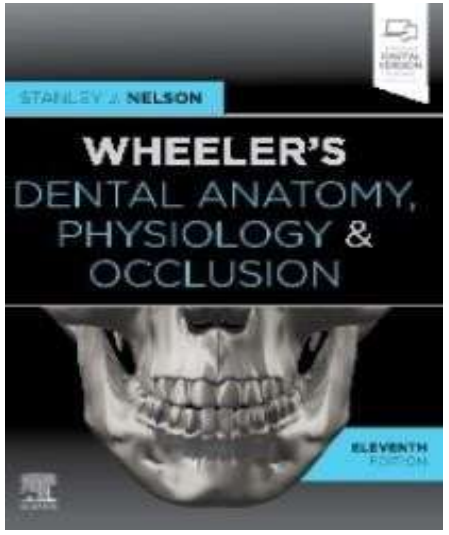
Dental Anatomy

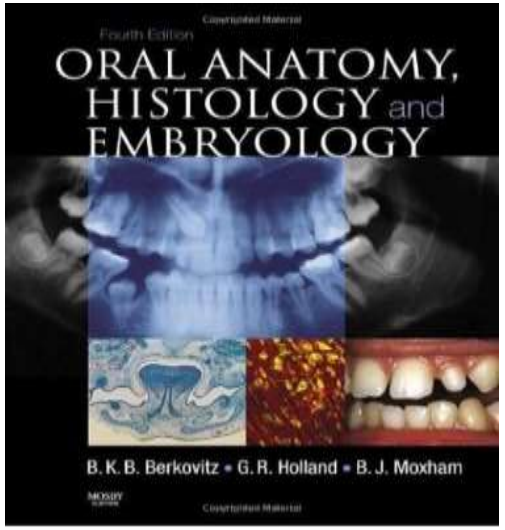
By Sereen Hawamdeh

Lecture 8

- INTENDED LEARNING OUTCOME
- **To identify an extracted molar (maxillary or mandibular, first, second, or third and right or left)**
- **To understand the different roles molar teeth provide and how their form relates to their eventual function**
- **To recognize and name the pertinent dental anatomical form of each tooth (cusps, ridges, developmental grooves, triangular grooves, pits and developmental depressions)**
- **To discuss the major differences and similarities between the maxillary first, second and third molars**
- **To describe briefly the various occlusal forms possible for a maxillary molar.**
- **To understand the occlusal positions of maxillary molars in a class I occlusal relationship during static occlusion**
- **To distinguish the different chronological timelines for each maxillary molar tooth.**

Wheeler's Dental Anatomy, Physiology, and Occlusion; by Major M Ash & Stanley J Nelson, 9th or 11th edition





Oral Anatomy, Histology and Embryology. By B. K. B. Berkowitz, G. R. Holland, B. J. Moxham , 4th or 5th edition

MOLARS

- By definition; **molars** are **the most posterior** teeth at the back of a mammal's mouth and are used for the **grinding of food**.

- **3 Molars** per **quadrant** in the **permanent** set of teeth (**12** permanent molars), and two molars per **quadrant** in the **deciduous** dentition (8 deciduous).

Note:

you will find 2 molars in this model because it's an acrylic model & that's the way they present molars in acrylic teeth, but most humans have 3 molars teeth.

MOLARS

- The largest occlusal surfaces of any of the teeth
- Three to five major cusps.
- Lower permanent molars always have two lingual cusps.
- Upper permanent molars always have two buccal cusps.
- Lower molars have two roots.

Unique in their design than any other tooth in the oral cavity…

The largest and strongest teeth in the mouth by virtue* of their crown bulk size and root anchorage in bone.

Virtue : بفضل

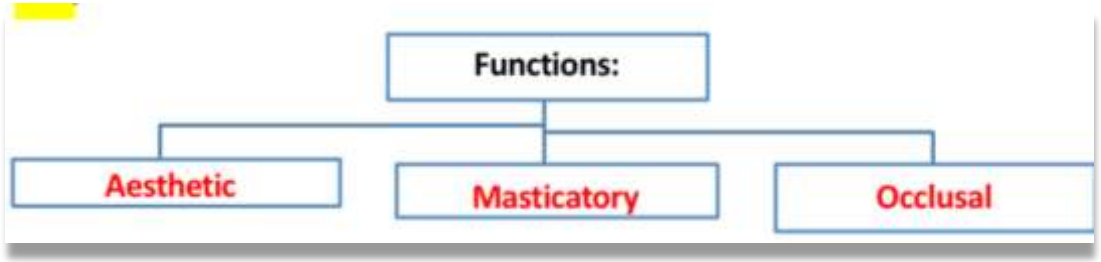
Molars

Unprecedented/ Accessional/ nonsuccedaneous

: They are NOT preceded by primary teeth.

Permanent molars are accessional teeth without primary predecessors.

In contrast permanent incisors, canines and premolars are succedaneous (successional teeth).



Note:
lower 1st molar erupts before upper 1st molar

Functions of molars:

The **primary** functions of the teeth are for:
Mastication / Swallowing / Speech / Expressions /Psychologic Aesthetics/ Cranio- mandibular stabilization.

Masticatory:

Molars are chewing teeth; they mainly **crush and grind** the food and they perform the major portion of the work in the mastication and comminution of food.

note: they slice food into particles that are small enough to be swallowed and digested in the digest tract

Aesthetics:

are not restricted to the six anterior maxillary teeth and premolars.

In large smiles,.**the 1st molar can be seen & highly contribute to the aesthetic smile .**

In most people, during laughing, second molars can be seen AS well.

Occlusal :

The **bulky size** and the **strong multiple roots** anchor these teeth in the jaws and support the muscles of mastication.

BITE FORCE: in an average homo sapiens female the bite force on second molars can reach up to 2300N (equals around 234.5 KG!!!)

very powerful!!!

(Reference comparison of other animals :https://royalsocietypublishing.org/doi/10.1098/rspb.2010.0509)

Angelina Jolie

You can see both her upper and lower molars when she smiles wide

The preservation of **VERTICAL DIMENSION** of the jaws also contribute to the overall facial dimension and thus the overall facial aesthetics.

note: because that preservation VERTICAL DIMENSION when the molars are present, it also contributes to the aesthetics of

the face …

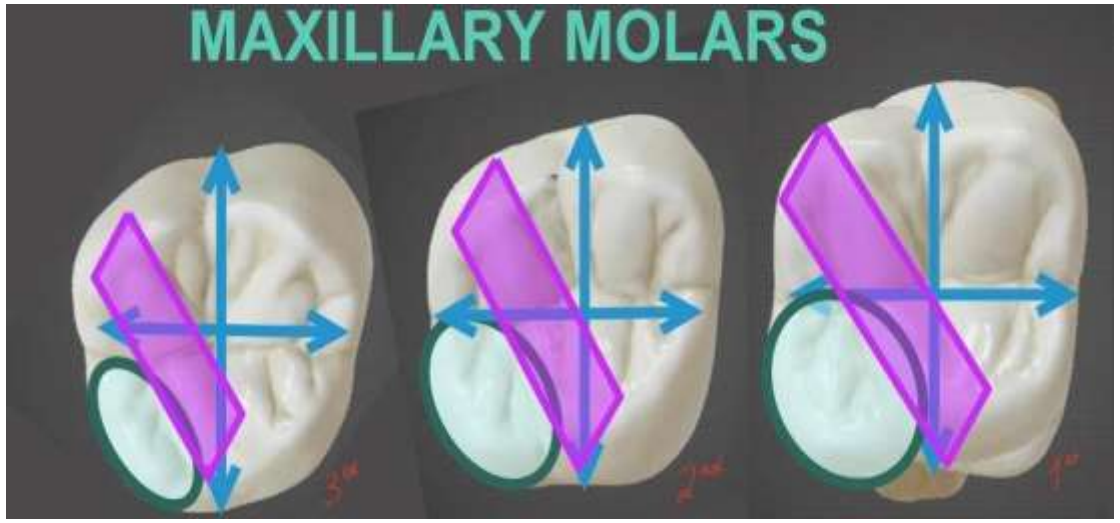
Anna Hathaway

You can see two molars of hers while smiling.

*They need treatment

➢ MAXILLARY MOLARS

- 6 molars in the maxilla
- Posterior teeth
- 3 or more cusps: At least 2 buccal cusps and one or more lingual cusps
- 3 roots: 2 buccal and 1 palatal
- Position: Distal to second premolars and Mesial to none!



Disto-lingual cusp shrinks in size when going posteriorly to almost being missing in the 3rd molar

Bucco-lingual dimension is larger than the mesio-distal dimension

1st molar is the largest &shows the least morphological variation ...while 3rd molar is the smallest &shows the most morphological variation!

OBLIQUE RIDGE. : mesio lingual. To. distro buccal
(Db Ml □ □)
(Characteristic of the maxillary molars)

Maxillary 1St Molar

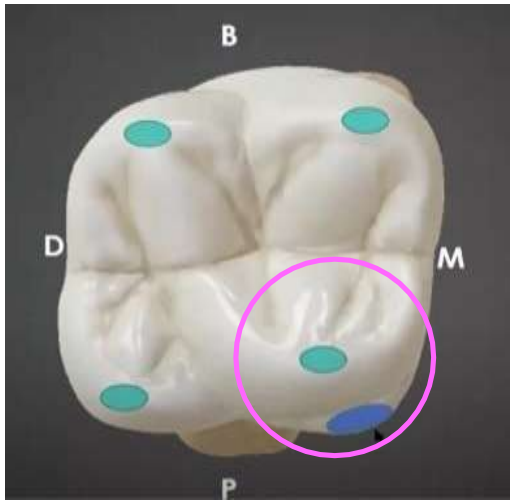
Occlusal View:

4 developed functional cusps **(MB/ DB/ MP/ DP)**

1 supplemental cusp called the "**Cusp of Carabelli**", **or** "**Carabelli's tubercle**"

*Mesio lingual(palatal) cusp is the **largest** that causes a BUCCAL and Distal convergence!

3 roots (one the palatal roots +two buccal roots)



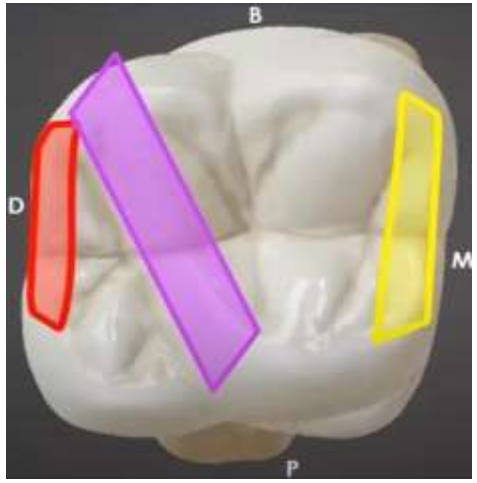
Note : Cusps of the palatal side of upper molars, are the functional cusps

MESIAL MARGINAL RIDGE

is longer & more prominent

than the **DISTAL MARGINAL RIDGE**

Oblique ridge: joins the mesio palatal cusp to the distal buccal cusp



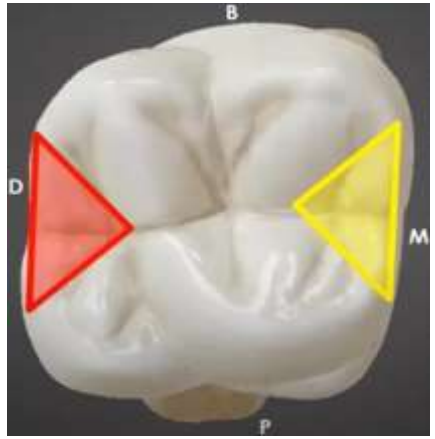
Mesial and distal triangular fossae; minor fossae.

Mesial triangular fossa:

- Mesial pit.
- MB & ML supplementary grooves.

Distal triangular fossa:

- Distal pit.
- DB & DL Supplementary grooves.



Two distinct components:

TRIGON (because it looks like tringle)

- Bears MB, ML & DB cusps

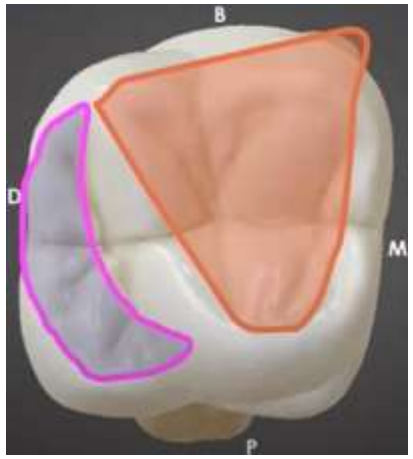
-Tricuspate triangle

Talon (looks like a tail of a bird or an animal)

- Bears DL cusp & D MR

- Located DL to the tricuspate triangle

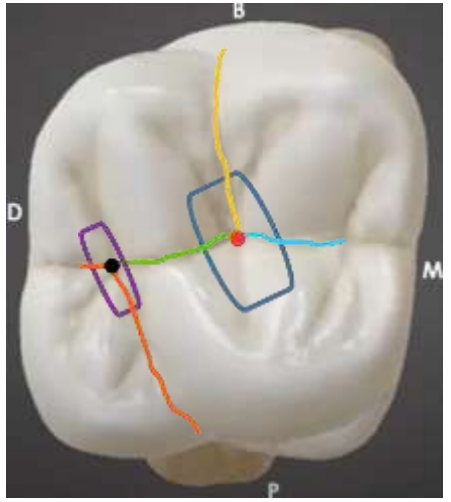
-Well developed in 1st molar &undergoes reduction in size in 2nd & 3rd molars.



Two Major Fossae:

1 **Central fossa** (middle of trigon)
Central pit
Buccal groove
Distal groove
Central groove

2 **Distal fossa**
D pit
DL groove or distal oblique which continues as the L\p groove



Buccal view:

The **mesio-buccal** and **disto-buccal** cusps dominate the facial outline.

MB & DB cusps are of almost equal height.

Note:(distal –buccal is little bit smaller in size but is the same height as a mesial buccal cusp)

Mesio-buccal is wider than **disto-buccal**

Buccal developmental groove separates **MB** and **DB** cusps and terminates halfway the crown height in the **BUCCAL PIT.**

Mesio-lingual cusp is the largest and tallest it can be seen I this aspect.

Note add by doctor:

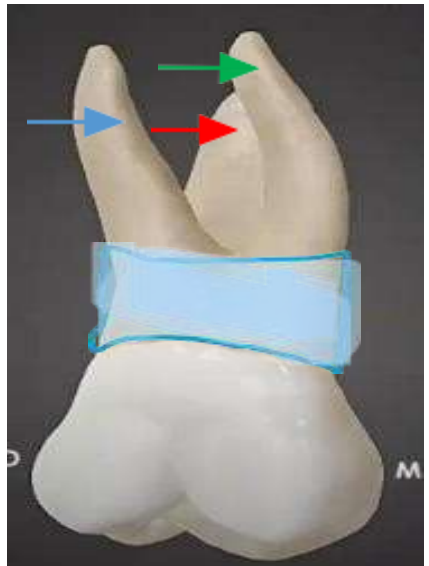
in this buccal area you might find people with pit only being lesioned with caries or there is a cavitated lesion under the pit because pits as anatomy they are a severe depression ,in the truth structure and it's because the loops have joined while the tooth has been developing and forming and this pit is like the joint of two surfaces inside a deep groove ,this is very much attractive to bacteria which kind of acidifies the food and produces by-products that are dissolving for the tooth structure and that creates a cavity ,in the pit it's very favorable for a bacteria to accumulate and decalcify the tooth structure .

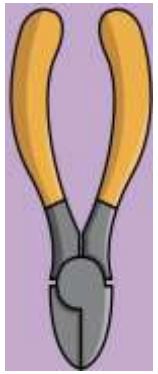
All three roots are visible. (palatal+ DB+MB)

The **buccal roots** present a '**plier handle**' appearance with the larger and longer lingual(palatal) root which is almost centered between them.

The bifurcation between the MB and DB roots starts **at the end of the root trunk on the junction between Cervical & middle thirds.**

Mesio-Buccal root is usually the **smallest**, but it has a **curvature** and **might have two canals. (MB 2)**



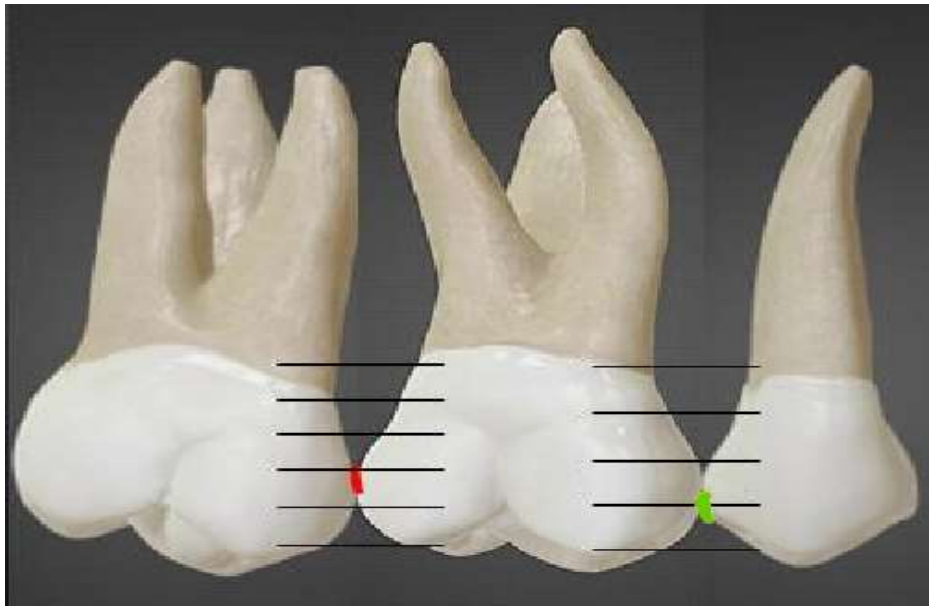


Mesial contact area:

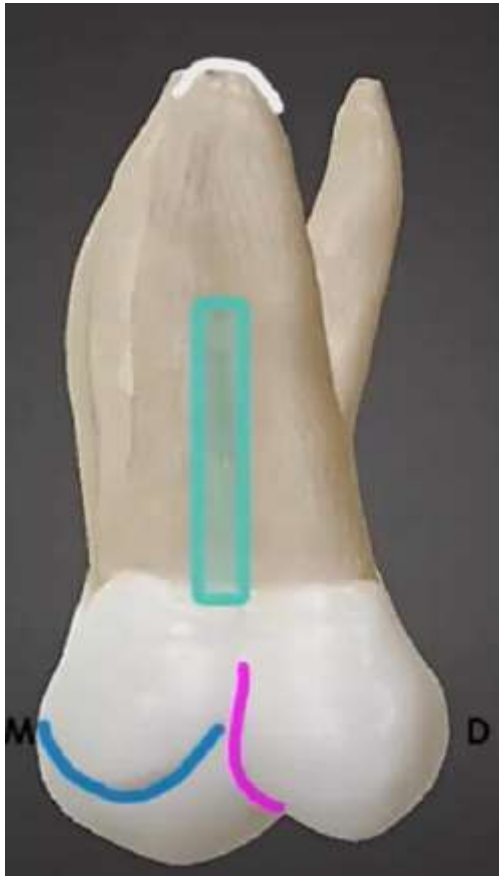
3/4 the distance from cervical line to mesial marginal ridge.

Distal contact areas:

3/5 the distance from cervical line to distal marginal ridge.



Palatal view:



Unequal sizes of the two cusps.

The **fifth cusp** of the supplemental "**Cusp of Carabelli**" can be seen clearly on the **MLcusp** (does not appear on any other cusp)

very important note:

it appears mainly and only in first maxillary molar

Disto-lingual groove separates the two lingual cusps **Palatal root:**

- **Tapered with blunt apex**
- **Shallow vertical depression** from cervical line to 2/3 of the root length

Clinical notes the doctor mentioned:

The bifurcation between the MB and DB roots starts at junction between Cervical &middle thirds.

 CLINICAL SIGNIFICANCE: periodontal disease reaching bifurcation: prognosis

Mesio-Buccal root is usually the smallest, but it has a curvature and might have two canals.

 CLINICAL SIGNIFICANCE: endodontic treatment of this tooth needs proper inspection for the second Mesio-Buccal canal (MB2)

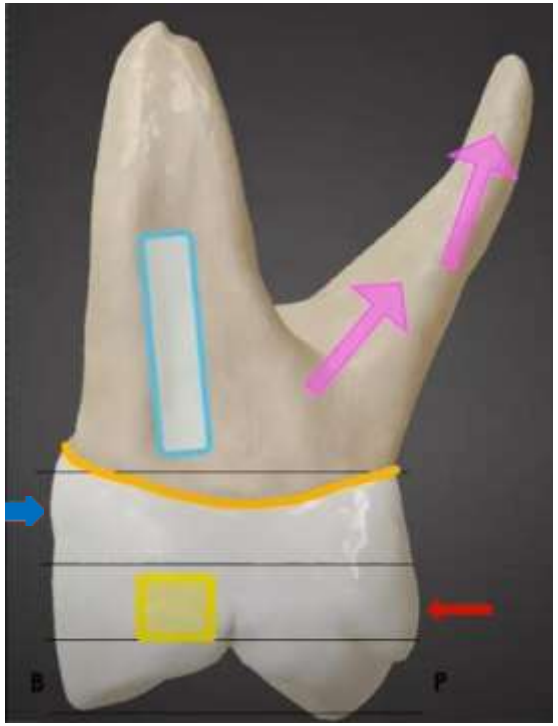
Mesial view:

Trapezoidal outline: with maximum bucco-palatal dimension is at the cervix of the crown.

Buccal Maximum curvature (hight of contour):
middle of cervical 3rd then outline continues straight.

Palatal maximum curvature (hight of contour):

middle of middle 3rd.



Palatal root **is narrow & Banana- shaped**

it curves palatally then buccally at the

apex. **Mesial contact point** placed more

to the buccal.

Note: Mesial contact point is under the marginal ridge, the fourth the dimension of the crawn

Mesial marginal ridge side is marked by **several tubercles &supplementary**

grooves. **Cervical line** is **slightly curved towards the crown (1 mm)**

Deep developmental groove on the root surface on mesio-buccal root

Distal view :

Buccal and palatal profiles are **similar** to in this view to the mesial side.

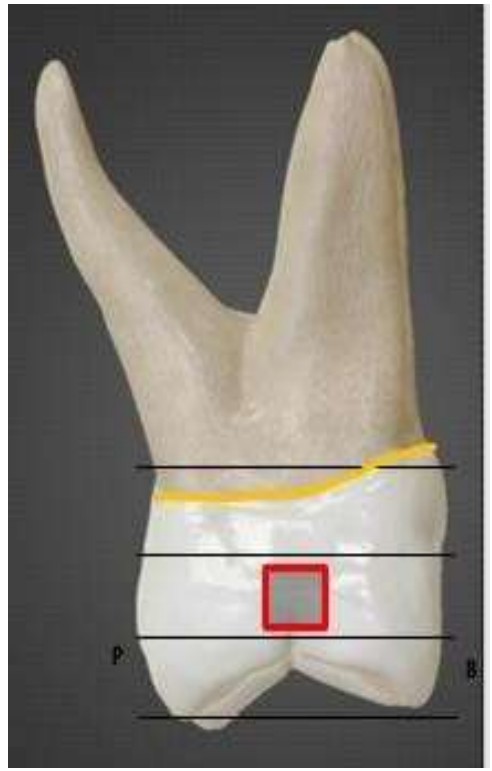
Cervical line on this side is nearly **straight** (0 mm) **Distal**

contact point lies in the centre (bucco-palatally)

Distal marginal ridge **rarely** has tubercles, it is shorter &less prominent than mesial marginal ridge

You can see part of the occlusal surface.

Disto-buccal root is the <u>smallest</u> in size .

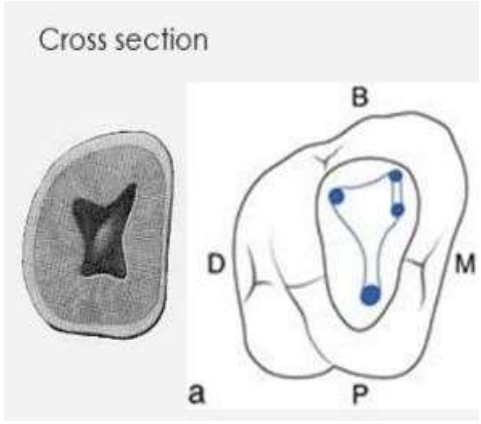


Note : palatal root>Mesio buccal> disto-buccal

Pulp morphology:

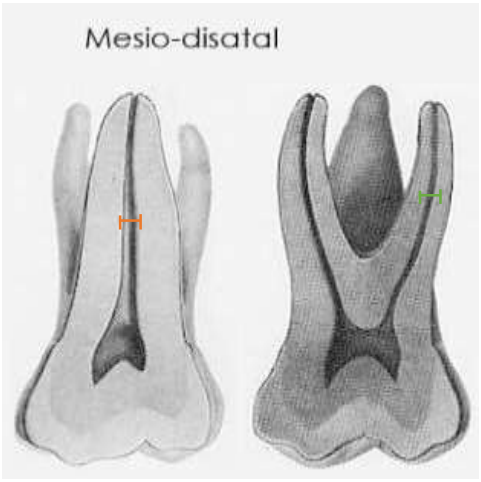
In a cross-sectional view at cervix:

- **3-4 canals** with 3-4 canal orifices
- The shape of access cavity is **triangular** with head of triangle towards the mesio-palatal cusp and the base towards the buccal.



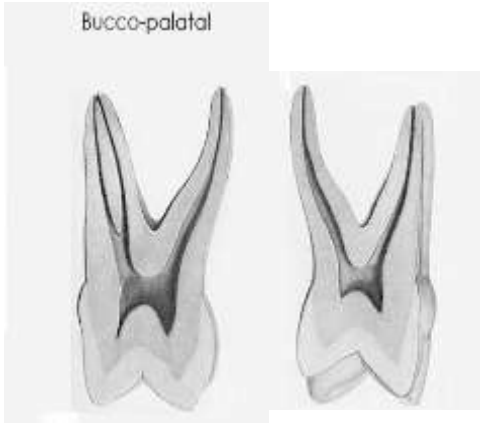
In a **mesio-distal cross-sectional** view:

- **2 horns, MB is higher**
- Large Pulp chamber (it has a roof & a floor)
- **Buccal canals are (narrow)**
  while palatal canal is usually (wide)



In a bucco-palatal cross-sectional view:

- Pulp chamber is **wider**
- **2 horns of equal height**



#Pulp morphology is complicated and variant between individuals.

Maxillary second molar

Similar to maxillary first molar generally but differ in the followings:

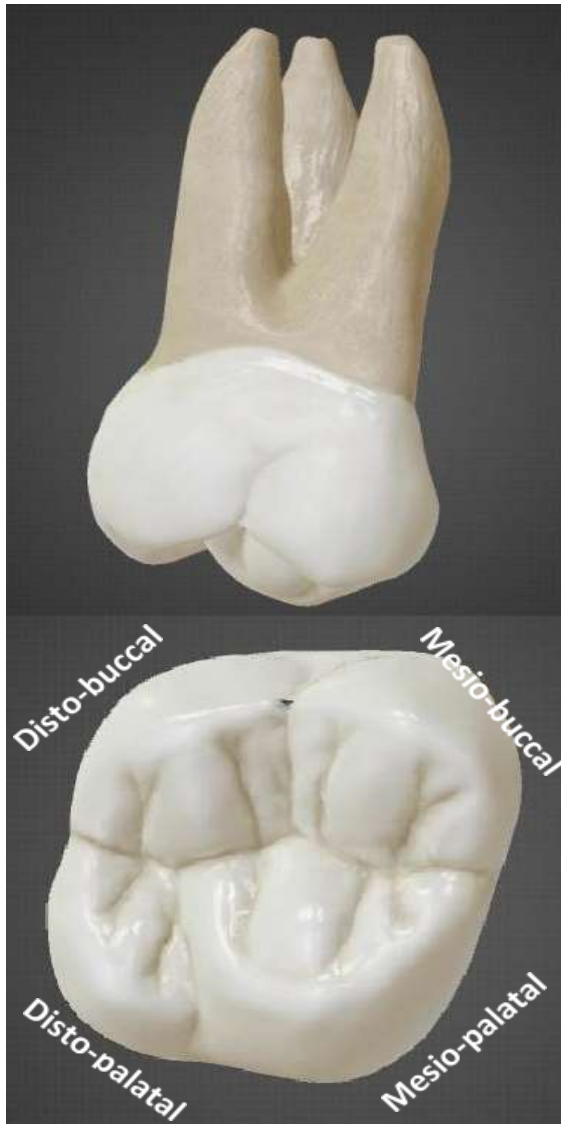
The disto-buccal cusp **is not as well developed** as in maxillary first molar. **The disto palatal cusp is smaller.**

The cusp of Carabelli is **absent** from this tooth. (Anatomical landmark)

The roots are of the **same length** as 1st molar and sometimes **longer**

The roots are slightly **less divergent**

The crown is **shorter cervico-occlusally** with almost the **same width** bucco-palatally when compared to maxillary first molar



Occlusal View:

narrower crown mesiodistally when compared to the first molar

The disto-palatal cusp is smaller in the 2nd molar (**smaller talon**).

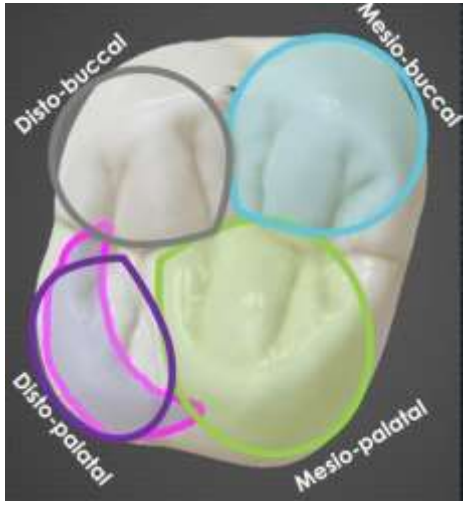
Difference in the size of cusps is more exaggerated

Largest to smallest:

mesiopalatal, mesiobuccal, distobuccal, and distopalatal.

#More variable pit/groove pattern (mare variation between individuals)

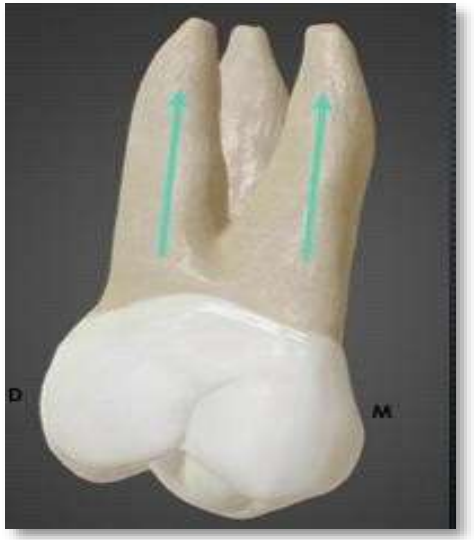
#More numerous supplementary groove...



Buccal View:

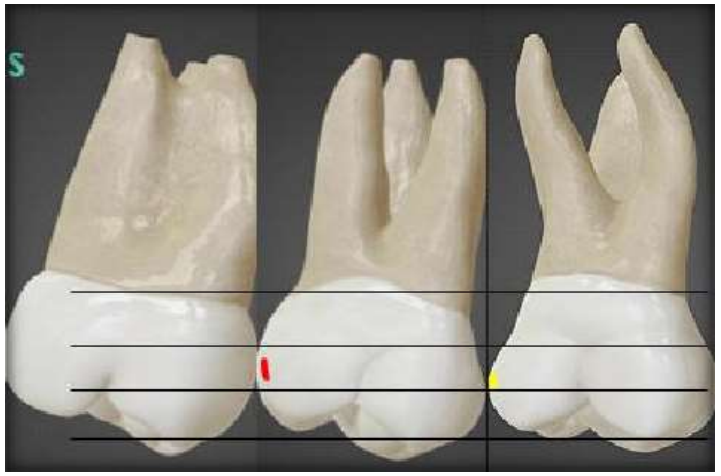
Similar to the first molar

The **two buccal roots are nearly parallel,** and they are more straight compared to 1st molar.



Both Mesial and Distal contact points tend to be centred bucco-palatally below the marginal ridges.

Molars become shorter and less complicated



Palatal (Lingual)View:

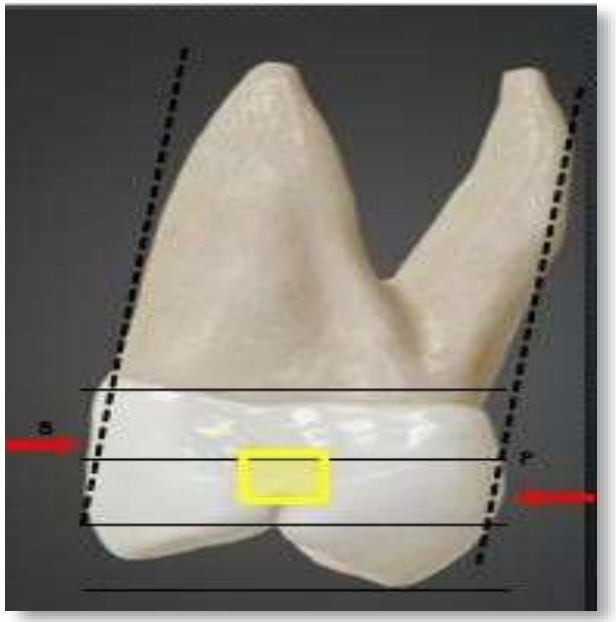
Palatal root is narrower mesio-distally slightly distally inclined.

Mesial View:

- The crown is **shorter** than the first molar.
- The **palatal &mesio-buccal roots have less divergence**

  and roots tend to remain within the crown profile.
- **Buccal Maximum curvature: middle of cervical 3rd**
- **Palatal maximum curvature: middle of middle 3rd**
- **Mesial marginal ridge** has less numerous tubercles

  compared to 1st molar.

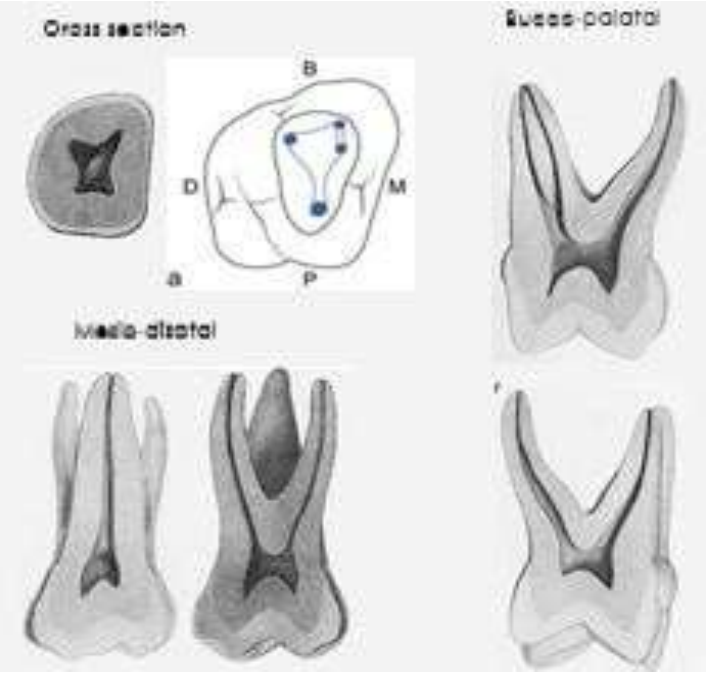


Distal View:

A greater portion of the occlusal aspect is visible from this aspect.

Pulp morphology:

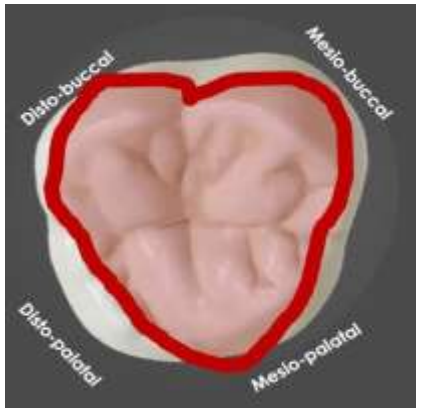
Similar to morphology and access cavity of maxillary first molar but the second mesio-buccal canal (MB2) is less likely to be present



Maxillary third molar

Maxillary (and mandibular) third molars show more developmental variation than any other permanent tooth. They are also frequently congenitally missing.

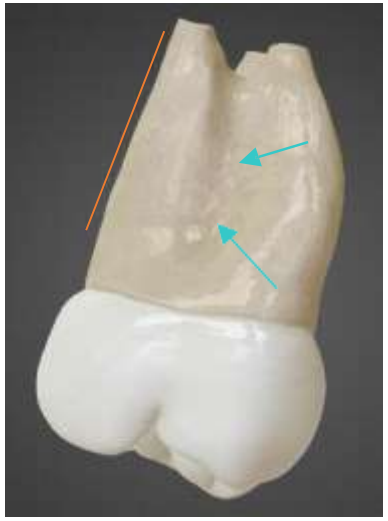
- Maxillary third molars vary considerably in size shape and position
- Some third molars resemble the adjacent second molar; others may have many cusps, small 'cusplets', and many grooves.
- The crown of this tooth is the **smallest** of the maxillary molars
- The outline of the occlusal surface can be described as triangular or "heart-shaped♡".
- Difference in the size of cusps is even more exaggerated: Largest to smallest: mesiopalatal, mesiobuccal and distobuccal distopalatal is of minimal size.
- Oblique ridge is barely visible
- Pit/groove pattern is variable
- Numerous supplementary grooves



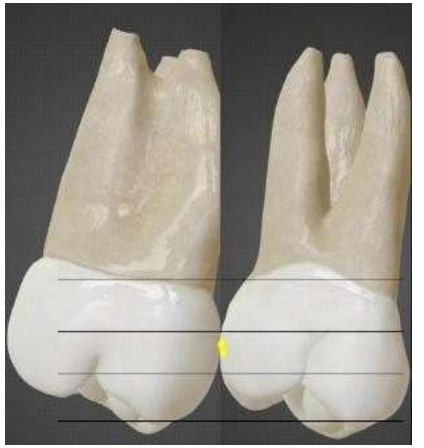
Buccal view:

The crown:

- Shorter and smaller in all dimensions.
- The mesial buccal cusp is larger than the distal buccal cusp.
- Two buccal roots are present, they are shorter but in commonly found fused.
- Roots shows a slight distal inclination.



- **Mesial contact point middle of crown is below the marginal ridges.**
- **Technically, the mesial surface is the only 'proximal' surface. The distal surface does not contact another tooth.**



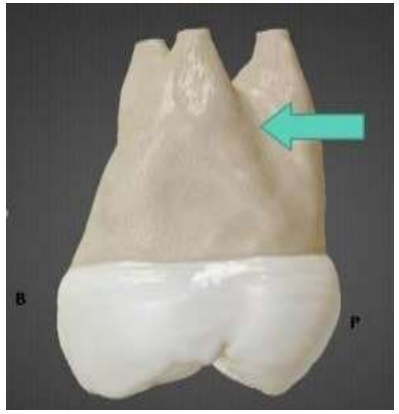
Lingual view:

Either **one** large palatal cusp or **two** with poorly developed disto- palatal cusp and its poorly developed **lingual groove.**

Palatal root is often fused to the two buccal roots.

Mesial view:

- The rounded or bulbous outline.
- Crown profile is irregular
- Fused roots



Distal view:

A greater portion of the occlusal aspect is visible from this aspect compared with 1st &2nd maxillary molars

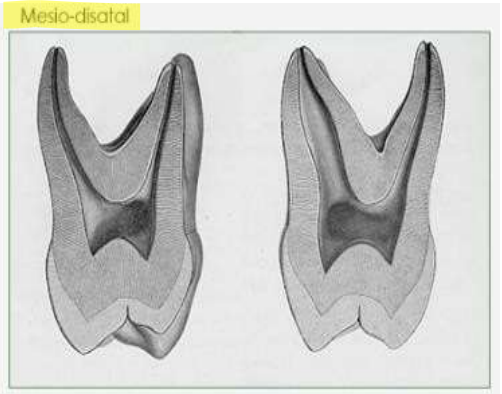
Pulp morphology:

In a cross sectional view at cervix the pulp looks:

- **Ovoid**
- **Narrow mesio-distally**

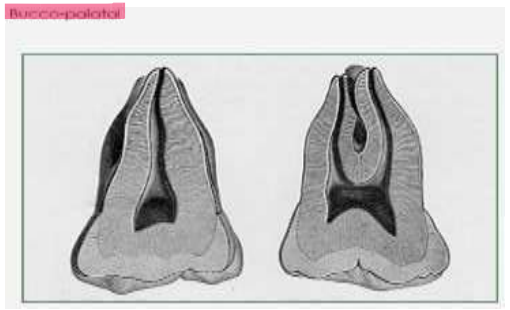
In a mesio-distal sectional view:

- **Large mesiobuccal horn & small distobuccal horn**



In a bucco-palatal sectional view:

- **Mesiobuccal and palatal horns are of equal pr ominence**



Little note:

The doctor talked a little bit clanicaly about the 3rd molar and how it vary in morphology and different studies about whether it should be extracted or not and its conditions…

You can check this paper which the doctor provided to us for further knowledge (https://fisjo.sharepoint.com/:b:/s/DentalAnatomyTheoryCourse/Eb3xfevFagRHhWd1kOWz6igBuZ4ZSLo9Pnn29xuQmODK2Q?e=HJuCmQ)

These are three research papers for further readings doctor Aseel provided us

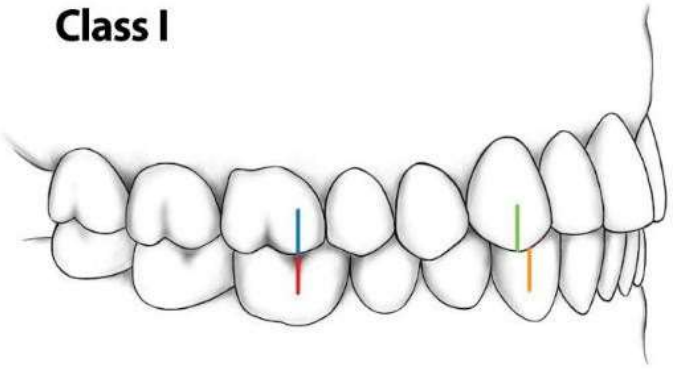
1. Mesio-buccal root: https://fisjo.sharepoint.com/:b:/s/DentalAnatomyTheoryCourse/EQoalT-GHhJMklJccMcvncIBF-CwdnkwDRMaCBFqqRR4YQ?e=Kf2B0W

2. Shortened dental arch: https://fisjo.sharepoint.com/:b:/s/DentalAnatomyTheoryCourse/EWaLmcKhv6lBhbKYokeMDzABxCsxNfr_cMVHGRJu_3dGWg?e=ibXpEv

3. To extract or not to extract: https://fisjo.sharepoint.com/:b:/s/DentalAnatomyTheoryCourse/Eb3xfevFagRHhWd1kOWz6igBuZ4ZSLo9Pnn29xuQmODK2Q?e=28uHzE

Occlusion:

In a typical Class I occlusal relationship:

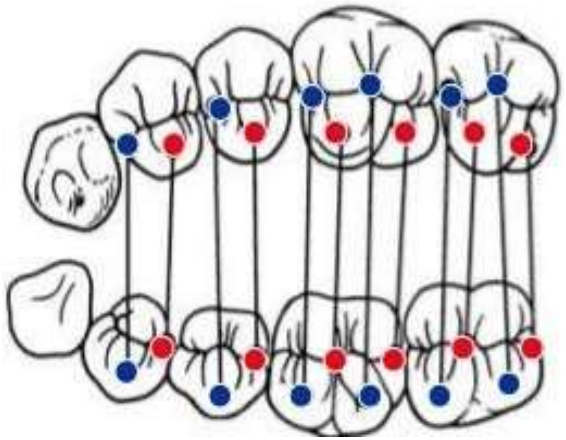


→ **Static: maximum Inter-cuspation during centric occlusion:**

- **Maxillary 1st molar is ½ tooth distal to the Mandibular 1st molar**
- **Maxillary 2nd molar is ½ tooth distal to the Mandibular 2nd molar**

→ **Static: maximum Inter-cuspation during centric occlusion:**

- **Mesio-palatal cusp of maxillary 1st molar occludes in the central fossa of mandibular 1st molar**
- **Disto-palatal cusp of maxillary 1st molar occludes in the distal triangular fossa of mandibular 1st molar**
- **Mesio-palatal cusp of maxillary 1st molar occludes in the central fossa of mandibular 1st molar**
- **Disto-palatal cusp of maxillary 1st molar occludes in the distal triangular fossa of mandibular 1st molar**



Tooth chronology

	Maxillary 1st molar	Maxillary 2nd molar	Maxillary 3rd molar
evidence of calcification:	At birth	2-3.5 yrs	8-10 yrs.
Enamel completed:	3-4 yrs.	7-8 yrs	12-16 yrs.
Eruption	6-7 yrs.	11-13 yrs.	17-21 yrs.
Root completed:	9-10 yrs.	14-15 yrs.	18-25 yrs.

Thank You