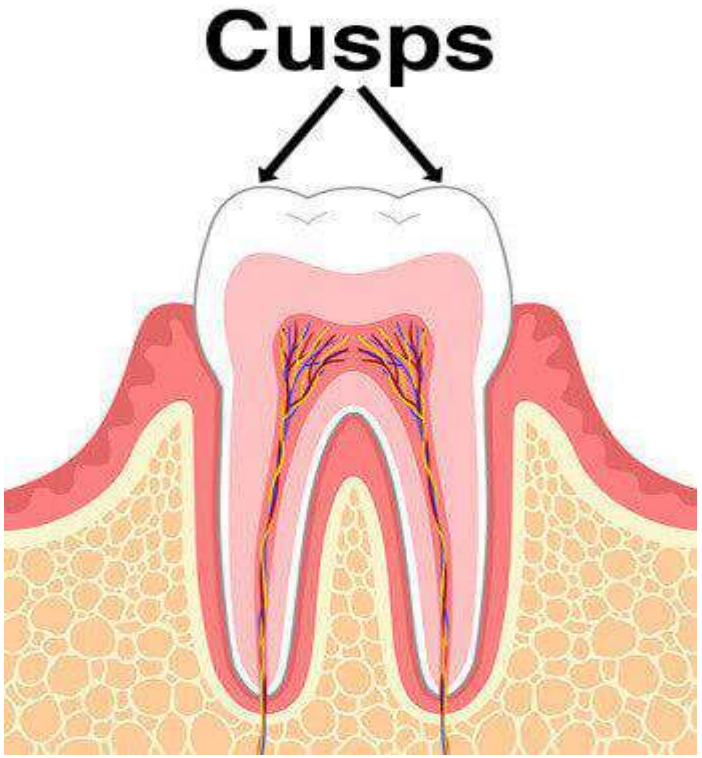
The crowns and roots of teeth have been separated into thirds for the sake of description. When the crown and root surfaces are separated into thirds, the thirds are called according to their position. When seen from the labial or buccal side, the crown and root can be split into thirds from the incisal or occlusal surface of the crown to the apex of the root. The crown is split into three sections: the incisal or occlusal third, the middle third, and the cervical third. The root is split into three sections: the cervical third, the middle third, and the apical third. Horizontally there are mesial, middle
And distal surfaces.

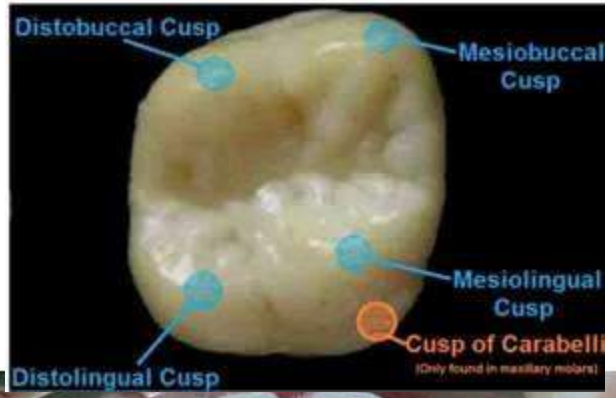


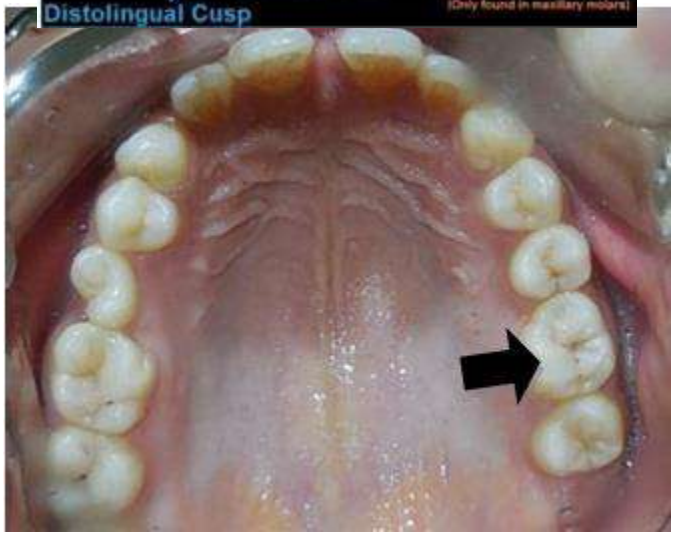
ANATOMICAL LANDMARKS OF THE TEETH

A. Crown elevation

1. Cusp : is an elevation or hill on the crown portion of a tooth making up a divisional part of the occlusal surface.





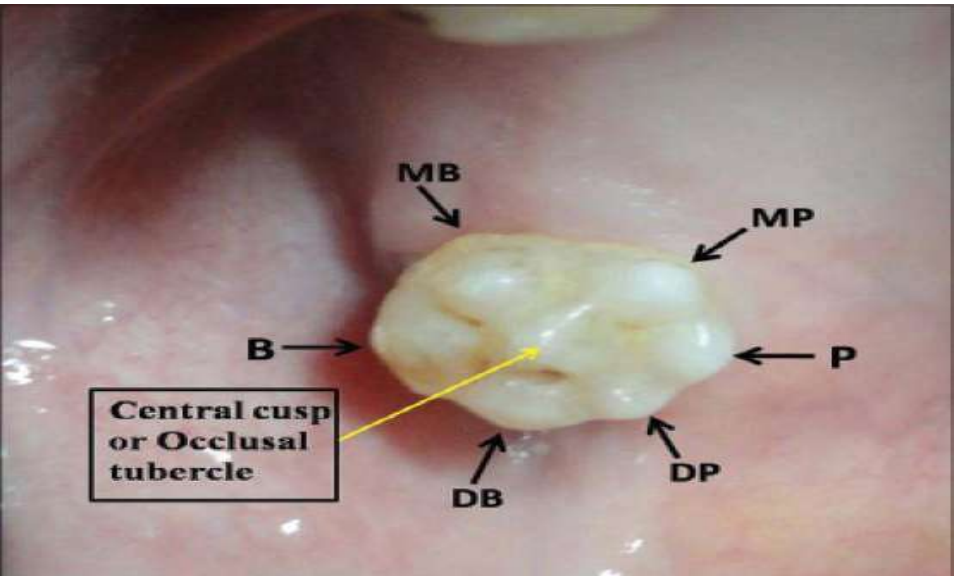


2. Tubercle: is a smaller elevation on some portion of the crown produced by an extra formation of enamel.

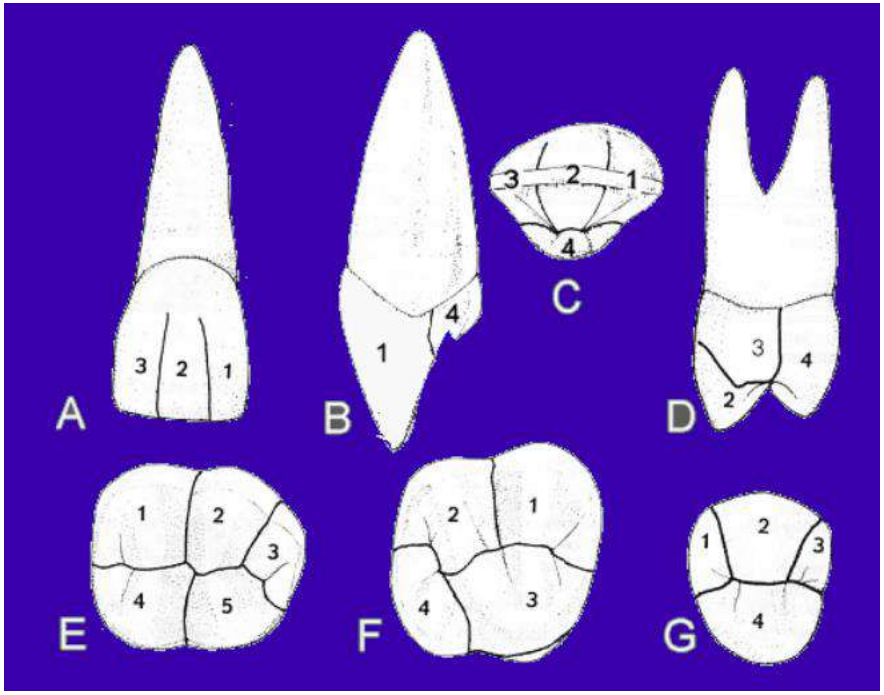
Tubercle is noticed at :

- the palatal surface of E & 6
- sometimes at the lingual surface of incisors over the cingulum.

N.B. Tubercle differs from cusp , it is formed of enamel only while cusp is formed of pulp horn covered by dentin and enamel.

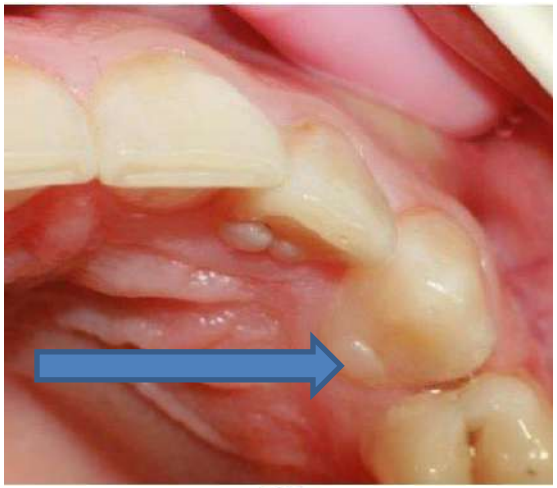


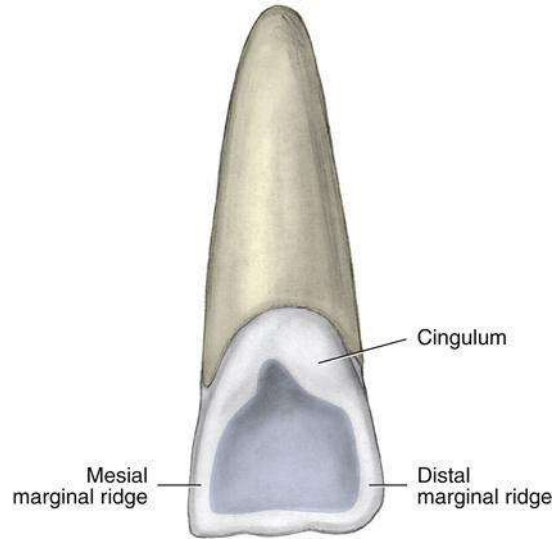
3.Lobe: This is one of the key sites of calcification and expansion during crown formation. Each tooth develops from four or more lobes. These lobes are represented by pulp horns in the chamber.

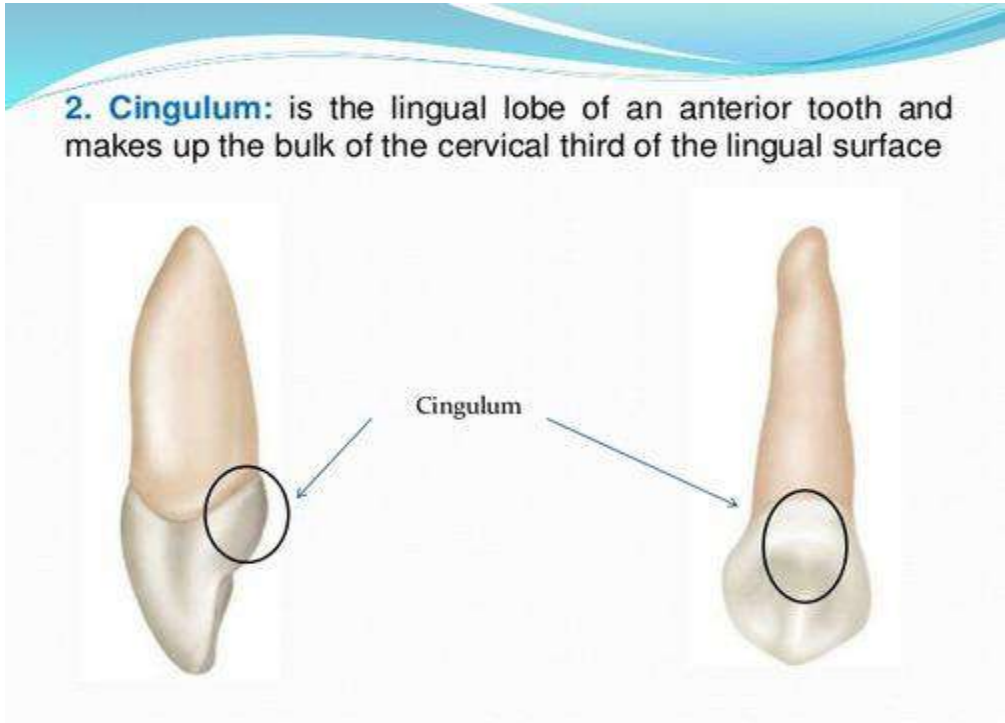


4. Mamelons: is any one of the three rounded protuberances found on the incisal ridges of newly erupted incisor teeth.

5. Cingulum: a (Latin word for “girdle”) is the lingual lobe of an anterior tooth. It makes up the bulk of the cervical third of the lingual surface.

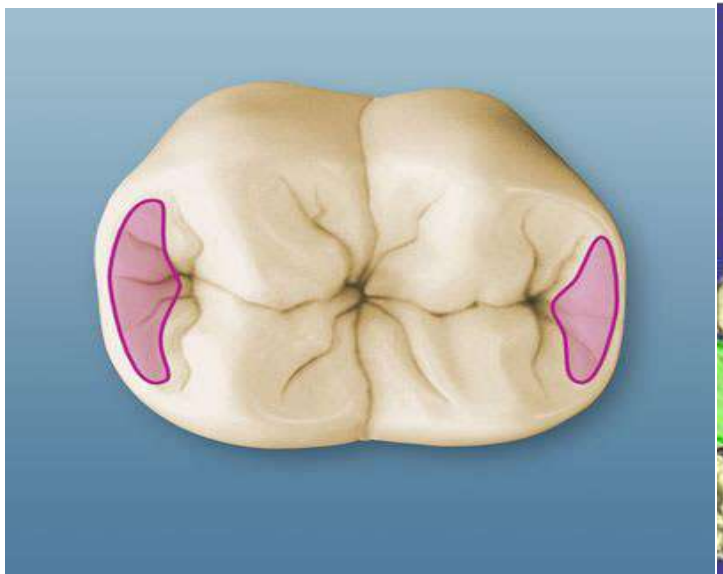


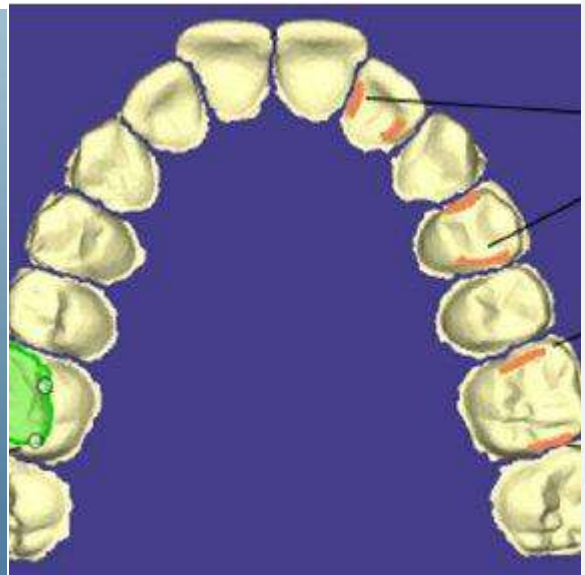


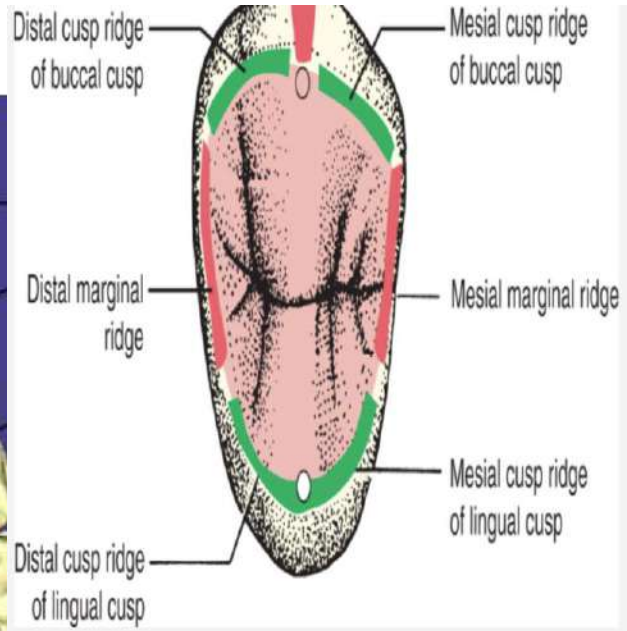


6. Ridge: is any linear elevation on the surface of a tooth and is named according to its location (e.g., buccal ridge, incisal ridge, marginal ridge).

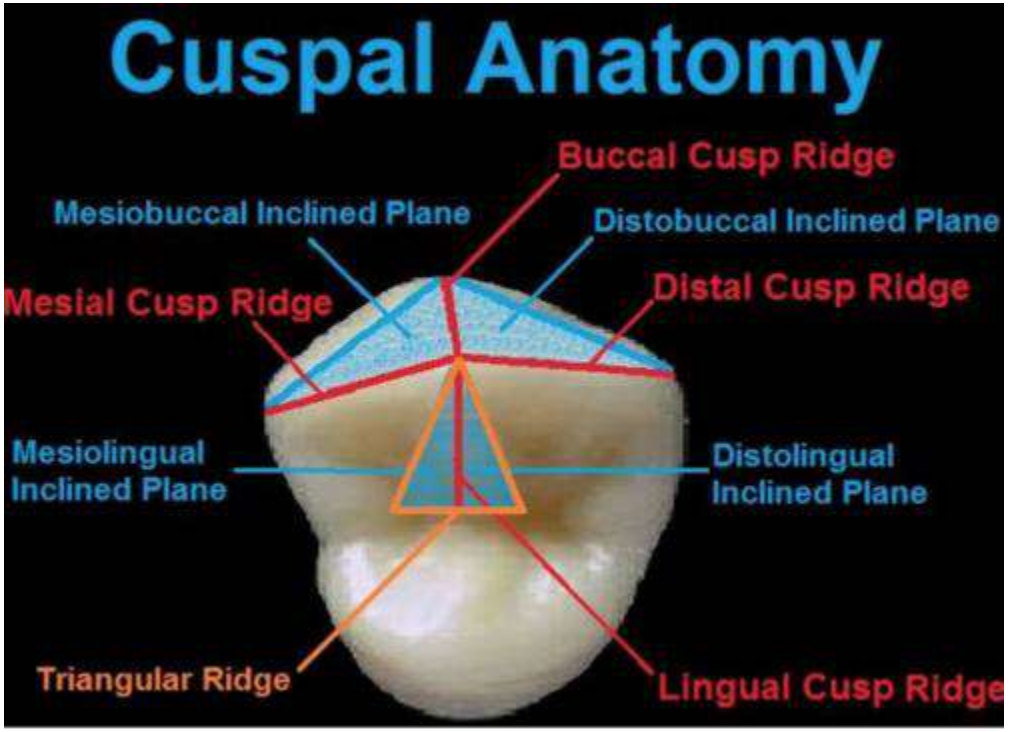
Marginal ridge: Marginal ridges are those rounded borders of the enamel that form the mesial and distal margins of the occlusal surfaces of premolars and molars and the mesial and distal margins of the lingual surfaces of the incisors and canines.





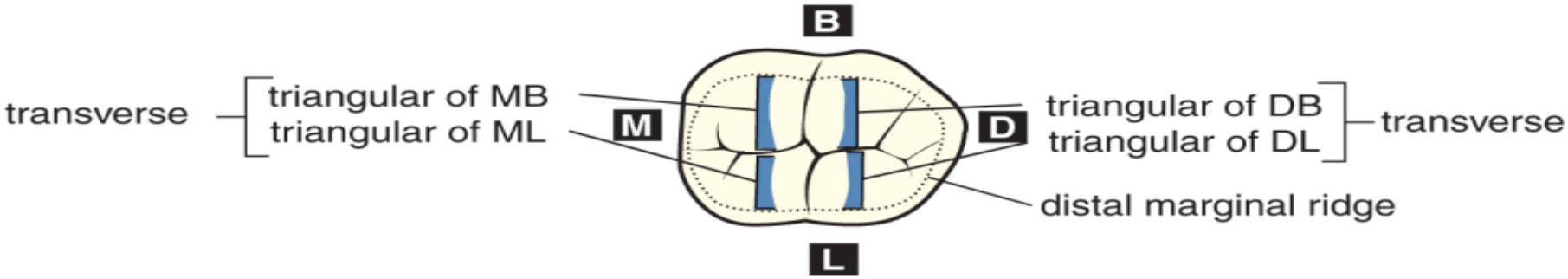


B. Triangular ridge: descend from the tips of the cusps of molars and premolars toward the central part of the occlusal surfaces. They are so named because the slopes of each side of the ridge are inclined to resemble two sides of a triangle. . They are named after the cusps to which they belong, for example, the triangular ridge of the buccal cusp of the maxillary first premolar.

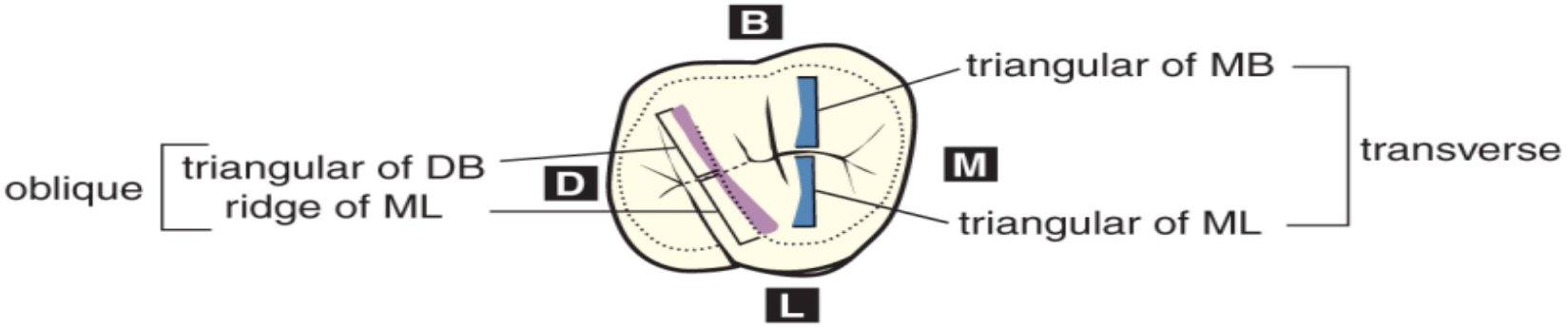


C. Transverse Ridge: is the union of two triangular ridges crossing transversely the surface of a posterior tooth.

D. Oblique ridge: is a ridge crossing obliquely the occlusal surfaces of maxillary molars



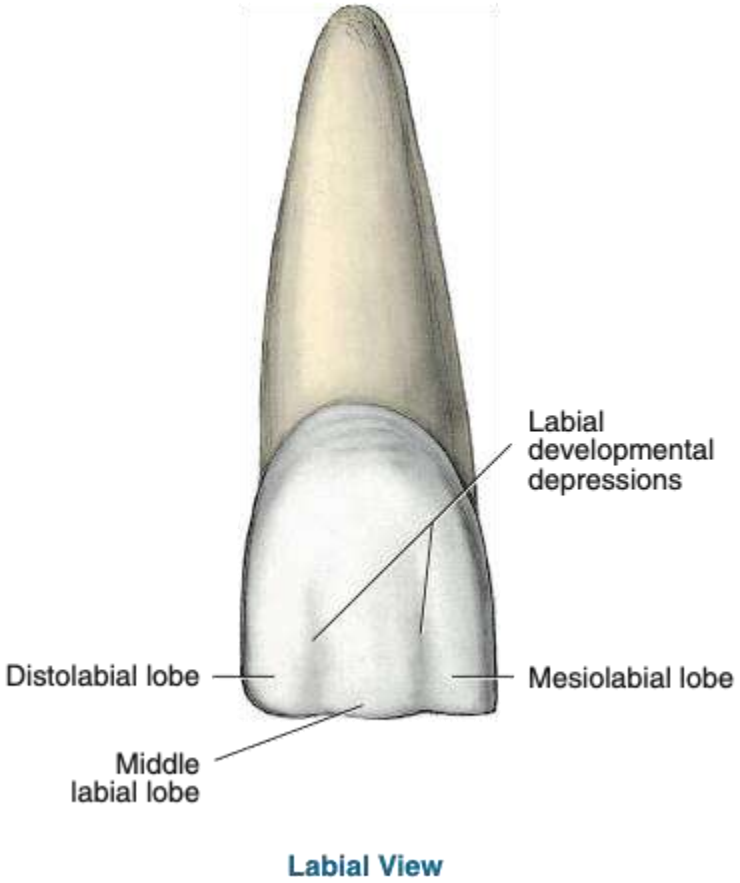
Mandibular molar



Maxillary molar

E. Linear ridge: Any elevated areas of teeth run in a line name after their location

- Labial
- Incisal
- Cervical
- Lingual
- Buccal

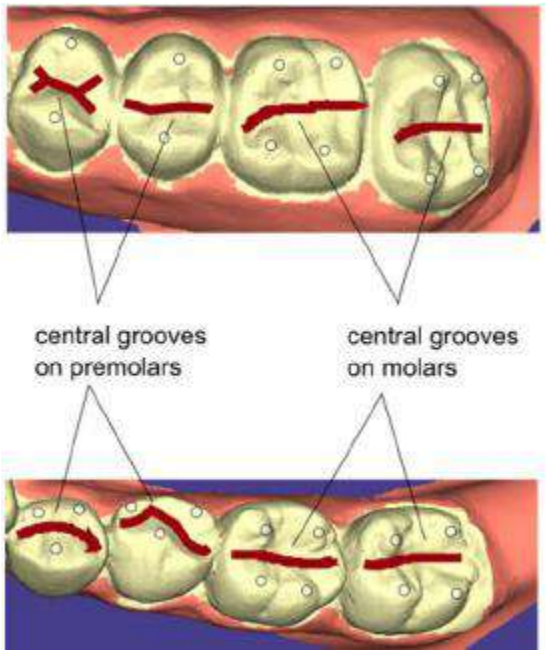


B-Crown Depressions: Linear Depressions

1-Developmental grooves: Shallow grooves that separate cusps or primary parts of teeth.

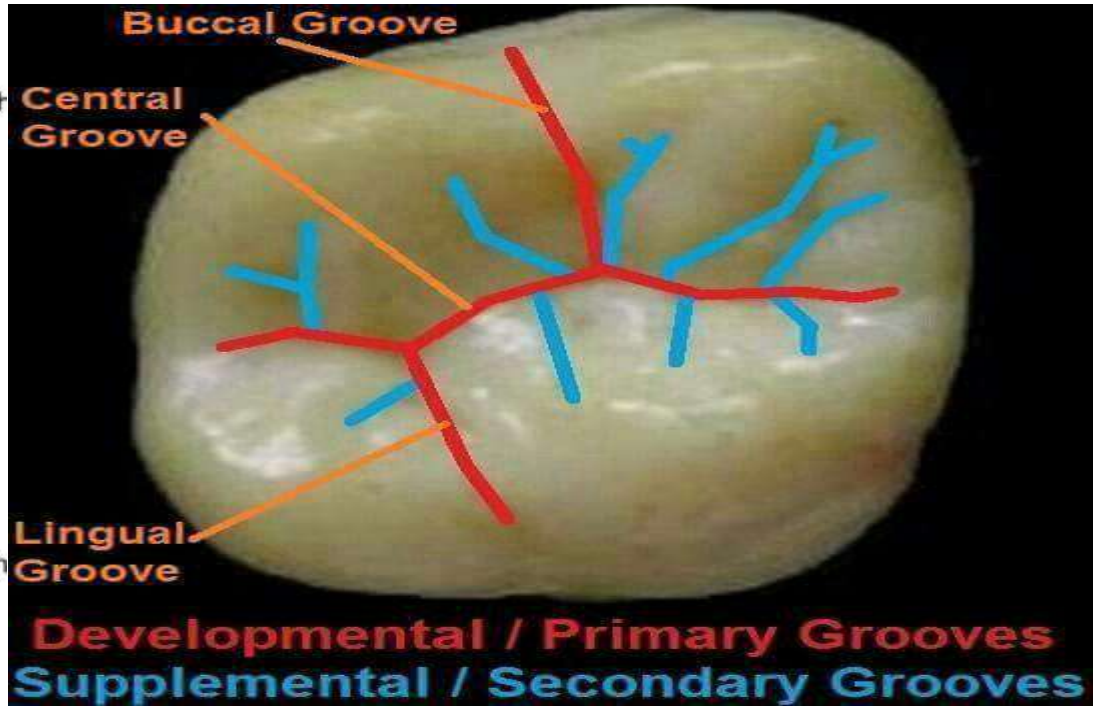
2- Supplemental Grooves: Small , irregularly placed auxiliary grooves. Branches from developmental grooves.

The third molars followed by second permanent molars are characterized by high number of supplemental grooves.

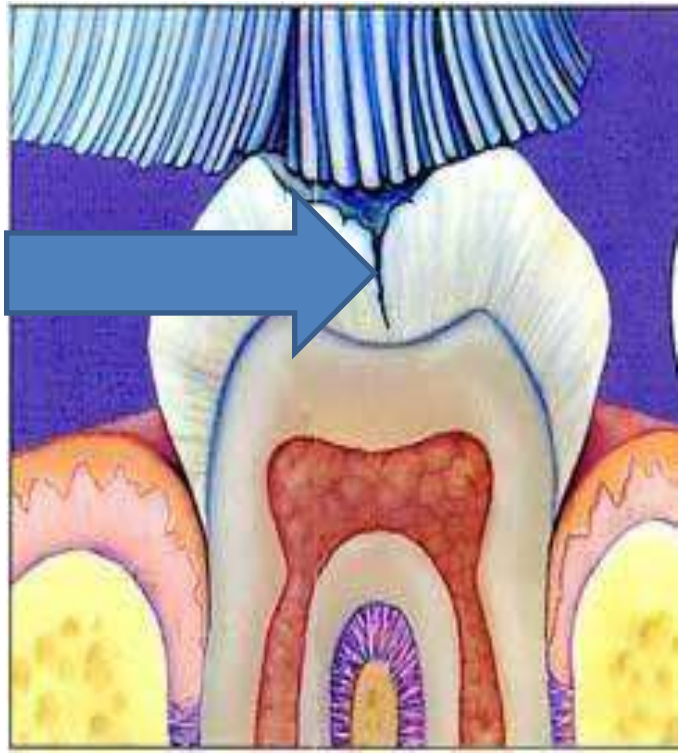


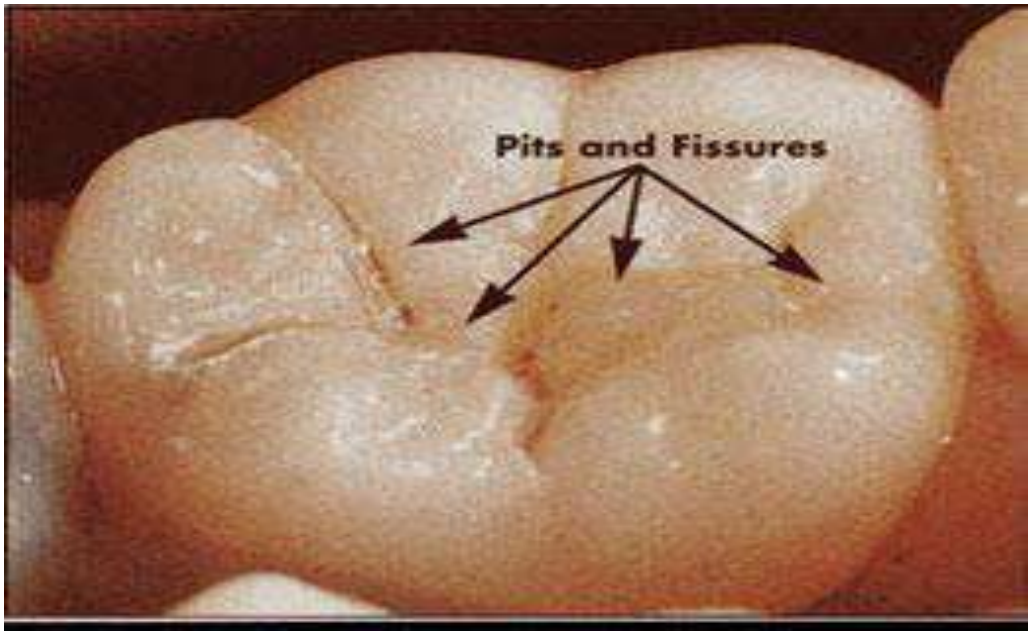
(a) Upper arch

(b) Lower arch



3- Fissures: Found in the bottom of developmental grooves. Result from incomplete union of the primary lobes. Represent a fault in enamel. (deepest portion of the developmental grooves).





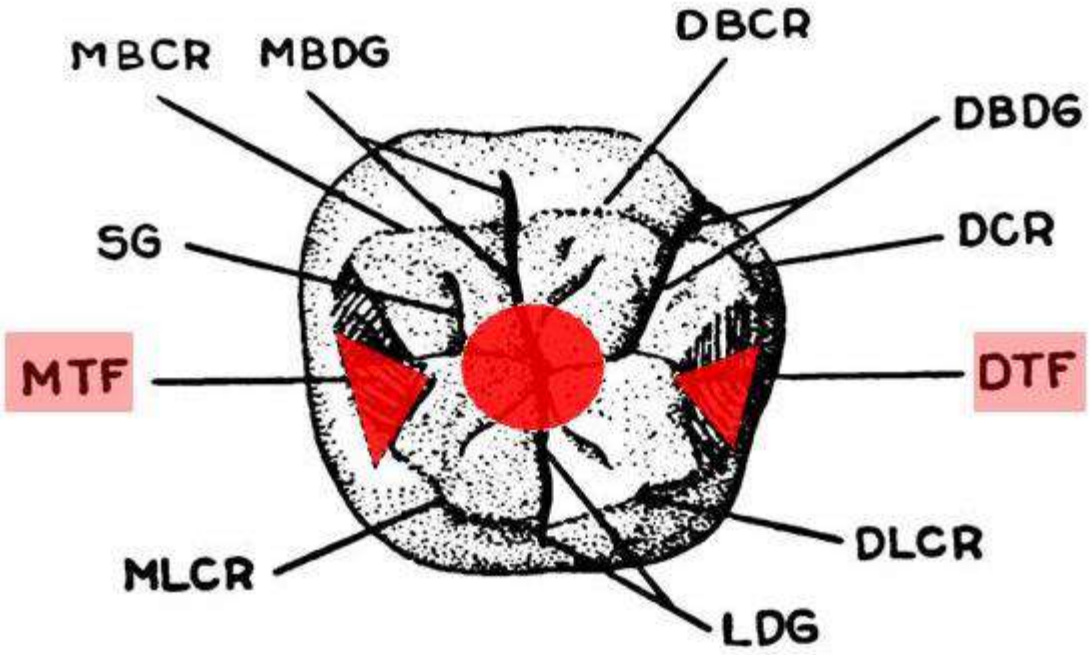
Irregular Depressions

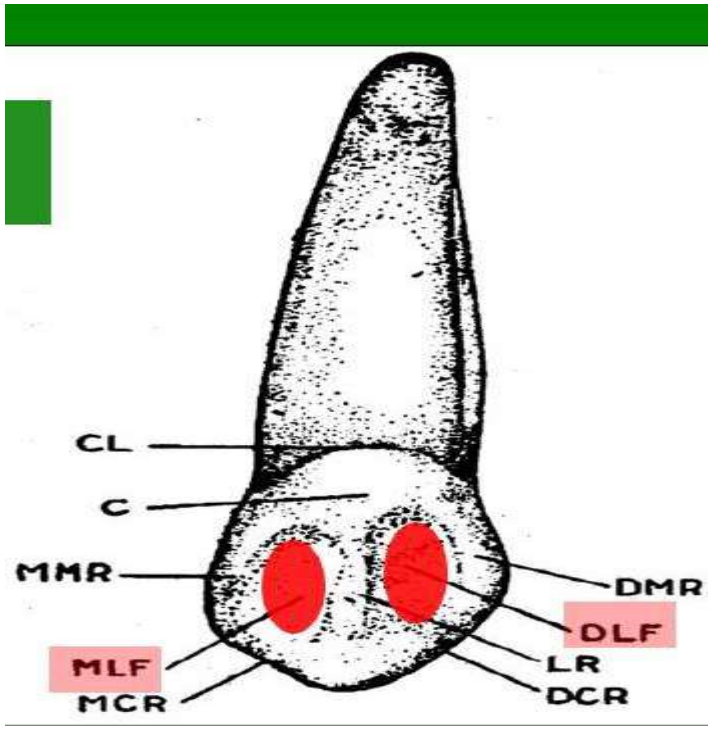
1-Fossa: Any irregular depression or concavity and it can be named according to its location.

A. Lingual fossae: are on the lingual surface of incisors

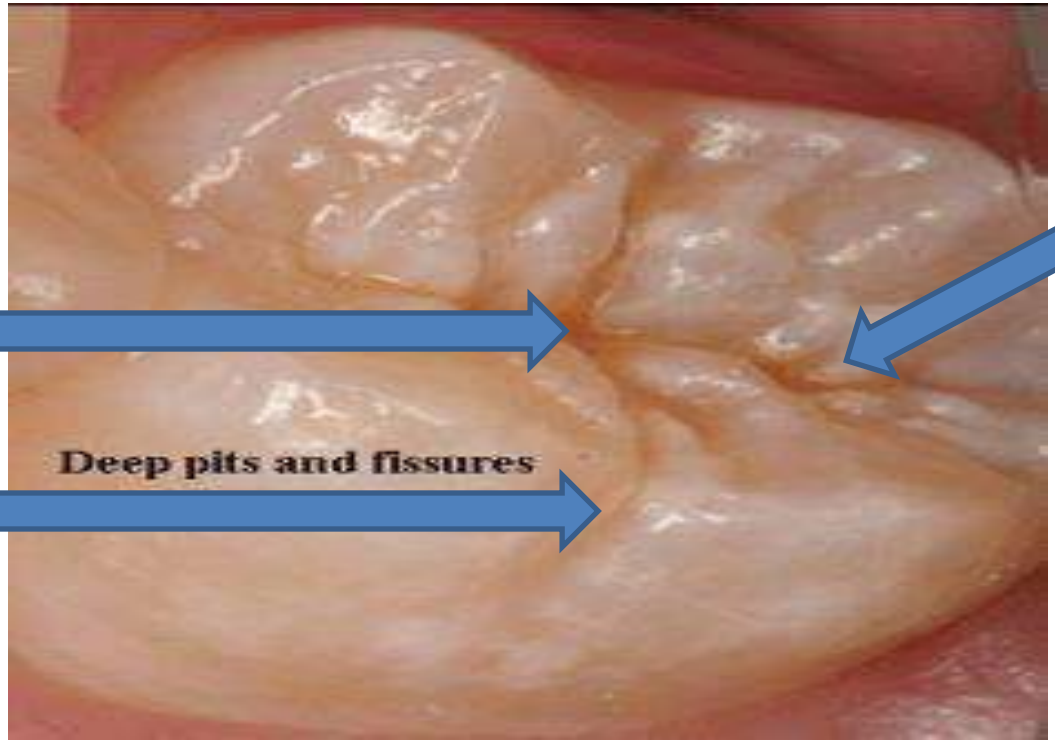
B. Central fossae : are on the occlusal surface of molars.

C. Triangular fossae : are found on molars and premolars on the occlusal surfaces mesial or distal to marginal ridges.





2-PITS: are small pinpoint HERE depressions located at the junction of developmental grooves or at terminals of those grooves. For instance, central pit is a term used to describe a landmark in the central fossa of molars where developmental grooves join. Pits are developed as a result of incomplete formation of enamel. 1.central pit 2.lingual pit 3.buccal pit



Central fossa

lingual fossa

triangular fossa

CUSP OF CARABELLI

- It is accessory lingual cusp located on the mesio palatal cusp of maxillary second deciduous molars and first, second and third permanent molars
- It may be unilateral or bilateral, with marked deviation in size.
- In some cases, accessory cusp is seen occasionally on mandibular permanent or deciduous molar

Maxillary Anterior Teeth

The PERMANENT Maxillary Incisors

The maxillary incisors are four in number. The maxillary central incisors are centered in the maxilla, one on either side of the median line, with the mesial surface of each in contact with the mesial surface of the other. The right and left maxillary lateral incisors are distal to the central incisors.

The maxillary central incisor is bigger than the lateral incisor. These teeth act in synchrony and are physically identical. The incisors are cutting teeth. Their primary role is to chop food particles during the mastication process. These teeth have incisal edges rather than cusps like the canines and posterior teeth.

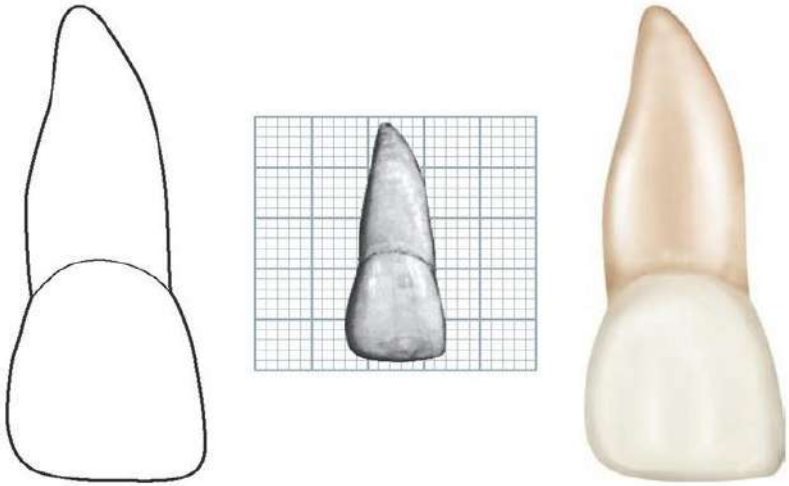
Incisor

Eruption: 7 to 8 years
Root completed: 10 years

The maxillary central incisor has the greatest mesiodistally width of any anterior tooth. The incisal borders of this tooth exhibit three rounded characteristics termed mamelons when it is just erupted into the mouth. Mamelons fade away over time when the enamel wears away due to friction.

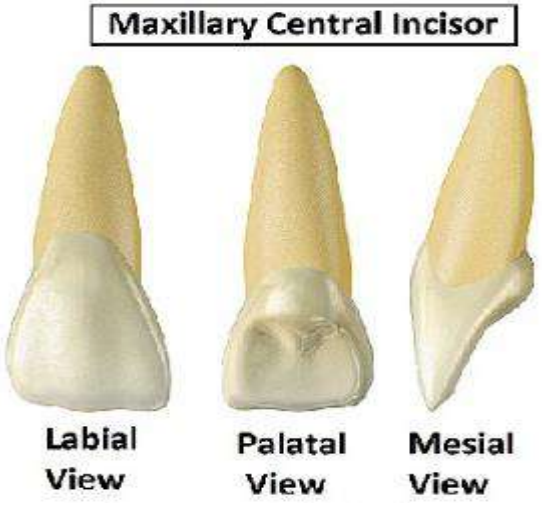
Labial Aspect:

1. it is less convex than the maxillary lateral incisor or canine, which gives the central incisor a square or rectangular appearance.
2. The mesial outline of the crown is only slightly convex, with the crest of curvature (representing the contact area) approaching the mesioincisal angle.
3. The distal outline of the crown is more convex than the mesial outline, the crest of curvature being higher toward the cervical line.
4. The mesioincisal angle is sharper than the distal incisal angle. After the mammelons are worn away, the incisal edge of the maxillary central incisor is straight mesiodistally.



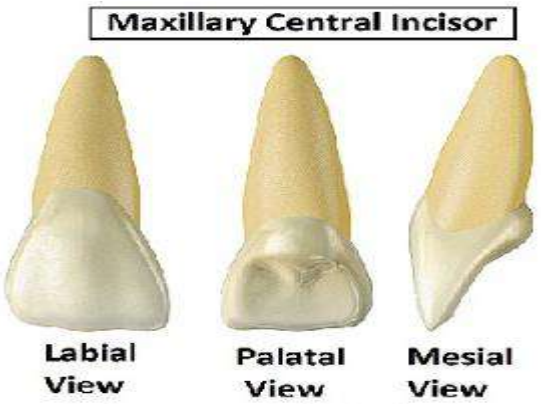
Lingual Aspect: ‘

1. the surface form of the maxillary central incisor is more irregular.
2. The largest part of the middle and incisal portions of the lingual area is concave this shallow concavity is called the lingual fossa. The concavity is bordered by mesial and distal marginal ridges, the lingual portion of the incisal ridge, and the convexity toward the root which is called the cingulum. The crown and root taper lingually, making the lingual portion of the root narrower than the labial portion.



Mesial Aspect:

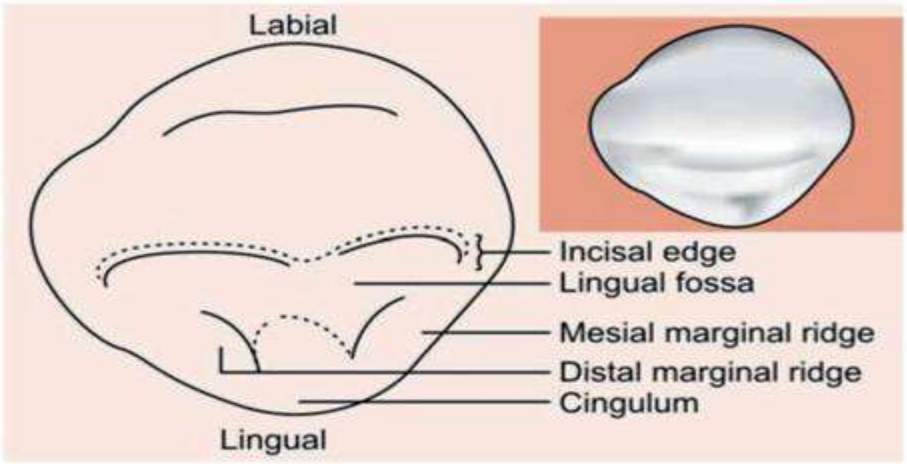
1. The crown is triangular, with the base of the triangle at the cervix and the apex at the incisal ridge.
2. The incisal ridge of the crown is on a line with the center of the root.
3. Labially and lingually, immediately coronal to the cervical line are the crests of curvature of these surfaces. These crests of contour give the crown its greatest labiolingual measurement.
4. The labial outline of the crown from the crest of curvature to the incisal ridge is very slightly convex.
5. The lingual outline is convex at the point where it joins the crest of curvature at the cingulum; it then becomes concave at the mesial marginal ridge, and it becomes slightly convex again at the linguoincisal ridge and the incisal edge.
6. The cervical line curves incisally to a noticeable degree. The root of this tooth from the mesial aspect is cone-shaped, and the apex of the root is usually bluntly rounded.



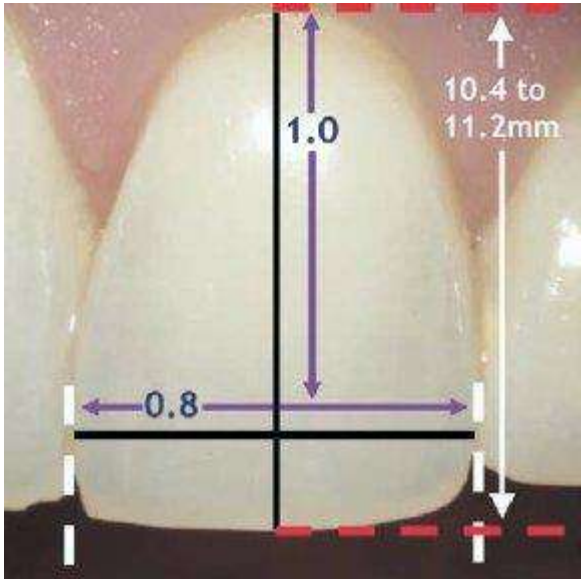
Distal Aspect: There is little difference between the distal and mesial outlines of this tooth. The curvature of the cervical line outlining the cementoenamel junction is less in extent on the distal than on the mesial surfaces.

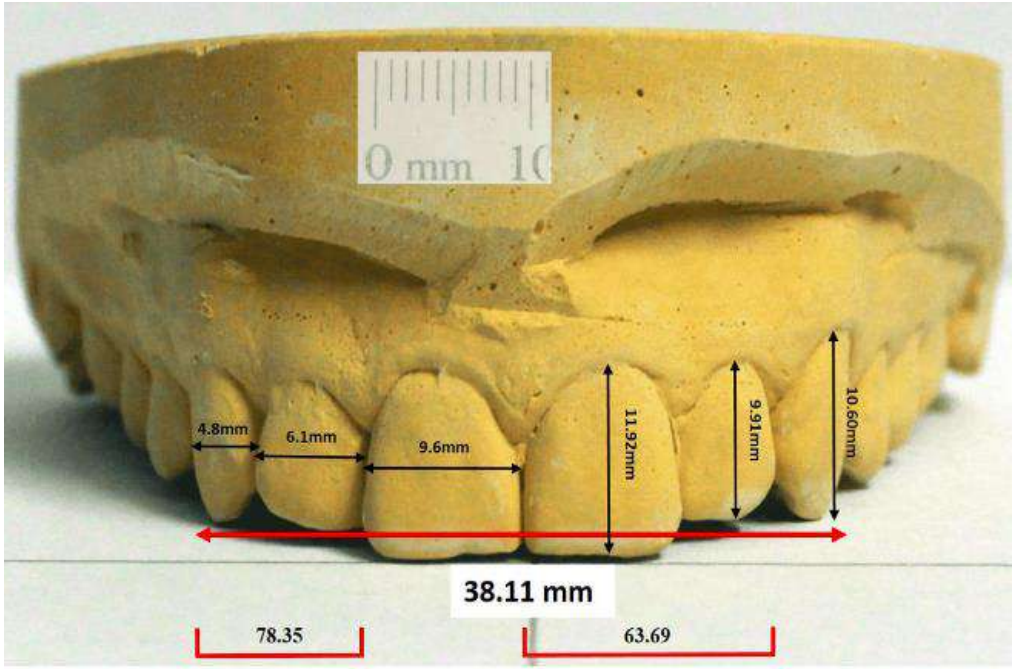
Incisal Aspect:

1. The labial surface appears broad and flat.
2. The outline of the lingual portion tapers lingually toward the cingulum. The cingulum of the crown makes up the cervical portion of the lingual surface.
3. The crown conforms to a triangular outline reflected by the outline of the root cross section at the cervix. The distance between the mesioincisal angle to the cingulum is slightly longer than the distance between the distoincisal angle to the cingulum.
4. The incisal ridge may be seen clearly, and differentiated with its slope toward the lingual aspect, is easily distinguished.



Average mesiodistal width= 8-10mm
Average crown length= 9-12mm





Maxillary Lateral Incisor:

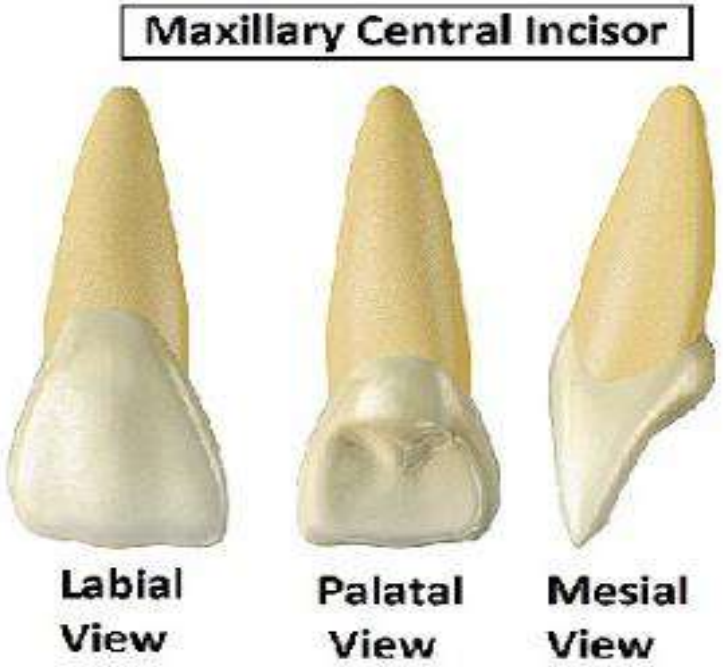
The maxillary lateral incisor supplements the central incisor in function. The crown of it looks like the crown of the central incisor. The lateral incisor is smaller in all dimension except root length.

Eruption: 8-9 years

Root complete: 11years

Principal features of maxillary lateral incisor:

1. Crown is more rounded, shorter and narrower mesio-distally than the maxillary central incisor.
2. Mesioincisal angle is rounded and distoincisal angle is more rounded.
3. Single root with tapered distally curved pointed apex.
4. lingual fossa is more concave than that of maxillary central incisor.



Labial Aspect:

1. The labial surface of crown is convex than that of the maxillary central incisor.
2. The crown is smaller in all dimension as compared with the maxillary central incisor.
3. The mesial outline of the crown resembles that of the central incisor, with a more rounded mesioincisal angle. The crest of contour mesially is usually at the point of junction of the middle and incisal third.
4. The distal outline of the crown from the labial aspect differs somewhat from that of the central incisor. The distal outline is more rounded, and the crest of contour is more cervical.
5. The root length is greater in proportion to its crown length of the crown

Mesial Aspect:

The mesial aspect is similar to that of central incisor except that:

1. The root appears longer.
2. Crown labiolingually is narrower.
3. Curvature of the cervical line is less in depth.

Distal Aspect:

1. The distal aspect similar to mesial aspect except that; Curvature of the cervical line is less in depth.
1. Sometimes a developmental groove is seen extending along the center of the root.

Incisal Aspect:

The incisal aspect of this tooth sometimes resembles that of central incisor, or it may resemble that of a small canine

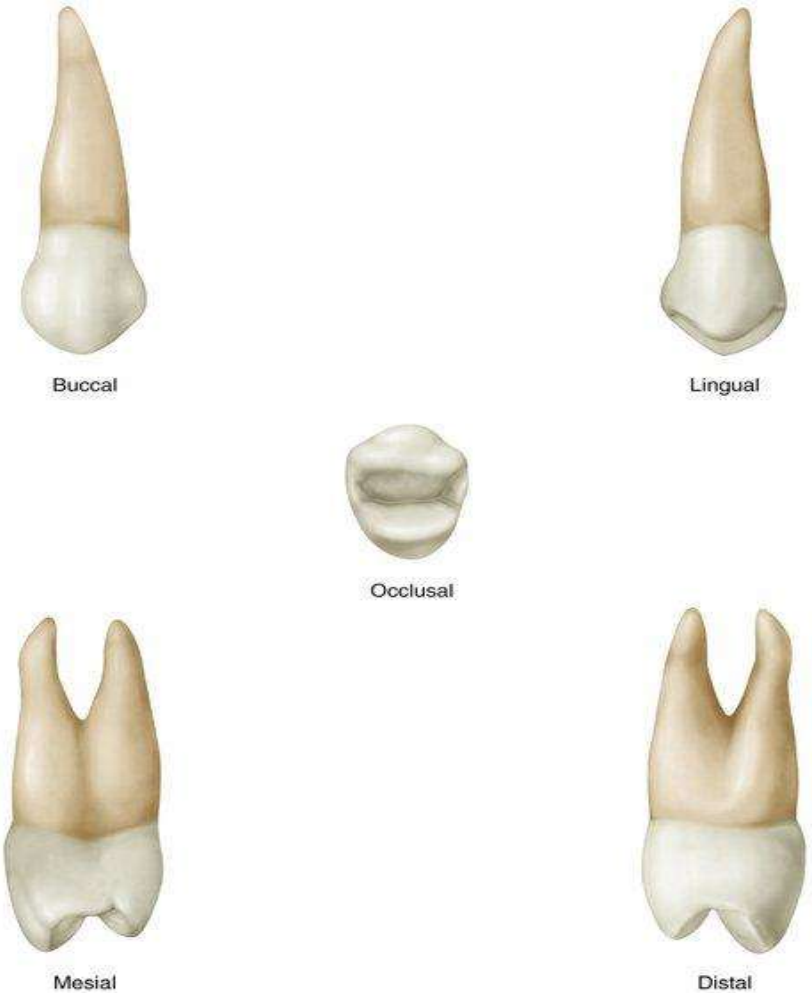
1. The cingulum, may be large; the incisal rigde also; the labiolingual dimension may be greater in comparison with the mesiodistal dimension. If these variations are present, the tooth has a marked resemblance to a small canine.
2. All maxillary lateral incisors exhibit more convexity labially and lingually from the incisal aspect than maxillary central incisors.

maxillary permanent premolars

There are four maxillary premolars—two in the right maxilla and two in the left. The name bicuspid, which is also frequently used to describe human teeth, assumes that there are two cusps, which is incorrect because mandibular premolars in humans can have anywhere from one to three cusps.

The maxillary first premolar is greater in size than the maxillary second premolar is the. The dental arch's premolars are located in the middle. Following the exfoliation of the deciduous molars.

Maxillary first premolar:
Eruption time 10-11 years
Root complete time 12-13 years



Features

1. Two well distinct cusps, with the buccal cusp being about 1 mm longer than the lingual one.
2. The buccal cusp's mesial slope is longer than its distal slope.
3. There are two roots: lingual and buccal. The middle part of the root is where the bifurcation occurs.
4. Developmental depression on mesial surface of the crown extending to the root.
5. Central developmental groove interrupts the mesial marginal ridge.
6. The occlusal outline is angular

Buccal surface

1. The crown is roughly trapezoidal.
2. The buccal surface of the crown is convex with a strongly developed middle Buccal ridge which is continuous from the tip of the cusp to the cervical line (center of middle third).
3. The mesial outline of the crown is slightly concave above the contact area. The contact area is represented by a relatively broad curvature, the crest of which lies immediately occlusal to the halfway point from the cervical line to the tip of the buccal cusp.

Buccal

4. The distal outline of the crown is almost straight line above the contact area.
5. A pointed buccal cusp tip with a long straight mesial slope and a short distal slope.
6. The contact areas are nearly at the same level with each other.
7. The root 3-4 mm shorter than root of canine. It form bears a close resemblance (cone shape)

Buccal

Lingual surface

From the lingual aspect, the gross outline of the maxillary first premolar is the reverse of the gross outline of the buccal aspect.

1. The crown tapers toward the lingual because the crown is narrower mesiodistally in the lingual aspect.
2. The lingual cusp is smooth and spheroidal, the cusp tip is pointed with mesial and distal slopes meeting at an angle of 90 degrees.
3. The lingual cusp is shorter than the buccal cusp.

Mesial surface

1. The mesial aspect of the crown of the maxillary first premolar is roughly trapezoidal. However, the longest of the uneven sides is toward the cervical portion and the shortest is toward the occlusal portion.
2. Another characteristic is that the tips of the cusps are well within the confines of the root trunk.
3. The cervical line may be regular in outline or irregular, has less curvature than in any anterior teeth.
4. The buccal outline is convex, the crest of curvature is within the cervical third and then less curved to the cusp tip.

Mesial

5. The lingual outline of the crown is convex, the crest of curvature is within the middle third.

6. The mesial marginal ridge is at the level of the junction of the middle and occlusal thirds and is a crossed by mesial developmental groove.

7. The root is bifurcated for half its length.

8. The mesial developmental depression starts from the contact area to the bifurcation area.

9. Buccal outline of buccal root is straight above cervical line with a tendency to lingual inclination above bifurcation .

Lingual outline of lingual root is straight from cervical line to root apex without inclination.

Mesial

Distal surface

1. The crown surface is convex at all points except for a small flattened area just cervical to the contact area and buccal to the center of the distal surface. The curvature of the cervical line is less on the distal than on the mesial surface.
2. There is no evidence of a developmental groove crossing the distal marginal ridge of the crown. If a developmental groove should be noticeable, it is shallow and insignifiants.
3. The root trunk is flattened on the distal surface above the cervical line and does not shows developmental depression.
4. The bifurcation of the roots is at a higher level apical than in the mesial side.

Distal

Occlusal surface

1. The occlusal aspect of the maxillary first premolar resembles roughly a six-sided or hexagonal figure. This hexagonal figure, however, is not equilateral. The two buccal sides are nearly equal, the mesial side is shorter than the distal side and the mesiolingual side is shorter than the distolingual side.
2. The crest of the distal contact area is buccal to the mesial contact area
3. The buccolingual dimension is much greater than mesiodistal dimension.

Occlusal

4. The occlusal surface is circumscribed by the cusp ridges and marginal ridges.
5. A central developmetal groove divides the crown bucco-lingually, it crosses from distal side to mesial which joins with the mesial marginal groove.
6. The lingual cusp pointed more sharply than the buccal cusp.
7. In the mesial and distal triangular fossae, there are two developmental grooves join the central groove with the junction of the grooves make developmental pit.

Occlusal

Maxillary Second Premolar

Features:

1. The maxillary second premolar supplements the maxillary first premolar in function. The two teeth resemble each other so closely.
2. The maxillary second premolar is less angular, giving a more rounded effect to the crown from all aspects.
3. It has a single root, Usually the root length of the second premolar is as great, if not a millimeter or so greater, than that of the first premolar
4. The maxillary second premolar may have a crown that is noticeably smaller cervico-occlusally and also mesiodistally.

Eruption time: 10-12 years

Root completed time: 12-14 years

Buccal surface

1. It may be noticed that the buccal cusp of the second premolar is not as long as that of the first premolar and it appears less pointed.
2. The mesial slope of the buccal cusp ridge is usually shorter than the distal slope. The opposite is true of the first premolar.
3. The crown and root of the second premolar are thicker at their cervical portions.

Lingual surface

Little variation may be seen except that the lingual cusp is longer, making the crown longer on the lingual side.

Mesial surface

1. The mesial aspect shows the difference in cusp length between the two teeth. The cusps of the second premolar are shorter, with the buccal and lingual cusps more nearly the same length.
2. There is no deep developmental depression on the mesial surface of the crown as on the first premolar; the crown surface is convex instead. A shallow developmental groove appears on the single tapered root.
3. There is no deep developmental groove crossing the mesial marginal ridge, and except for the variation in root form.

Distal surface

There is no outstanding variation to be noted when we view the distal aspect.

Occlusal surface

From the occlusal aspect, some differences are to be noted between the two premolars.

1. The outline of the crown is more rounded or oval, rather than angular.
2. The central developmental groove is shorter and more irregular, and there is a tendency toward multiple supplementary grooves radiating from the central groove. This arrangement makes for an irregular occlusal surface and gives the surface a very wrinkled appearance

The maxillary first molar

The maxillary first molar is the sixth tooth from the midline. One is present on the right side and one on the left side.

Eruption time: 6 years

Root complete: 9-10 years

The maxillary first molar is normally the largest tooth in the maxillary arch. It has well-developed functioning cusps and one supplemental cusp of little practical use.

The mesiobuccal, distobucal, mesiolingual, and distolingual cusps have the highest physiological significance. The cusp or tubercle of Carabelli is a supplementary cusp.

The roots are divided into three roots: mesiobuccal, distobuccal, and lingual. The lingual root is the longest root; the mesiobuccal root is not as long, but it is wider buccolingually, making it more resistant to torsion than the lingual root. The distobuccal root is the smallest and most gently shaped of the three.

Buccal surface

1-The crown is roughly trapezoidal, with cervical and occlusal outlines representing the uneven sides.

2-Parts of four cusps are seen, the mesiobuccal, distobuccal, mesioalingual and distolingual.

3-The mesiobuccal cusp is broader than the distobuccal cusp, and its mesial solpe meets its distal slope at an obtuse angle. The mesial slope of the distobuccal cusp meets its distal slope at right angle. The distobuccal cusp is therefore sharper than the mesiobuccal cusp.

5-The mesial outline of the crown follows a nearly straight path downward and mesially, curving occlusally as it reaches the contact area this is approximately two thirds the distance from cervical line to tip of mesiobuccal cusp. It continues downward and distally with the mesial slope of the mesiobuccal cusp.

6-The distal outline of the crown is convex. The crest of curvature is located at a level approximately half the distance from cervical line to tip of cusp. The distal contact area is in the middle of the middle third.

there is a deep developmental groove buccally on the root trunk.

Lingual surface

1-From the lingual aspect, the gross outline of maxillary first molar is the reverse of that from the buccal aspect.

2-The variation between the outline of the mesial suface and that of the distal surface is apparent.

3- A shallow depression extend from the terminus of the lingual groove to the center of the lingual surface of the lingual root at the cervical line and then continues in an apical direction on the lingual root.

4-The lingual cusps are the only ones to be seen from the lingual aspect. The mesiolingual cusp is much the larger.
5-The angle formed by the mesial outline of the crown and the mesial slope of the mesiolingual cusp is alomost 90 degrees. An obtuse angle describes the junction of the mesial and distal slopes of this cusp.
6-the distolingual cusp is so spheroidal and smooth.

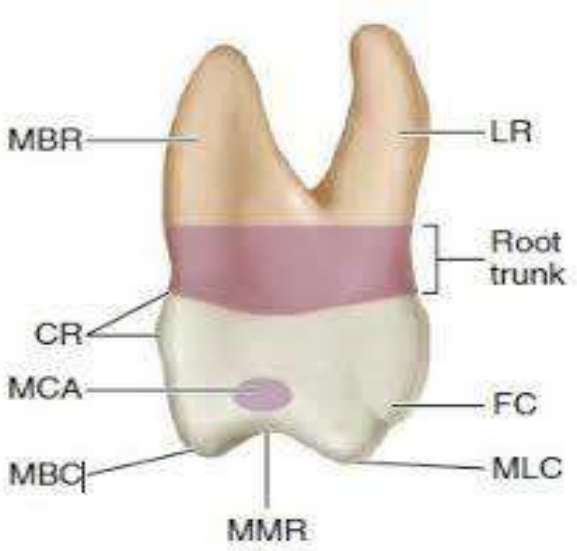
Mesial surface

1-From this aspect, the increased buccolingual dimensions may be observed

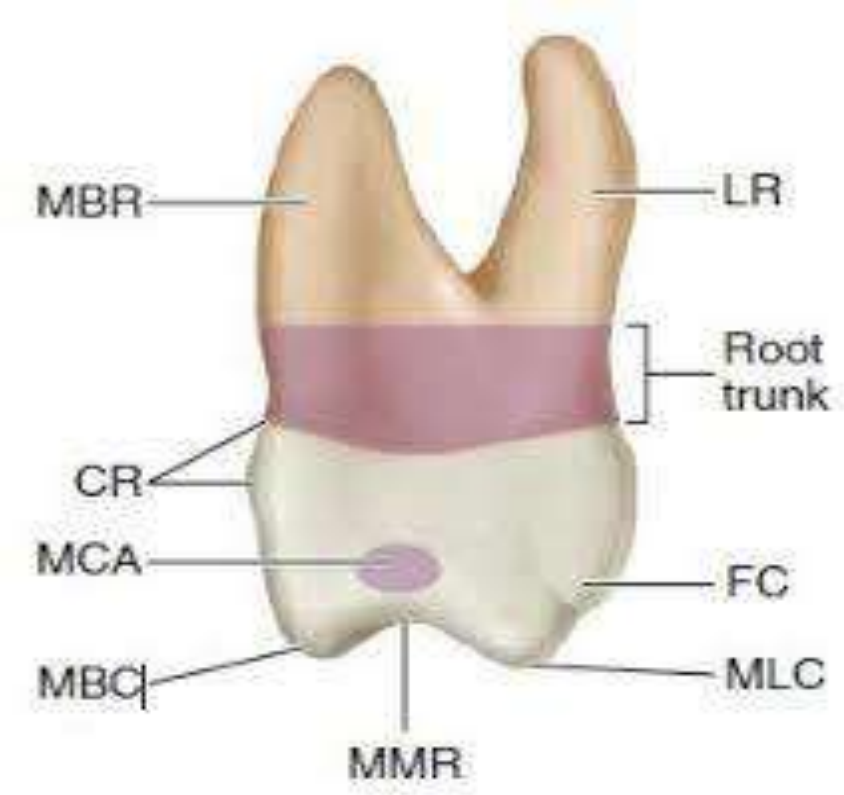
2-The outline of the crown makes a short arc buccally to its crest of curvature within the cervical third of the crown. The outline then becomes slightly convex as it progresses downward and inward to the mesiobuccal cusp. The lingual outline of the crown curves outward and lingually approximately to the same extent as on the buccal side.

3-The cervical line of the crown is irregular, curving occlusally.

The mesial contact area is above the marginal ridge, approximately at the junction of the middle and occlusal thirds of the crown.



4. The mesio-buccal root is broad and flattened on its mesial surface. The level of the bifurcation is a little closer to the cervical line than is found between the roots buccally.
5. The lingual root is longer than the mesial root but is narrower from this aspect. It is a banana-shaped, extending lingually to the lingual and its concave outline to the buccal

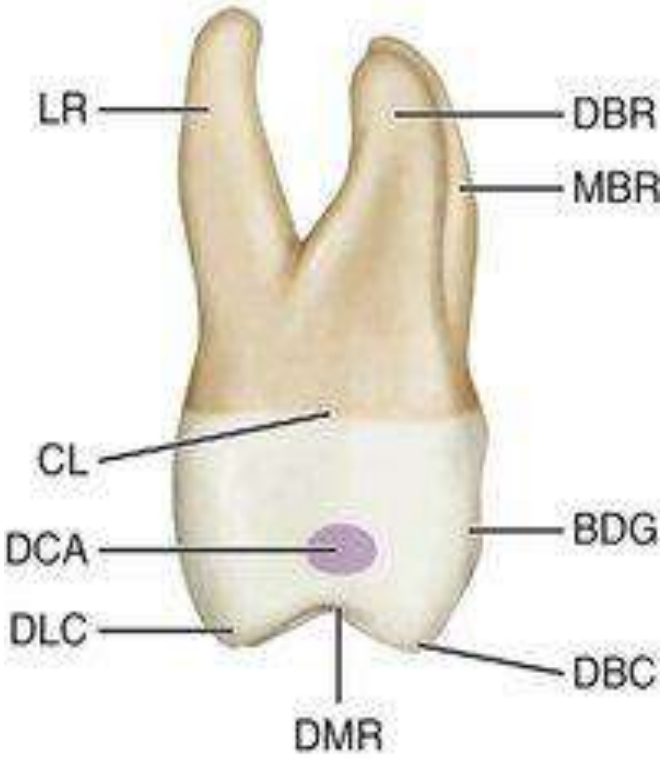


Distal surface

1-The gross outline of this aspect is similar to that of the mesial aspect except several variations must be noted from the distal aspect.

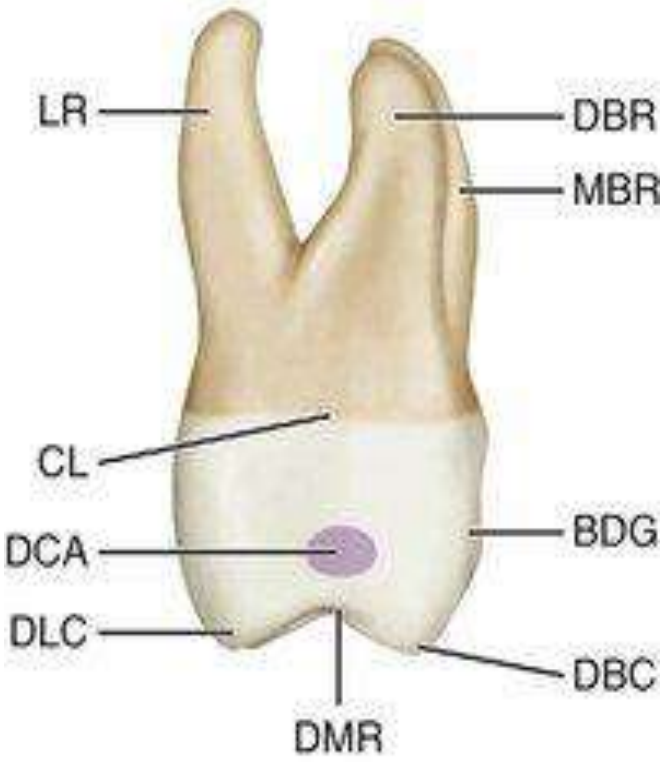
2-Because of the tendency of the crown to taper distally on the buccal surface, most of the buccal surface of the crown may be seen. This is because the buccolingual measurement of the crown mesially is greater than the same measurement distally.

3-The cervical line is almost straight across from buccal to lingual.



4-The distobuccal root is narrower at its base than either of the others. the lingual outline of the root from the apex to the bifurcation is slightly concave. There is no concavity between the bifurcation of the roots and the cervical line. The bifurcation here is more apical than either of the other two areas on this tooth.

5-The distal surface of the crown is convex, with a smoothly rounded surface except for a small area near the distobuccal root at the cervical third.



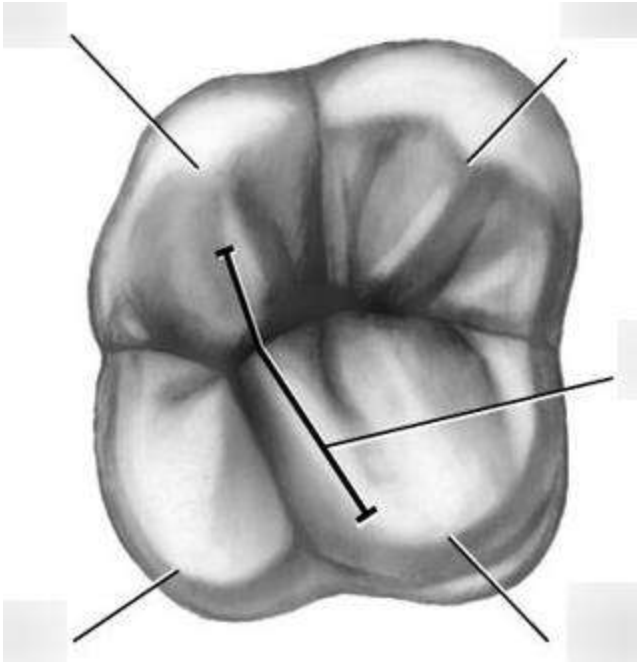
Occlusal surface

1.Generally it is rhomboidal.

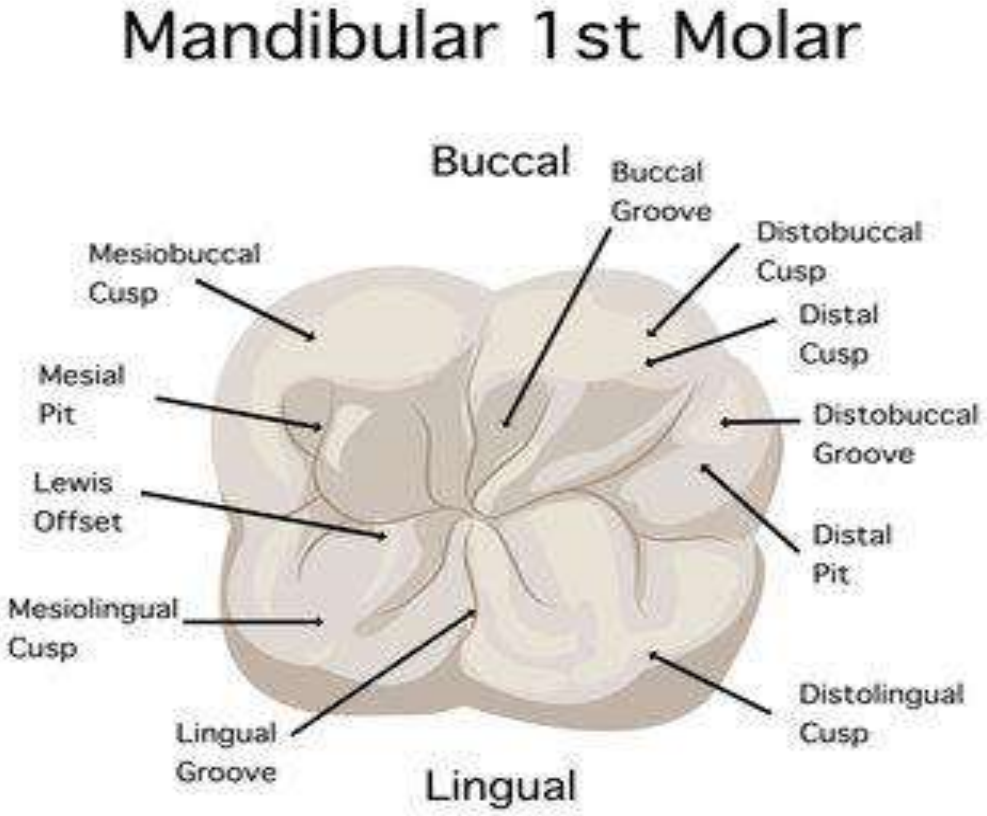
2. two developmental grooves extends both on the buccal and lingual aspects.

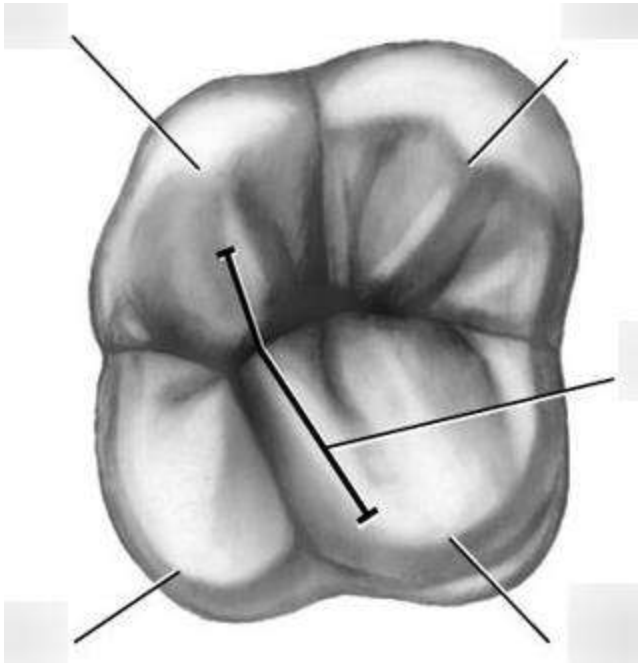
3. the distances from the buccal or lingual grooves to the mesial contact area are greater than that from the B or L grooves to the D contact area

4. The dimensions of the crown at the contact area are greater than that occlusal to it



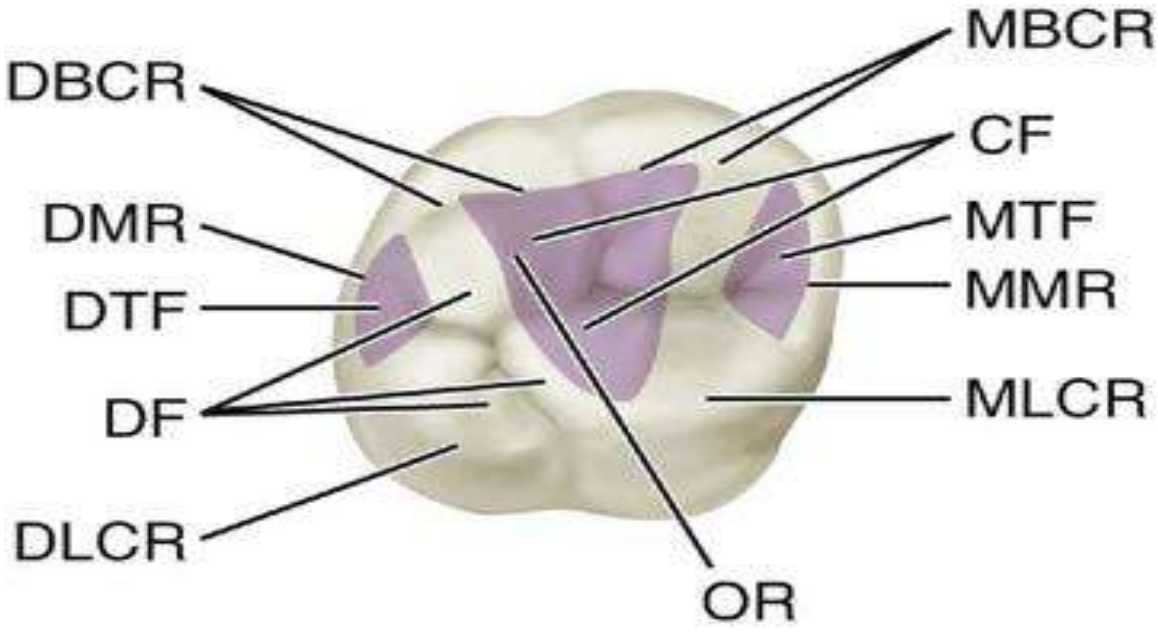
The four major cusps are well developed, with the small minor, or fifth cusp appearing on the lingual surface of the mesiolingual cusp. The fifth cusp may be indistinct. The mesiolingual cusp is the largest cusp; it is followed in size by the mesiobuccal, distolingual , distobuccal, and fifth cusps.





There are two major fossae and two minor fossae. The major fossae are the central fossa, (which is triangular and mesial to the oblique ridge), and the distal fossa, (which is linear and distal to the oblique ridge). The two minor fossae are the mesial triangular fossa, immediately distal to the mesial marginal ridge, and the distal triangular fossa, immediately mesial to the distal marginal ridge.

The oblique ridge is a ridge that crosses the occlusal surface obliquely. It is formed by the union of the triangular ridge of the distobuccal cusp and the distal ridge of the mesiolingual cusp.



There are 6 developmental grooves:

1-Central developmental groove radiate from central pit and progress in a mesial direction at an obtuse angle to the buccal developmental groove to end in mesial triangular fossa

2- Buccal developmental groove

3-Distal oblique groove

4-Lingual developmental groove

5-Transverse groove of the oblique ridge

6-Fifth cusp groove

There are three pits:

1. Central pit
2. Mesial pit
3. Distal pit

The Permanent Maxillary Canines

Each one is the third tooth from the median line, right and left, in the maxilla, and there are two of them, located at the "corners" of the mouth. Long crowns and the longest root characterize it. Medial labial lobes incisally developed into strong and prominent, well-formed cusp, hence earning the name "cuspid tooth."

Canine eminence:- it is a bony ridge over lying the labial portions of the canine roots, they help to form a foundation that ensures normal facial expression at the "corners" of the mouth jaws.

Eruption: 11– 12 years
Root completed: 13 – 15 years
Width:7-9mm
Length:26-28mm
Crown length: 9-11mm

Functions of the canine:-

1- The ability of tearing with partial mastication of food since the canine crowns have some characteristics of functional form which will bear a resemblance to incisor form, and some which resemble the premolar form.

2- cosmetic : it maintain natural facial expression because of their position at the corner of the mouth, length and angulation of root and the present of canine eminence.

3- Stabilize and support the incisors and premolars, since they are located between these groups.

Labial surface

1. The mesiodistal measurement of the crown is about 1 mm less than that of the maxillary central incisor.
2. From a labial view, the mesial half of the crown resembles a portion of an incisor, whereas the distal half resembles a portion of a premolar. This tooth seems to be a compromise in the change from anterior to posterior teeth in the dental arch.
3. The cervical line labially is convex, with the convexity toward the root portion.

4. Mesially, the outline of the crown may be convex from the cervix to the center of the mesial contact area (which is located at the junction of middle and incisal thirds) then may exhibit a slight concavity above the contact area to cusp tip.
5. Distally, the outline of the crown is usually concave between the cervical line and the distal contact area (which is located at the center of the middle third) then may exhibit a slight convexity to cusp tip.
6. The cusp tip is on a line with the center of the root, the cusp has a mesial slope and a distal slope, the mesial slope being the shorter of the two.

7. The labial surface of the crown is smooth, with shallow depressions mesially and distally.
8. The middle labial elevation extend from cervical line to the cusp tip is called labial ridge.
9. The root is cone shape. the apical third is mostly bends distally with a pointed apex.

Lingual surface

1. The crown and root are narrower lingually than labially.
2. cervical line shows a more even curvature, it may be straight for a short interval at this point.
3. The cingulum is large, and in some instances is pointed like a small cusp. Occasionally, a welldeveloped lingual ridge is seen which is confluent with the cusp tip; this extends to a point near the cingulum.

3.The shallow concavities between lingual ridge and the marginal ridges are called mesial and distal lingual fossae.
4.The lingual portion of the root is narrower than the labial portion, a part of the mesial and distal surface of the root is visible from the lingual aspect.

Mesial surface

1. The labiolingual measurement is approximately 1mm greater than that of the maxillary central incisor.
2. The crown is triangle in shape.
3. The entire labial outline from the mesial aspect exhibits more convexity from the cervical line to the cusp tip than the maxillary central incisor.

4. The lingual outline from the mesial aspect may be represented by a convex line describing the cingulum, then become straight at the middle third then become convex again in the incisal third.

5. The root is taper and broad with developmental depression extended from the cervical line to the apical third.

6. From this aspect the line bisecting the cusp tip is labial to a line bisecting the root.

Distal surface

It is similar to the mesial aspect except that:

1. The cervical line exhibits less curvature toward the cusp ridge.
2. The distal marginal ridge is more irregular in outline.
3. The surface displays more concavity usually above the contact area, and the developmental depression is more marked.

Distal

Incisal surface

1. The labiolingual dimension is greater than the mesiodistal,
2. The tip of the cusp is labial to the center of the crown labiolingually and mesial to the center mesiodistally.
3. The crown is convex labially and lingually. The labial ridge, the lingual ridge, mesial and distal fossa, the cingulum and the mesial and distal marginal ridge could be seen clearly from this aspect.

Permanent mandibular canine

Eruption: 9 – 10 years

Root completed : 12 – 14 years Its closely similar to the upper canine in shape and function which is tearing and partial mastication.

Labial surface

1- The is narrower mesiodistally than that of the maxillary canine and the contact area are higher in position giving an impression that the crown is longer.

2- The mesial contact area being near the mesioincisal angle.

3- The distal contact area is more toward the incisal than that of the maxillary canine, but not up to the level of the mesial area.

4- The mesial outline of the crown of the mandibular canine is nearly straight with the mesial outline of the root.

5- The distal outline of the crown is convex at the contact area then it become concave toward the cervical line.

6- The root is mostly shorter than that of upper three and its taper to a more pointed apex and it is usually carved mesially.

Lingual surface

1- Its smoother and more flatter , simulating the lingual surface of mandibular incisors

2-The cusp, the incisal ridge, cingulum, lingual fossa, marginal ridge are less developed than that of upper three.

3- The central lingual ridge is poorly developed.

4- The lingual portion of the root is narrower relatively than that of the maxillary canine.

Mesial surface

1- The labial outline of crown is less convex and the lingual outline is less concave.

2- The incisal ridge is thinner making the cusp tip is more pointed than upper three. 3- The tip of the cusp is more nearly centered over the root.

4- The cervical line curves more toward the incisal portion than does the cervical line on the maxillary canine.

5- The developmental depression mesially on the root of the mandibular canine is more pronounced and sometimes quite deep.

Distal surface

With a few needless differences, the distal aspect is quite identical to the mesial aspect.

Distal

Incisal surface

The outlines of the crowns of mandibular and maxillary canines from the incisal aspect are often similar, however the mesiodistal dimension of the mandibular canine is less than the labiolingual dimension, the mesial outline is less curved.

Permanent Mandibular Molars

- The mandibular molars are larger than any other mandibular teeth.
- They are three in number on each side of the mandible.
- All mandibular molars have crowns somewhat longer mesiodistally than buccolingually
- Each mandibular molar has two roots, one mesial and one distal.
- The crown of the molars are shorter cervico-occlusaly than those of the teeth anterior to them, but their dimension are greater in every other respect.

Mandibular first molar

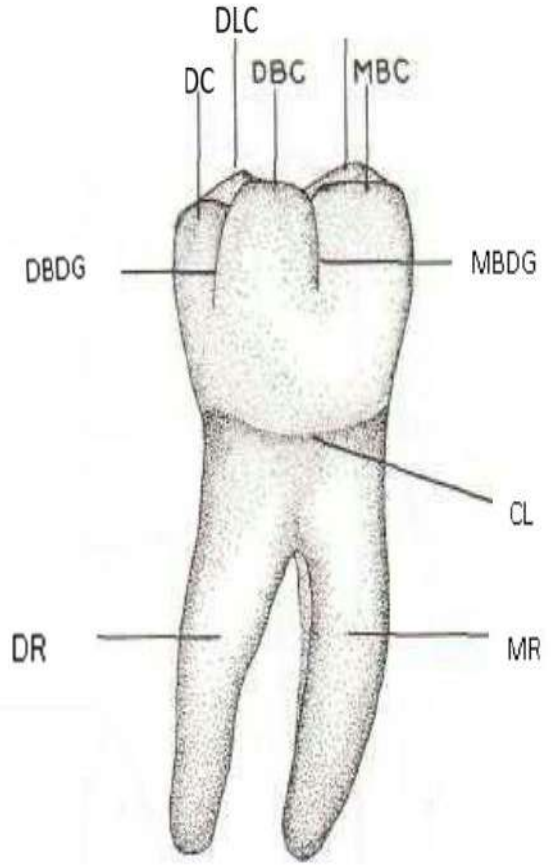
Eruptions time: 6-7 years

Root Completed: 9-10 years

- Normally, the mandibular first molar is the largest tooth in the mandibular arch.
- It has five well-developed cusps two buccal, two lingual and one distal.
- Two root one mesial and one distal. –
- The dimension of the crown mesiodistally is greater by about 1 mm than the dimension buccolingually.

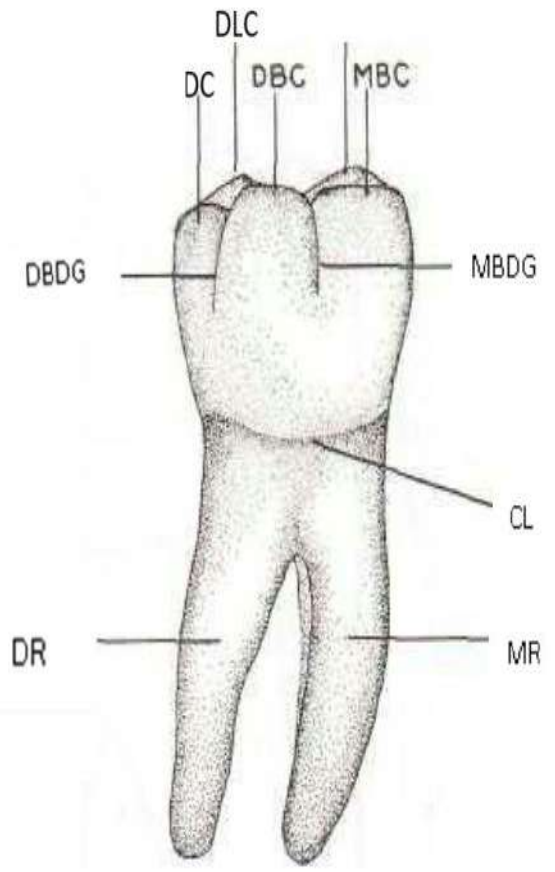
Buccal aspect

1. The crown of the mandibular first molar is roughly trapezoidal.
2. All five of its cusps are in view from buccal aspect.
3. the mesiobuccal , distobuccal, and distal cusps are relatively flat.
3. The mesial outline of the crown is somewhat concave at the cervical third up to its junction with the convex outline of the broad contact area.
4. The distal outline of the crown is straight above the cervical line to its junction with the convex outline of the distal contact
5. The surface of buccal portion of the crown is smoothly convex at the casp portions with developmental groove between the cusps.
6.The cervical line is regular



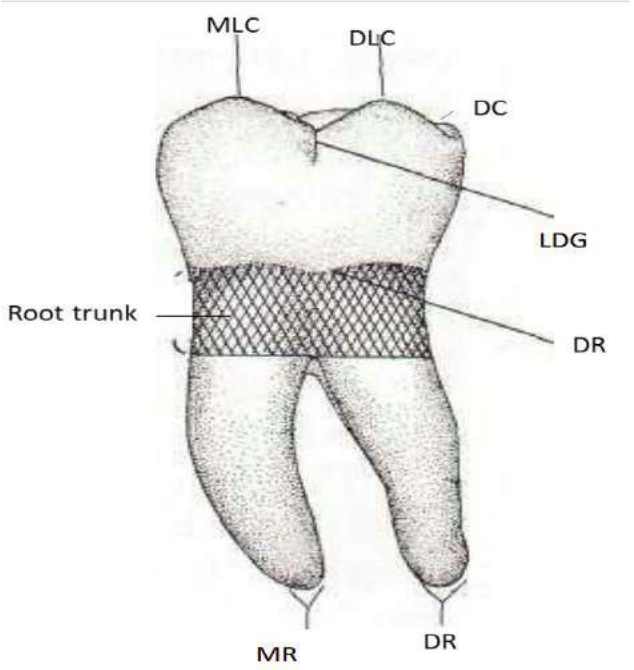
The point of bifurcation of the two roots is approximately 3 mm below the cervical line.

- The mesial root is curved mesially from a point shortly below the cervical line to the middle third portion. From this point it curves distally to the tapered apex.
- The distal root is less curved .
- The root may show some curvature at its apical third in either a mesial or a distal direction.
- The apex is usually more pointed than that of the mesial



Lingual Aspect

- The two lingual cusps are pointed and they separated by the lingual groove.
- The mesiolingual cusp is the widest mesiodistally, with its cusp tip somewhat higher than the distolingual cusp.
- The cervical line lingually is irregular.
- The roots of the mandibular first molar appear somewhat different from the lingual aspect. They measure about 1 mm longer lingually than buccally.



Mesial Aspect

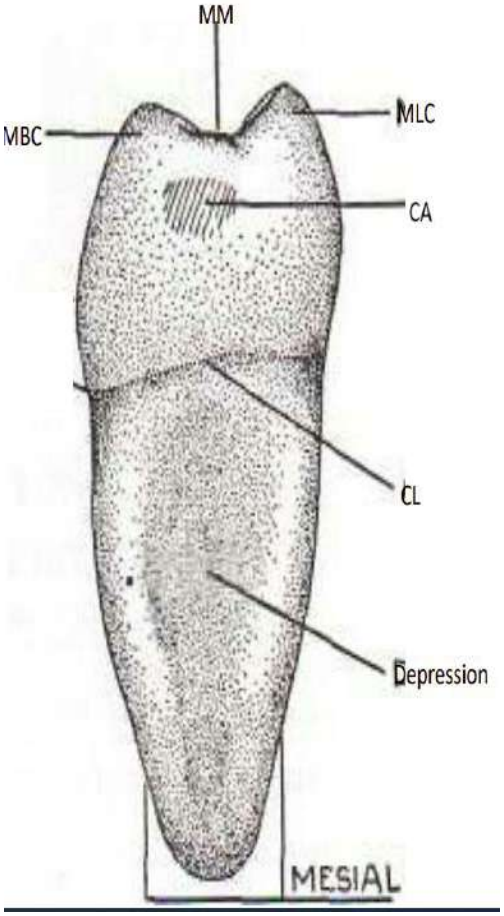
-From the mesial aspect, two cusps and one root only are to be seen

-The buccolingual measurement of the tooth is greater at the mesial portion than it is at the distal portion.

-Contact area located at occlusal third and almost center buccolingually.

-The buccal outline of the crown is convex immediately above the cervical line

-Lingual outline is straight in lingual direction above cervical line to the middle third and then become convex from this point to the tip of mesiolingual cusp.

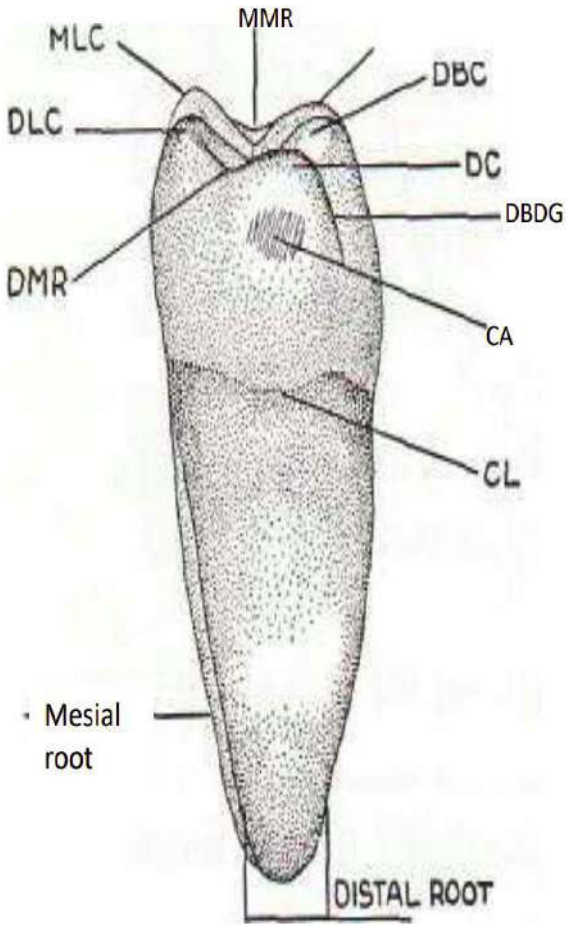


Distal aspect

1-We see more of the tooth from the distal aspect

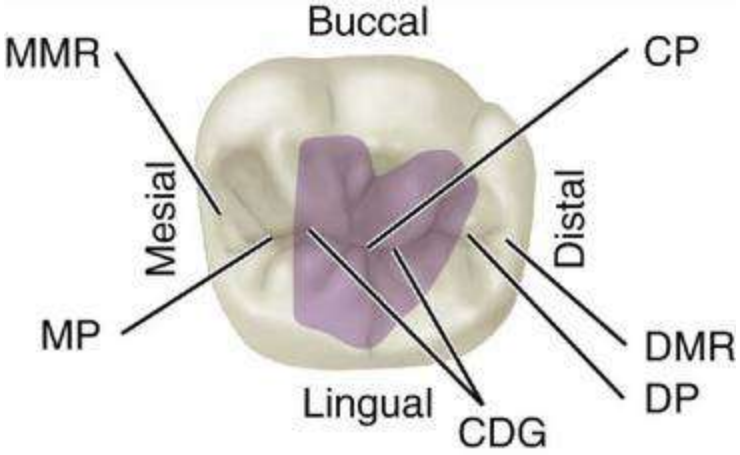
2- the distal contact area is placed just below the distal cusp ridge of the distal cusp and at a slightly higher than mesial contact area.

3- -The cervical line distally usually extends straight across buccolingually and it might be irregular.



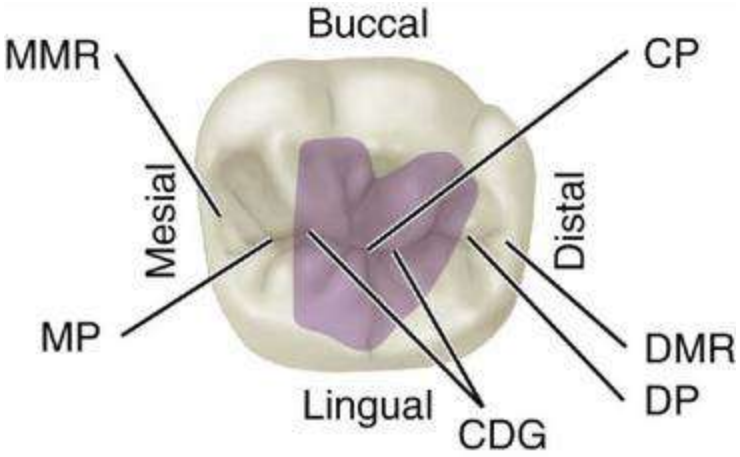
Occlusal Aspect

- The mandibular first molar is somewhat hexagonal from the occlusal aspect.
- The crown measurement is 1 mm or greater mesiodistally than buccolingually.
- The buccolingual measurement of the crown is greater on the mesial than on the distal.
- The crown of mandibular first molar converges lingually from the contact areas.



- There is a major fossa and there are two minor fossae.
- The major fossa is the central fossa. it is centrally placed on the occlusal surface between buccal and lingual cusp ridges.
- The two minor fossae are:

the mesial triangular fossa,
the distal triangular fossa.

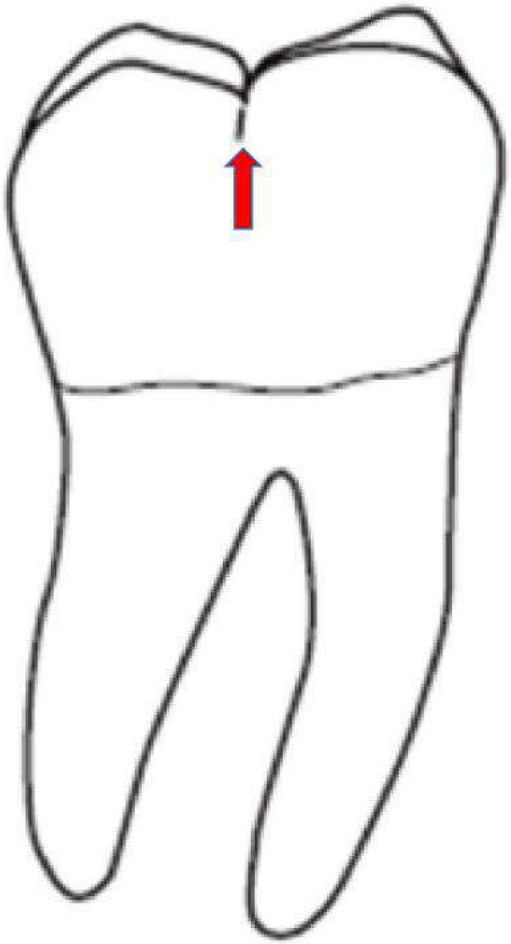


Mandibular second molar
Eruptions time: 11-13 years
Root Completed: 14-15 years

It is supplements mandibular 1st molar in function. It is smaller than the first molar. The crown has four well-developed cusps with no distal or a fifth cusp. The tooth has one mesial and one distal root.

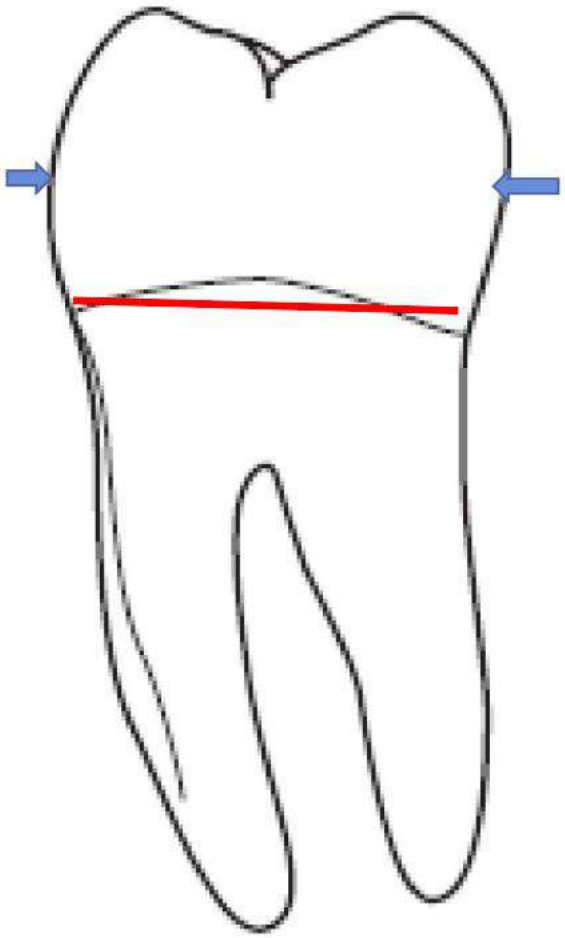
Buccal Aspect

1. The crown is shorter cervico-occlusally and narrower mesiodistally than 1st m
2. one buccal developmental groove between the mesiobuccal and the distobuccal cusps.
3. The roots is shorter and closer together and inclined distally.



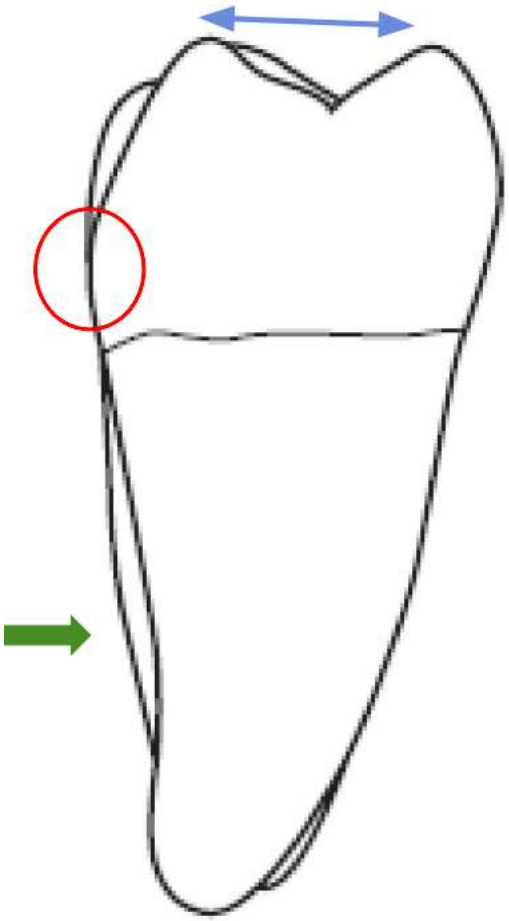
Lingual Aspect

1. The crown and root converge lingually but to a slight degree; little of the mesial or distal surfaces may therefore be seen from this aspect.
2. The curvatures mesially and distally on the crown that describe the contact areas are more noticeable from the lingual aspect. They prove to be at a slightly lower level, especially in the distal area, than those of the first molar.



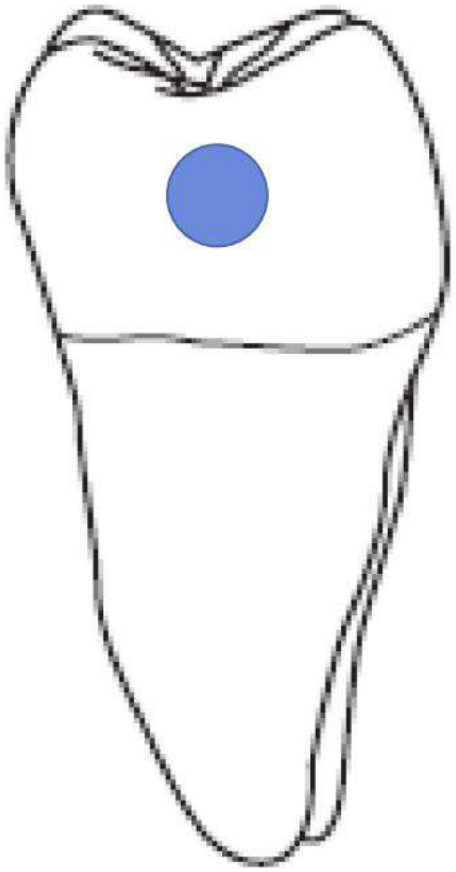
Mesial Aspect

1. The cervical ridge buccally on the crown portion is less pronounced.
2. The occlusal surface more constricted buccolingually.
3. The cervical line less curvature.
4. The mesial root is somewhat pointed apically. Sometime the distal root is is seen buccally in opposing to first molar.



Distal Aspect

1. absence of a distal cusp and a distobuccal groove.
2. The contact area is centered on the distal surface buccolingually and from cervical line and marginal ridge.



Occlusal Aspect

1. Rectangular from the occlusal aspect.
2. No distal cusp and no distobuccal developmental groove as in first molar.
3. The buccal and lingual developmental grooves meet the central developmental groove at right angles dividing the occlusal aspect into four nearly equal parts.
4. many supplemental grooves radiating from the developmental grooves.

Mandibular third molar

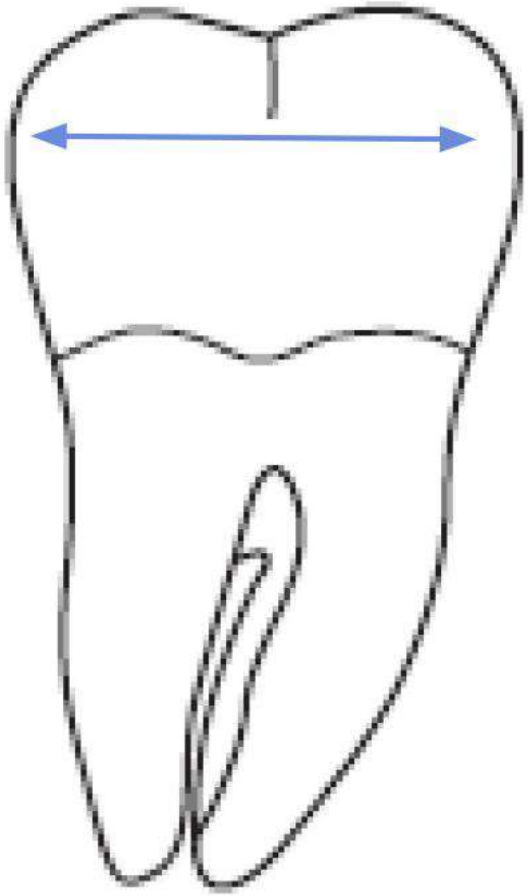
Eruptions time: 17-21 years

Root Completed: 18-25 years

The mandibular third molar presents many anomalies both in form and in position. And are the most likely to be impacted, wholly or partially, in the jaw. It supplements the second molar in function, It show irregular development of the crown portion, with undersized roots.

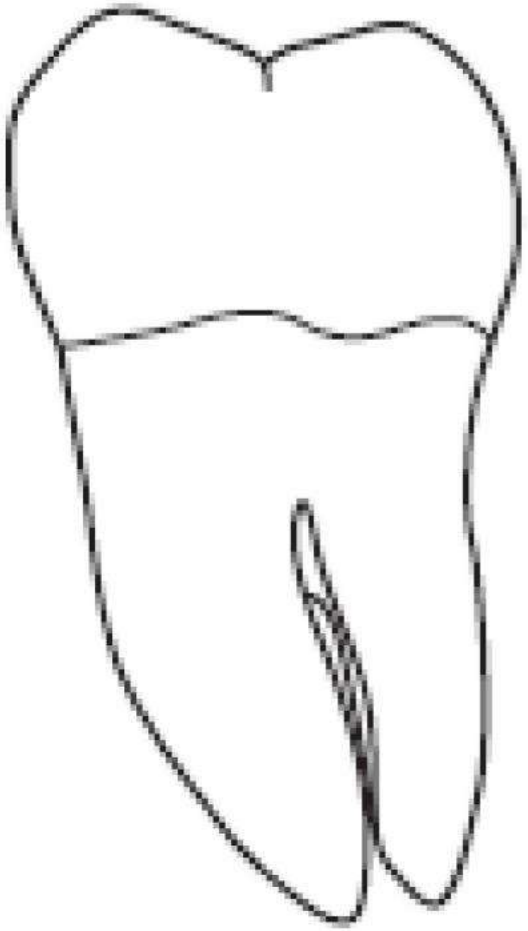
Buccal Aspect

- The buccal cusps are short and rounded.
- The crown is wider at contact areas mesiodistally than at the cervical area
- the crest of contour mesially and distally is located a little more than half the distance from cervical line to tips of cusps.
- One mesial and one distal roots which are shorter and poorer development, and they inclined distally in greater.



Lingual Aspect

- It closely in form to the second molar except for size and root development

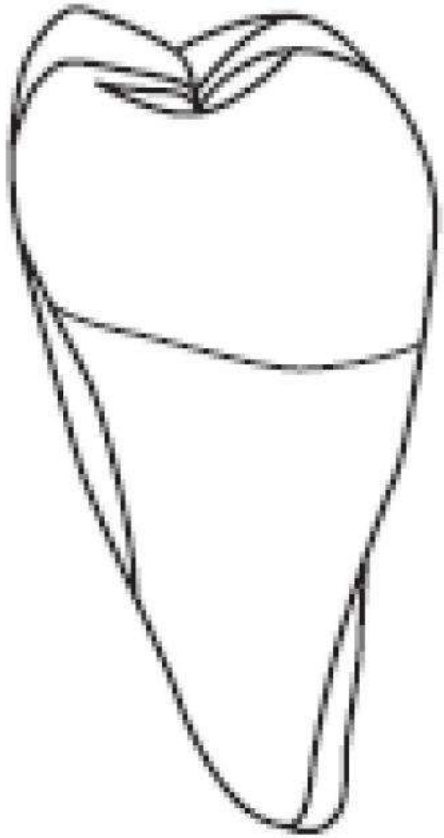


Mesial Aspect

- Resembles the mandibular second molar except in dimensions.
- The roots are shorter, with the mesial root more tapering and the apex of the mesial root is more pointed.

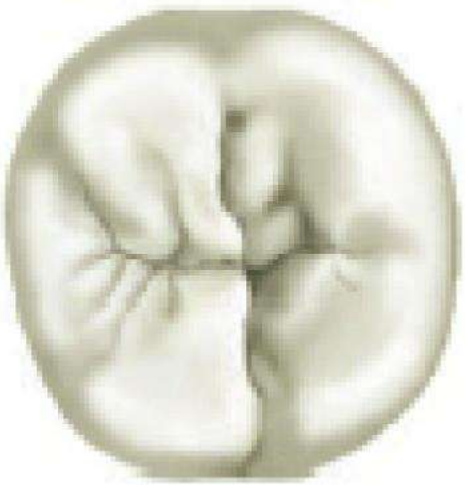
Distal Aspect

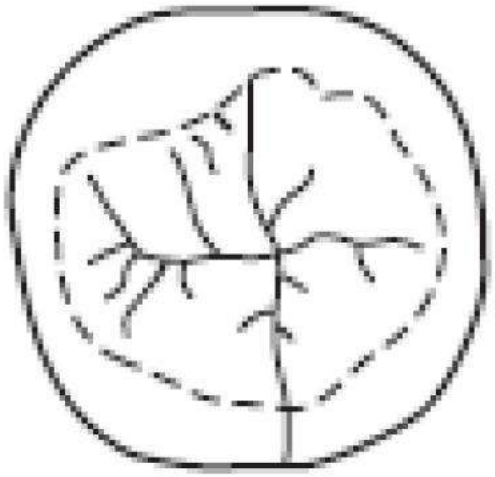
- Smaller in size than mandibular second molar.
- The distal root appears small, both in length and in buccolingual measurement, compared with the large crown portion.



Occlusal Aspect

- It is similar to that of the second mandibular molar with more rounded outline and a smaller buccolingual measurement distally .





The Permanent Mandibular Incisors

1. The mandibular incisors are four in number.
2. The mandibular centeral incisors are centered in the mandible

3- The right and left mandibular lateral are distal to the central incisors.

4- The mandibular incisors have smaller mesiodistal dimensions than any of the other teeth.

5-These teeth are similar in form and have smooth crown surfaces.

6- The labial surface of these teeth are inclined lingually so that the incisal ridges are lingual to a line bisecting the root.

The permanent mandibular central incisor
Eruption: 6-7 years
Root completed: 9 years

Labial aspect:

1.The incisal ridge of the crown is straight and at approximately a right angle to the long axis of the tooth.

2.The labial aspect is regular, tapering evenly from the mesial and distal incisal angles to the apical portion of the root.

3.The mesioincisal and distoincisal angle is nearly right angles

4. Contact area located at same level in the incisal third of the crown

5. The labial face of the crown is smooth, with a flattened surface at the incisal third; the middle the cervical third is more convex.
6. The labial surface of the root is regular and convex.
7. The apical third of the root terminates in a small pointed taper, curving distally.

Lingual aspect:

1. The lingual surface of the crown is smooth, with very slight concavity at the incisal third between marginal ridges.
2. 2. The lingual surface becomes flat and then convex at the cervical third.

Lingual

Mesial aspect:

1. The labial outline of the crown is triangular
2. The incisal ridge is rounded and its center usually lingual to the center of the root.
3. The root outlines from the mesial aspect are straight with the crown outline from the cervical line, begins to taper in the middle third area, tapering rapidly in the apical third to a bluntly rounded or a pointed root
4. Most of the roots have a broad developmental depression for most of the root length

Mesial

Distal aspect:

1. The cervial line curves incisally about 1 mm less than on the mesial.
2. The distal surface of the crown and root of the mandibular central incisor is similar to that of the mesial surface.
3. The developmental depression of the root may be more marked, with well-defined developmental groove at its center.

Distal

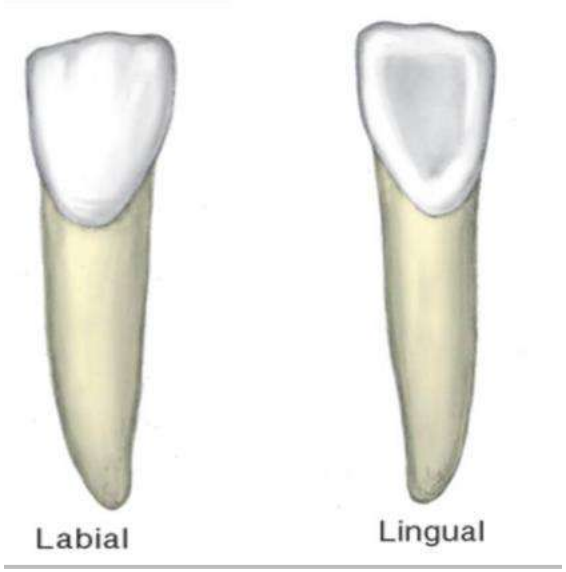
Incisal aspect:

1. This aspect illustrates the bilateral symmetry, the mesial half of the crown is almost identical with the distal half.
2. The incisal edge is at right angles to a line bisecting the crown labiolingually.
3. The labiolingual diameter of the crown is always greater than mesiodistally.
4. The labial surface of the crown is wider mesiodistally than the lingual surface.

Incisal

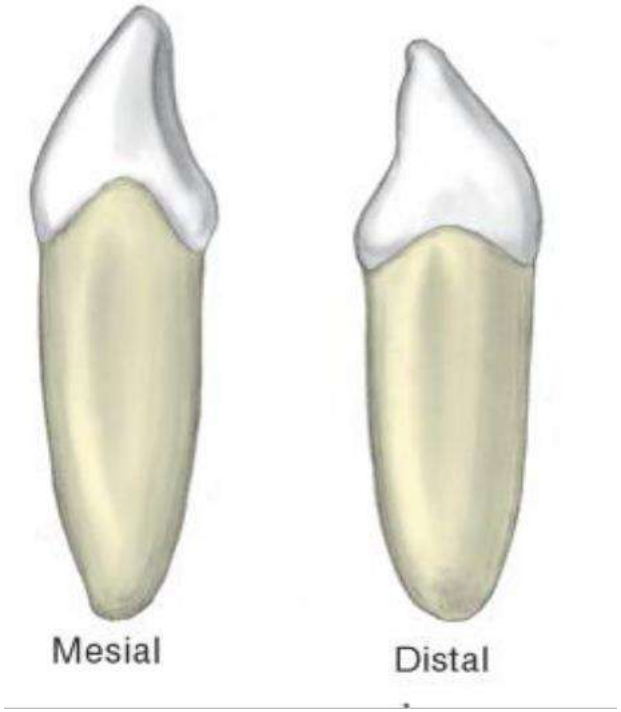
The permanent mandibular Lateral incisor
Eruption: 7-8 years
Root completed: 10 years
The mandibular lateral incisor is somewhat larger, but its form closely resembles the mandibular central incisor.

Labial and lingual aspects:
The labial and lingual aspects show the added 1 mm that is present at the distal half.



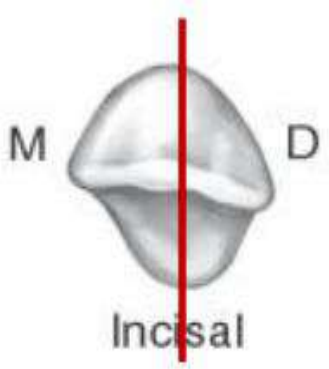
Mesial and distal aspects:

1. The mesial side of the crown is longer than the distal side
2. The distal contact area is toward the cervical than the mesial contact area
3. The cervical line less curve in the distal aspect
4. The root may be longer.



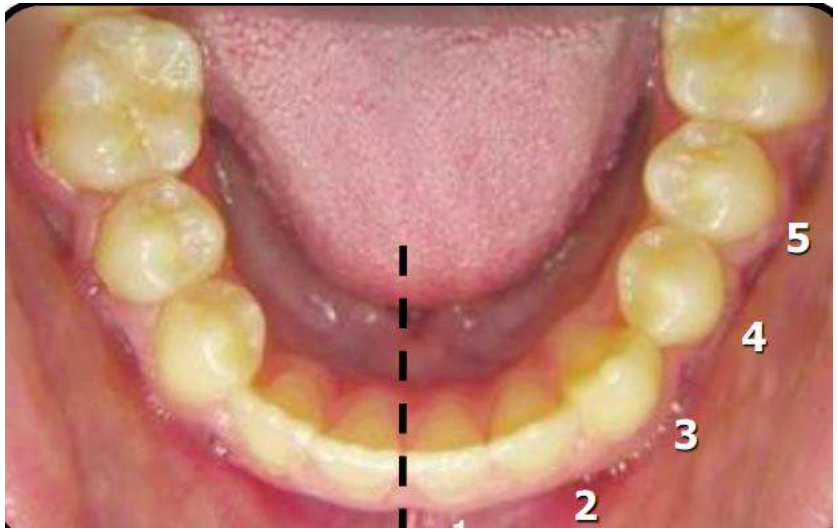
Incisal Aspect:

The incisal edge is not at approximate right angles to a line bisecting the crown and root labiolingually, as was found in the central incisor. The cingulum is slightly distal to mesiodistal midline.



PERMANENT MANDIBULAR FIRST PREMOLARS

Eruption time 10 – 12 years
Root completed 12 – 13 years
The 1st premolar is situated between the canine (3) and the 2nd premolar (5)



Buccal Aspect

- The crown of mandibular first premolar is nearly symmetrical bilaterally, has roughly trapezoidal shape.
- mandibular first premolar has a large, pointed buccal cusp.
- The contact areas are located nearly at the same level they are located slightly above the center of middle third.
- The mesial out line of crown is straight or slightly concave from the contact area to cervical line, the outline of mesial slope of the buccual cusp usually shows some concavity

• The distal out line of crown is slightly concave from the contact area to cervical line, the distal slope of the buccual cusp usually exhibits some concavity.

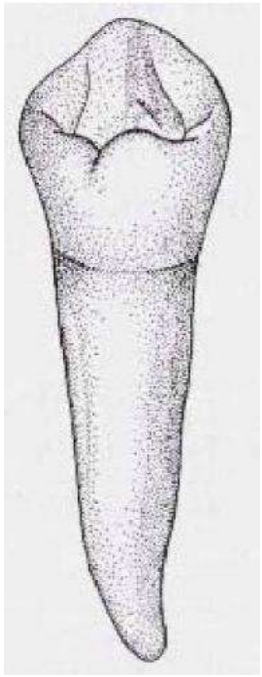
•The measurement mesiodistally at the cervical line is small

.The cervical line is regular and slightly convex towards the root. .The root outline is conical and the apical third in most cases carved distally.

Lingual Aspect:-

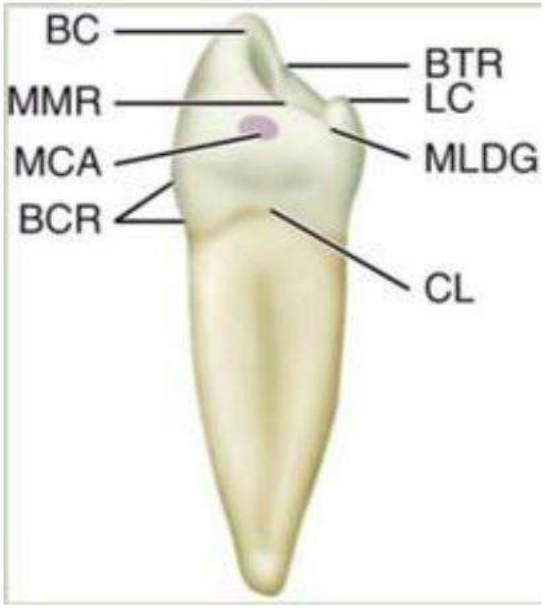
The crown and the root tapers The lingual cusp is short

- The mesiolingual developmental groove which separated between the mesial marginal ridge from the lingual cusp
- The root tapered evenly from cervical line to a pointed apex.



Mesial Aspect:-

1. The crown outline is roughly rhomboidal
2. The tip of buccal cusp is on a line with the long axis of the root and the apex of the root.
3. The tip of the lingual cusp is on a line with the lingual outline of the root.
4. root tapered with pointed apex. With developmental depression. Occasionally a deep developmental groove is seen along the root.



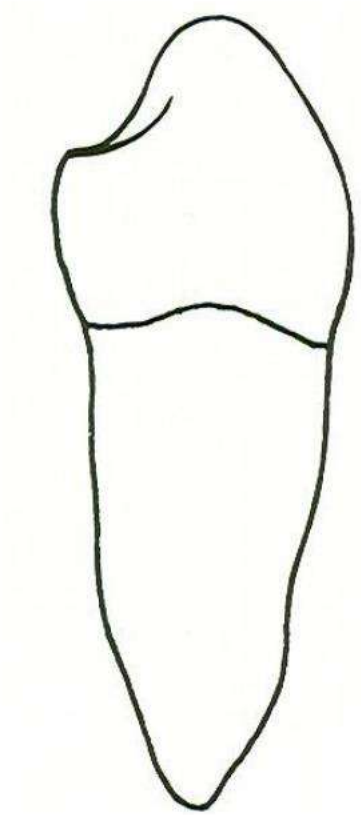
Distal Aspect:-

The distal aspect of the mandibular first premolar differs from the mesial aspect in some respects

1- The distal marginal ridge is higher than the mesial one.

2- The distal contact area is broader than the mesial contact area.

3- The cervical line is less curved.



Occlusal aspect

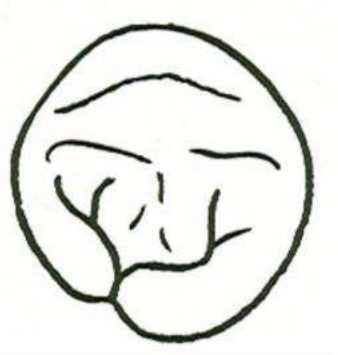
Two form of the occlusal aspect are present which are roughly diamond-shaped and circular form, the two form having the following characteristics :-

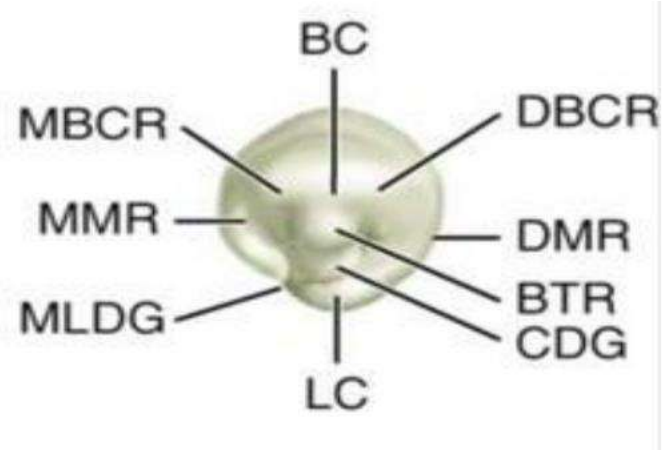
1-The buccal cusp makes up the major of the tooth crown.

2-The buccal cusp having two cusp ridge which are the mesiobuccal and the distobuccal cusp ridges

3-The crown converges sharply to the center of the lingual surface. 4-The lingual cusp is small.

5-The mesial and distal triangle fossa are more directed buccally.





PERMANENT MANDIBULAR SECOND PREMOLARS

Eruption time 11 – 12 years

Root completed 13 – 14 years

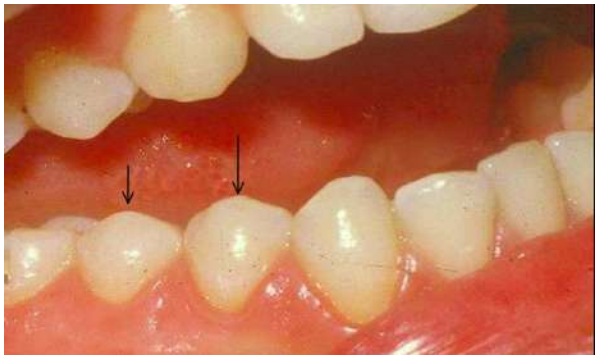
The lower second premolar is the fifth tooth from the middle line of the mandible. This tooth resembles the lower four from the buccal aspect only. It has a single root which is longer than that of the 1st premolar.

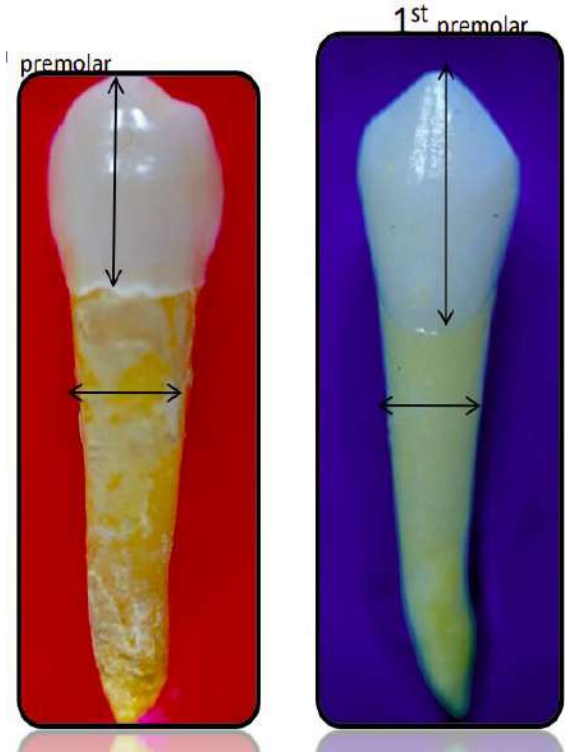
The tooth has two forms:

1. Three cusps configuration with the occlusal surface being more angular.
2. Two cusps configuration with the occlusal outline being more ovoid in shape

Buccal Aspect:-

1. The buccal cusp is shorter than in lower four.
2. The contact areas are broader and appear to be higher because of the short buccal cusp.
3. the mesio-buccal and disto-buccal cusp ridges (cusp slopes) are less steep, more rounded.
4. The crown is shorter overall and is wider in the cervical third than the mandibular first premolar.
5. The cervical line is less curved than it does on mandibular first premolars.
6. the root is broader mesiodistally than lower four. the root apex is more blunt





Lingual Aspect:-

1- The lingual cusp or cusps are well developed and longer than that of lower four so that less of the occlusal surface can be seen from this aspect.

2- In the three- cusp type there are two lingual cusp, the mesiolingual one which are the larger and the longer one of the both and the distolingual one and there is a short groove extended occlusolingually between them.

3- In the two-cusp type there is one lingual cusp with no developmental groove, but there is a developmental depression distolingually between the lingual cusp and the distal marginal ridge.

4- The crown is converge lingually.

5- The lingual portion of the root is smoothly convex for most of its length

Mesial Aspect:-

Lower five differs from the lower four from this aspect as follows:-

1- The crown and root are wider buccolingually.

2- The buccal cusp is shoter than lower four.

3- The lingual cusp is more developed.

4- There is no mesiolingual developmental groove on the crown portion.

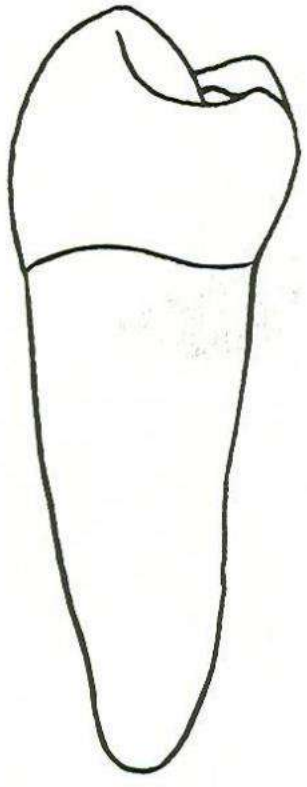
5-The marginal ridge is at right angles to the long axis of the tooth.

6- Less of the occlusal surface may be seen

7- The root is longer. And the root apex is more blunt.

Distal Aspect:-

This aspect is similar to the mesial aspect except that most of the occlusal surface can be seen from this aspect since the distal marginal ridge is at lower level than the mesial marginal ridge . The disto-lingual cusp is usually smaller and shorter than the mesio-lingual cusp (Three-cusp type), so both lingual cusps are seen from this aspect.



Occlusal Aspect:-

Three-cusp type:-

1- Is square in shape

2- buccal cusp which is the larger then the mesiolingual cusp then the distolingual cusp which is the smallest.

3- Each cusp has well formed triangular ridge. the three triangular ridges converge toward a central fossa, which has central pit

4-There are three developmental grooves radiate from the central pit and form a Y on the occlusal surface and separate the triangular ridges: the mesial, distal MR and lingual developmental grooves.

TWO CUSP TYPE

1- it is rounded in shape

2-there is no central pit, it has the central developmental groove which is end in the center of the mesial and the distal fossa.

3-The triangular ridges of the two cusps form a transverse ridge.

4-The mesial and distal fossae are roughly circular

Maxillary 2nd and 3rd molar

Maxillary second molar
Eruption time: 12-13
It's main function is to support the 1st maxillary molar in function (grinding)

Buccal aspect

The crown is little shorter cervicoocclusally and narrower mesiodistally than max. first molar Distobuccal cusp is smaller and allow part of distal marginal ridge and distolingual cusp to be seen Buccal roots about the same length and more parallel than max. 1st molar

Lingual aspect:

In compare to the max. first molar Distolingual cusp is smaller No fifth cusp The. The apex of palatal root is in the line with in the distolingual cusp tip

Mesial aspect:

Buccolingual dimension of the second molar is about the same with max.first molar but the crown length is less The root don’t spread bucco-lingually but with in the crown out line.

Distal aspect:

The distobuccal cusp is smaller The mesiolingual cusp can be seen from this aspect The apex of lingual root is with the line of distolingual cusp

Occlusal aspect

Rhomboidal outline that is resembles that of first molar and it is most common but the mesiodistal dimeter is less about 1mm. The cusp well developed but the distal cusps are smaller

Heart shape that is more reassemble the third molar this shape result from the poorly developed distolingual cusp and makes the developed of 3 other cusps predominant

Maxillary 3rd molar:

1.Eruption time (17_23)

2.It is appears as developmental anomaly which is vary in shape,size and contour

3.It’s supplement the max. Second molar in function

4.The crown is smaller and root short and tends to fuse.

5.The occlousal surface predominating heart shaped in which the distolingual cusp is very small and poorly developed and may absent entirely.