

Dental Anatomy

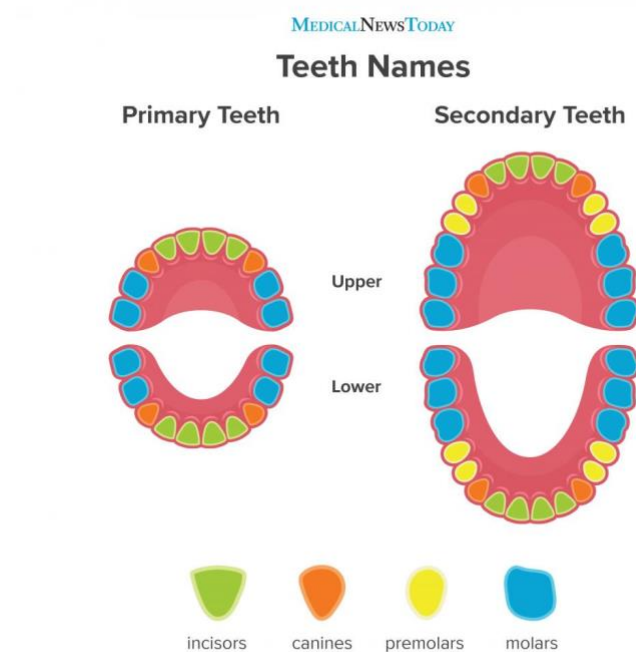
Lec 1

Assis. Lec. Noor Ghazi

Humans have two sets of teeth in their lifetime. The first set of teeth to be seen in the mouth is the **primary** or **deciduous** dentition, **milk tooth**. The term deciduous can mean not permanent, transitory.

The second set of teeth is the **Permanent** or **succedaneous dentition**. The term succedaneous can be used to describe a successor dentition.

Note: The term mandibular refers to the lower jaw, or mandible. The term maxillary refers to the upper jaw, or maxilla.



Formulae for human Teeth

(I for incisor, C for canine, P for premolar, M for molar). The formulae include one side only.

******The dental formula for the primary/deciduous teeth in humans is as follows: I 2/2 C 1/1 M2/2 =10

This formula should be read as: incisors, two maxillary and two mandibular; canines, one maxillary and one mandibular; molars, two maxillary and two mandibular equal to 10 teeth altogether on one side, right or left.

******A dental formula for the permanent human dentition is as follows: I 2/2 C 1/1 P 2/2 M 3/3= 16

Premolars have now been added to the formula, two maxillary and two mandibular, and a third molar has been added, one maxillary and one mandibular.

Tooth Numbering Systems

In clinical practice some “shorthand” system of tooth notation is necessary for recording data. There are several systems in use in the world, for example:

A/The universal system of notation:

The universal system of notation for the entire primary dentition is as follows:

Right										Left
	A	B	C	D	E	F	G	H	I	J
	T	S	R	Q	P	O	N	M	L	K

B/Palmer notation system:

In this system the arches are divided into quadrants with the entire dentition being notated as follows:

Right

Left

E D C B A	A B C D E
E D C B A	A B C D E

In the **universal notation system** for the permanent dentition, the maxillary teeth are numbered from 1 through 16, beginning with the right third molar. Beginning with the mandibular left third molar, the teeth are numbered 17 through 32. Thus, the maxillary right 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:

Right

Left

1 2 3 4 5 6 7 8	9 10 11 12 13 14 15 16
32 31 30 29 28 27 26 25	24 23 22 21 20 19 18 17

The Palmer notation for the entire permanent dentition is as follows:

Right

Left

8 7 6 5 4 3 2 1	1 2 3 4 5 6 7 8
8 7 6 5 4 3 2 1	1 2 3 4 5 6 7 8

FDI two-digit tooth numbering system
Teeth numbering chart for adult teeth

upper right								upper left							
															
18	17	16	15	14	13	12	11	21	22	23	24	25	26	27	28
48	47	46	45	44	43	42	41	31	32	33	34	35	36	37	38
															
molars		premolars		canines		incisors		canines		premolars		molars			
lower right								lower left							

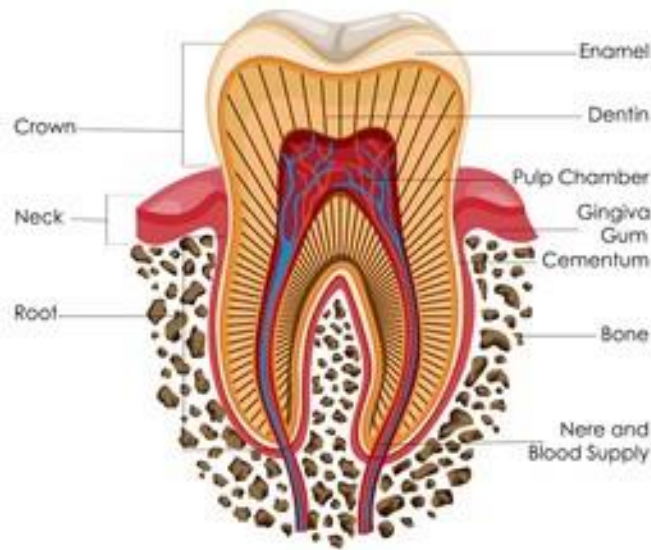
The Crown and Root:

Each tooth has crown and root portion. The crown is covered with enamel and the root portion is covered with cementum. The crown and root join at cementoenamel junction; this junction also called the cervical line.

The main bulk of the tooth is composed of dentin, which is clear in the cross section of the tooth. The pulp chamber is in the crown portion mainly, and the pulp canal is in the root. The spaces are continuous with each other and called pulp cavity.

The four tooth tissues **are enamel, cementum, dentin, and pulp**, the first three are known as **hard tissues**, the last as **soft tissues**.

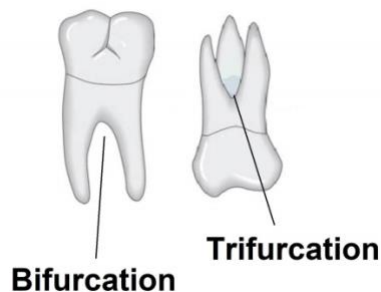
Tooth Diagram



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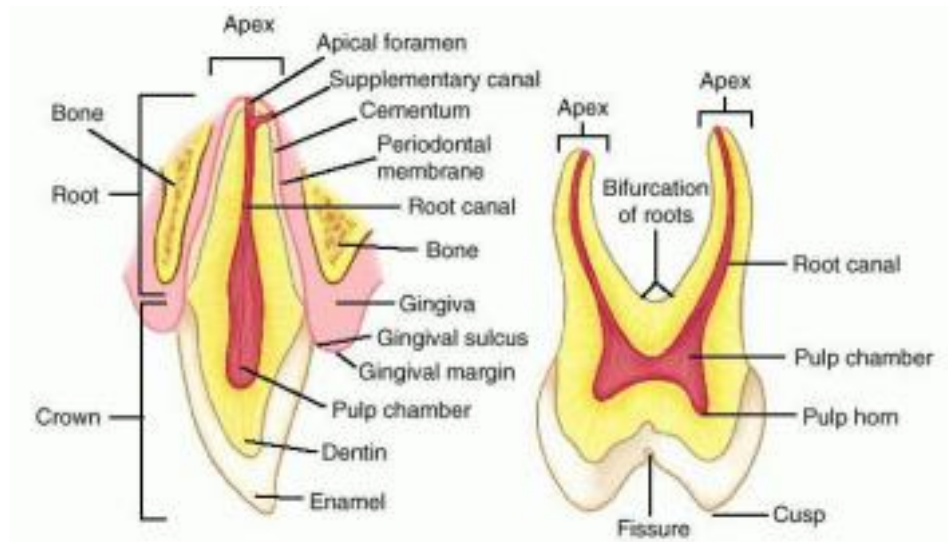
The crown of any tooth may have incisal ridge or edge as in the central and lateral incisor; single cusp as in the canines or two or more cusps, as in the premolars and molars, the incisal ridges and cusps form the cutting surfaces on tooth crowns.

The root portion of the tooth may be single with one apex or terminal end as usually found in anterior teeth and some of the premolars; or multiple with bifurcation or trifurcation dividing the root portion into two or more extensions or roots as found on all molars and some premolars.



The root portion of the tooth is firmly fixed in the bony process of the jaw. The portion of the jaw which serves as a support for the tooth is

called **alveolar process**. The bone of the tooth socket is called the **alveolus**.



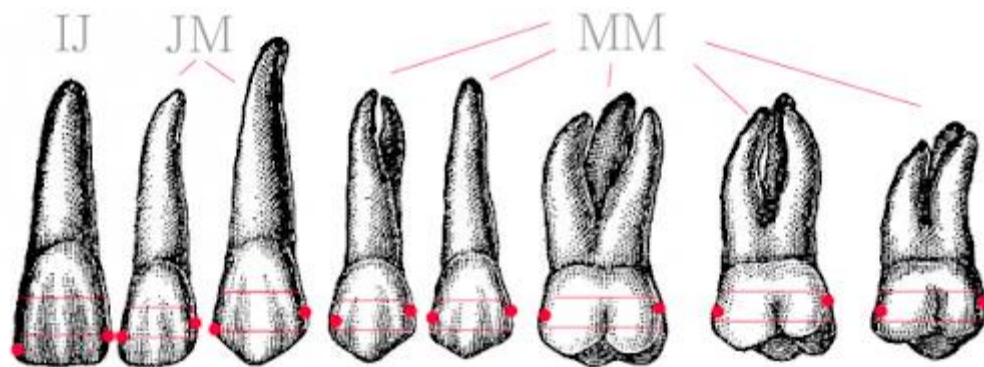
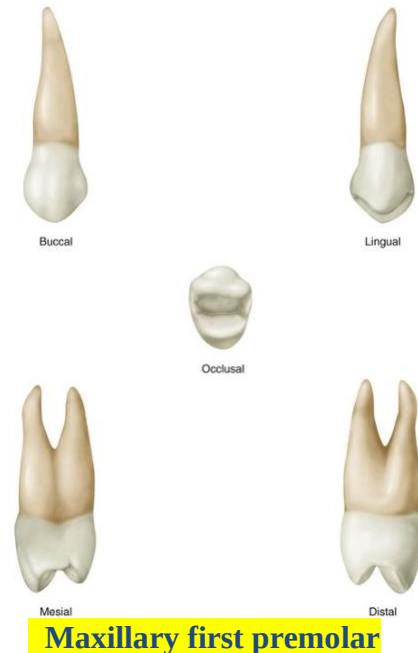
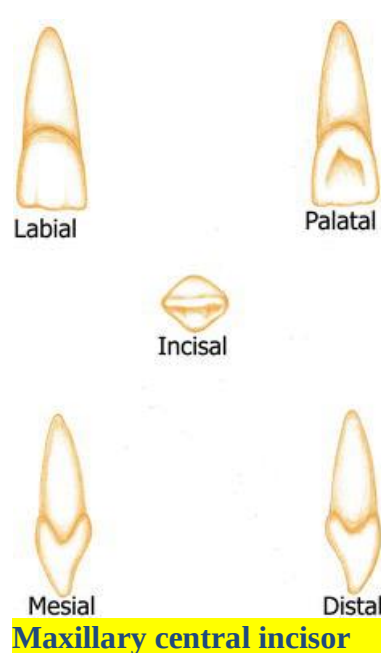
Surfaces and ridges:

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

In the incisors and canine, the surfaces toward the lip are called **labial surfaces**; in the premolars and molars those facing the cheek are the **buccal surfaces**. The labial and buccal surfaces are called **facial surfaces**. All surfaces facing toward the tongue are called **lingual surfaces**. The surfaces of the premolars and molars which come in contact with those in the opposite jaw during occlusion are called the **occlusal surfaces**. In the incisors and canines are called **incisal 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 position of the surface relative to the median line of the face. Those proximal surfaces which are faced toward the median line are called **mesial surfaces** and those most distant from the median line are called **distal surfaces**.

The area of the mesial or distal surface of the tooth which touches its neighbor in the arch is called the **contact area**. Central and lateral incisors and canines as group are called **anterior teeth**. Premolars and molars as group are called **posterior teeth**.



Contact area, Mesial and Distal surfaces

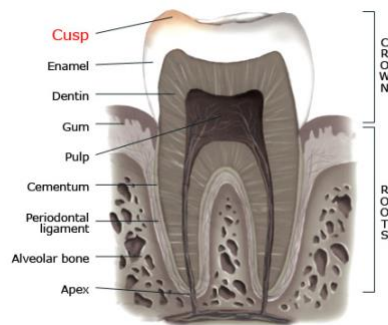
Dental Anatomy

Lec 2

Assis. Lec. Noor Ghazi

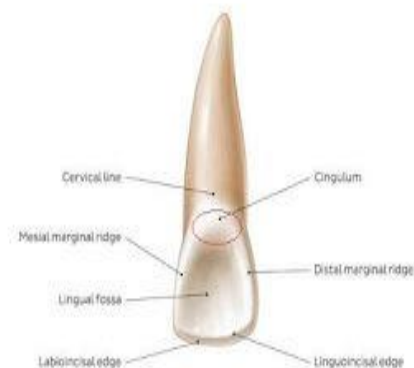
LANDMARKS

A cusp: is a pointed or rounded elevation on the occlusal surface of a tooth.

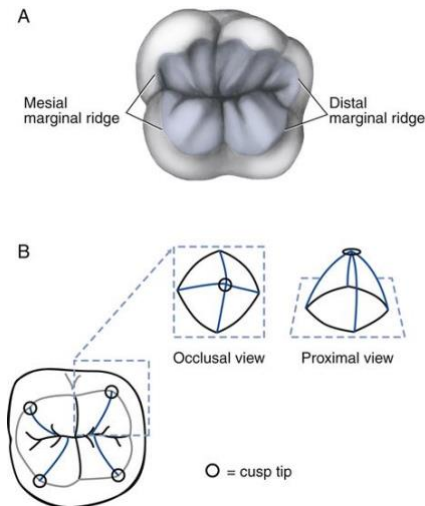


A tubercle: is a smaller elevation on some portion of the crown produced by extra formation of enamel.

A cingulum: is the lingual lobe of an anterior tooth. It makes up the bulk of the cervical third of the lingual surface.



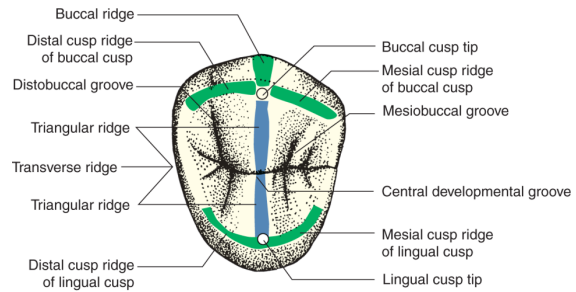
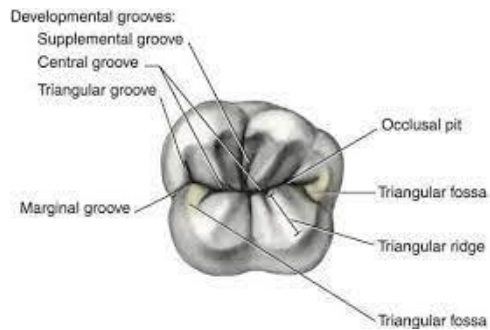
A ridge: is any linear elevation on the surface of a tooth & is named according to its location (eg . buccal ridge , incisal ridge , marginal ridge)



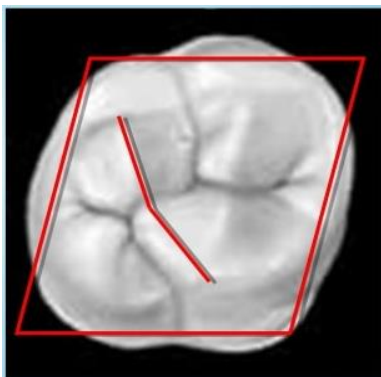
Marginal ridge: are those rounded borders of the enamel that form the mesial & distal margins of the occlusal surfaces of premolars & molars & the mesial & distal margins of the lingual surfaces of the incisors & canines.

Triangular ridges : descend from the tips of the cusp of molars & 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 side of a triangle.

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



The oblique ridge: is a ridge crossing obliquely the occlusal surfaces of maxillary molars. It is formed by the union of triangular ridge of the distobuccal cusp & the distal ridge of the mesiolingual cusp



A sulcus: is along depression or valley in the surface of a tooth.

A developmental groove : is a shallow groove or line between the primary parts of the crown or root .

Pits : are small pinpoint depressions located at the junction of developmental grooves or at terminals of those grooves .

Line angle: It's formed by the junction of two surfaces and gets its name from these surfaces. Example :(mesio-labial line angle).

Point angle: It's formed by the junction of three surfaces and gets its name from these surfaces. Example:(mesio-labio- incisal point angle).

Mamelon: It's any one of the three rounded protuberances found on the incisal ridge of newly erupted incisor teeth.

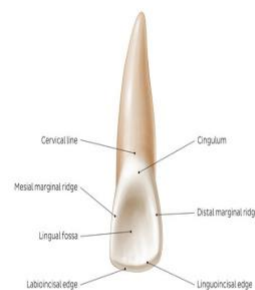
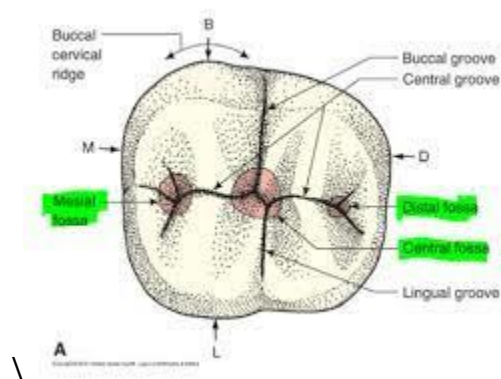


Fossa: It's an irregular depression or concavity.

A: Lingual fossa: It's located on the lingual surface of incisors.

B: Central fossa: It's located on the occlusal surface of molars.

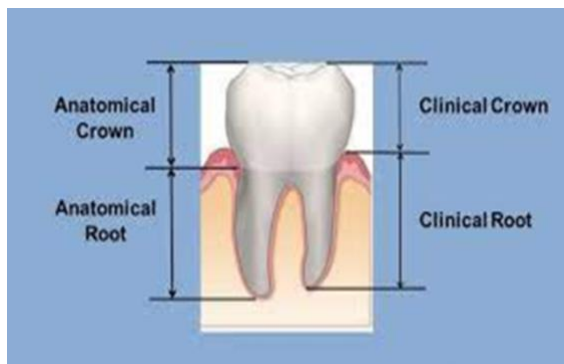
C: Triangular fossa: It's located on the occlusal surface of premolars and molars.



Anatomical crown: is the portion of the tooth which is covered by enamel.

Clinical crown: is the portion of the tooth which is visible in the mouth.

Natal teeth: No teeth are visible in the mouth at birth however; occasionally infants are born with erupted mandibular incisor. These teeth are mobile and interfere with sucking and must be extracted with topical anesthesia.



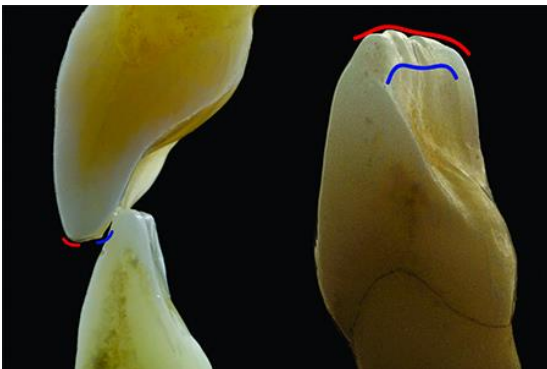
The permanent maxillary Incisors:

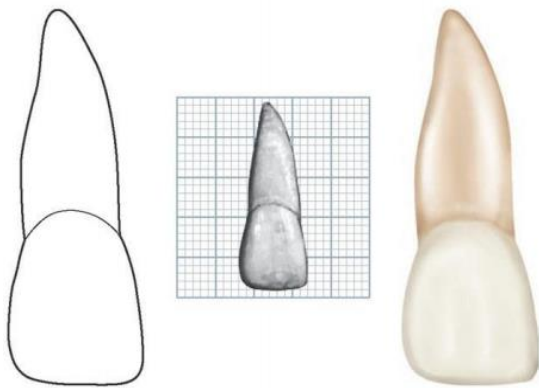
The maxillary incisors are four in number. The maxillary central incisor is larger than the lateral incisor they are similar anatomically , their major function is to cut food during the process of mastication مضغ. These teeth have incisal ridges and edges.

Incisal ridge: is that portion of the crown which makes up the complete incisal portion.

Incisal edge: It an angle formed by the merging of two flat surfaces.

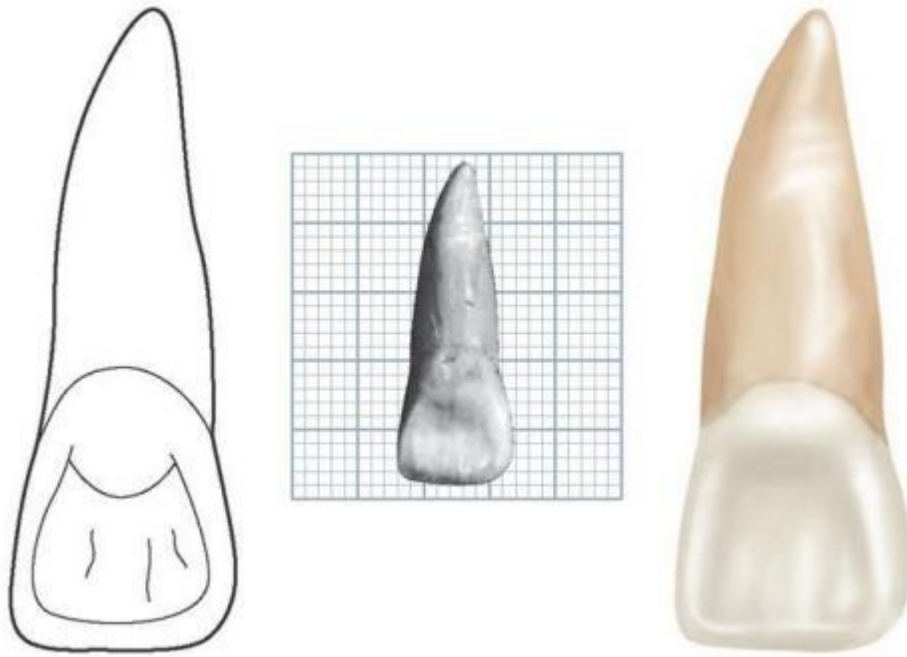
Therefore, an **incisal edge** does not exist on an **incisor** until occlusal wear has created a flattened surface linguoincisorally, which surface forms an angle with the labial surface.





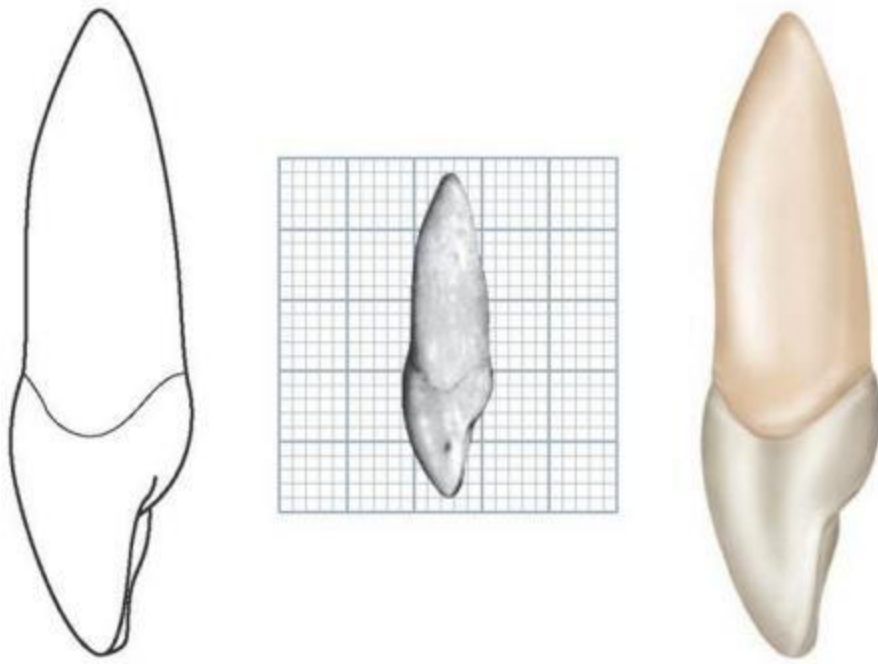
Labial Aspect:

- 1- It is the widest anterior tooth mesio-distally.
- 2- It has asquare or rectangular appearance.
- 3- Sharp mesio- incisal angle and rounded disto- incisal angle.
- 4- The crown is usually convex, especially toward the cervical third, and are flat at the middle and incisal portions
- 5- The mesial outline is slightly convex with a crest of curvature (representing the contact area) near the mesio- incisal angle.
- 6- The distal outline is more convex than mesial outline with crest of curvature being at the junction between incisal and middle thirds.
- 7- The incisal outline in newly erupted teeth has elevations called mamelons, with age the mamelons will disappear and straight incisal outline is seen.
- 8- The cervical, outline of the crown follows a semicircular direction with the curvature directed towards the root.
- 9- The single root is cone in shape with a blunt apex, It is 2-3mm longer than the crown.



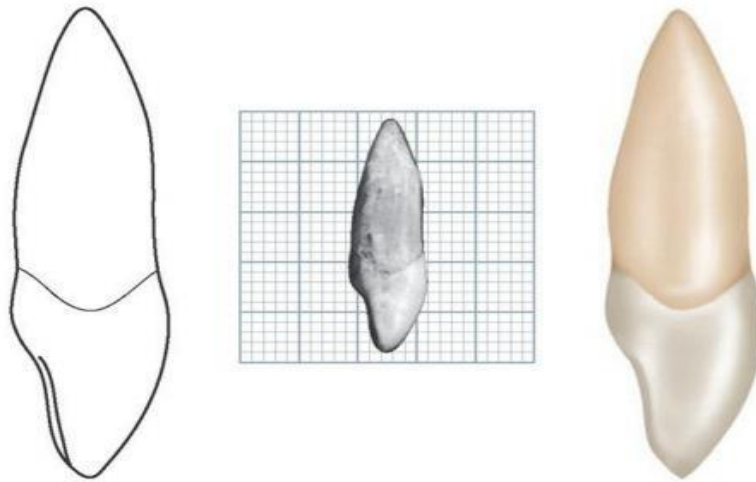
Lingual Aspect:

- 1- The lingual outline of the maxillary central incisor is the reverse of that found on the labial aspect. The lingual aspect of the crown has convexities & concavity.
- 2- Below the cervical line, there is a smooth convexity called cingulum which confluent with raised marginal ridge mesially and distally.
- 3- The crown & root taper lingually therefore mesio-distal dimension of the lingual surface is narrower than that of the labial surface.
- 4- Below the cingulum a shallow concavity is present called the lingual fossa.
- 5- The lingual fossa is bordered mesially by the mesial marginal ridge, distally by the distal marginal ridge, cervically by the cingulum, incisally by the lingual portion of the incisal ridge.



Mesial Aspect:

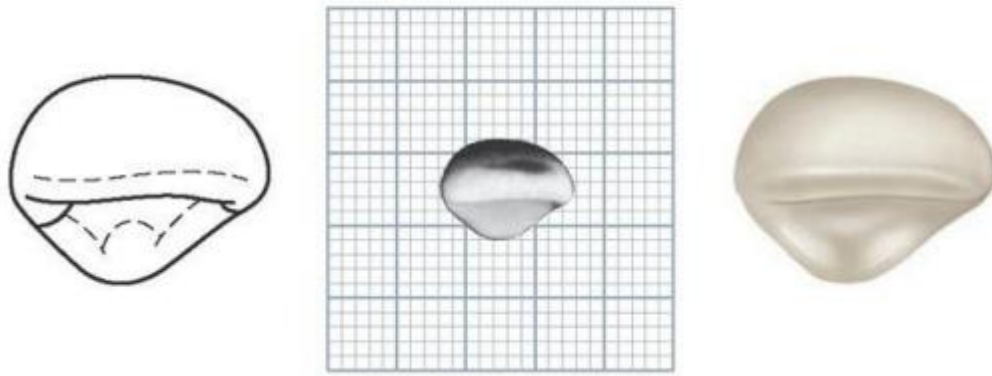
- 1) The crown is wedge وتد shaped or triangular with the base of the triangle at the cervix عنق and the apex القمة at the incisal ridge.
- 2) A line which bisects ينصف the crown will bisect the root.
- 3) The crest of curvature labially and lingually are immediately at cervical third of the crown, this will give the crown its greatest labio-lingual measurement.
- 4) The labial outline of the crown from crest of curvature to the incisal ridge is slightly convex.
- 5) The lingual outline of the crown is convex at the cingulum then becomes concave downward then slightly convex at the incisal ridge.
- 6) The cervical outline curves incisally more than any surface on any tooth, about 3-4mm.



Distal Aspect:

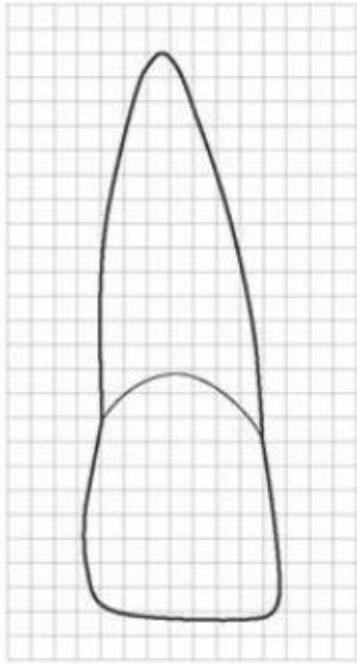
There is little difference between mesial & distal outline

The curvature of the cervical line is less on extent distally than mesially.

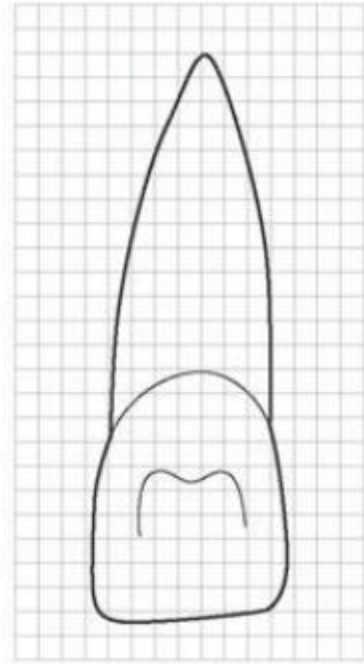


Incisal Aspect:

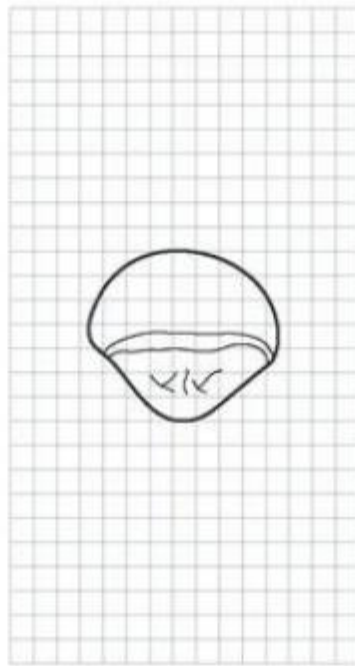
- 1) The incisal edge is centered over the root.
- 2) The labial outline is broad & flat in comparison with the lingual surface especially toward the incisal third.
- 3) the cervical portion of the crown labially is convex.
- 4) The outline of the lingual part tapers lingually.
- 5) The crown has triangular shape, as the root shape in cross section.
- 6) The mesio-distal dimension labially is greater than that lingually.



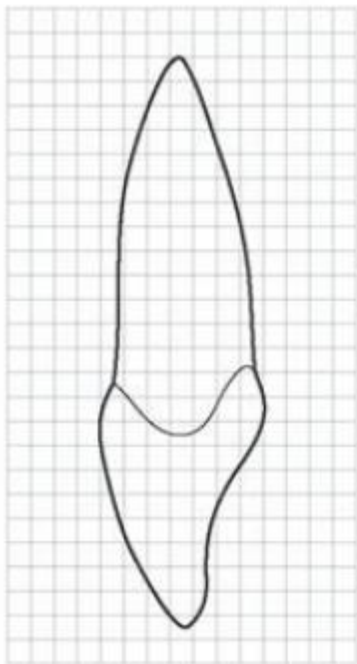
Labial



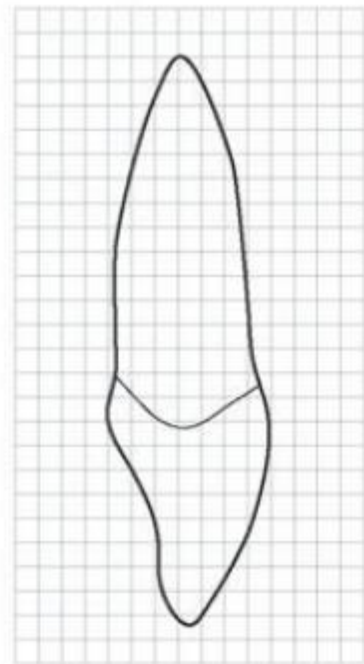
Lingual



Incisal



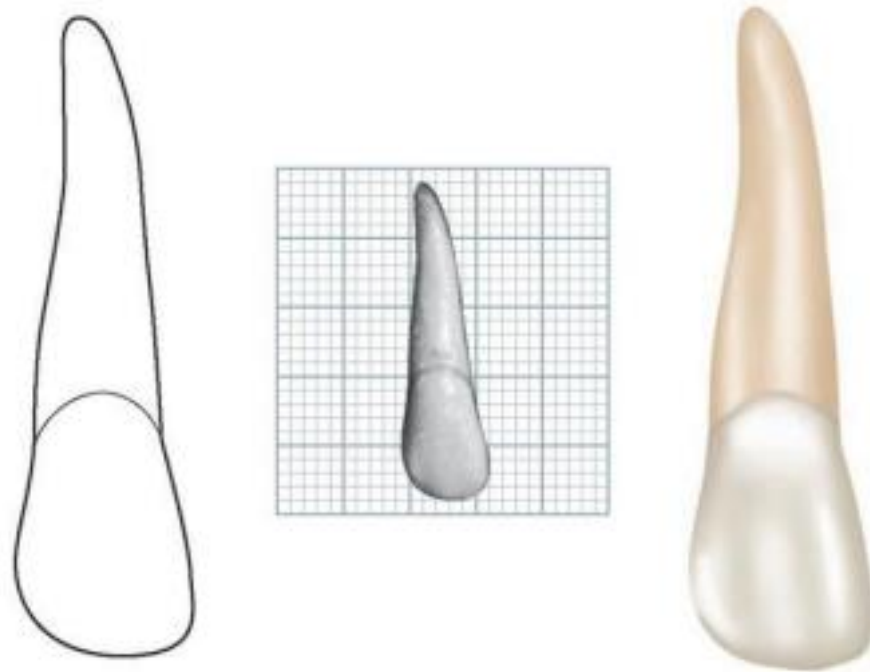
Mesial



Distal

MAXILLARY LATERAL INCISOR

The lateral incisor resembles the central incisor in function, form, anatomy, but is generally smaller in all dimensions except root length. Because it resembles the maxillary central incisor in form, direct comparisons are made with the central incisor in its



description.

THE LABIAL ASPECT:

- 1- The crown is more rounded, shorter and narrower than that of the maxillary central incisor, but the root is as long as or longer than that of the maxillary central incisor.
- 2-The labial surface of the crown is more convex than that of the maxillary central incisor.
- 3-The mesial outline resembles that of the maxillary central incisor with more rounded mesio-incisal angle with the crest of curvature (contact point) located between the middle and incisal thirds.
- 4-The distal outline is more rounded with crest of curvature (contact point) at the center of middle third.
- 5- The root tapers and curves distally at the apex and ends in a pointed apex.

Maxillary central incisor bigger and lateral incisor smaller



Maxillary Lateral Incisor



Distoincisor angle more rounded

Mesioincisor angle more rounded

Maxillary Central Incisor



Distoincisor angle

Mesioincisor angle

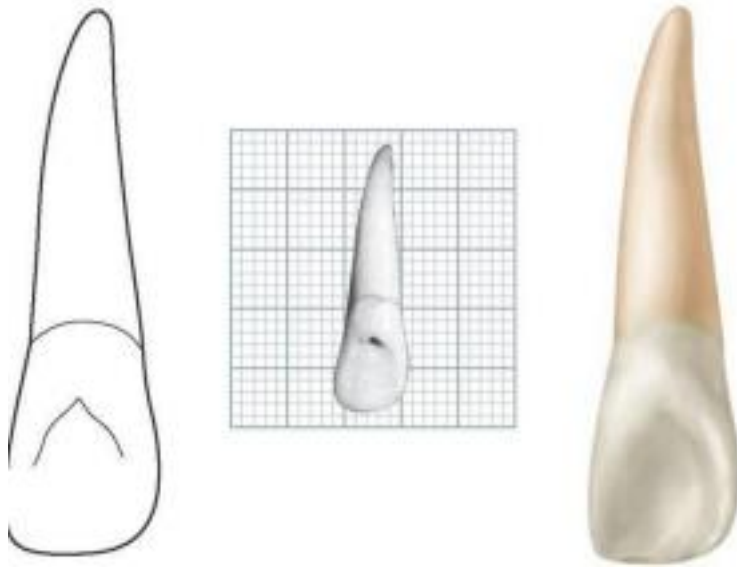
THE LINGUAL ASPECT:

1- mesial and distal marginal ridges and the lingual portion of the incisal ridge are well marked واضح.

2- the cingulum is usually prominent, بارزة with a tendency ميل toward deep developmental grooves within the lingual fossa, where it joins the cingulum.

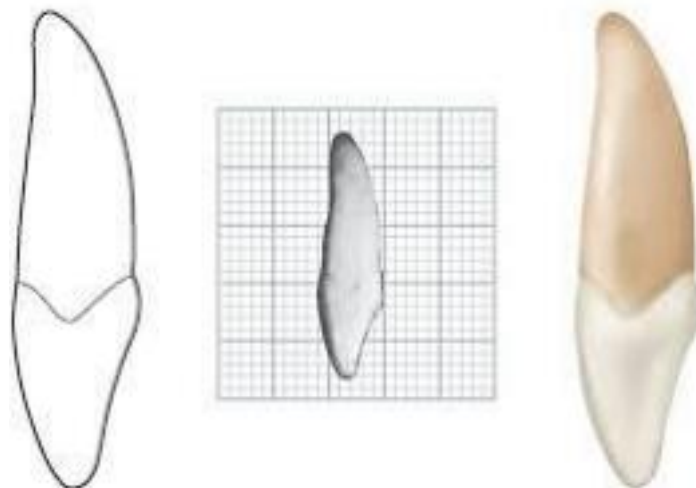
3- the lingual fossa is more concave than that found on the central incisor. 4- The tooth tapers toward the lingual, resembling a central incisor. **It is not uncommon to find a deep developmental groove at the side of

the cingulum, usually on the distal side, which may extend up on the root for part or all of its length.



THE MESIAL ASPECT:

- 1-**The crown is narrower labio-lingually than the maxillary central incisor.
- 2-**The curvature of the cervical line is less than that of the maxillary central incisor.
- 3-**The root appears as a tapered cone and a line bisecting the root bisect the incisal ridge which is well developed.



DISTAL ASPECT:

- 1-The curvature of cervical line distally is less than that of mesially.
- 2- It is not uncommon to find a developmental groove on the crown extending to the root.

INCISAL ASPECT:

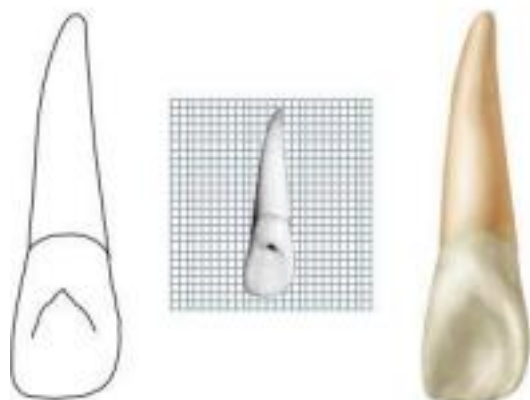
- 1- The incisal aspect of this tooth sometimes resembles that of the central incisor, or it may resemble that of a small canine.
- 2- the cingulum and incisal ridge may be large.
- 3- the labiolingual dimension may be larger than the mesiodistal dimension.
- 4- All maxillary lateral incisors exhibit more convexity labially and lingually from the incisal aspect than do the maxillary central incisors.

ANOMALIES DEVELOPMENTAL تشوهات خلقية اثناء النمو:

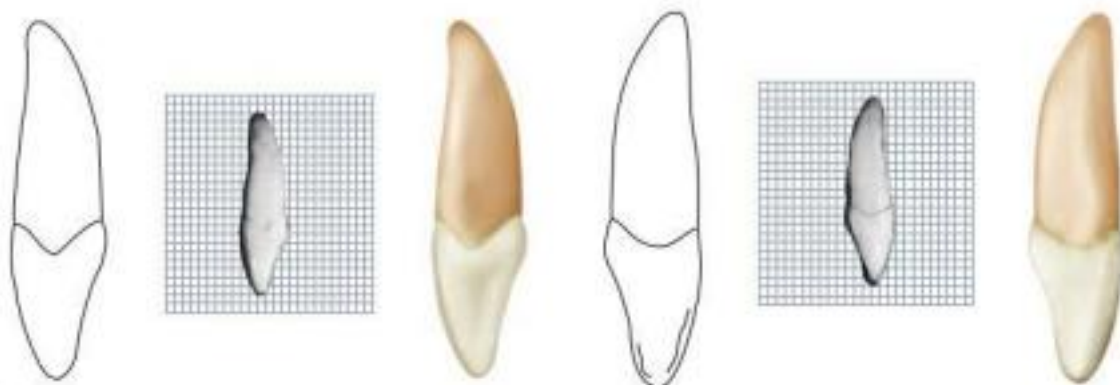
Maxillary lateral incisors vary in form more than any other tooth in the mouth except the third molar.

- 1- Peg-shaped lateral incisor with a small conical crown. شكل الخنزير سن
- 2- The maxillary lateral incisor may be congenitally missing خلقيا مفقود
- 3- The presence of a palatogingival groove in maxillary incisors. This groove is also referred to as the palatoradicular groove.

	LENGTH OF CROWN	LENGTH OF ROOT	MESIODISTAL DIAMETER OF CROWN	MESIODISTAL DIAMETER OF CROWN AT CERVIX	LABIO- OR BUCCOLINGUAL DIAMETER OF CROWN	LABIO- OR BUCCOLINGUAL DIAMETER OF CROWN AT CERVIX	CURVATURE OF CERVICAL LINE— MEDIAL	CURVATURE OF CERVICAL LINE— DISTAL
Maxillary Teeth								
Central incisor	10.5	13.0	8.5	7.0	7.0	6.0	3.5	2.5
Lateral incisor	9.0	13.0	6.5	5.0	6.0	5.0	3.0	2.0

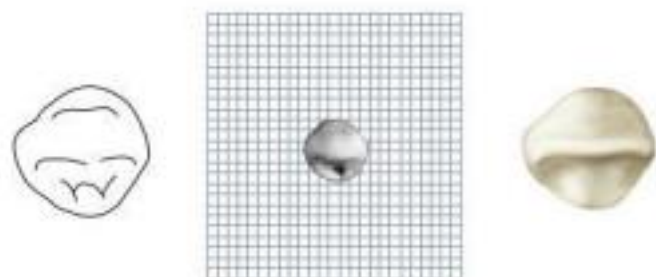


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1



2

Dental anatomy

Lec: 5

Dr. Noor Ghazi

Permanent mandibular incisors

Mandibular incisors are 4 in number : 2 central (right & left) and 2 lateral incisors (right & left).

Characteristic features of permanent mandibular incisors:

- 1- The mandibular incisors have smaller mesiodistal dimension than of the other teeth .
- 2- The contact area are near the incisal ridges mesially and distally .
- 3- The lingual surface is relatively smooth and featureless with the marginal ridges and the cingulum being not well developed.
- 4- The labial surface inclined lingually so that the incisal ridge is lingual to a line bisecting the root.



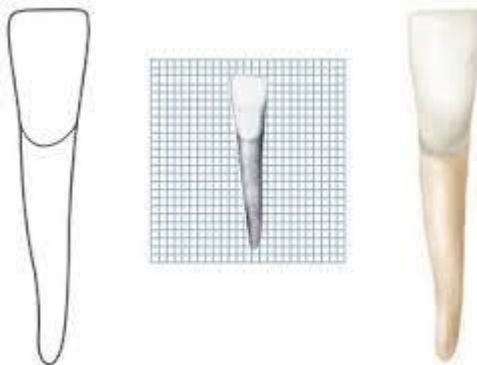
Principal identifying features of mandibular central

incisors:

- 1- It is the smallest tooth in the permanent dentition.
- 2- The incisal ridge is lingually inclined.
- 3- Well defined developmental depression is seen on the root mesially & distally.

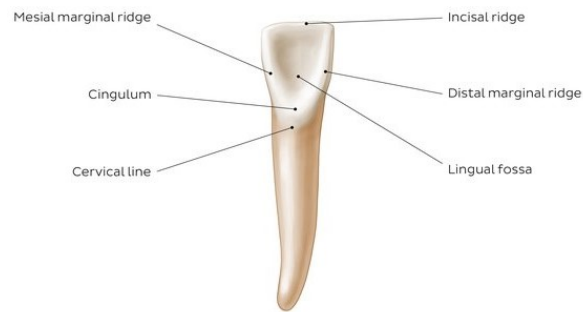
The labial aspect :

- 1- The incisal ridge is straight and nearly at a right angle to the long axis of the tooth.
- 2- The disto_incisal angle is more rounded than the mesio_incisal angle.
- 3- The contact areas are incisal to the junction between incisal and middle third.
- 4- The mesial & distal root outline are straight with a distally curved apex.
- 5- The labial surface of the crown is smooth ,being flat at incisor third and becoming more convex as it goes cervically.



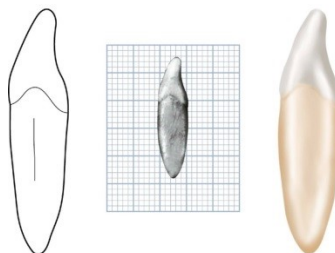
Lingual aspect :

- 1- The lingual surface of the crown is smooth with very slight concavity at the incisal third .
- 2- No developmental grooves are found near the cingulum.



Mesial aspect :

- 1- The labial outline of the crown above the cervical curvature is straight .
- 2- The lingual outline of the crown shows a shallow concavity and the incisal ridge is rounded and its center is usually lingual to the center of the root.
- 3- The curvature labially and lingually above the cervical line is less than found on maxillary incisors.
- 4- The curvature of cervical line curves incisally above one third the length of the crown .
- 5- The mesial surface of the root have a broad developmental depression for most of the root length .the depression usually are deeper at the junction of middle & apical third .

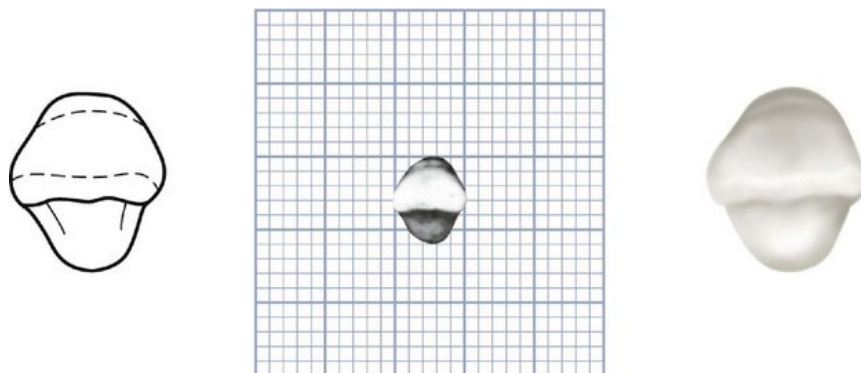


Distal aspect :

- 1- The cervical line curvature is less than that mesially about 1 mm less.
- 2- The developmental depression in the root is more marked than that on the mesial side with a deeper & more well defined developmental groove in its center.

Incisal aspect :

- 1- The mesial half of the crown is almost identical to the distal half (bilateral symmetry)
- 2- The incisal edge is at right angle to a line bisecting the crown labio_lingually (mark of identification).
- 3- At the incisal third, the labial surface of the crown is slightly convex & the lingual surface is slightly concave.
- 4- More of the labial surface may be seen than of the lingual surface from this aspect (the line of vision with the long axis of the tooth)
- 5- Labio_lingual diameter of the crown greater than mesio_distal one.

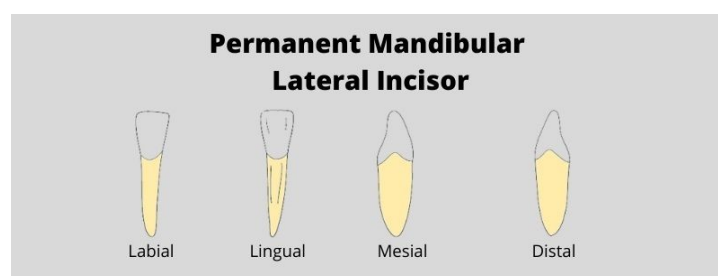


Mandibular lateral incisors:

It's the second mandibular tooth from the median line (right&left)

Principal identifying features :

- 1- Its form closely resemble the mandibular central incisor but it's somewhat larger .
- 2-The crown is slightly larger ,but the root is considerable longer than the mandibular central incisors .
- 3-The mesial side of the crown is longer than the distal side causing the incisal ridge to slope downward in a distal direction .
- 4-The distal contact area is more toward the cervical area than the mesial contact area to contact properly the mesial contact area of mandibular canine .
- 5-Faint marginal ridges but more prominent than in mandibular central incisor.
- 6-The root form is similar to that of mandibular central incisor including the developmental depression mesially and distally .
- 7- No marked difference is evident between the mesial and distal surface of central &lateral incisor even the curvatures of cervical line mesially & distally are similar in extent .
- 8-The incisal edge is not at right angles to a line bisecting the crown and root labio-lingually as was found when observing the mandibular central incisor ,the edge follows the curvature of the mandibular dental arch giving the crown of mandibular lateral incisor the appearance of being twisted slightly on its root base.



Some differences between maxillary & mandibular central incisor:

Features	Maxillary central incisor	Mandibular central incisor
Location of incisal ridge	Centered over the root	More lingually positioned
Labial outline(from mesial aspect)	Curvature is more labially&lingually	Curvature is less labially&lingually
Lingual aspect	Featurefull	featureless
Contact area	More cervically	More incisally
Size	Larger	Smaller

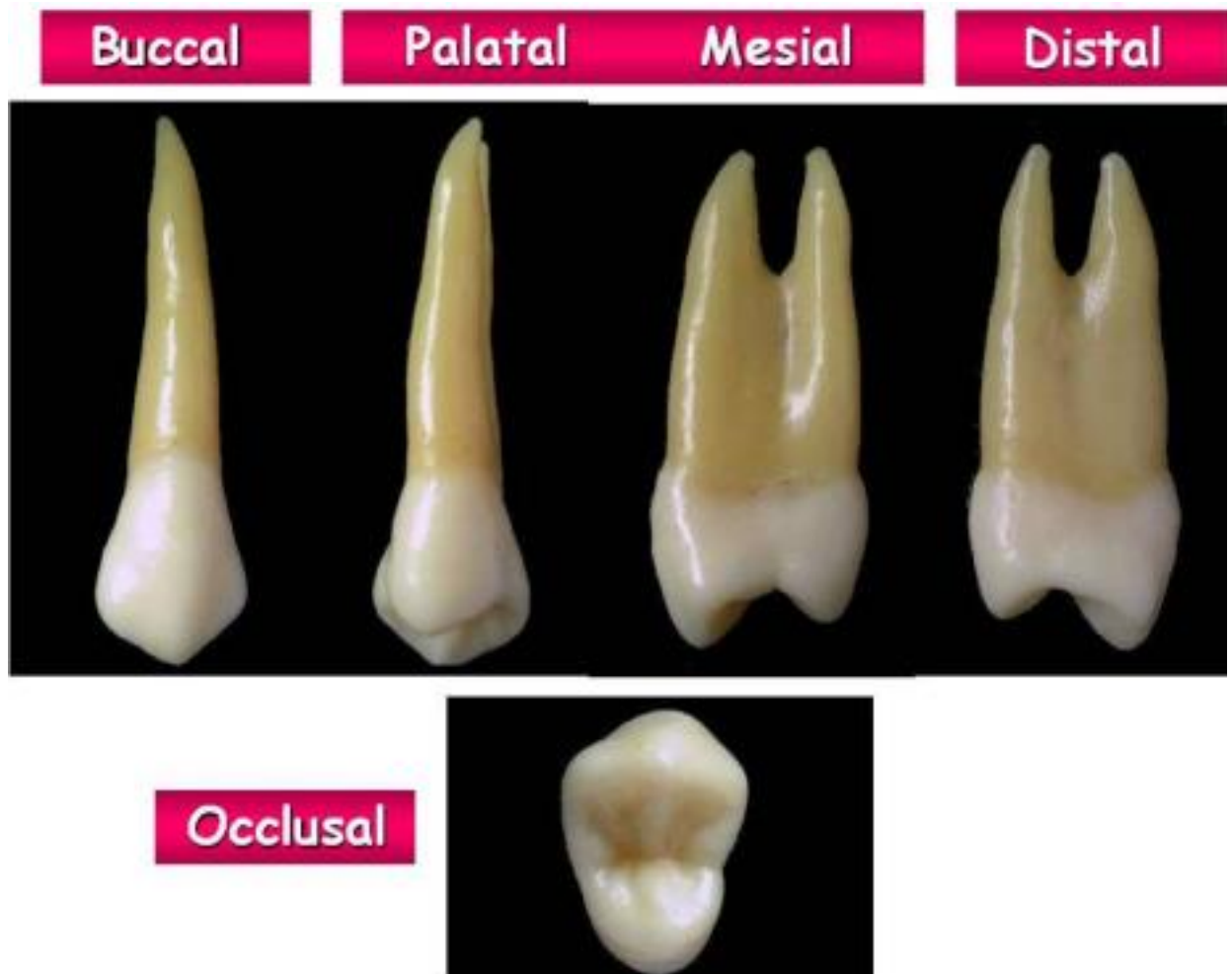
Good luck

Permanent maxillary premolars

The maxillary premolars have shorter crown and shorter root than those of the maxillary canines. Resemble the canines when viewed from the buccal aspect. The buccal cusp of maxillary first premolar is long & sharp assisting the canine as a tearing tooth, also have two roots, one is placed buccally & one lingually.

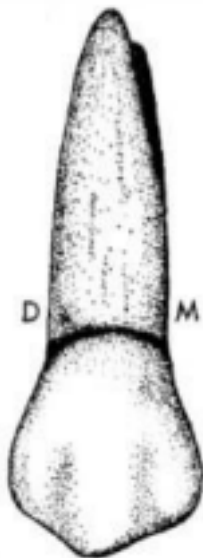
Premolars are named so because they are anterior to molars in permanent dentition. They are also called bicuspid (having two cusps) but this name is not widely used because the mandibular 1st premolar has one functional cusp.

Maxillary 1st premolar



Buccal aspect :

1-The mesial outline is slightly concave from



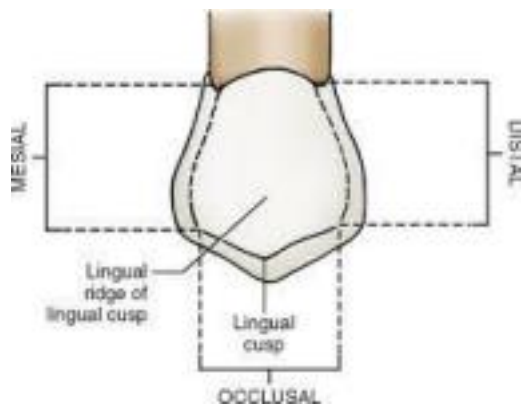
the cervical line to the contact area. The crest of curvature of the mesial contact areas is immediately occlusal to the center of the middle third.

2- The distal outline of the crown is straighter than that mesially. the distal contact area slightly more occlusally than that found mesially.

3- The mesial slope of the cusp is straight and longer than the distal slope, which is shorter and more curved.

4- Buccal surface of the crown is convex showing a strongly developed middle buccal lobe. The ridge which is continuous from the tip of the cusp to the cervical line is called the buccal ridge.

Lingual aspect :



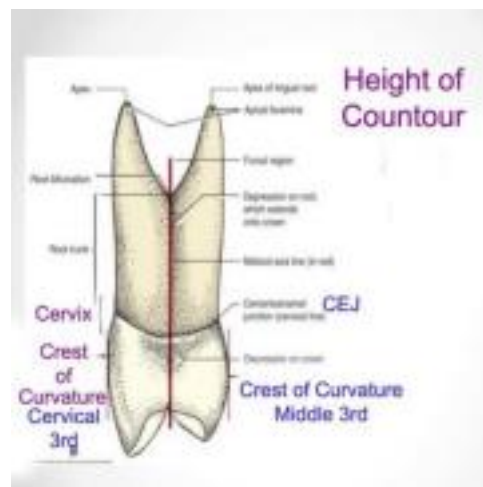
1- The crown tapers lingually, the lingual cusp is narrower and shorter than the buccal cusp.

2- The lingual cusp is smooth and spheroidal كروي. The cusp tip is pointed with mesial and distal slopes meeting at right angle.

3-The mesial and distal outlines lingually are convex being continuous with the slopes of the lingual cusp.

4- The apex of the lingual root is more blunt حاد غيبي than the buccal one.

Mesial aspect :



1-

The crown is nearly trapezoidal منحيف شبه, with the longest side is toward the cervical line, and the shortest is toward the occlusal portion.

2- The cervical line has less curvature (1mm) than any anterior tooth.

3- The lingual outline is convex and the crest of curvature is near the center of middle third.

4- The buccal outline is convex and the crest of curvature is at the junction between the cervical and middle third.

5- The mesial marginal ridge is at the level of the junction of the middle and occlusal thirds and it is crossed by the mesial developmental groove.

6- The root is bifurcated for half of its total length.

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

Distal aspect :

The differences between distal and mesial aspects are: 1- The cervical line curvature is less than that mesially.

2- There is no developmental groove crossing the distal marginal ridge.

3- There is no developmental depression.



Occlusal aspect :

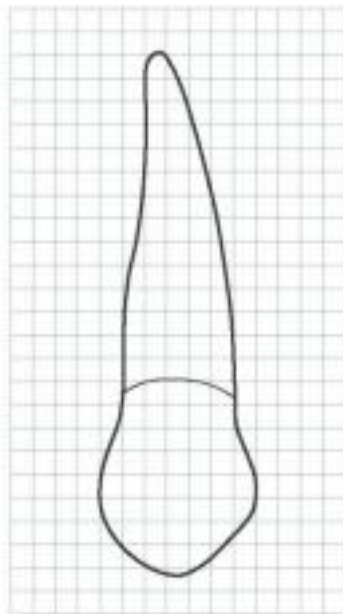
1- It resembles an unequal hexagon (six-sided figure).

2- The distal crest of curvature is buccal to the mesial crest of curvature.

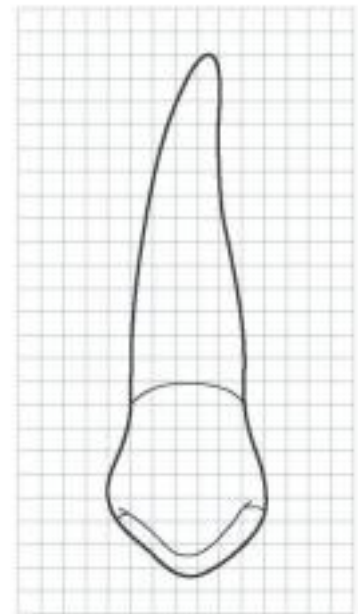
3- The bucco-lingual dimension is much greater than the mesio distal dimension.

4- A central developmental groove divides the crown into buccal and lingual parts.

5- presence of mesial and distal triangular fossae.



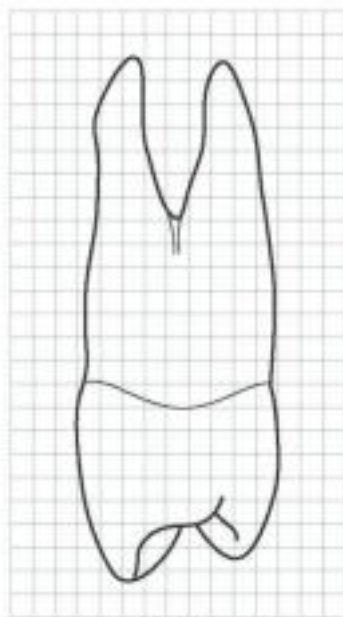
Buccal



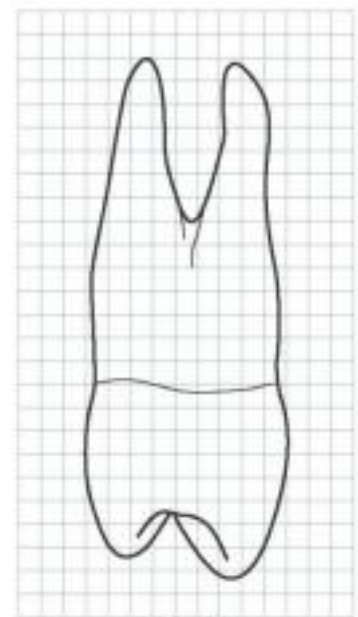
Lingual



Occlusal



Mesial



Distal

Maxillary 2nd premolar

Principal identifying features:

- 1- The buccal and lingual cusps are equal in height.
- 2- Mesial slope of the buccal cusp is shorter than the distal slope.
- 3- It has a single root.
- 4- The occlusal surface is more rounded or oval.
- 5- The central developmental groove is shorter and more irregular with more supplemental grooves on the occlusal surface.
- 6- There is no mesial groove crossing the mesial marginal ridge.
- 7- The mesial surface has no developmental depression



Dental anatomy

Lec: 9

Assis lec. Noor Ghazi

Permanent mandibular 1st premolar

Principal identifying features

Fourth tooth from the midline, it is the smallest premolar in the human dentition. It resembles both the mandibular canine and the mandibular second premolar in function and has some of the characteristic of each of them.

Characteristics that resemble those of those mandibular canines:

- 1 -The buccal cusp is long, sharp and is the only occluding cusp.
- 2 -The bucco-lingual measurement is similar to that of the mandibular canine.
- 3 -The occlusal surface slopes sharply lingually in a cervical direction.
- 4-The mesio-buccal cusp ridge is shorter than the disto-buccal cusp ridge.
- 5 The outline from the occlusal surface resembles the incisal aspect of the mandibular canine.

Characteristics that resemble those of those mandibular 2nd premolar :-

- 1- The mesial and distal contact areas are located at nearly the same level.
- 2- The curvature of the cervical line mesially and distally is similar.
- 3-The tooth has more than one cusp.
- 4- The length of the root is closer to the length of the root of mandibular 2 premolar.

Principle identifying features

- 1 -Marked lingual inclination of the crown.
- 2 -Two cusps: buccal and lingual; the buccal cusp is larger, and the lingual cusp is like a more developed cingulum.
- 3-Circular occlusal outline.
- 4 -Single rounded root

Buccal Aspect

1. The crown is roughly trapezoidal with a prominent buccal ridge, which continues from the cusp tip to the cervical line.
2. The mesial slop of the buccal cusp is shorter than the distal slop.
3. The contact areas mesially and distally are broad and with the crests of curvatures almost at the same level mesially & distally, this level being a little more than half the distance from the cervical line to the cusp tip.
4. The mesial and distal outlines from the cervical line to the crest of curvature are slightly concave.
5. The tip of the buccal cusp is sharp and located mesial to the long axis of the crown.

Lingual Aspect

1. -The crown and the root taper lingually and the occlusal surface inclines greatly cervically.
2. -The lingual cusp is poorly developed, but is pointed.
3. There is a developmental groove named mesio-lingual developmental groove which divides the mesio-buccal and lingual lobes.

Mesial Aspect

1. The tip of the buccal cusp nearly reaches the center of the root, and the convexity of the lingual outline of the lingual cusp will be lingual to the lingual outline of the root.
2. The buccal outline is very curved and the crest of curvature is near the middle third of the crown.
3. The lingual outline is less curved than the buccal outline, with the crest of curvature at the center of middle third.
4. The height of the lingual cusp is two-third the height of the buccal cusp from the cervical line to the tip of the cusp.
5. -The surface of the crown mesially is smooth except for the presence of the mesio-lingual developmental groove.

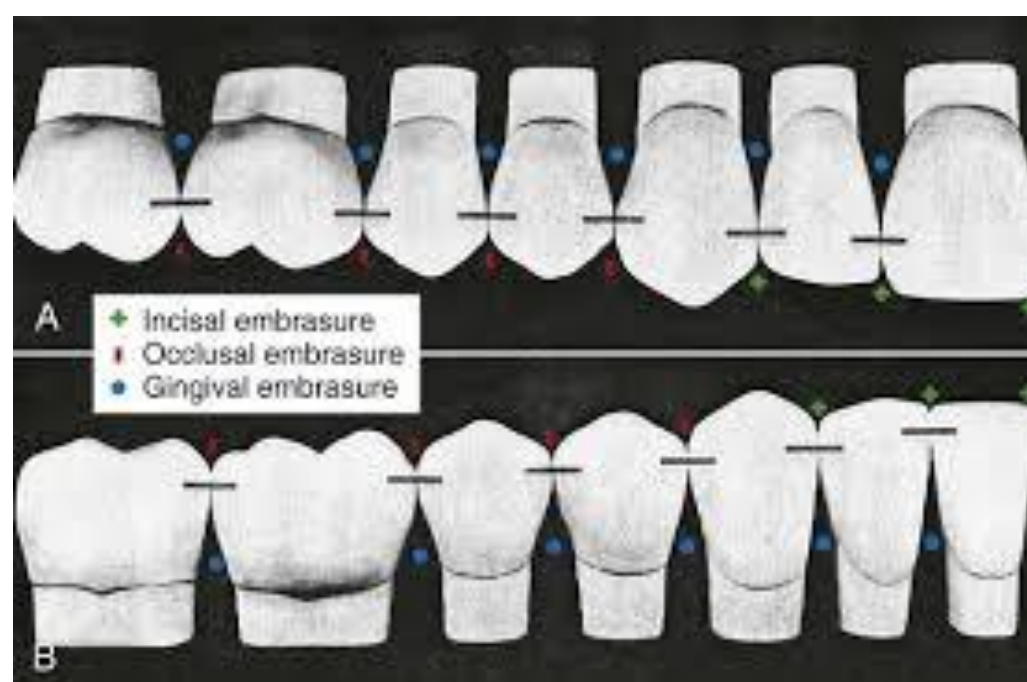
Distal Aspect

The distal aspect differs from the mesial aspect in the following points:

1. There is no developmental groove in the distal aspect.
2. -The distal marginal ridge is higher than the mesial marginal ridge, with less inclination lingually.
3. The curvature of the cervical line distally is nill.

Occlusal Aspect

1. The buccal ridge is prominent.
2. The mesio-buccal and disto-buccal line angle s are rounded and prominent.
3. The crown converges sharply to the center of the lingual surface.
4. The marginal ridges are well developed.
5. The lingual cusp is small.
6. The triangular ridge of the buccal cusp is large while triangular ridge of the lingual cusp is small.
7. There are two fossae: mesial and distal.
8. -The mesial contact area is smaller than the distal contact area because it is constricted by the mesio-lingual developmental groove.



Dental anatomy

Lec19

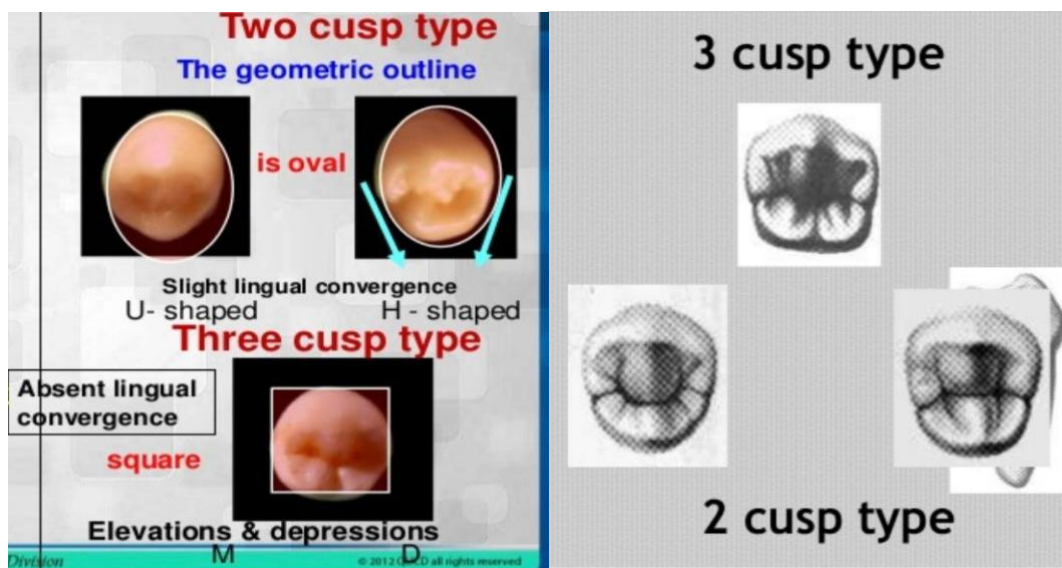
Assis.lec.

Noor Ghazi

Permanent mandibular second premolar

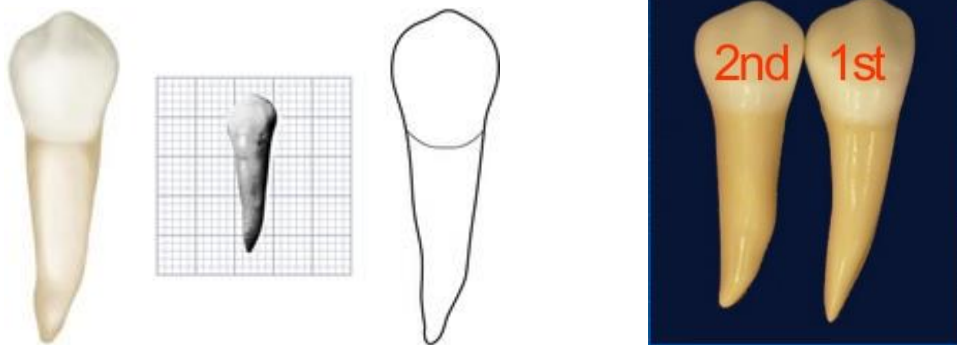
Principal identifying features

- 1- It resembles the mandibular first premolar from the buccal aspect, the mesio distal measurement of the crown and its general outline are similar but the tooth is larger and has better development in other respects.
- 2- The tooth assumes two common forms; the first form which probably occurs most often is the **three cusp type** which appear more angular from the occlusal aspect; the second form is the **two cusp type** which appear more rounded from the occlusal aspect .
- 3- The occlusal outline is almost square in appearance with no mesio lingual developmental groove.



Buccal Aspect

- 1- The buccal cusp is shorter and less pointed than that of mandibular first premolar.
- 2- The contact areas, both mesial and distal are broad and appears to be higher because of short buccal cusp.
- 3- The root is broader mesio- distally than that of mandibular first premolar ending with a blunter apex.



Lingual Aspect

The lingual surface of the crown is smooth and spheroidal.

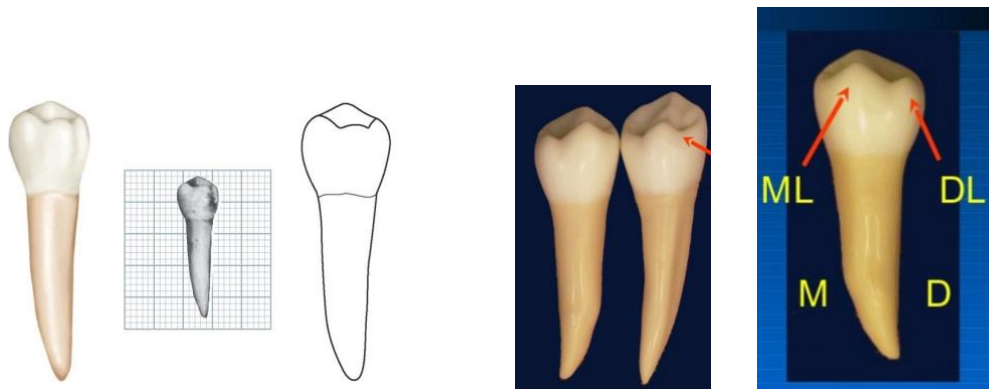
From this aspect, this tooth differs from the mandibular first premolar in:

- 1-The lingual cusps are more developed making the cusp or cus (depending on the type) longer than in mandibular first premolar.
- 2- Less of the occlusal surface may be seen from this aspect, however because the lingual cusp are not as long as the buccal cusp; part of buccal portion of the occlusal surface may be seen.
- 3- A in three cusp type:

There are two lingual cusps, the mesio lingual is larger than the disto lingual cusp and are divided by the lingual developmental groove.

3_ B in two cusp type:

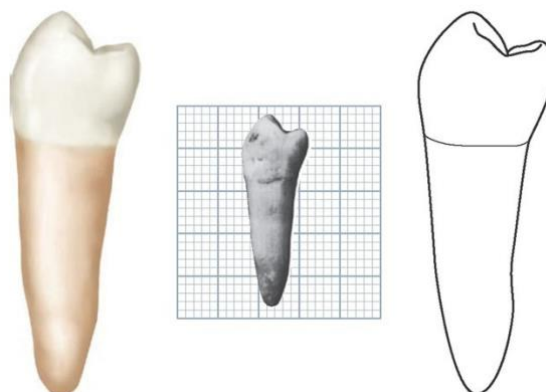
There is a single lingual cusp of the same height as in the three-cusp type.



Mesial Aspect

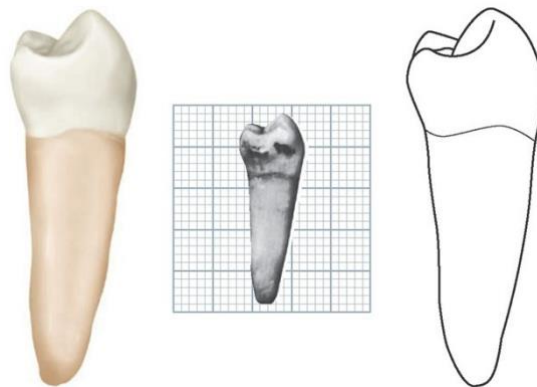
From this aspect, this tooth differs from the mandibular first premolar in:

- 1- The crown and root are wider bucco- lingually.
- 2- The buccal cusp is not nearly centered over the root trunk and its shorter.
- 3- The lingual lobe development is greater.
- 4- The marginal ridges are at a right angle to the long axis of the tooth.
- 5- Less of the occlusal surface may be seen.
- 6- No mesio- lingual developmental groove on the crown portion.
- 7- The root is longer with blunter apex.



Distal Aspect

- 1- All the three cusps may be seen .
 - 2- More of the occlusal surface may be seen because the distal marginal ridge is at a lower level than the mesial marginal ridge.
- *The crowns of all posterior teeth are tipped distally to long axis of the roots, therefore when the tooth is held vertically more of the occlusal surface may be seen from the distal aspect than from the mesial aspect.
- **The angulation of occlusal surfaces to long axis of all posterior teeth, mandibular and maxillary is an important observation to remember not only in the study of individual tooth form but also in the study of alignment and occlusion
- .



Occlusal Aspect

A : three cusp type

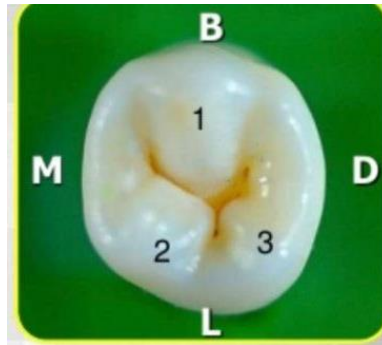
- 1- The occlusal aspect is square in shape.
- 2- The square type has 3 cusps: the buccal cusp is the largest followed by the mesio- lingual cusp and then the disto- lingual cusp.
- 3- Each cusp has well-formed triangular ridge separated by deep development grooves which form a **Y shape** on the occlusal surface.
- 4- There are three developmental grooves:
 - *mesial developmental groove ending in mesial triangular fossa.

*distal developmental groove ending in distal triangular fossa.

*lingual developmental separating the two lingual cusps.

5- The grooves converge in a **central pit** which is slightly placed slightly toward the distal side.

6- Supplemental grooves and depressions are often seen.

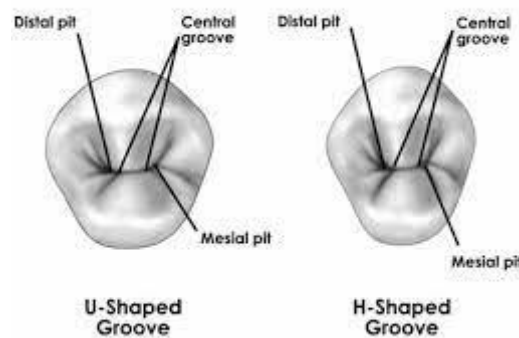


B: two cusp type

1- Appear more rounded than the more angular three cusp type.

2- There is one well developed lingual cusp which is large and opposite the buccal cusp.

3- A central developmental groove travels in a mesio- distal direction with its terminals centered in the mesial and distal triangular fossa, sometimes mesial and distal developmental pits in the centers of these fossa may be seen.



Dental anatomy

Lec: 11

Assis lec. Noor Ghazi

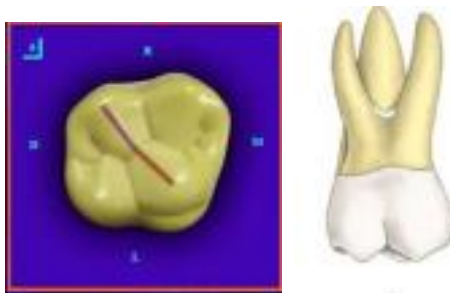
Permanent maxillary molars

Permanent maxillary molars are the largest and strongest maxillary teeth. They have three roots, two buccal and one lingual (largest). The crowns have two buccal cusps and two lingual cusps. They are not succedaneous teeth as they erupt behind deciduous molar (It has no predecessor سلف).

****Succedaneous teeth:** are permanent teeth that replace the deciduous teeth.

Maxillary 1st molar

Principal identifying features: -



- 1- It is the largest tooth in the maxillary arch.
- 2- The presence of fifth cusp (supplemental cusp) named the cusp or tubercle of carabelli: a nonfunctional cusp on the lingual surface of the mesio-lingual cusp.
- 3- The presence of an oblique ridge extending from the mesiolingual cusp to the distobuccal cusp.
- 4- The presence of three well- separated and well-developed roots: two buccal and one lingual, the lingual root is the longest.

Buccal Aspect

1- The crown is roughly trapezoidal ^{منحرف شبه} cervical and occlusal outlines representing the uneven sides and the cervical line shows very little convexity, which is directed toward the root.

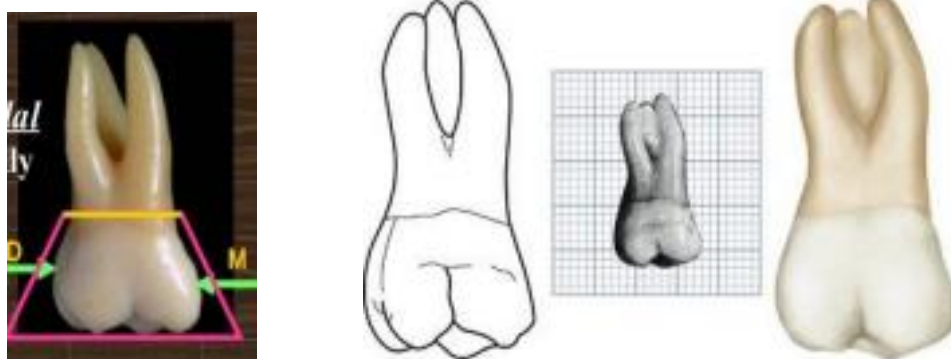
2- The mesial outline of the crown is straight curving occlusally as it reaches the contact area which is located at the junction between the occlusal and middle third.

3- The distal outline of the crown is convex with the contact area located at the center of the middle third.

4- The mesiobuccal cusp is broader than the distobuccal cusp and its mesial and distal slopes meet at an obtuse angle ^{منفرجة} while the mesial and distal slopes of the distobuccal meet at right angle (which is sharper) and we may see the lingual cusps from this aspect.

5- The buccal developmental groove that divides the two buccal cusps is approximately equidistance between the mesiobuccal and distolingual line angle. The groove terminates at a point half the distance from its origin occlusally to the cervical line of the crown.

6- The three roots are visible from this aspect and the axes of the roots are inclined distally. The lingual root is the longest.



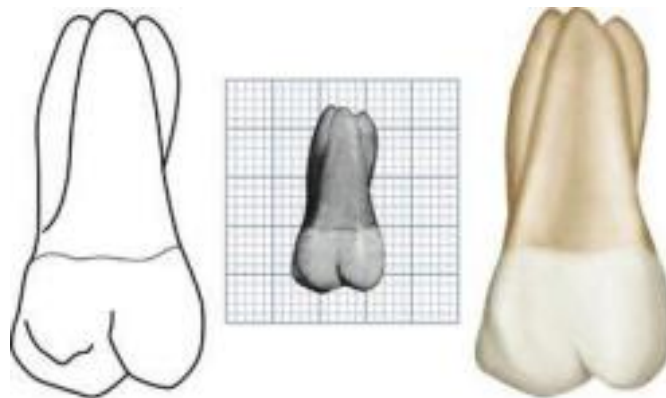
Lingual Aspect

1- The lingual cusps only can be seen with the mesiolingual cusp is the largest cusp and accounts for $\frac{3}{5}$ of the mesiodistal width of the crown, while the distolingual cusp accounts for $\frac{2}{5}$ of the mesiodistal dimension.

2- The lingual developmental groove starts approximately at the center mesiodistally and curve sharply distally and continue on the occlusal surface.

3- The fifth cusp (cusp of carabelli) is 1.5mm cervical to the mesiolingual cusp tip and irregular developmental groove separates this cusp from the mesiolingual cusp.

4- There are three roots visible from this aspect. The large lingual root making up most of the foreground الصورة مقدمة and all of the mesial outline of the mesiobuccal root and part of its apex. The distal outline of the distobuccal root is seen above its middle third including all of its apical outline.



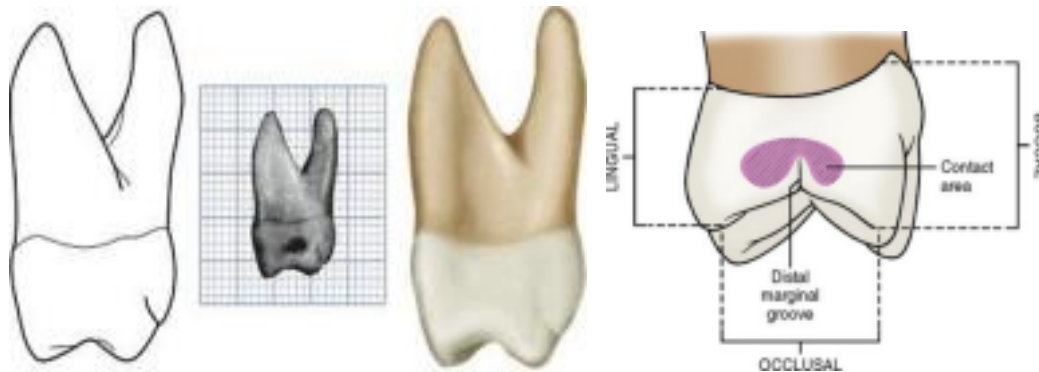
Mesial Aspect

1- The buccal outline has a crest of curvature within the cervical third, then it continues with a slight convex outline to the tip of the cusp.

2- The lingual outline has a crest of curvature near the middle third of the crown rather than a point within the cervical third, as it is buccally and it shows a convex pattern until it reaches the cusp of carabelli, at which it shows another convexity.

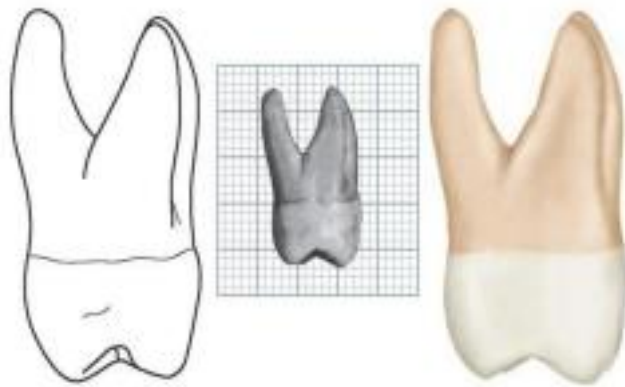
3-The cervical line is irregular curving occlusally not more than 1mm at any one point.

4-The mesial contact area is closer to the marginal ridge than the cervical line at the junction of the middle and occlusal thirds of the crown and its somewhat buccal to the center of the crown buccolingually. 5-The lingual and mesiobuccal roots can be seen from this aspect, the lingual root is longer and narrower from this aspect than mesiobuccal root.



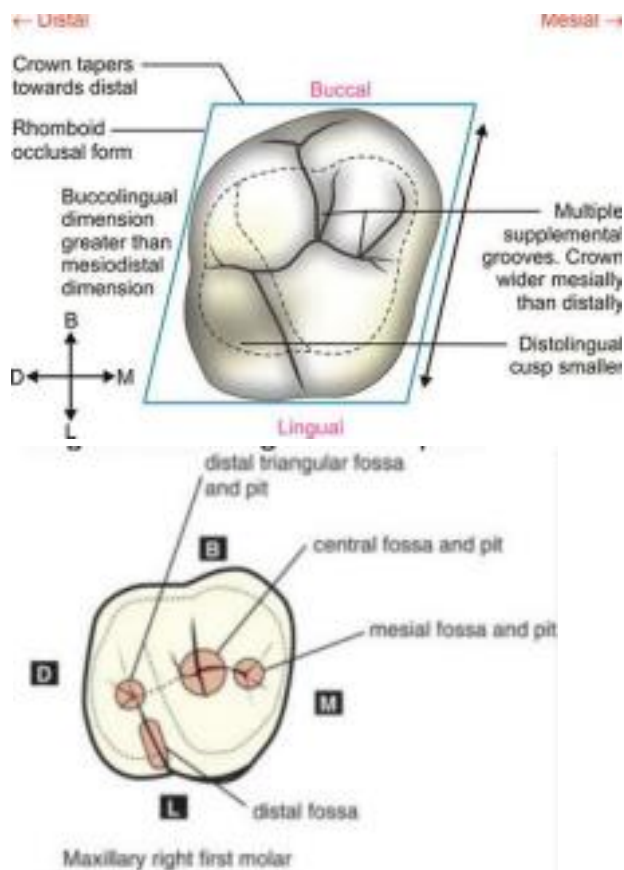
Distal Aspect

- 1-The general outline is similar to that of the mesial aspect but the buccolingual measurements are more mesially than distally.
- 2-The distal marginal ridge is located more cervically so we can see part of the occlusal surface.
- 3-The curvature of the cervical line is zero.
- 4-All the three roots are visible and the distobuccal root is the smallest one.



Occlusal Aspect

- 1-Somewhat rhomboidal with greater buccolingual measurement mesially than distally and greater mesiodistal measurement lingually than buccally.
- 2-Four well developed cusps can be seen: the mesiolingual cusp is the largest, then the mesiobuccal then the distolingual then the distobuccal then the cusp of carabelli.
- 3- The mesiobuccal and distolingual line angles are acute while the mesiolingual and distobuccal are obtuse.
- 4-There is an oblique ridge formed by the union of the triangular ridge of the distobuccal and the distal ridge of mesiolingual cusp crossing the occlusal surface obliquely.



5- There are **four fossae**:

A-Major fossa:

1-Central fossa: located mesial to oblique ridge

2-Distal fossa: located distal to the oblique ridge

B-Minor fossae:

1-Mesial triangular fossa: located distal to the mesial marginal ridge **2-Distal triangular fossa:** located mesial to the distal marginal ridge 6-There are **six developmental grooves**:

a-Central developmental groove: from the central pit to the mesial triangular fossa.

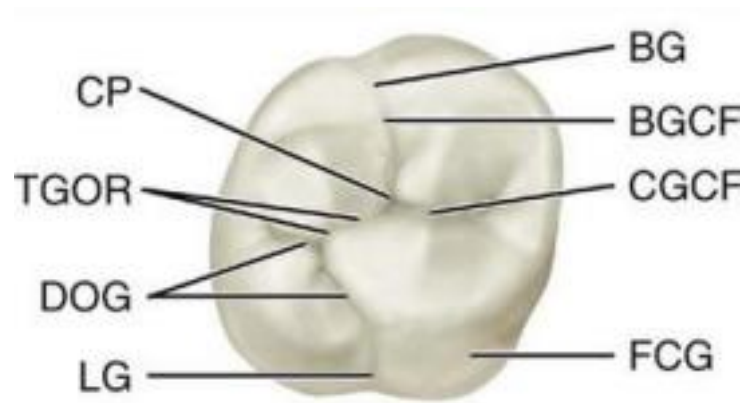
b-Buccal developmental groove: from the central pit to the buccal surface between the mesiobuccal and distobuccal cusps

c-Distal oblique groove: from the distal triangular fossa going obliquely

d-Lingual developmental groove: this groove join with the distal oblique groove going between the mesiolingual and distolingual cusp in a cervical direction

e- Transverse groove of oblique ridge: this groove crosses the oblique ridge

f-Fifth cusp groove: this groove passes between the fifth cusp and the mesiolingual cusp



Maxillary right first molar, occlusal aspect, developmental grooves. *BG*, Buccal groove; *BGCF*, buccal groove of central fossa; *CGCF*, central groove of central fossa; *FCG*, fifth cusp groove; *LG*, lingual groove; *DOG*, distal oblique groove; *TGOR*, transverse groove of oblique ridge; *CP*, central pit.

Dental anatomy

Lec: 12
Ghazi

Assis lec. Noor

Principal identifying features

- 1-No fifth cusp is evident.
- 2-Roots are less divergent and may be coalescent (joined together).
- 3-Both distal cusps (distobuccal and distolingual cusps) are less developed.
- 4- The crown is smaller in overall dimensions than the maxillary 1st molar.
- 5-Two types of maxillary second molars according to the shape of occlusal aspect:
 - A) Rhomboidal type: has an occlusal form resemble first molar.
 - B) Heart-shaped type: That has an occlusal form is more typical of the maxillary third molar.



Buccal Aspect

- 1- The crown is a little shorter cervico-occlusally (about 0.5 mm) and narrower mesio- distally than the maxillary 1st molar.
- 2- The distobuccal cusp is smaller and allows part of the distal marginal ridge and part of the distolingual cusp to be seen.
- 3- The buccal roots are about the same length. They are more nearly parallel and are inclined distally more than those of maxillary first molar.
- 4-The palatal root is the longest root (1mm longer than the buccal roots).

1



Lingual Aspect

1- The disto lingual cusp is smaller than that in the maxillary 1st molar.

2- Part of the distobuccal cusp may be seen mesial to the distolingual cusp through the sulcus between the mesiolingual and distolingual cusp.

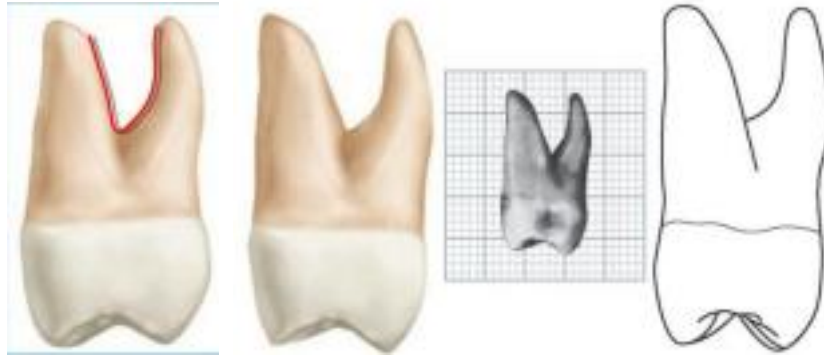
3- No fifth cusp is evident.



Mesial Aspect

1- The bucco-lingual dimension is the same as that of the maxillary 1st molar but the crown length is less.

2- The roots are less divergent bucco-lingually than those of the maxillary first molar; being within the confines of the crown outline.



Distal Aspect

Because the distobuccal cusp is smaller than in the maxillary 1st molar (i.e., smaller in comparison to the mesiobuccal cusp) more of the mesio buccal cusp may be seen from this aspect.



Occlusal

Aspect

- 1- The rhomboidal shape of the occlusal aspect is more visible in comparison with the maxillary first molar, the acute angles of the rhomboid are less and the obtuse angles are more.
- 2- The bucco-lingual diameter is the same as in maxillary first molar but the mesiodistal diameter is approximately (1) mm less.

- 3- The distal cusps (disto-buccal and disto-lingual cusp) are smaller and less developed than those of maxillary first molar.
- 4- No fifth cusp.

3

- 5- It's not uncommon to find more supplemental grooves as well as pits on the occlusal surface than are usually found on the maxillary first molar.



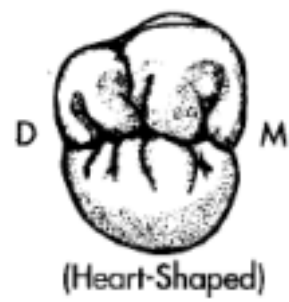
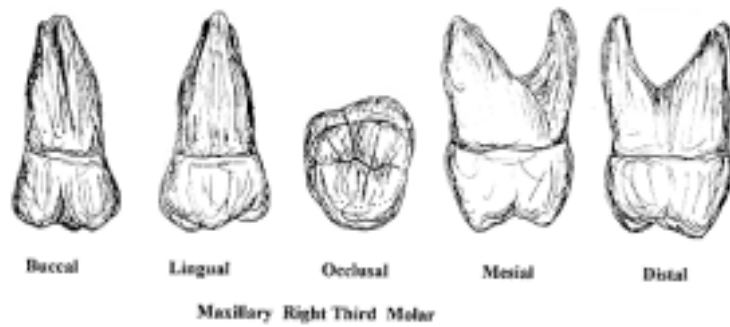
Maxillary third molar

Principal identifying features

- 1-It is the smallest maxillary molar tooth.
- 2-Triangular occlusal outline, the distolingual cusp is very small and poorly developed and it may be absent.
- 3-The roots are shorter, convergent, often fused and usually are three in number.
- 4- The mesio-lingual cusp is the largest cusp.
- 5-It may have many variations:
 - A) Rhomboidal type with four cusps.
 - B) Heart-shaped type with three cusps (most common type).
 - C) One cusp type occlusally (Peg shaped).
 - D) Congenitally missing.



4



Dental anatomy

Lec: 13

Assis lec. Noor Ghazi

Permanent mandibular molars

Permanent mandibular molars are larger than any other mandibular teeth, the crowns of mandibular molars are shorter cervico-occlusally than those of the teeth anterior to them. The crowns of mandibular molars are wider mesiodistally than bucco-lingually (the opposite arrangement is true of maxillary molars).

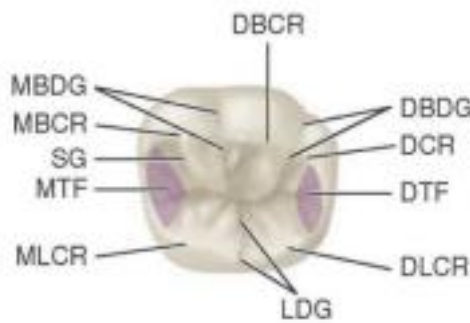


Mandibular 1st molar:

Principal identifying features

- 1- It's the largest tooth in the mandibular arch.
- 2- It has five well developed cusps: two buccal (mesiobuccal & distobuccal), two lingual (mesiolingual & distolingual) and one distal cusp.
- 3- Lingual inclination of the crown.
- 4- The presence of two buccal developmental grooves: mesiobuccal developmental groove and distobuccal developmental groove.

5-The occlusal outline is rectangular in shape, wider mesiodistally than buccolingually.



1

Buccal Aspect

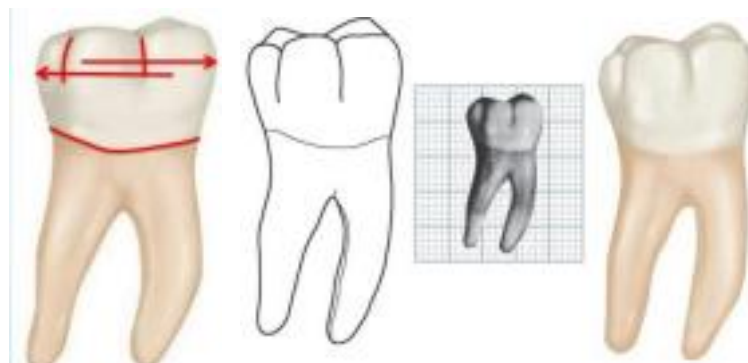
1- The mesial contact area is located at the junction between the occlusal and middle third, while the distal contact area is located at a lower level (at the center of the crown).

2- There are two buccal developmental grooves: mesiobuccal developmental groove (which separates between mesiobuccal and distobuccal cusp) and distobuccal developmental groove (which separates between the distobuccal and distal cusp). 3- The mesiobuccal, distobuccal and distal cusps are clearly visible and the cusp tips of the mesiolingual and distolingual cusps can be seen.

4-The buccal cusps (mesiobuccal and distobuccal) are flat occlusally and the distal cusp is rounded.

5-The mesiobuccal cusp is slightly wider than the distobuccal cusp and they make together 80% of the mesiodistal dimensions of the crown, and the distal cusp makes the rest 20%.

6- From the buccal aspect, the two roots can be seen (mesial and distal), the point of bifurcation of the roots is about 3mm below the cervical line.



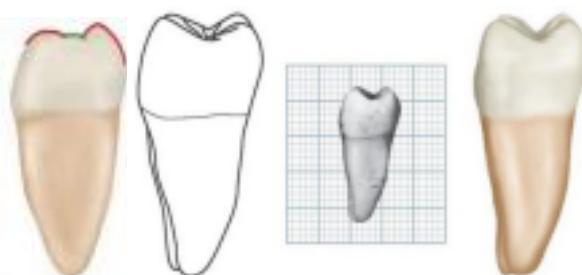
Lingual Aspect

- 1- From the lingual aspect three cusps can be seen: two lingual cusps and the lingual portion of the distal cusp. The mesiolingual cusp is the widest mesiodistally and has the highest cusp tip.
- 2- There is a lingual developmental groove extending downward acting as a line of division between the mesiolingual and distolingual cusp.



Mesial Aspect

- 1- From the mesial aspect two cusps and one root can be seen: the mesiobuccal cusp that is flat and mesiolingual cusp that is sharp and the mesial root.
- 2- The buccolingual measurement of the crown and root is greater at the mesial portion than it's at the distal portion
- 3- The cervical line is irregular, higher lingually than buccally.
- 4- The mesial marginal ridge is located 1mm below the level of the cusp tips.



Distal Aspect

1-Because the crown is shorter distally than mesially and the buccolingual measurement of the crown and root is less than its at mesial portion therefore most of the buccal, lingual and distal tooth structure can be seen from the distal aspect.

2-The cervical line is irregular.

3- The distal root narrower than mesial root.



3

Occlusal Aspect

1-The occlusal outline of the crown is rectangular in shape larger mesiodistally than buccolingually by 1mm or more.

2- From the occlusal aspect five well developed cusps can be seen: the mesiobuccal cusp is the largest, then the mesiolingual and the distolingual then the distobuccal then the distal cusp (the smallest).

3- The buccolingual measurement of the crown is greater on the mesial side than on the distal side and the mesiodistal measurement of the crown is greater on the buccal side than on the lingual side.

4-The distal contact area is on the distal cusp.

5- There are **three fossae**:

1-Central fossa: located in the center of the occlusal surface.

2-Mesial triangular fossa: located distal to the mesial

marginal ridge **3-Distal triangular fossa:** located mesial to the distal marginal ridge

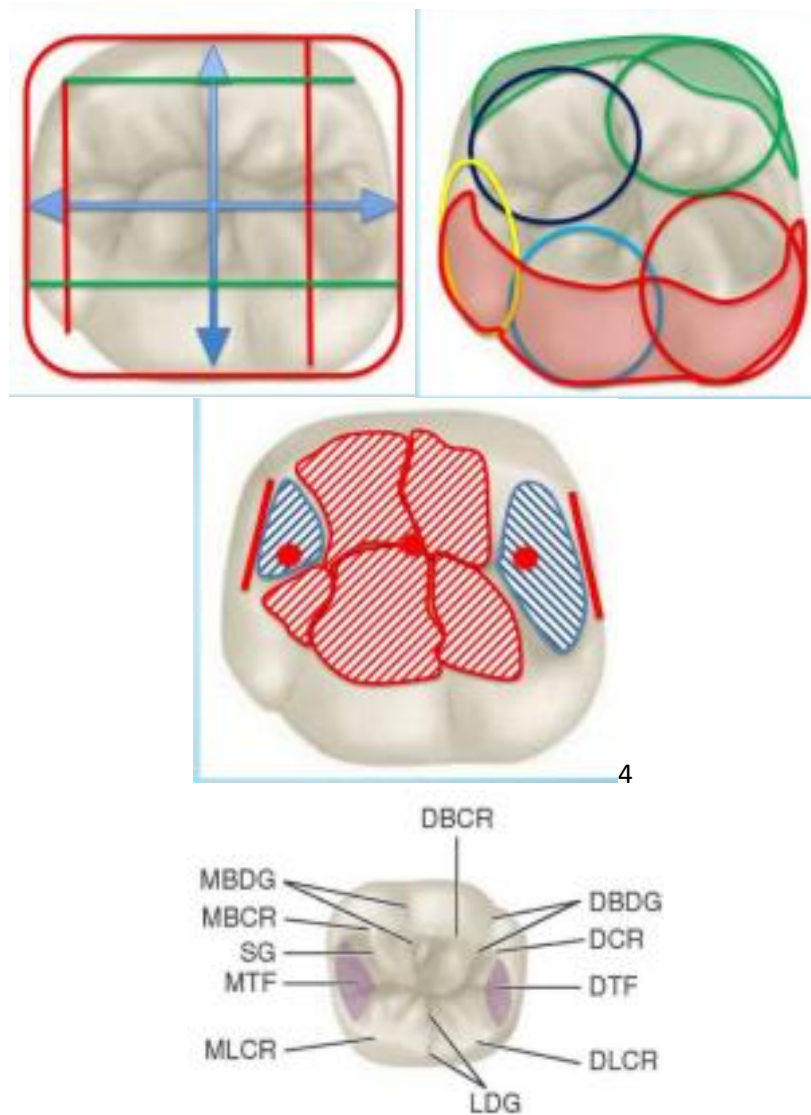
6-There are **four developmental grooves**:

a-Central developmental groove: located in the center of the crown buccolingually.

b-Mesiobuccal developmental groove: Passing between the mesiobuccal and distobuccal cusps.

c-Distobuccal developmental groove: Passing between the distobuccal and distal cusp.

d-Lingual developmental groove: Passing between the mesiolingual and distolingual cusp.



Mandibular second molar:

Principal identifying features:-

- 1- The presence of four cusps: two buccal (mesiobuccal & distobuccal) and two lingual (mesiolingual & distolingual)
- 2- The presence of buccal and lingual developmental groove meet with central groove at right angle..
- 3- The presence of many supplemental grooves on the occlusal surface.
- 4- The presence of two roots: one mesial and one distal but these two roots are not as broad as those of mandibular first molar, nor are they as widely separated.
- 5- Rounded rectangular occlusal outline.



Mandibular third molar:

Principal identifying features:-

- 1-The presence of four cusps (generally) but may be more as a variation.
- 2- The presence of two roots which are generally short and often fused.
- 3- Lingual inclination of the crown.
- 4- Smaller and more rounded crown as compared with the mandibular first molar.
- 5-The presence of great number of supplemental grooves on the occlusal surface.



Dental anatomy

Lec: 14

Assis lec. Noor Ghazi

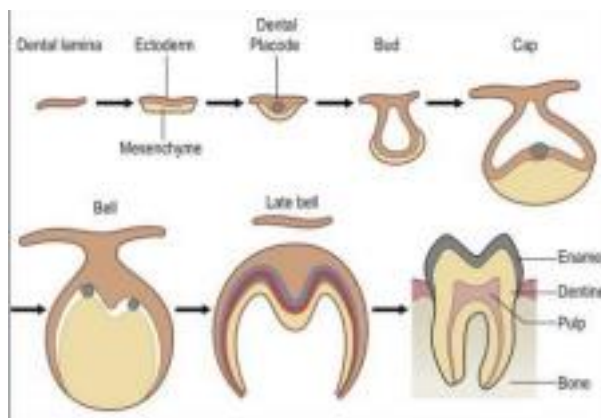
Tooth development

The development of the crown and root of the tooth takes place within the bone in the jaw.

**The tooth passes through stages named according to their shape: 1-Bud stage.

2-Cap stage.

3-Bell stage.



Dental development can be considered to have two components: 1-The formation of the crown and roots.

2-Eruption of the teeth.

Eruption means the tooth emerging through gingiva or continuous tooth movement from the dental bud to occlusal contact, usually the deciduous teeth begin to erupt at six months of age until (2.5-3) years.



Differences between deciduous and permanent teeth

- 1.The crowns of primary anterior teeth are wider mesiodistally in comparison with their crown length than the permanent teeth.
- 2.The enamel of primary teeth is relatively thin compared with permanent teeth.
- 3.The dentin thickness between the pulp chambers and the enamel is limited compared with permanent teeth.
- 4.The pulp horns of primary teeth are high and the pulp chambers are large.
- 5.The roots of primary teeth are narrow, long and flare markedly.
- 6.The primary teeth are usually less pigmented and are whiter in appearance than the permanent teeth.

Dental pulp

The functions of the dental pulp are:

- 1-Formation of dentin .
- 2-Nutrition .
- 3-Sensation.
- 4-Defence.

Pulp cavity

It is an internal space in the tooth , surrounded by dentin and contains the dental pulp. Generally the shape of pulp cavity resembles the external outline of the tooth.The pulp cavity is divided into two parts :

- 1-Pulp chamber
- 2-Pulp canal (root canal)

Pulp chamber:

It is that portion of the pulp cavity which is located in the anatomical crown of the tooth.

Pulp canal:

It is that portion of the pulp cavity which is located in the anatomical root of the tooth.

Apical foramen:

It is the constricted opening at the end of the root where the blood vessels and nerves enter the pulp.

Pulp horn:

It is the prolongation or projection of the pulp tissues in the roof of pulp chamber that correspond to the various major cusps or lobes of the crown. The number of the pulp horns equal to the number of cusps in the posterior teeth.

Lateral canal:

It is the lateral branching of the main root canal.

Pulp cavity of permanent maxillary incisors:

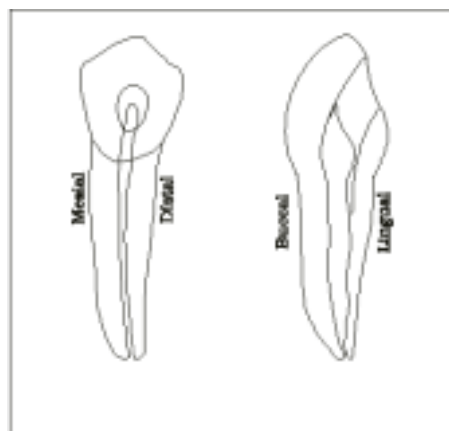
1. The maxillary central incisor has a wider pulp cavity than the maxillary lateral incisor.
2. In young age the maxillary central incisor has three pulp horns (corresponding to the three mamelons).
3. The pulp chamber of the maxillary central incisor is triangular in shape in cross section with rounded corners while that of the lateral incisor is more rounded.
4. The maxillary incisors have one pulp canal and one apical foramen (since the maxillary incisors have one root).

Pulp cavity of permanent mandibular incisors:

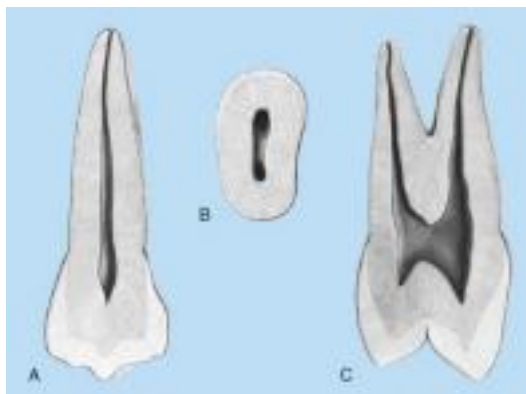
1. The mandibular lateral incisor tends to be a little larger than the mandibular central incisor in all dimensions and so the pulp chamber is also larger.
2. The pulp chamber of the mandibular incisor in cross section is oval in shape.
3. The mandibular incisors have usually one pulp canal and one apical foramen (This is in 90%) and may have two canals (in 10%).

Pulp cavity of permanent maxillary and mandibular canine:

1. The canine has one pulp horn (since it has one cusp) .
2. The canine has a pulp chamber that is oval in shape in cross section or triangular with rounded corner.
3. The canine has one pulp canal and one apical foramen.
4. The only difference between the maxillary and mandibular canine concerning the pulp cavity is that the mandibular canine has a smaller pulp cavity than the maxillary canine.



Pulp cavity of permanent maxillary premolars:



Maxillary 1st premolar:

- 1- Pulp cavity of maxillary 1st premolar has two pulp horns (since it has two cusps).
- 2- The cross section of the pulp chamber is elliptical in shape.

4

3-It has two pulp canals (in 80%) and may have three or one pulp canals in a small percentage.

Maxillary 2nd premolar:

- 1- It has two pulp horns (since it has two cusps).
- 2- The majority of the maxillary second premolars have one pulp canal in one root and in this case the cross section of pulp chamber is oval in shape, but we may see two pulp canals in two separated roots and in this case the cross section of pulp chamber is elliptical in shape like maxillary 1st premolar.

Pulp cavity of permanent mandibular premolars:**Mandibular 1st premolar:**

- 1- Pulp cavity of mandibular 1st premolar has two pulp horns (since it has two cusps).

2- The cross section of the pulp chamber is oval in shape. 3-

It has one pulp canal with one apical foramen (since it has one root). **Mandibular 2nd premolar:**

- 1- The only difference in the pulp cavity between the mandibular 1st premolar and mandibular 2nd premolar is that mandibular 2nd premolar has either two pulp horns (in the two cusps type) or three pulp horns (in the three cusps type).

Pulp cavity of permanent maxillary molars:**Maxillary 1st molar:**

- 1- Pulp cavity of maxillary 1st molar has four pulp horns (since it has four functional cusps).

2- The cross section of the pulp chamber is triangular in shape. 3-It has three roots, each root has one pulp canal but the mesiobuccal root may have two pulp canals.

Maxillary 2nd molar:

The same as the 1st molar but:

- 1- The pulp cavity is slightly smaller.

2- The mesiobuccal root contains only one root canal.

Pulp cavity of permanent mandibular molars:

Mandibular 1st molar:

1- It has five pulp horns (since it has five functional cusps).

5

2- The cross section of the pulp chamber is rectangular in shape. 3-It has two roots (mesial and distal), the mesial root has two pulp canals (mesiobuccal and mesiolingual) while the distal root has one canal. **Mandibular 2nd molar:**

The same as the 1st molar but it has four pulp horns.

