Dental Anatomy
or
Morphology of the Teeth

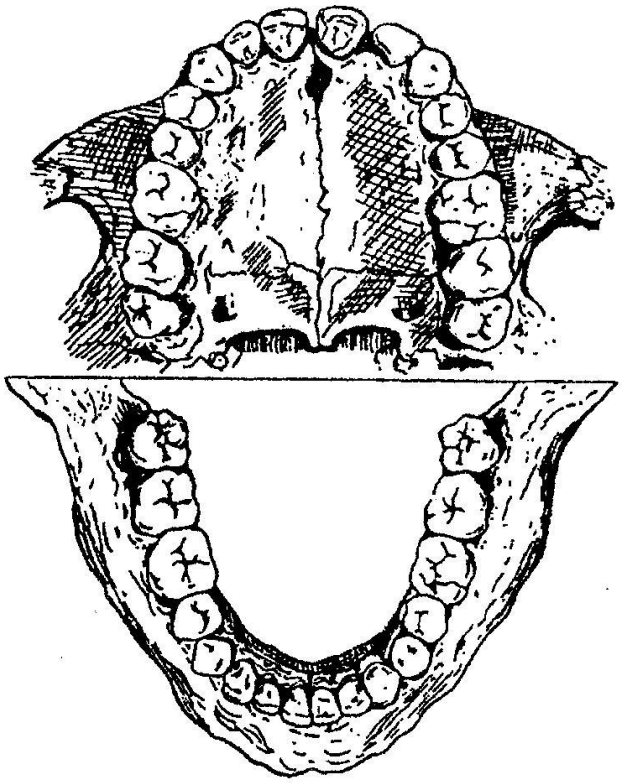
on behalf of Professor **Márton Krisztina**

presenting Professor **Székely Melinda**

Dentition

- All the teeth in the mouth together are referred to as the **dentition**.
- Humans have ***two dentitions*** throughout life, ”*dyphiodont*” beeing: one during childhood, called the **primary dentition**, and one called the **permanent** (also known as *secondary*) **dentition**.

Permanent maxillary and mandibular arches

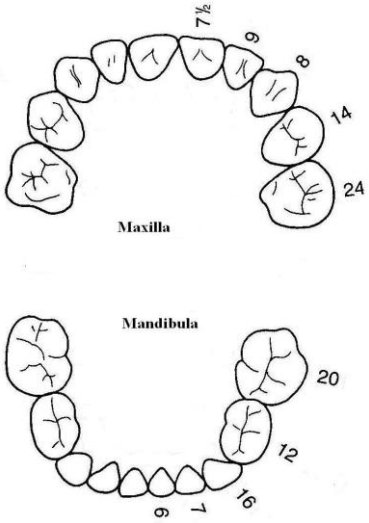


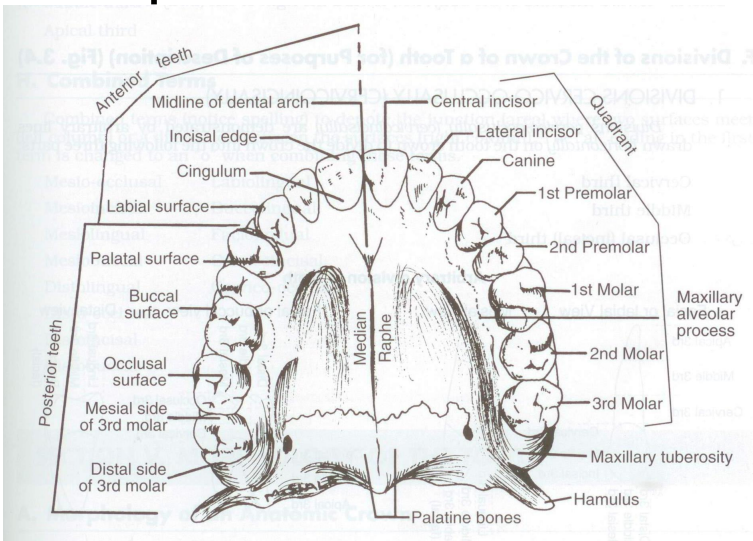
The teeth in the upper jawbones (called the maxillae) collectively form an arch shape known as the **maxillary arch** and those teeth in the lower jawbone (called the mandible) collectively form the **mandibular arch.**

Each arch can further be divided into the *left and right halves* also known as **left and right quadrants** since each *quadrant contains* *one fourth of all teeth* in that dentition.

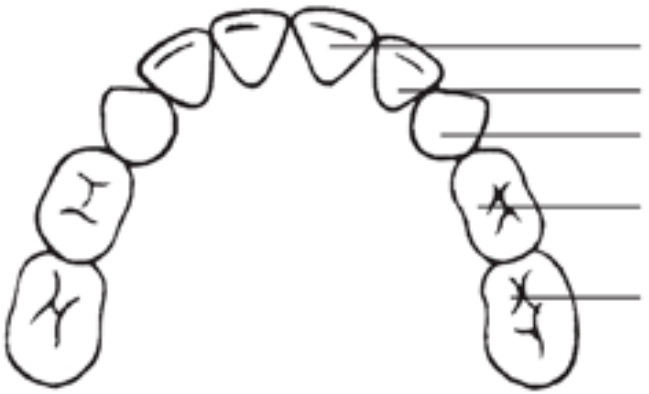
Dental characteristics of the human

- **20 primary** (**deciduous** or **milk**) **teeth**
  - divided into ***three*** **classes**, in a quadrant:
    - 2 incisors
    - 1 canine
    - 2 molars
- **32 permanent teeth**
  - divided into ***four*** **classes**, in a quadrant:
    - 2 incisors
    - 1 canine
    - 2 premolars
    - 3 molars

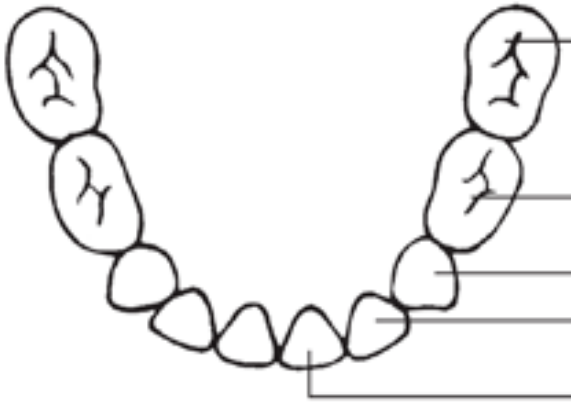




Baby Teeth Eruption Chart (ADA)

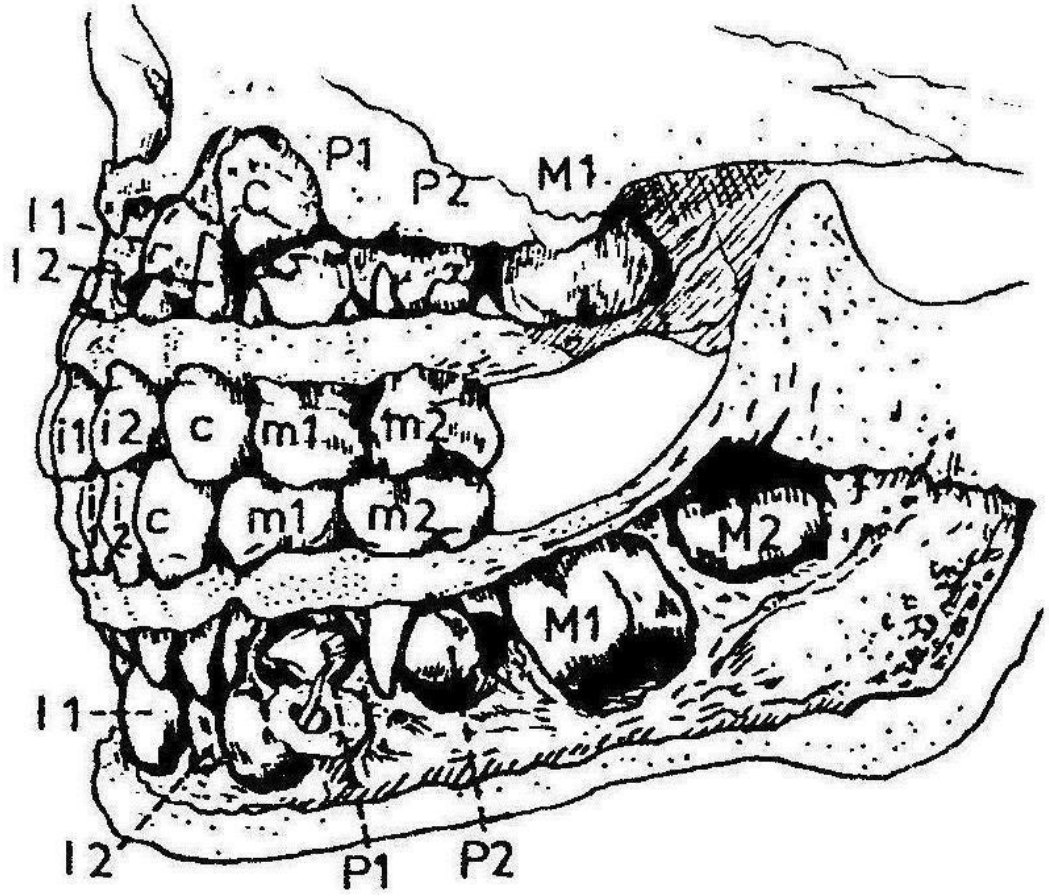


Upper Teeth	Erupt	Shed
Central incisor	8-12 mos.	6-7 yrs.
Lateral incisor	9-13 mos.	7-8 yrs.
Canine (cuspid)	16-22 mos.	10-12 yrs.
First molar	13-19 mos.	9-11 yrs.
Second molar	25-33 mos.	10-12 yrs.



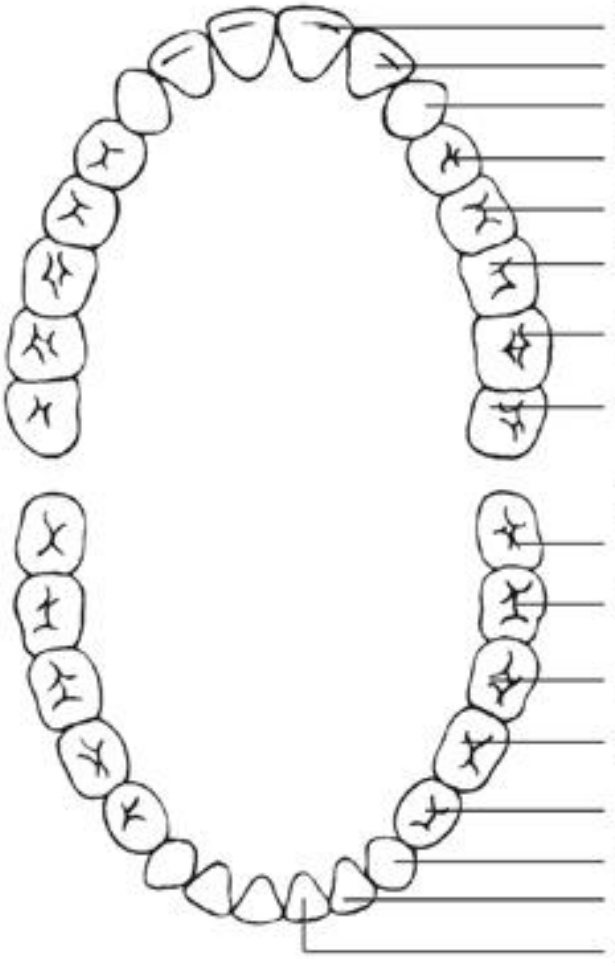
Lower Teeth	Erupt	Shed
Second molar	23-31 mos.	10-12 yrs.
First molar	14-18 mos.	9-11 yrs.
Canine (cuspid)	17-23 mos.	9-12 yrs.
Lateral incisor	10-16 mos.	7-8 yrs.
Central incisor	6-10 mos.	6-7 yrs.

Primary Dentition
viewed from the left



Models depicting the stage of development of the dentitions of a 3-year-old child.
All primary teeth have emerged into the oral cavity, and they have full roots, prior to resorption. Notice the various amounts of crown development and locations of the partially formed crowns of the permanent dentition.

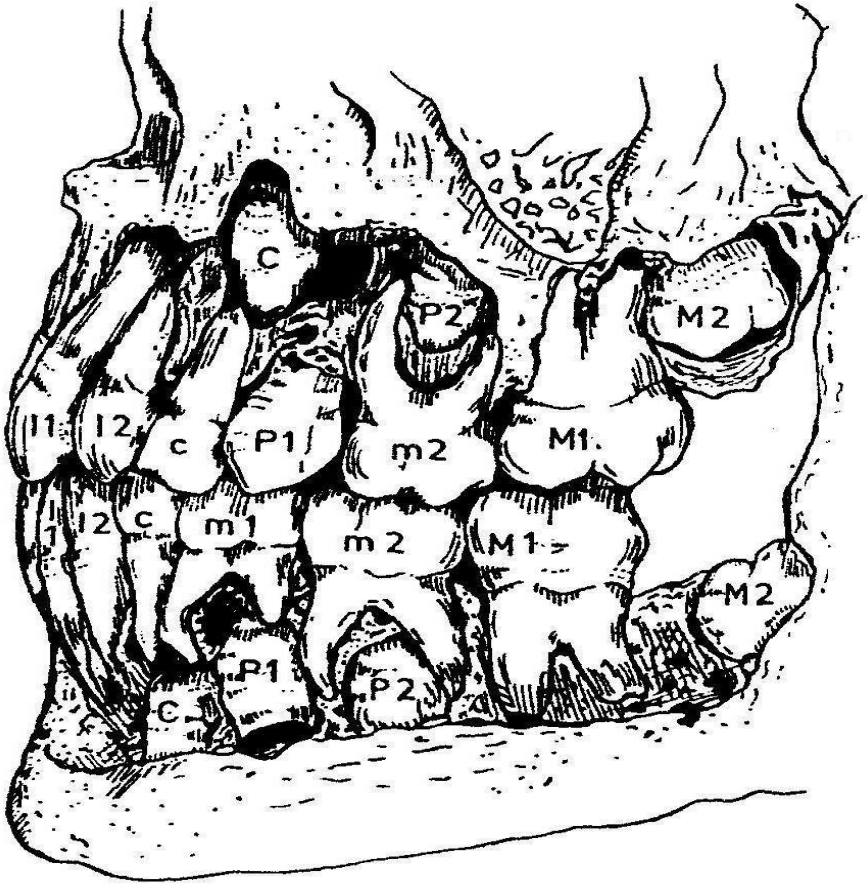
Permanent Teeth Eruption Chart

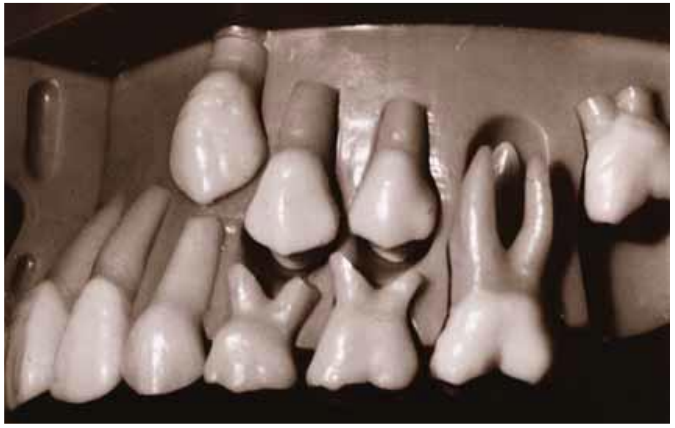


Upper Teeth	Erupt
Central incisor	7–8 yrs.
Lateral incisor	8–9 yrs.
Canine (cuspid)	11–12 yrs.
First premolar (first bicuspid)	10–11 yrs.
Second premolar (second bicuspid)	10–12 yrs.
First molar	6–7 yrs.
Second molar	12–13 yrs.
Third molar (wisdom tooth)	17–21 yrs.

Lower Teeth	Erupt
Third molar (wisdom tooth)	17–21 yrs.
Second molar	11–13 yrs.
First molar	6–7 yrs.
Second premolar (second bicuspid)	11–12 yrs.
First premolar (first bicuspid)	10–12 yrs.
Canine (cuspid)	9–10 yrs.
Lateral incisor	7–8 yrs.
Central incisor	6–7 yrs.

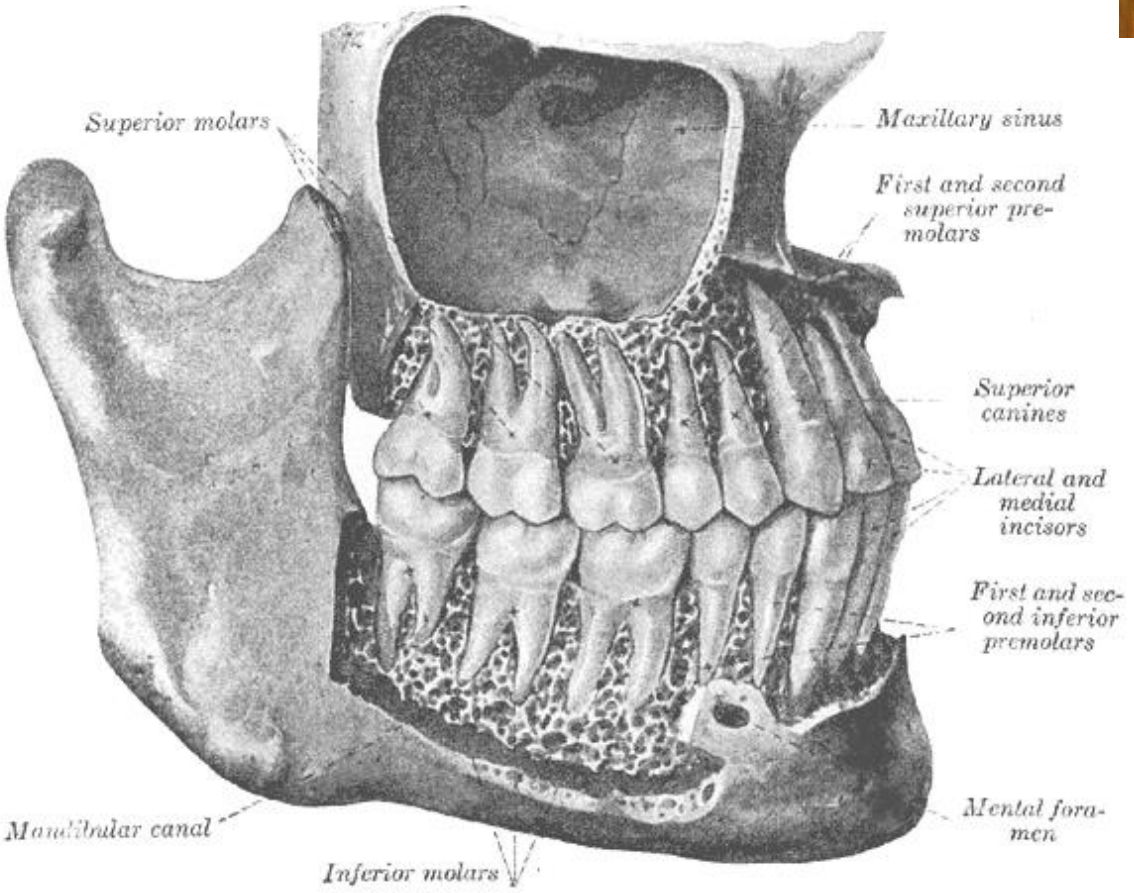
Mixed Dentition (primary and permanent teeth) viewed from the left



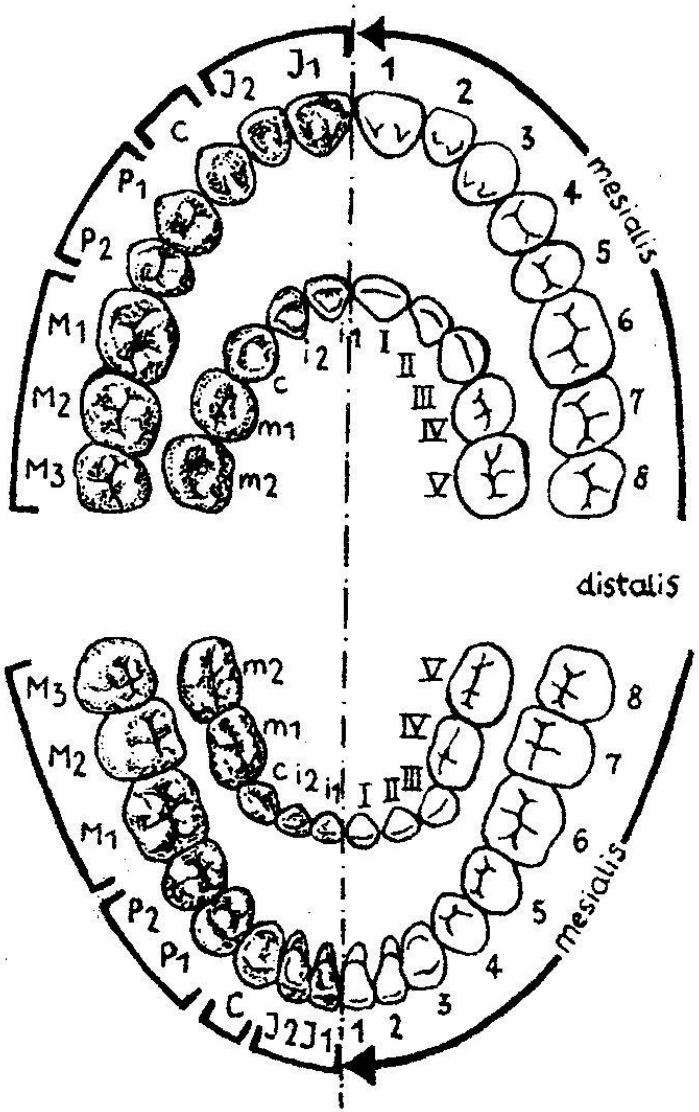


Tooth development of a 9-year-old child with mixed dentition.
The permanent central and lateral incisors and first molars have emerged into a functional level. The primary canines and molars are still functioning, although much of their roots have resorbed.
You can appreciate by the position of the maxillary canine (in the bone) why it is often the last permanent tooth to erupt except for the third molars.

Permanent Dentition
viewed from the right



Tooth Identification Systems
Signing (numbering) of teeth



Permanent teeth	**Primary teeth**
I = incisor (*incisivus*)	**i** = incisor
C = canine (*caninus*)	**c** = canine
P = premolar (*praemolaris*)	**m** = molar
M = molar (*molaris*)	
In index	In index
1 = central, first	**I** = central, first
2 = lateral, second	**II** = lateral, second

For example: $\mathbf{P_2}$ second premolar; $\mathbf{m_{II}}$ second primary molar

A **formula** can be used to represent the teeth in the human **primary dentition**, upper and lower quadrant, as follows:

$$\frac{2}{2}i;\frac{1}{1}c;\frac{2}{2}m$$

A **formula** can be used also to represent the teeth in the **permanent dentition**, upper and lower quadrant, as follows:

$$\frac{2}{2}I;\frac{1}{1}C;\frac{2}{2}P;\frac{3}{3}M$$

Individual teeth or tooth groups are often given an acronym: "**I**" stands for incisors, "**C**" for canine, "**P** or **PM**" for premolar, and "**M**" for molar.

Zsigmondy (1861) System

Zsigmondy's cross

[Palmer (1891) System]

Permanent teeth

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

Example: maxillary left permanent canine **|3**

Primary teeth

V	IV	III	II	I	I	II	III	IV	V
V	IV	III	II	I	I	II	III	IV	V

FDI System (1957)
(Federation Dentaire Internationale)
World Dental Federation

Permanent teeth

1.8 1.7 1.6 1.5 1.4 1.3 1.2 1.1	2.1 2.2 2.3 2.4 2.5 2.6 2.7 2.8
4.8 4.7 4.6 4.5 4.4 4.3 4.2 4.1	3.1 3.2 3.3 3.4 3.5 3.6 3.7 3.8

8/,

Primary teeth

5.5 5.4 5.3 5.2 5.1	6.1 6.2 6.3 6.4 6.5
8.5 8.4 8.3 8.2 8.1	7.1 7.2 7.3 7.4 7.5

This system uses two digits:

The **first digit** denotes the **quadrant** (right or left) **and arch** (maxillary or mandibular) **and dentition** (permanent or primary) as follows:

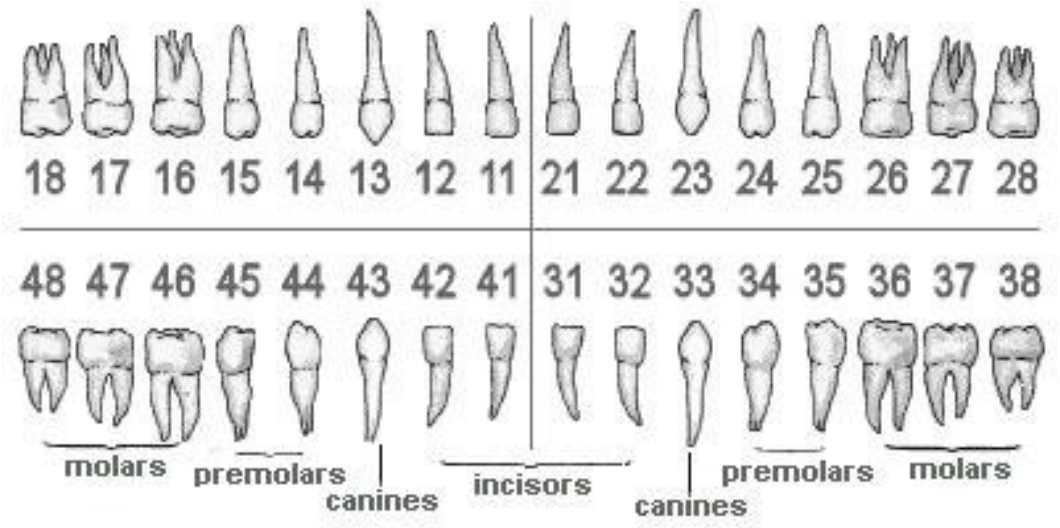
PERMANENT DENTITION

1 = maxillary, right quadrant
2 = maxillary, left quadrant
3 = mandibular, left quadrant
4 = mandibular, right quadrant

PRIMARY DENTITION

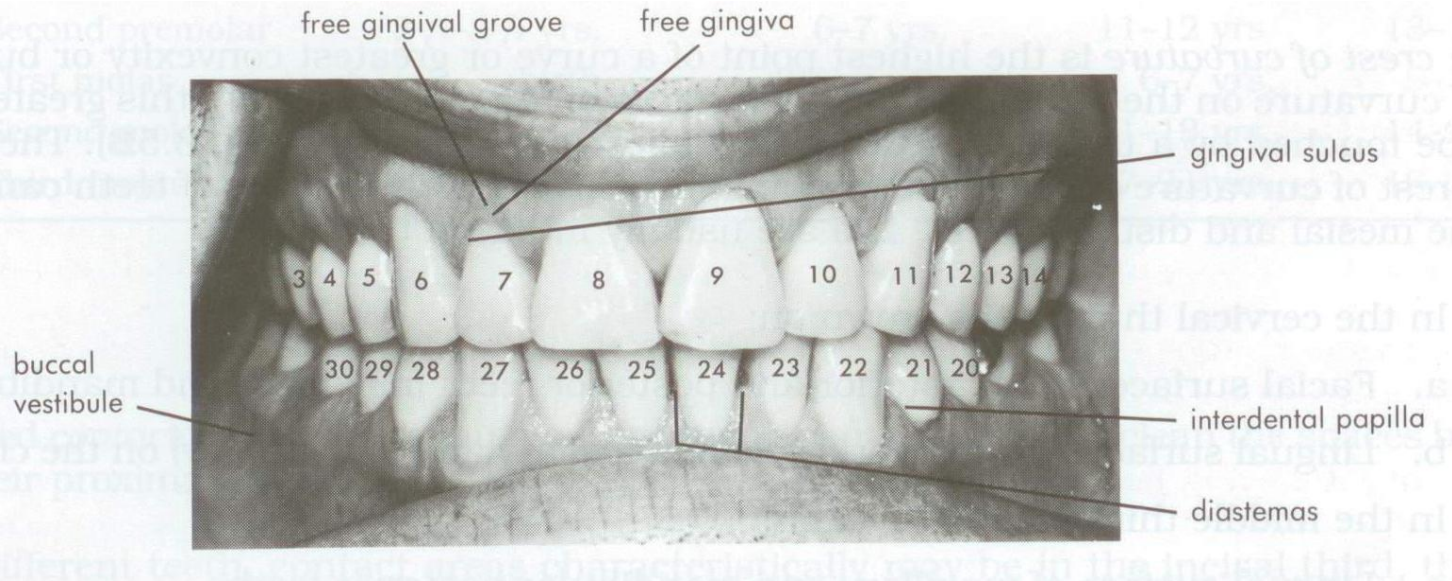
5 = maxillary, right quadrant
6 = maxillary, left quadrant
7 = mandibular, left quadrant
8 = mandibular, right quadrant

The **second digit** denotes the **tooth position** in each quadrant relative to the midline.



American System
(*Universal Numbering System, 1975*)
*ADA (*American Dental Association*) numbering*

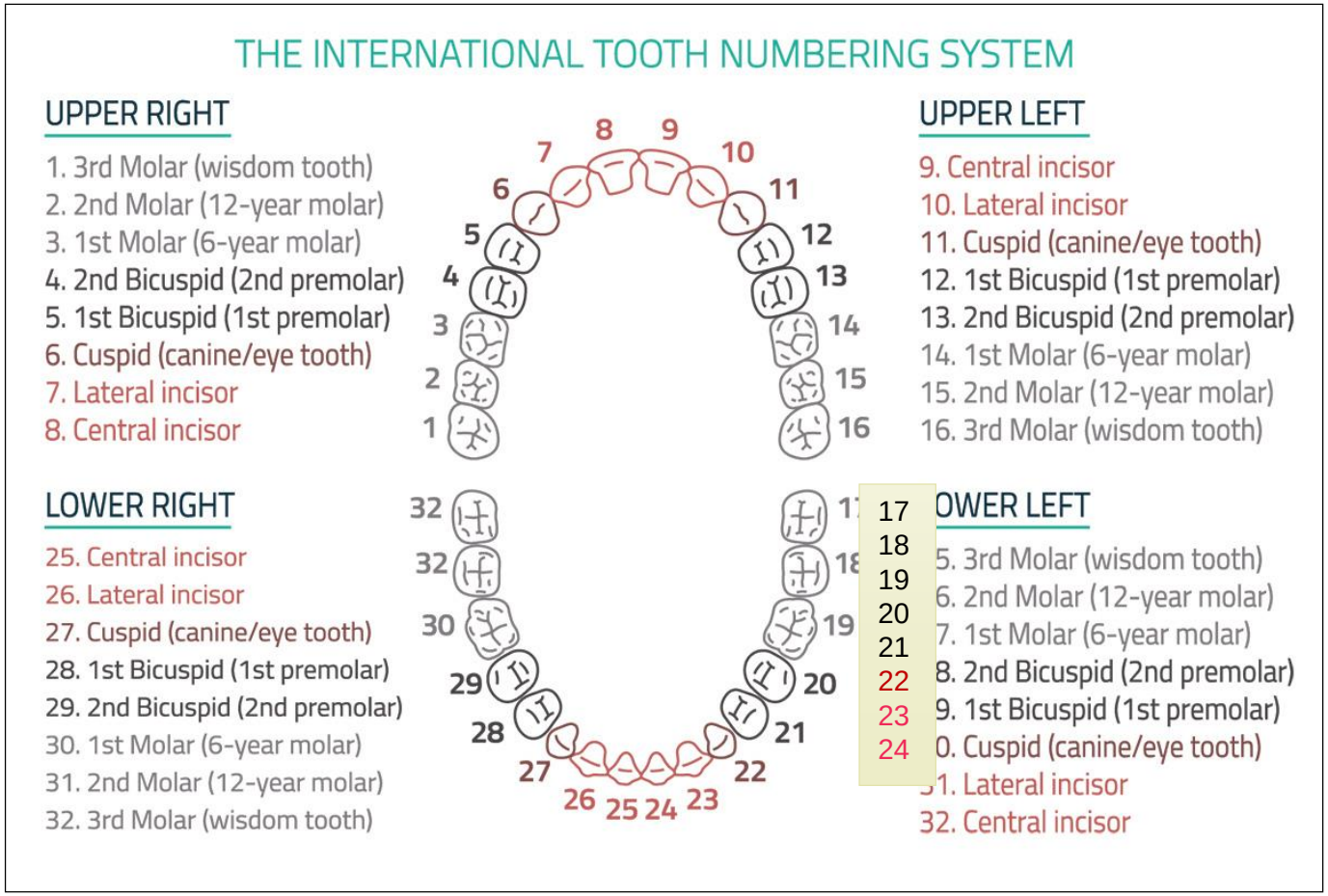
Permanent teeth



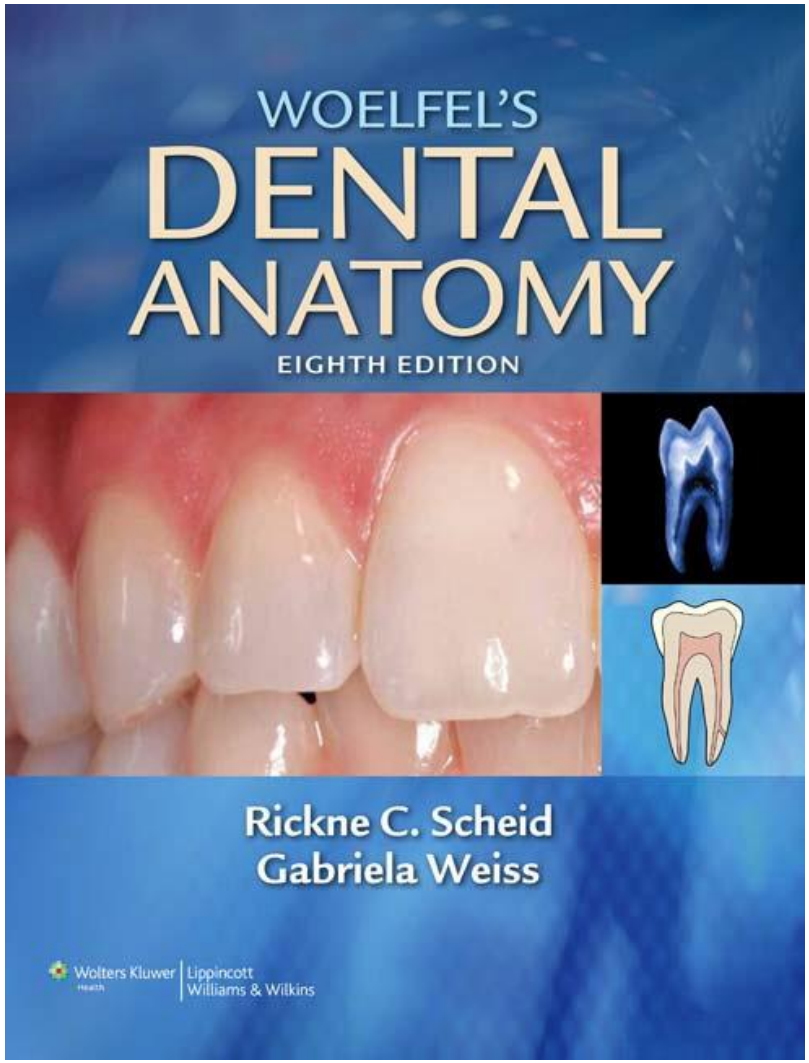
Primary teeth

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

ADA (American Dental Association) numbering



In this tooth numbering system the teeth are marked with consecutive numbers following a clockwise order beginning with the maxillary right third molar (1) and continuing to the mandibular right third molar (32).



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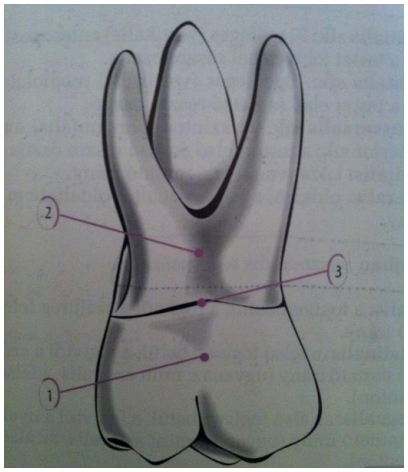
Basic anatomy

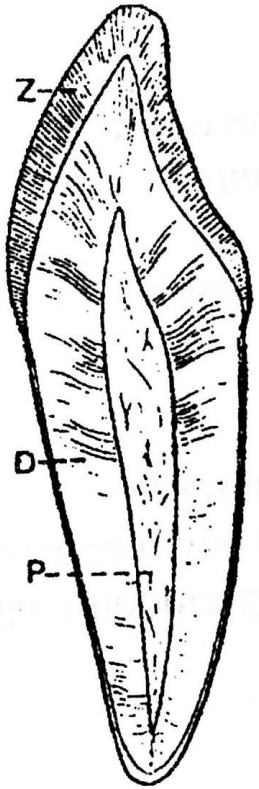


1. **Dental crown** – *Corona dentis*
2. **Dental root** – *Radix dentis*

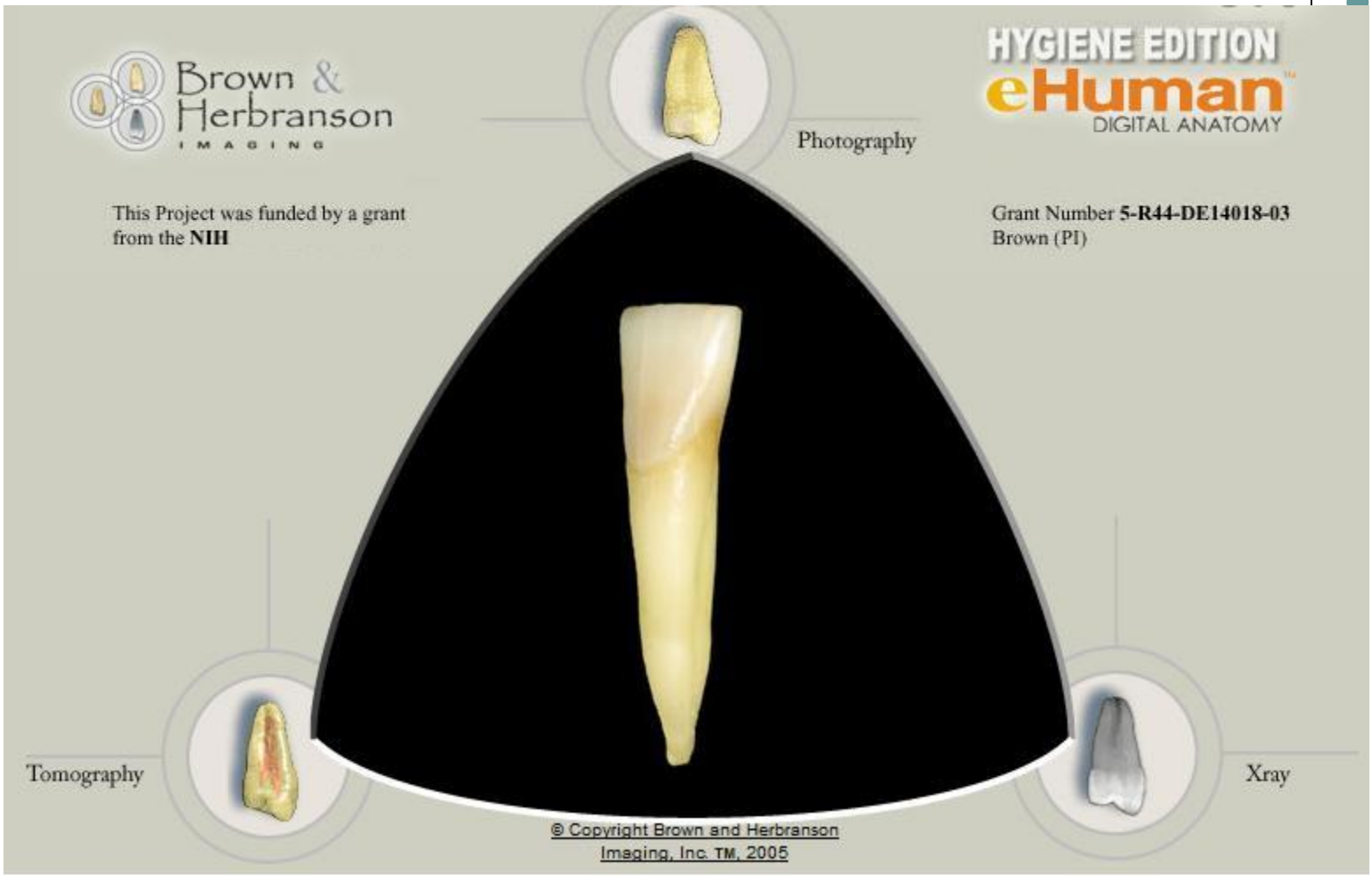
   The **anatomic crown** is that part of the tooth covered by an enamel layer, and the **anatomic root** is the part of a tooth covered by cementum.

3. **Dental neck** – *Cervix dentis*

   A **cervical line** (or **cementoenamel junction**) separates the anatomic crown from the anatomic root.



Tissues of the tooth: Z = enamel, D = dentine, P = pulp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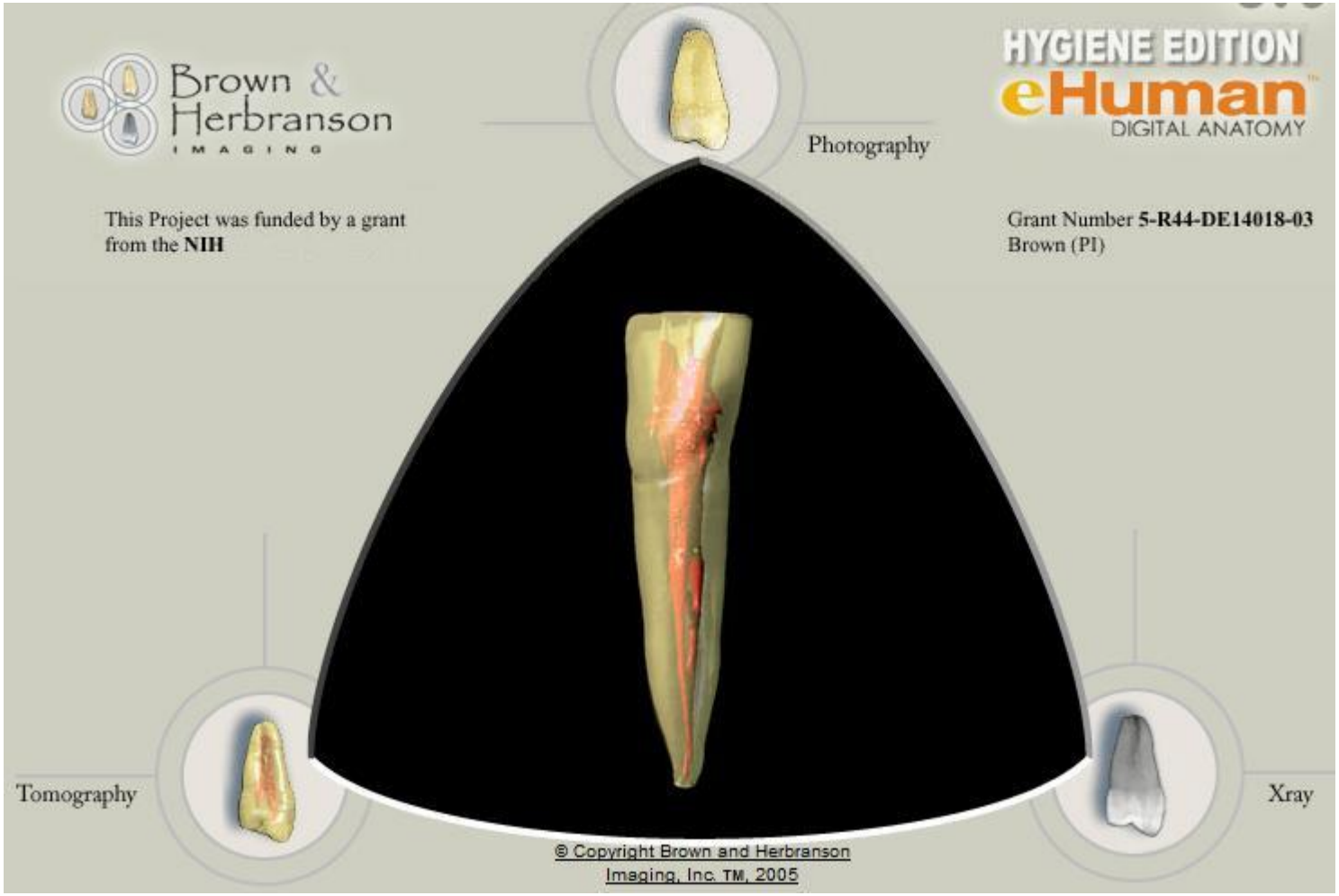
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Basic anatomy

1. **Dental crown – Corona dentis**:
    1. intraorally located, polychromatic, covered with enamel, anatomically finished at the cemento-enamel junction,
    2. the free gingival margin is attached a little bit more occlusally
    3. **clinical crown: coronal part of the tooth that is visible in the mouth (not always is the same as the anatomical crown**)

2. **Radix dentis**:
    1. situated in the alveolar process, covered with cementum,
    2. its shape is dependent on the type of the tooth,

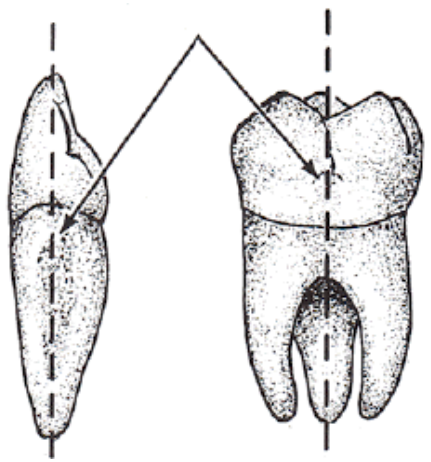
3. **Cervix dentis**:
    1. line formed by cemento-enamel junction, the border between the crown and the root
    2. its shape is uneven, its shade is more yellowish

The **clinical crown** refers specifically to the amount of tooth visible in the oral cavity, and the **clinical root** refers to the amount of tooth that is not visible since it is covered with gingiva (gum tissue).

This maxillary molar has a **very long clinical crown** since all of the anatomic crown and much of the anatomic root are exposed due to recession of the gingiva and loss of bone.

Long Axis and Axial Surface

- The long axis of a tooth is an imaginary line that goes through the crown and root around which the substance of a tooth is most symmetrically distributed.
- Any surface of a tooth that is parallel to the long axis is called an axial surface (e.g., mesial, distal, facial, or lingual surfaces).



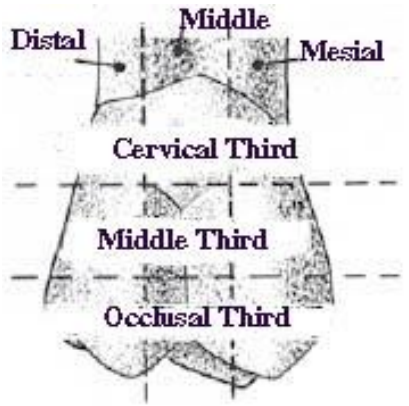
Division of a Crown in Thirds

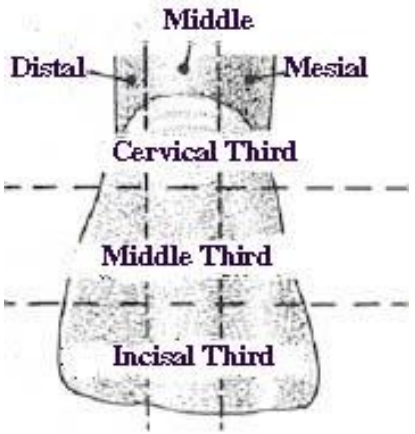
Horizontal Division

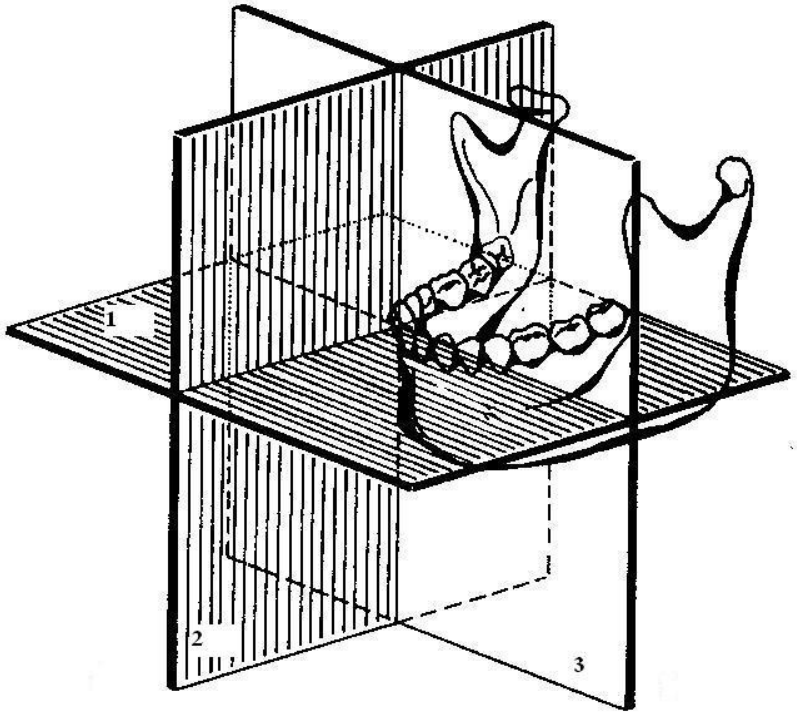
- Each axial surface of a crown is divided horizontally into a cervical, a middle, and an occlusal (or incisal) third.

Longitudinal Division

- Each mesial or distal axial surface may be divided into a facial, a middle, and an oral third.
- Each facial or oral surface may be divided into a mesial, a middle, and a distal third.



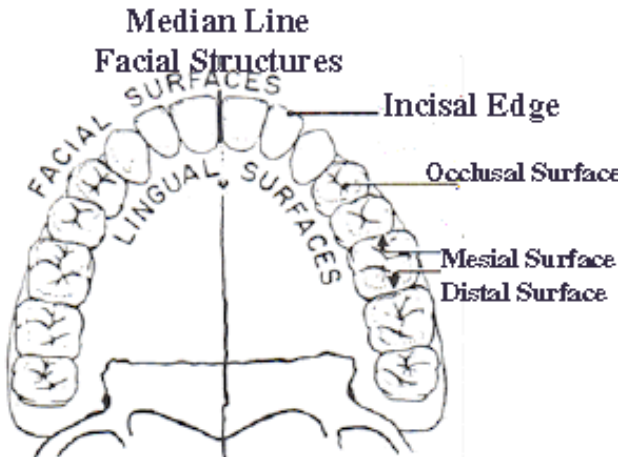




Reference planes: 1. horizontal plane; 2. sagital plane; 3. frontal plane

Nomination of the tooth surfaces

- **Vestibular or Facial:**
  - Surface, looking at the oral vestibulum
  - **Labial:**
    - Surface, contacting the lips
  - **Buccal:**
    - Surface contacting the cheeks
- **Oral:**
  - Surface, looking at the oral cavity
  - **Lingual:**
    - On the mandibule
  - **Palatal:**
    - On the maxilla



Nomination of the tooth surfaces

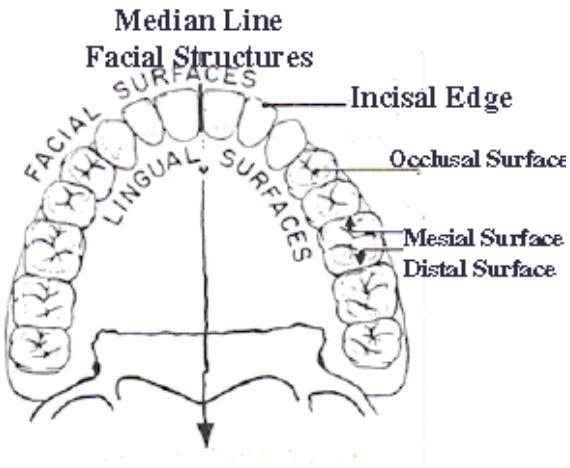
- **Proximal:**

  Tooth surfaces contacting with eachother:

  - **Mesial**
    - Surface looking at the midline
  - **Distal**
    - Surface looking at far from the midline

- **Occlusal:**

  Occluding surfaces



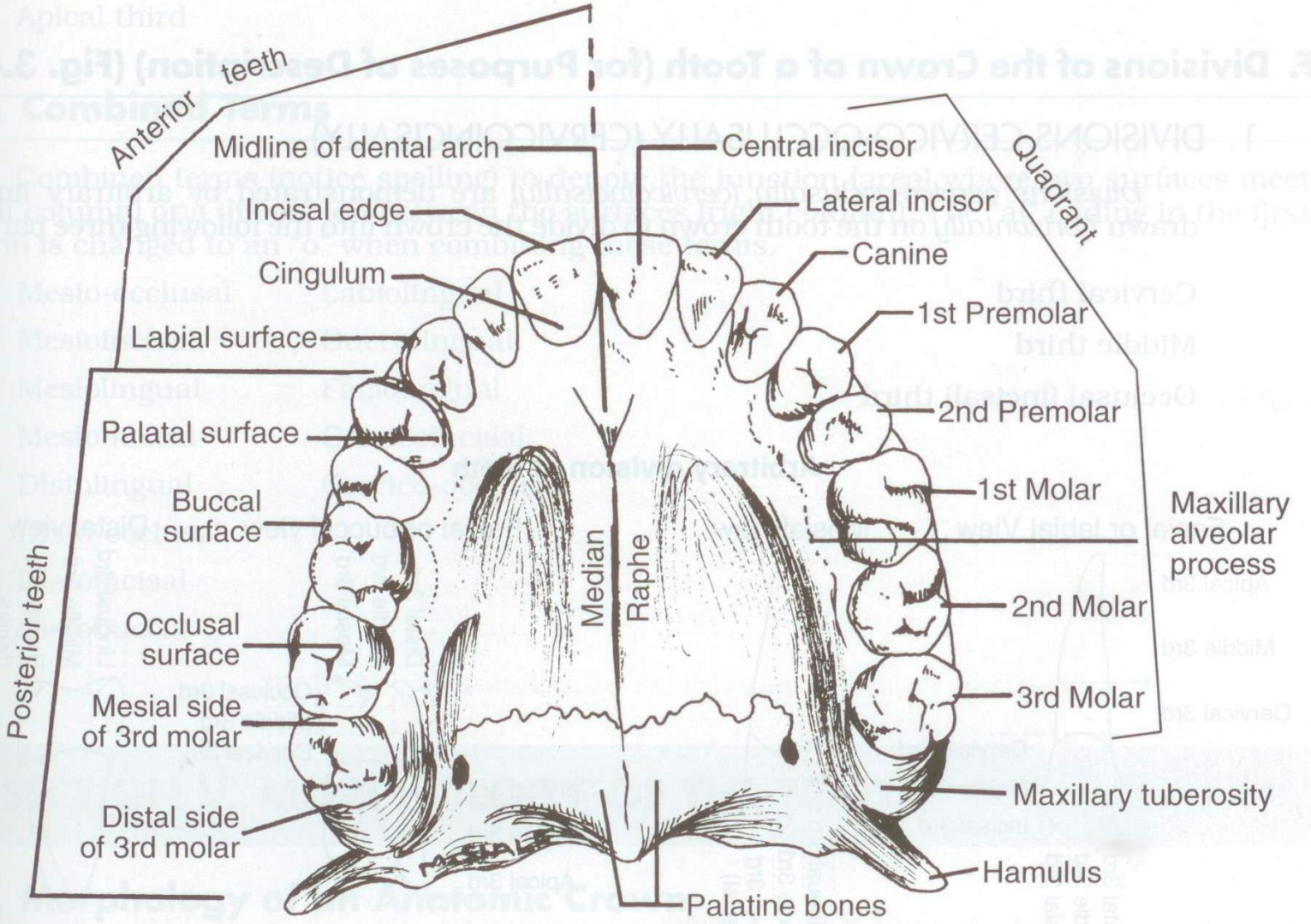


Figure 3.3. Maxillary dental arch and the bones of the hard palate. Remember that the labial surface of an anterior tooth and the buccal surface of a posterior tooth are both referred to as facial surfaces. Also, the mesial and distal sides or surfaces are correctly called proximal surfaces.

Crown Morphology

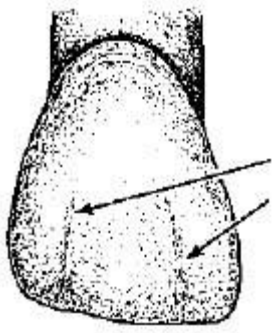
- As you study dental anatomy, you will discover there are almost no perfectly flat or perfectly straight surfaces, as most **surfaces are curved**.
- The morphology of a crown is a combination of **convex** and **concave** curves.
- A convex surface is one which is curved outward; a concave is curved inward.

Distinctive Crown Convexities and Concavities

Convexities

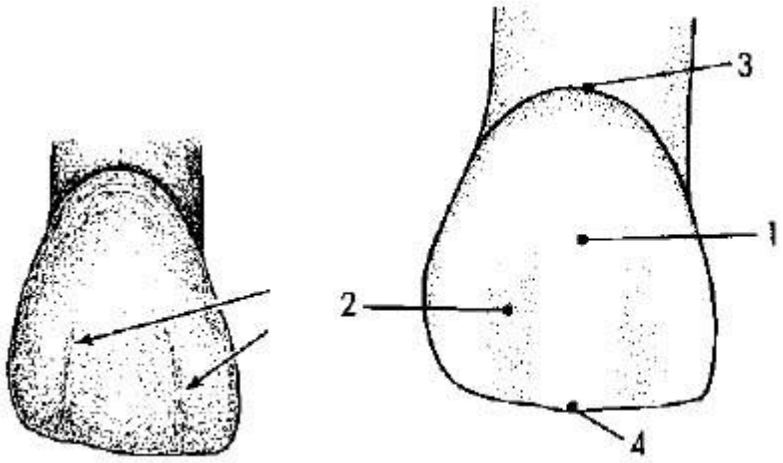
1. Lobe

- A lobe is one of the primary anatomical divisions of a crown; all teeth develop from either four or five lobes (for example, a central incisor forms from four lobes while first molars develop from five lobes.)
- Lobes are usually separated by readily identifiable developmental grooves.



Maxillary Central Incisor (Facial View)

1. Lobe
2. Developmental Groove
3. Cemento–Enamel Junction
4. Incisal Edge



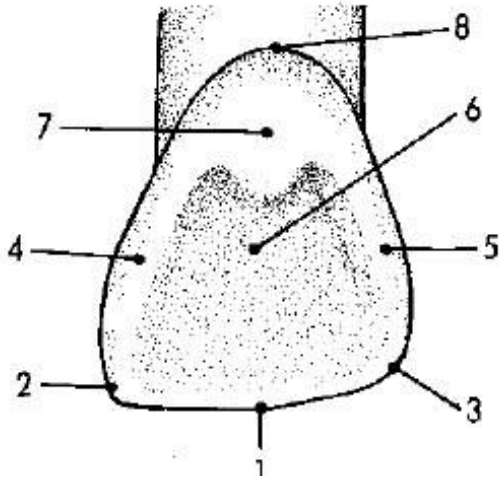
2. Mamelons

- These are small, rounded projections of enamel from the incisal edges of newly erupted anterior teeth.

- The projections wear away soon after eruption.

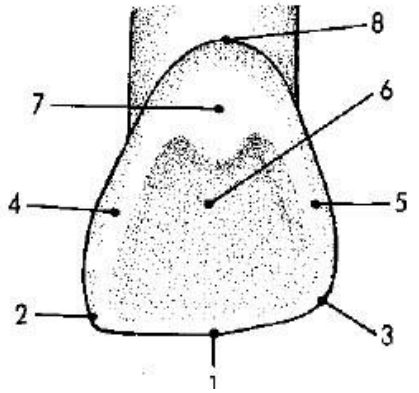
Maxillary Central Incisor (Oral View)

1. Incisal Edge
2. Mesio-Incisal Angle
3. Disto-Incisal Angle
4. Mesial Marginal Ridge
5. Distal Marginal Ridge
6. Palatal (Lingual) Fossa
7. Cingulum
8. Cemento-Enamel Junction



3. Cingulum

- A cingulum is found on the oral aspect of an anterior tooth.
- It is a convex mount of enamel localized to the cervical one-third of the crown.

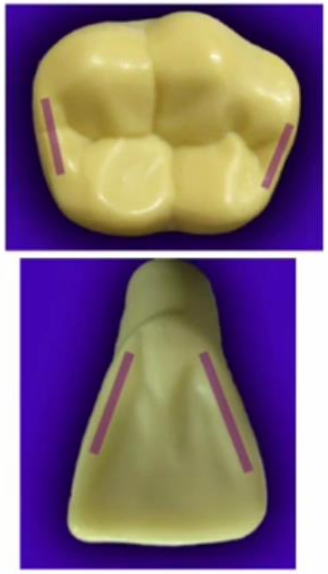


4. Cusp

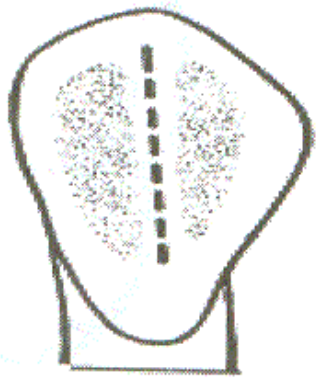
- A cusp is a pointed or rounded elevation of enamel that represents the tooth's cutting edge.
- It is found on cuspids and on the chewing surfaces of bicuspids and molars.

5. Ridge

- Any linear elevation found on the surface of a tooth.
- ***Marginal ridge*** is a linear, rounded border of enamel that forms the mesial and distal margins of anterior teeth as viewed from the lingual, and the mesial and distal borders of occlusal surfaces on posterior teeth.



- ***Lingual ridge*** is the ridge of enamel that extends from the cingulum to the cusp tip on the lingual surface of most cuspids is called the lingual ridge.



- ***Cusp Ridge*** – each cusp has four cusp ridges radiating from its tip and they are named according to the direction they take away from the cusp tip (for example: mesial, distal, facial and lingual).

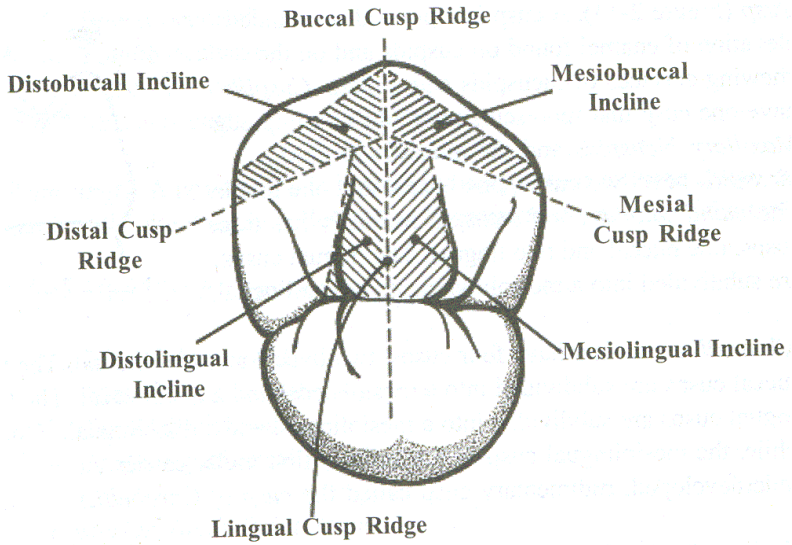


Figure 2-16. Cusp Ridges

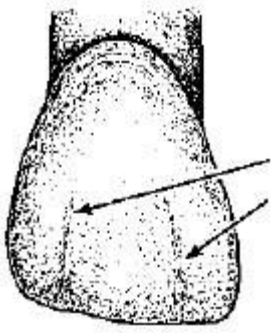
Concavities

1. Fossae

- The ***oral (lingual, palatal) fossa*** is an irregular, rounded concavity bound by the mesial marginal ridge, distal marginal ridge, cingulum and incisal edge of the oral surface of an incisor tooth.

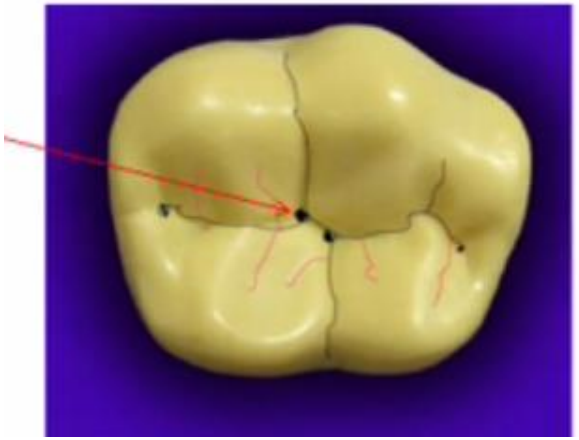
2. Groove

- ***Developmental grooves*** represent lines of union between lobes of the crown during its formation.
- These grooves appear on labial, occlusal, buccal, and oral surfaces, and are least apparent on the labial aspect of anteriors.
- ***Supplemental grooves*** are minor, auxiliary grooves that branches off from a much more prominent developmental groove and do not represent the junction of primary tooth parts.

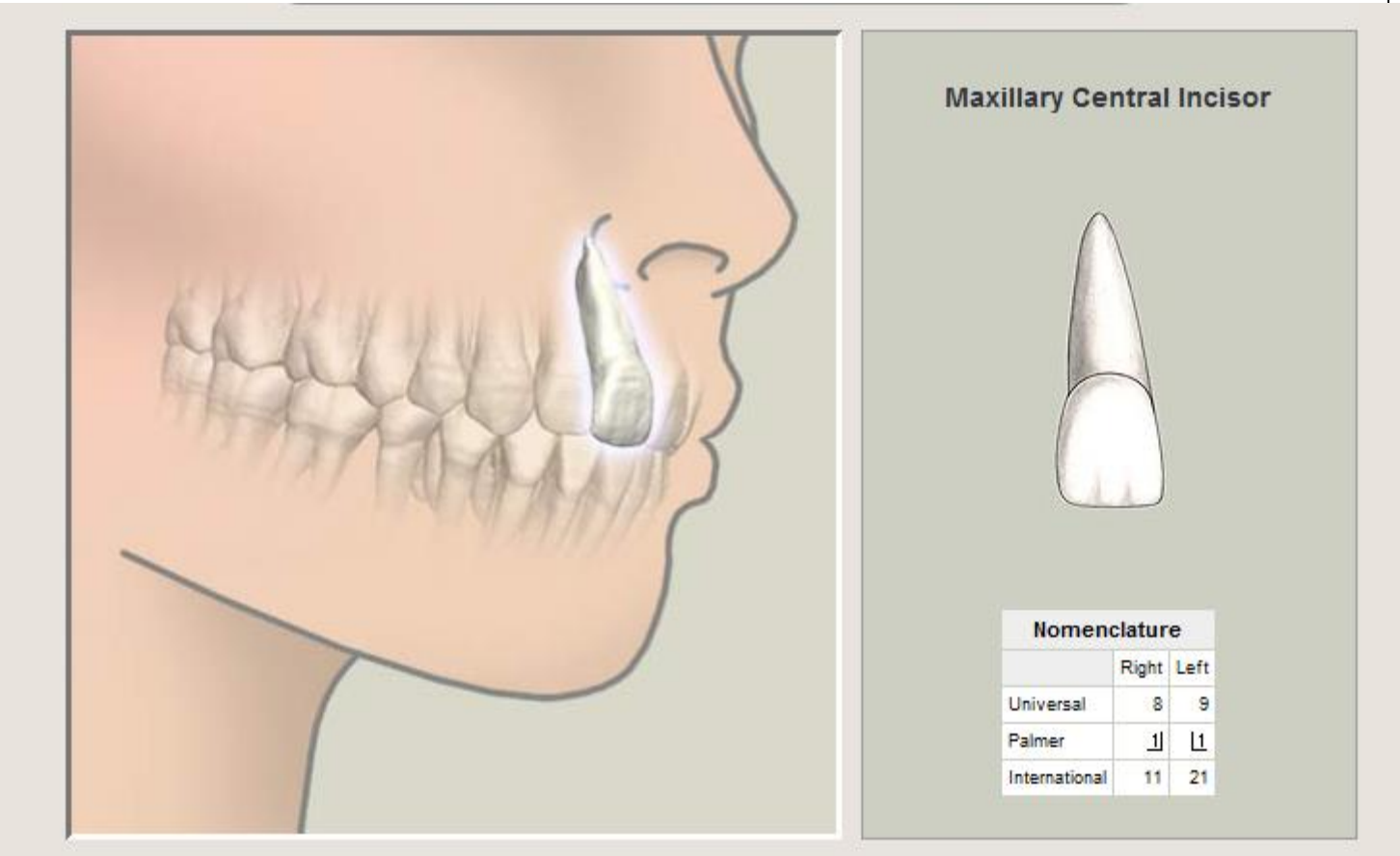


3. Pit

- A pit is a small, pinpoint fault on the surface of a tooth.
- A pit is usually found at the end of a developmental groove or at a place where two fissures intersect.



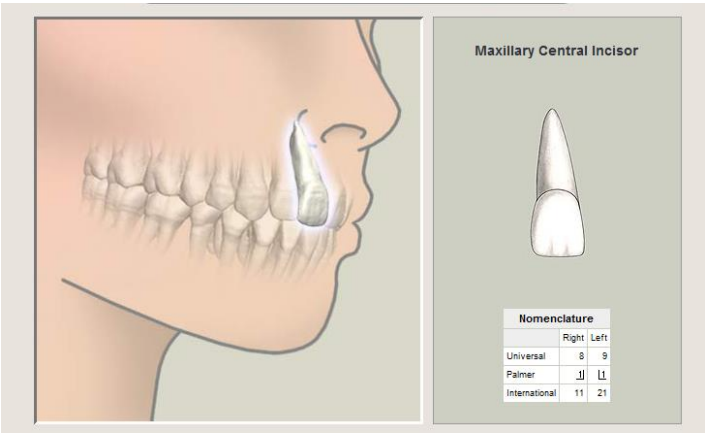
Anatomy (morphology) of permanent anterior teeth



Scheid RC, Weiss G: Woelfel's Dental Anatomy. 8th edition. Lippincott Williams&Wilkins, Philadelphia, 2012.

Maxillary central incisor (1.1, 2.1)

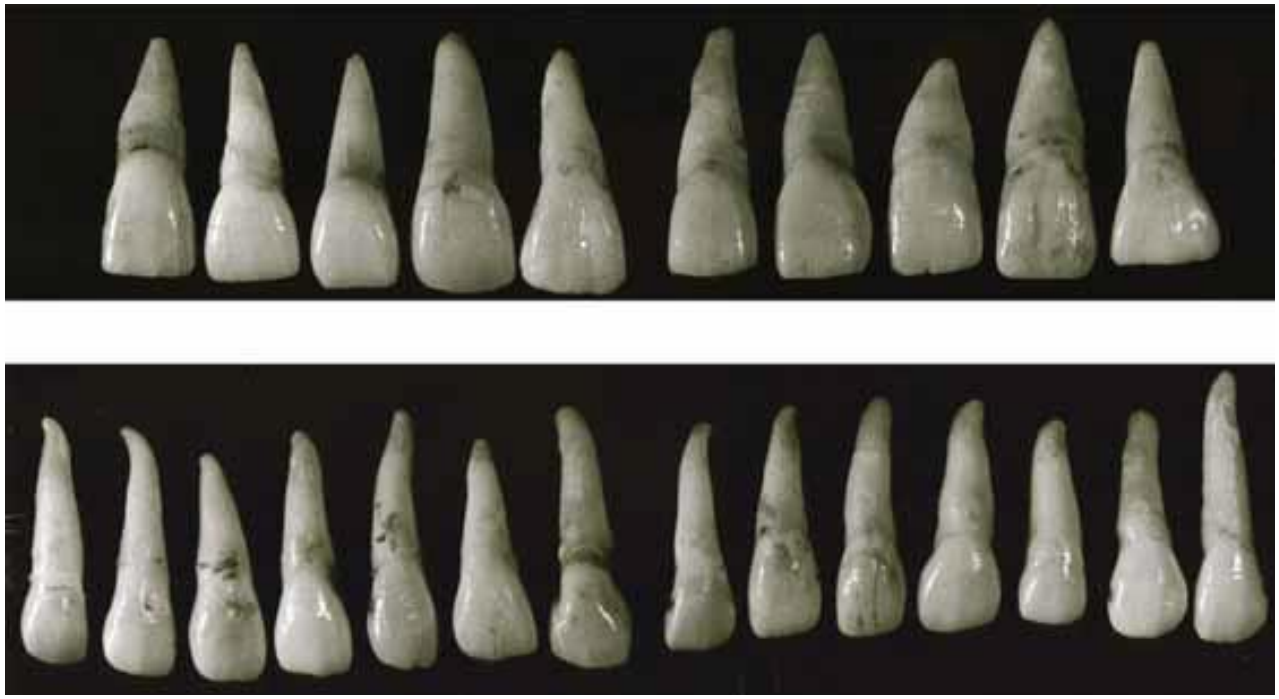
The **maxillary central incisor** is a human tooth in the front upper jaw, or maxilla, and is usually the most visible of all teeth in the mouth.
It is located mesial (closer to the midline of the face) to the maxillary lateral incisor.
As with all incisors, their function is for **shearing** or **cutting food during mastication**.
The surface area of the tooth used in eating is called an **incisal ridge** or **incisal edge**.



MAXILLARY INCISORS (labial)

Maxillary left central incisors

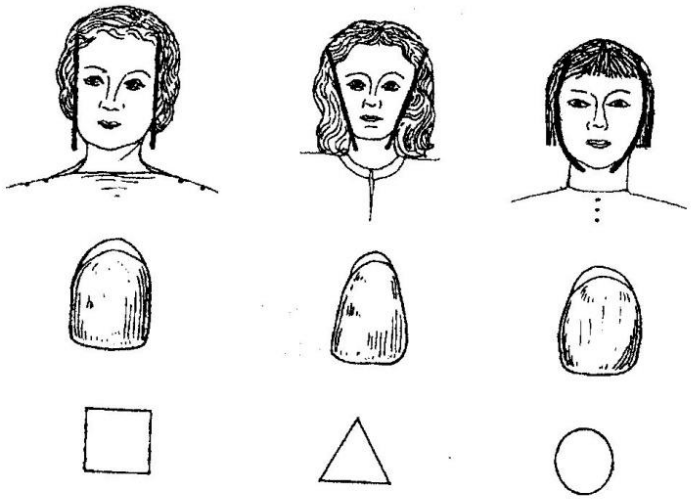
Maxillary right central incisors



D←Median→D

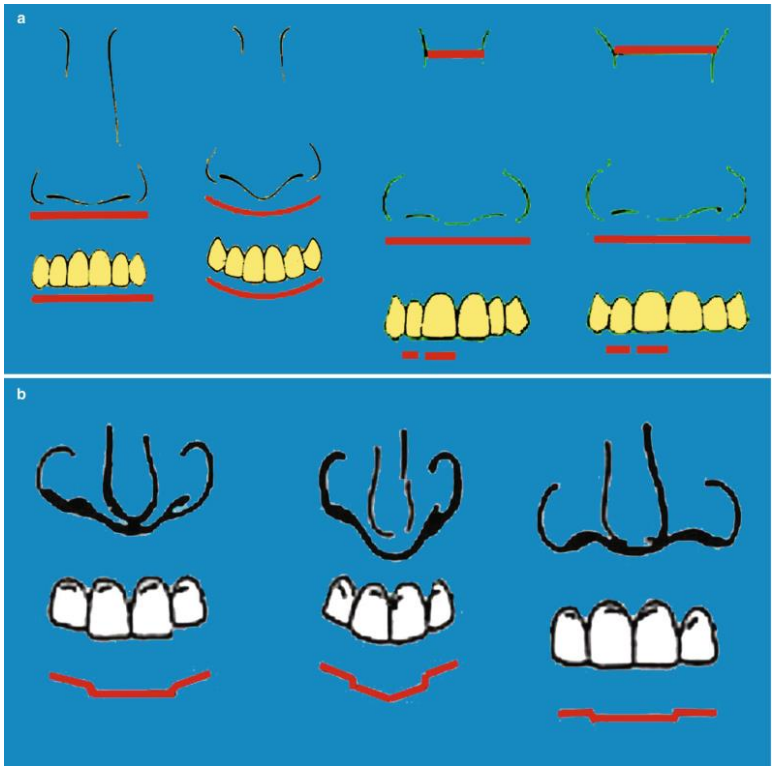
Maxillary left lateral incisors

Maxillary right lateral incisors

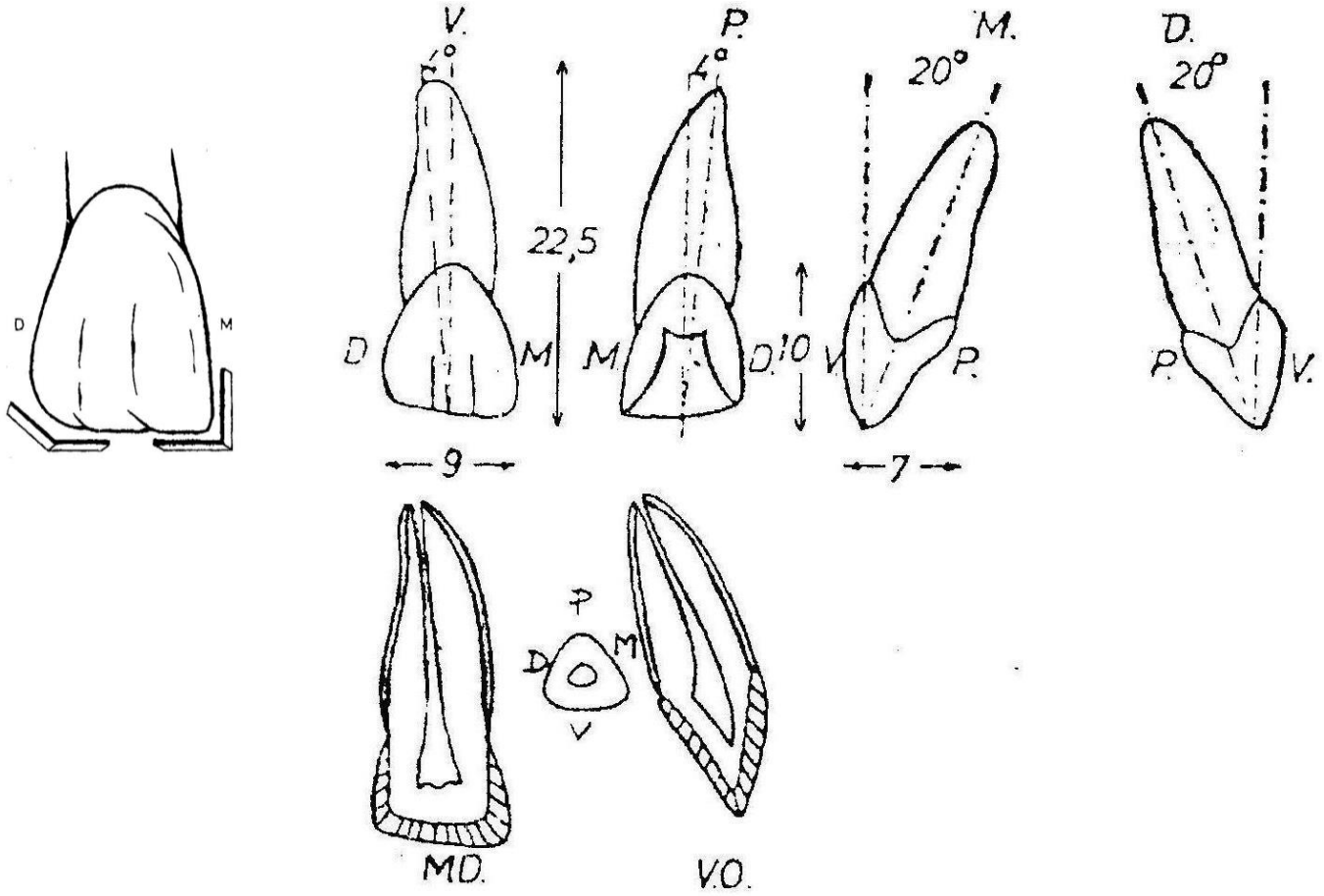


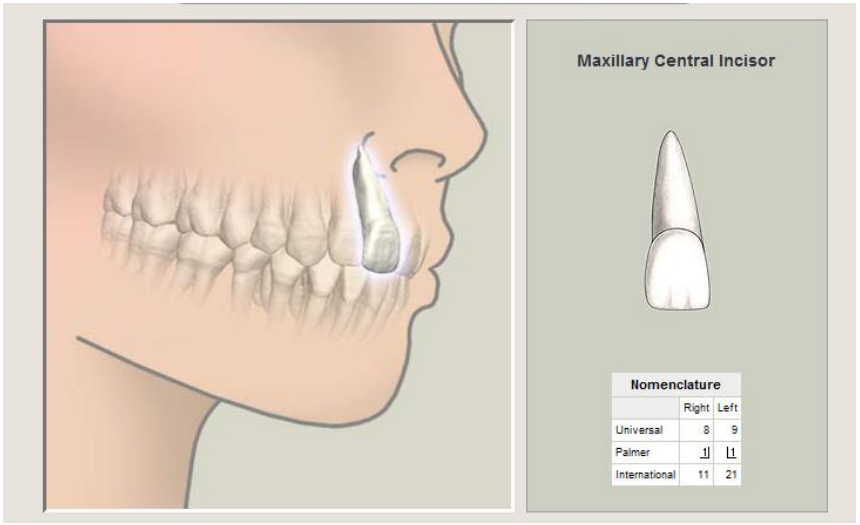
Williams–correlation between the face contour and the shape of the maxillary central incisors

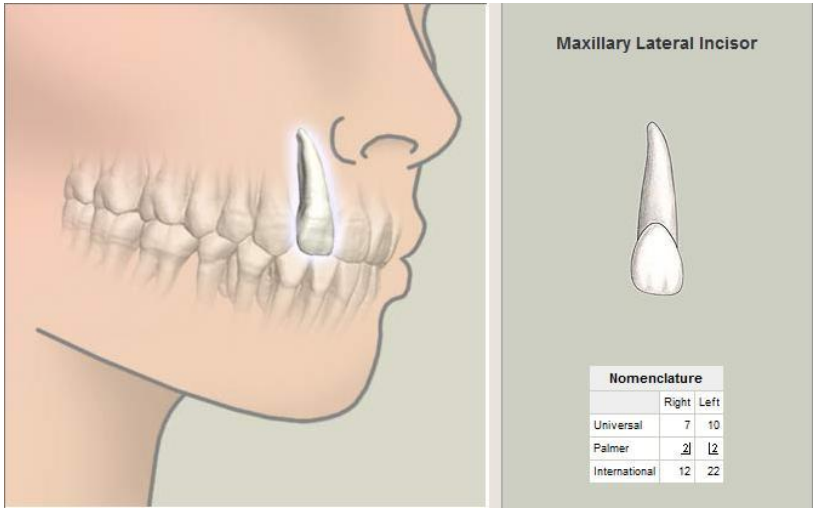
- ***Gerber*** have observed a proportionality between the width of the nose and the width of the maxillary incisors.



Morphology of Maxillary Central Incisor

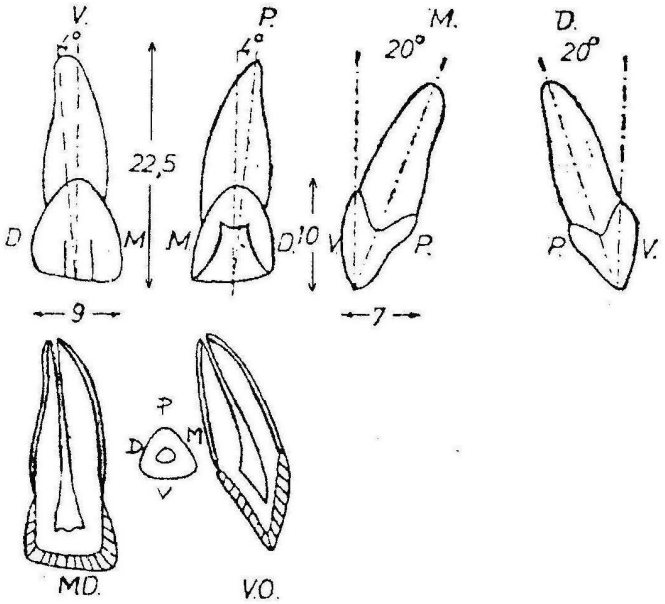


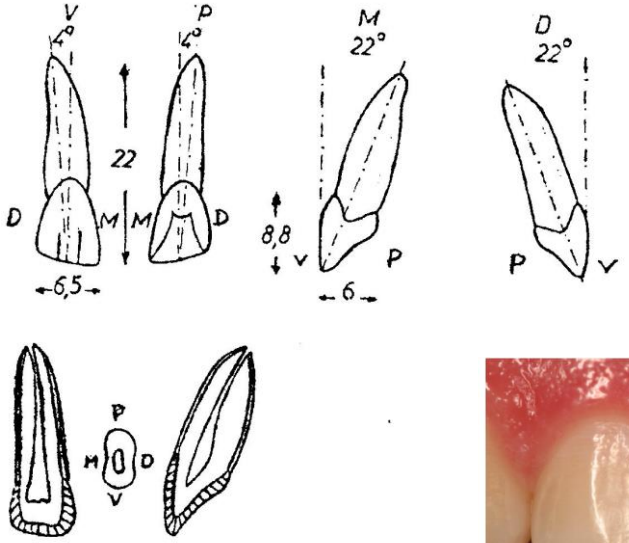


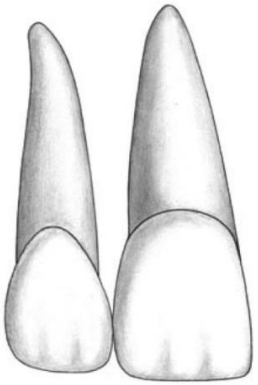


Scheid RC, Weiss G: Woelfel's Dental Anatomy. 8th edition. Lippincott Williams&Wilkins, Philadelphia, 2012.

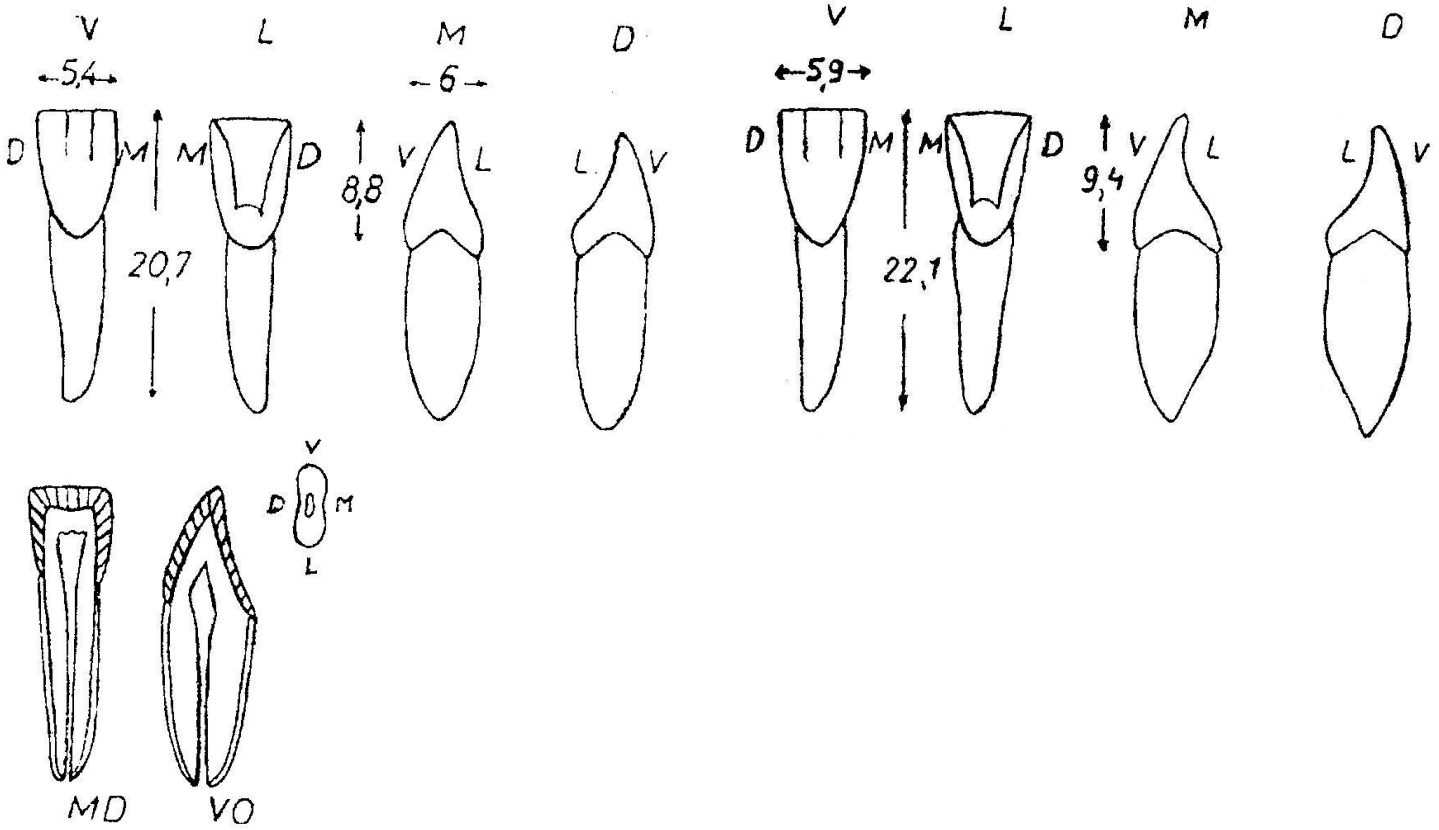
Maxillary central and lateral incisors

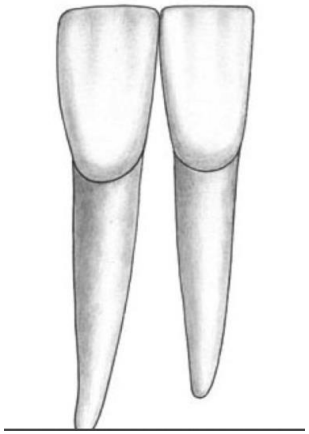






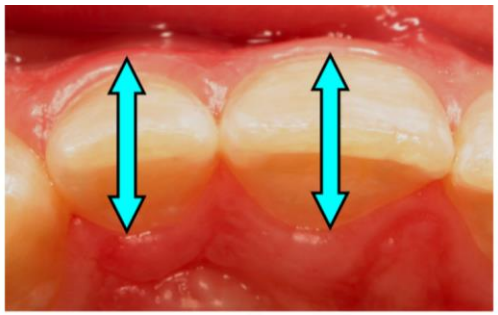
Mandibular central and lateral incisors

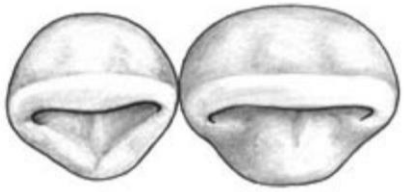




1. GENERAL **SIMILARITIES** OF MOST **INCISORS** FROM THE **FACIAL VIEW**

- All **incisor crowns**, when viewed from the facial, have a relatively *straight incisal edge* (vs. all other teeth that have one or more pointed cusp tips).

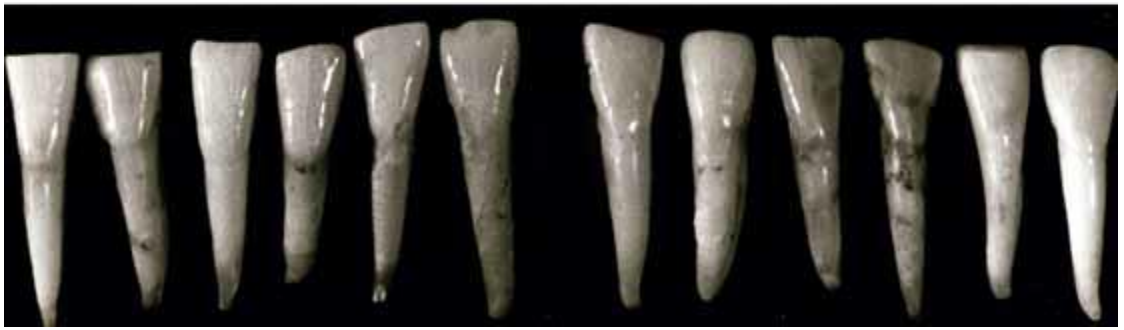




- Their crowns are relatively *rectangular*, longer incisogingivally than wide mesiodistally.
- They taper (narrower) from the widest mesiodistal areas of proximal contact toward the cervical line and are therefore *narrowest* in the *cervical third* and *broader* toward the *incisal third*.

Mandibular central incisors

Mandibular lateral incisors

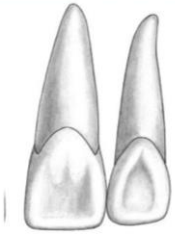


2. CHARACTERISTICS OF ALL **INCISORS** FROM THE **ORAL VIEW**

- **Incisor crowns**, when viewed from the oral, have a *narrower surface* because the mesial and distal surfaces converge orally.
- *Oral fossa* that is concave just incisal to the *cingulum*.

Maxillary central incisors

Maxillary lateral incisors



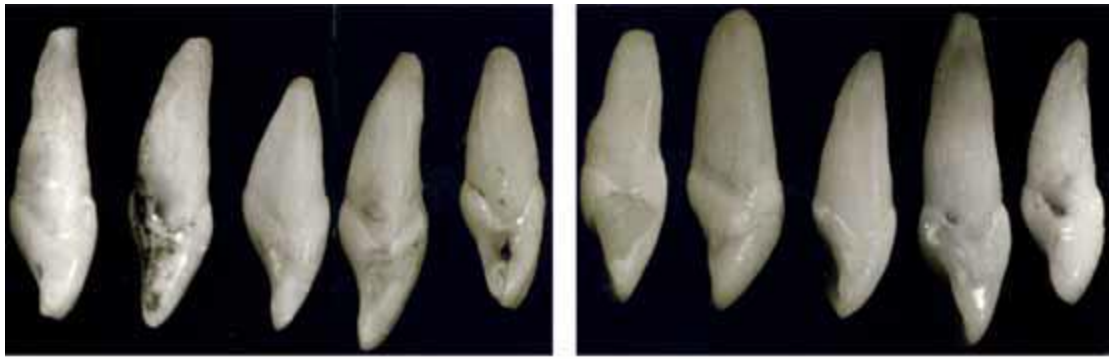
- The mesial and distal marginal ridges converge toward the cingulum and the crown outline tapers from proximal contact area toward the cingulum.

Mandibular central incisors

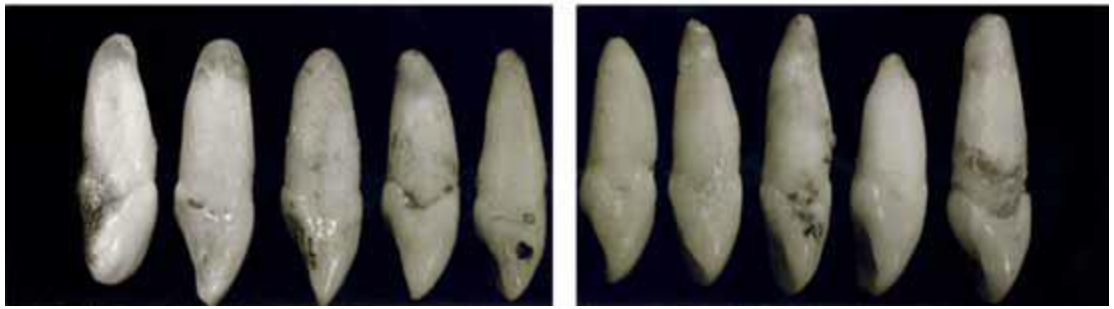
Mandibular lateral incisors

3. CHARACTERISTICS OF ALL **INCISORS** FROM THE **PROXIMAL VIEWS**

- **Incisor crowns**, when viewed from the proximal, are *wedge shaped* or *triangular*.
- They have a facial outline that is more *convex cervically* than incisally.



Maxillary central incisors



Maxillary lateral incisors

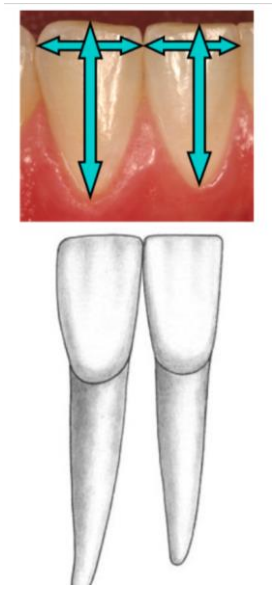
- The lingual height of contour is also in the cervical third, on the cingulum, but the contour of the incisal two thirds of the lingual surface is concave from cingulum area to the incisal edge.
- Therefore, the lingual outline is ***S****-shaped*, being *convex over the cingulum and concave* from the cingulum nearly *to the incisal edge*.

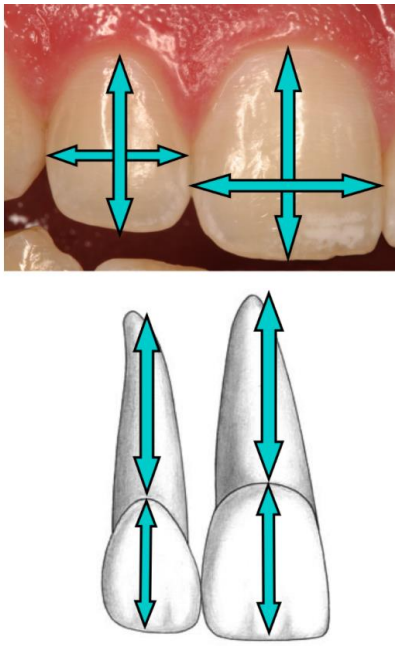
Mandibular central incisors

Mandibular lateral incisors

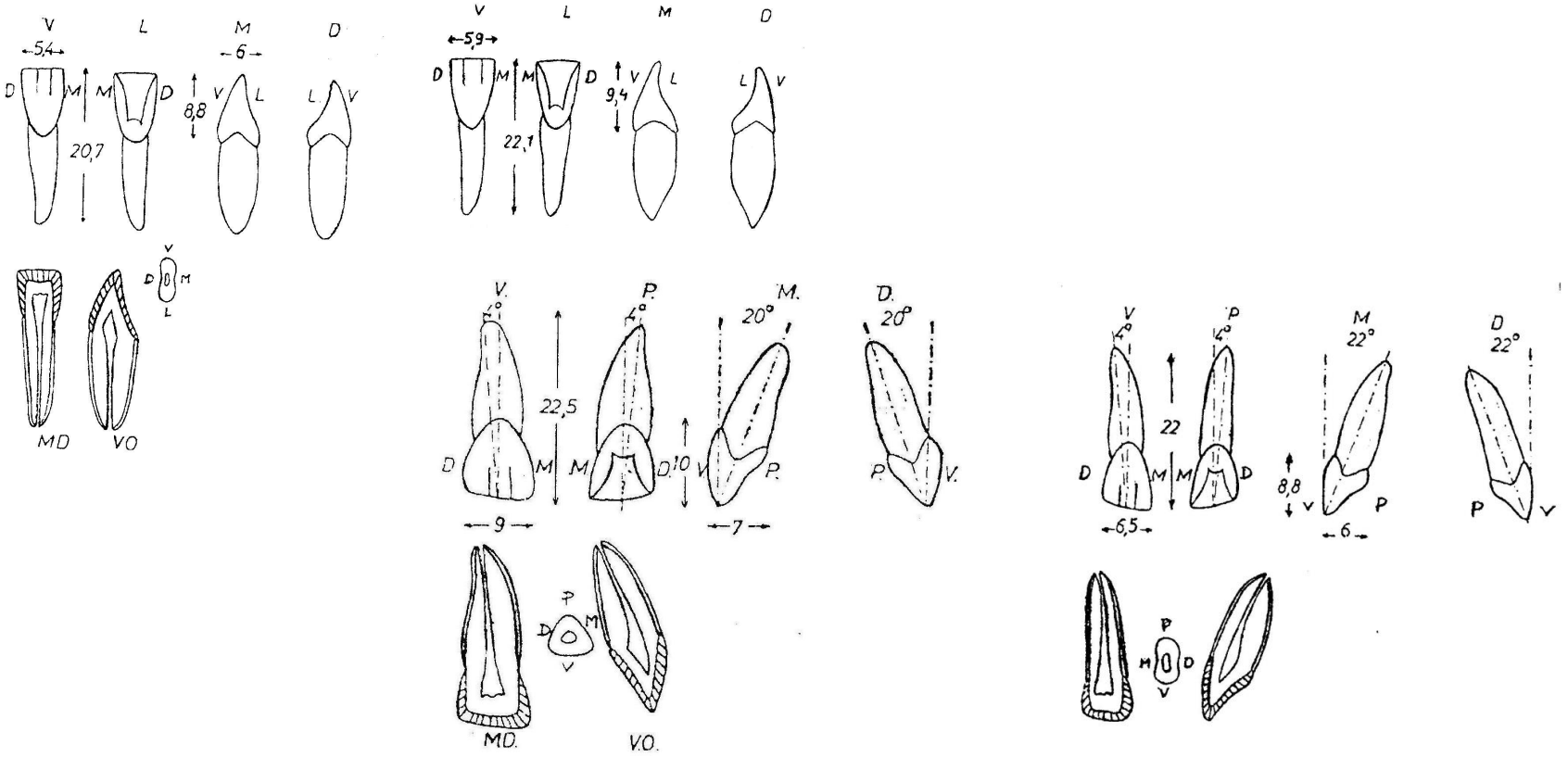
ARCH TRAITS THAT **DISTINGUISH MAXILLARY** FROM **MANDIBULAR** INCISORS

- **Mandibular incisors** are generally smaller than **maxillary incisors**.
- Mandibular incisor roots are longer in proportion to their crowns than are maxillary incisor roots.

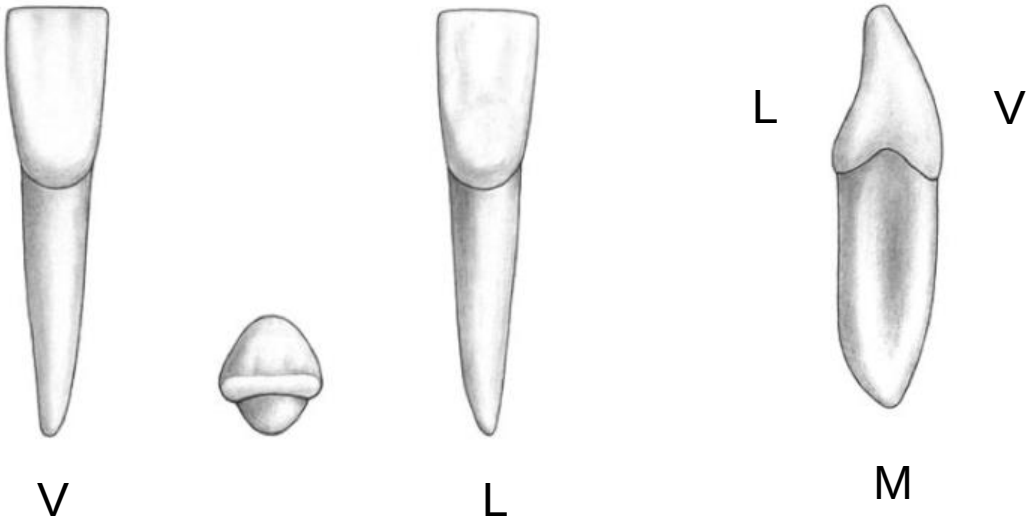




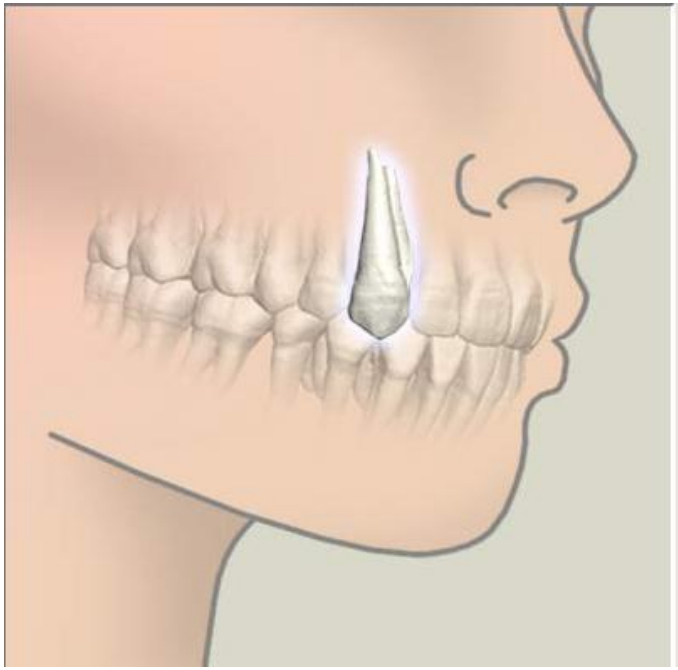
- **Mandibular central** and **lateral incisors** look *more alike* and are more *nearly the same size*, compared to *greater differences between* **maxillary central** and **lateral incisors**.

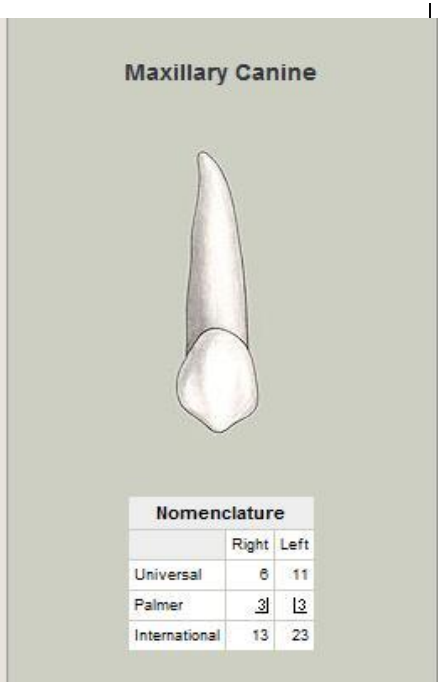


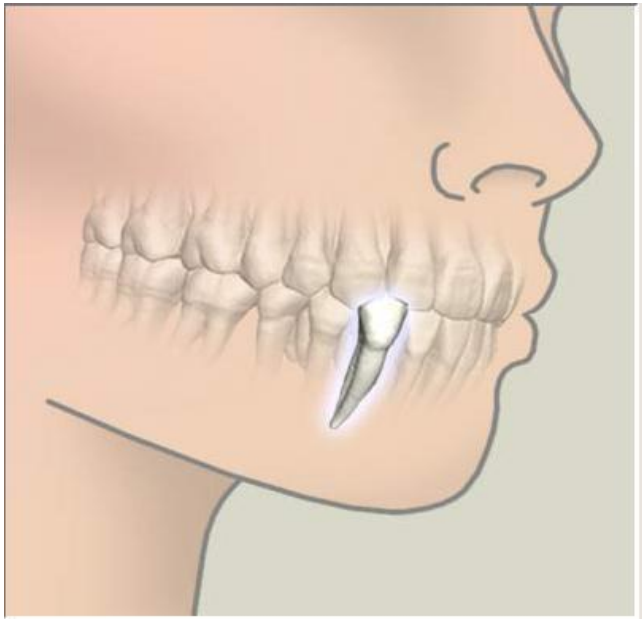
- Mandibular incisor crowns are relatively wider faciolingually than mesiodistally compared to maxillary central incisors, which are wider mesiodistally.
- Mandibular incisor crowns also have smoother lingual surfaces with less prominent anatomy than maxillary crowns, which have deeper fossae and more pronounced marginal ridges.

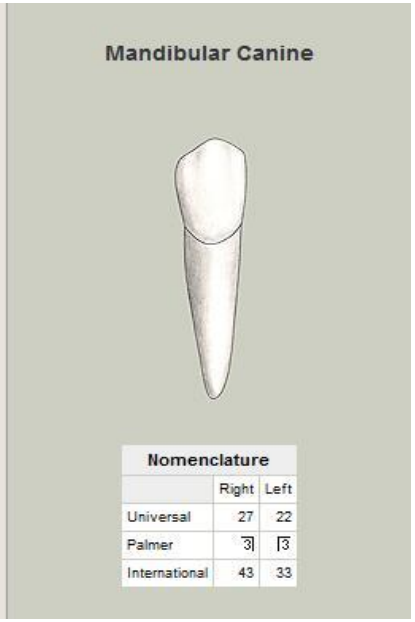


Canines

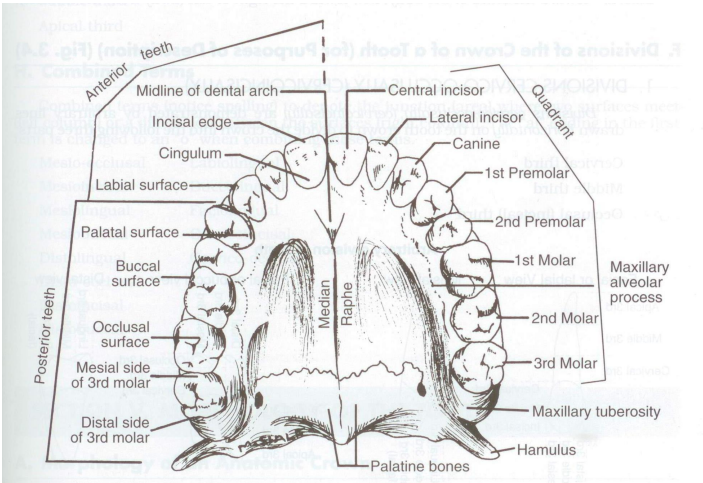


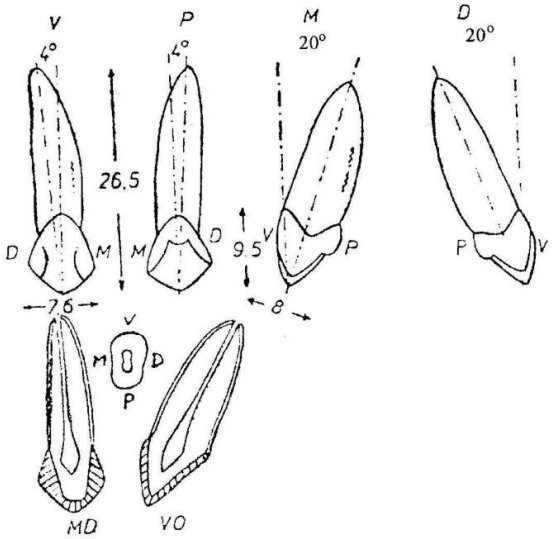

Maxillary Canine
Nomenclature
Right Left
Universal 6 11
Palmer 3 3
International 13 23



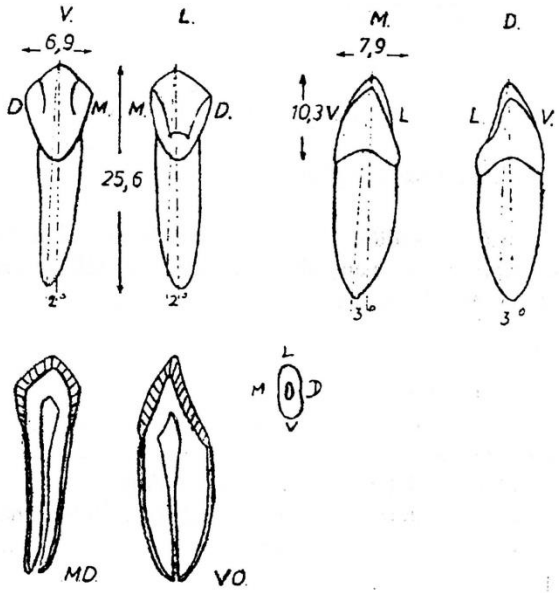

Mandibular Canine
Nomenclature
Right Left
Universal 27 22
Palmer 3 3
International 43 33

- Both the maxillary and mandibular canines are called the "**cornerstone**" of the mouth because they are all located three teeth away from the midline and separate the premolars from the incisors.
- The location of the canines reflect their dual function as they **complement** both the **premolars and incisors** during mastication or chewing. The most common action of the canines is **tearing of food**.
- The canine teeth can **withstand** the tremendous **lateral pressure caused by chewing**.





Maxillary Canine



Mandibular Canine

- The name ***canine*** is of **Greek** origin and is found in the writings of Hippocrates and Aristotle of 2350 years ago.
- ***Aristotle*** first described canine anatomy, stressing the intermediate nature of it between incisors and molars.
- ***Celsus*** was the first writer to mention the roots of teeth, saying the canine was monoradicular (that is, normally having one root).
- Although it is rare, the mandibular canine may have the *root divided*, results in labial and lingual roots and may be split only in the apical third, or it may extend into the cervical third of the root.

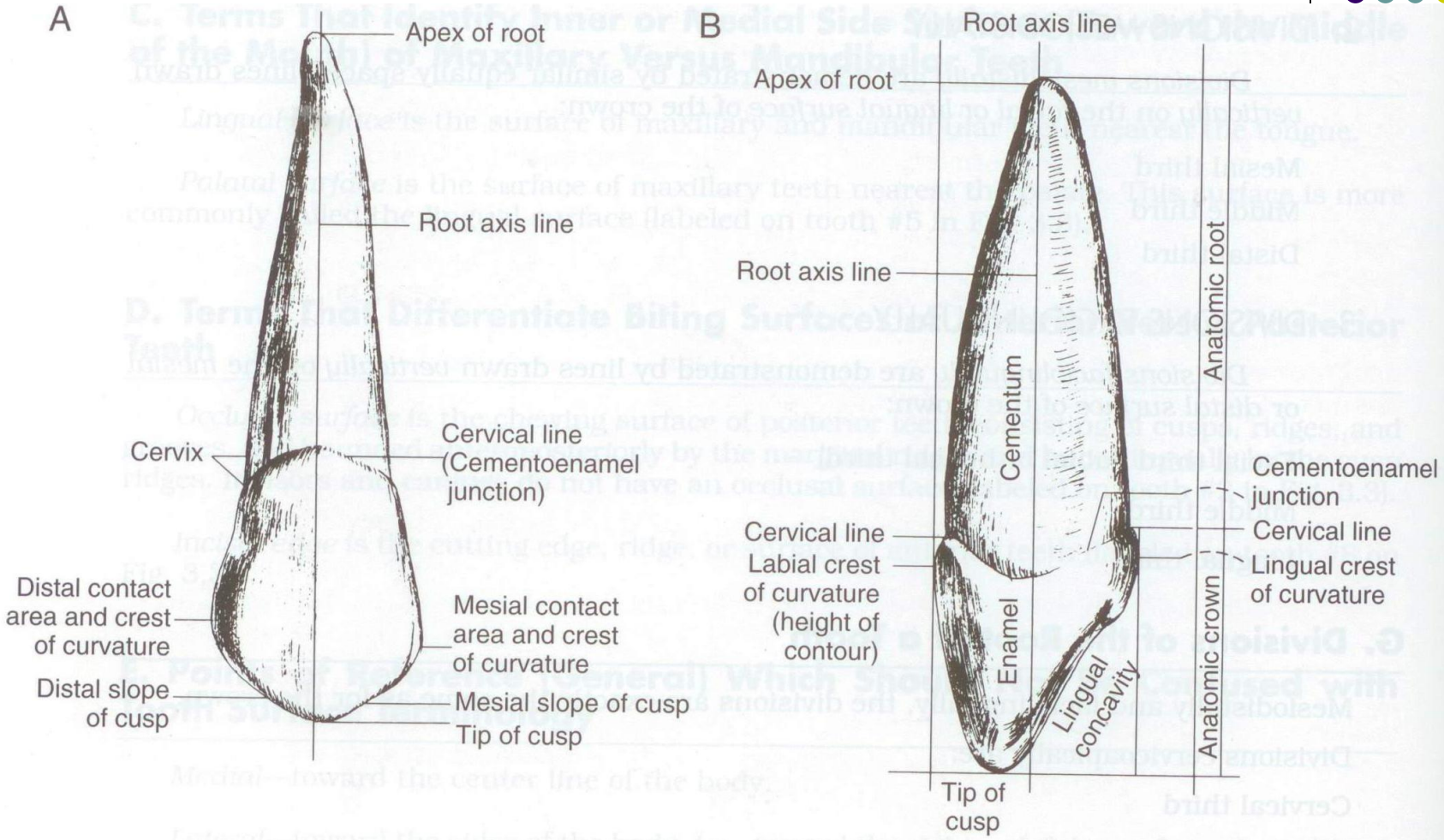
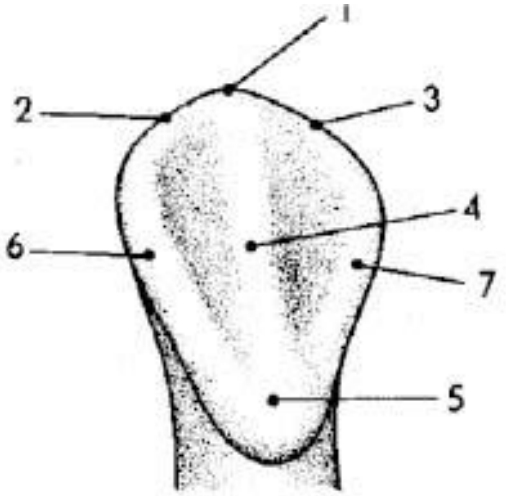


Figure 3.5. A. Labial surface of the maxillary right canine pictured in **B**. The root axis is determined by bisecting the root at the cervix. **B**. Mesial side of a maxillary right canine. The root axis line bisects the root in the cervical area. Customarily, other parts of the tooth are located or described relative to this line. In this case, for instance, the cusp tip is labial to the root axis line.

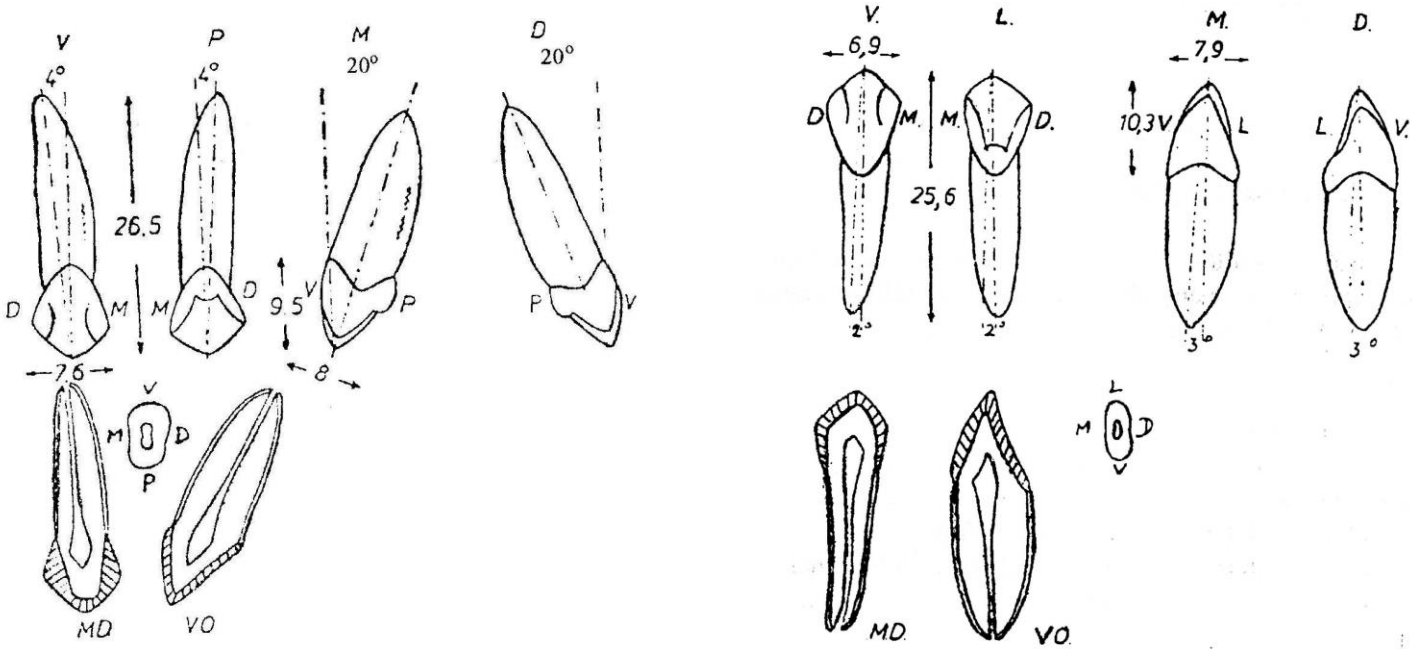
Mandibular Canine (lingual view)



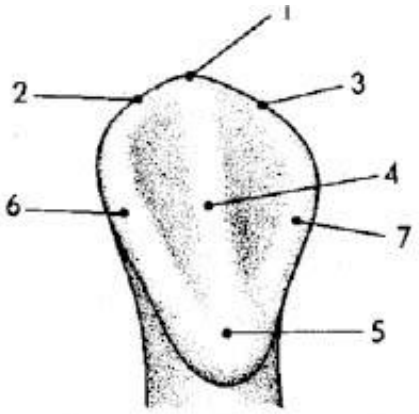
1. Cusp Tip
2. Mesial Cusp Ridge
3. Distal Cusp Ridge
4. Lingual Ridge
5. Cingulum
6. Mesial Marginal Ridge
7. Distal Marginal Ridge

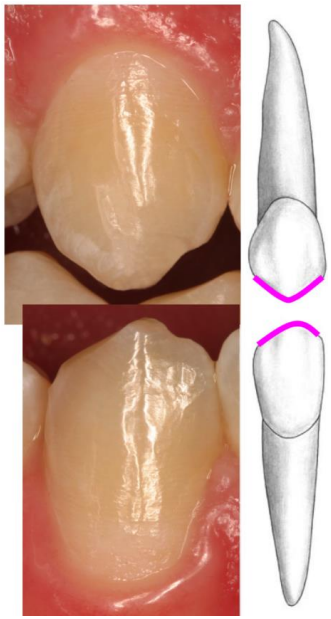
GENERAL CHARACTERISTICS (SIMILARITIES) OF CANINES

- **Size**: on average, canines are the longest teeth in each arch, and the **maxillary canine** is the *longest tooth* in the mouth even though the **mandibular canine** *crown is longer than the maxillary canine crown*.



- The incisal ridges of a canine, rather than being nearly straight horizontally like on incisors, are divided into *two inclines* called the **mesial and distal cusp ridges** (also called *cusp slopes* or *cusp arms*).
- Subsequently, canine crowns from the **facial view** resemble a **fivesided *pentagon.***

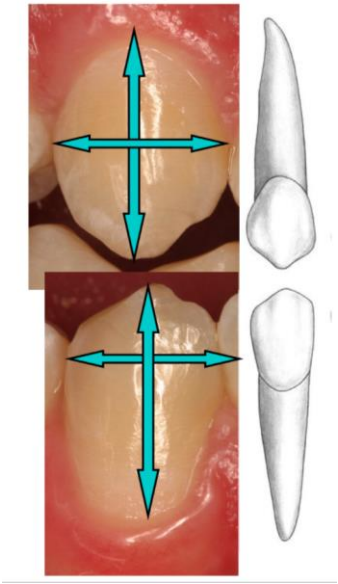




Maxillary canine

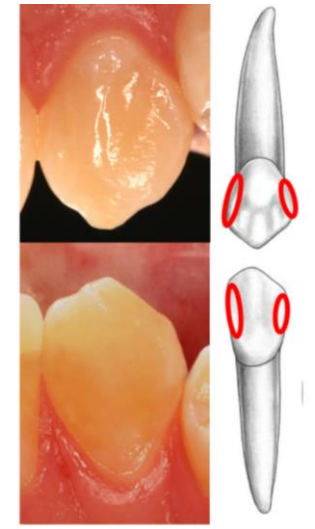
Mandibular canine

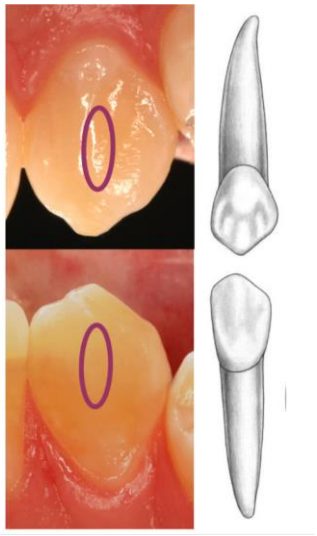
- The **labial surface** of a canine is prominently convex with a **vertical labial ridge**.
- Canines are the only teeth with a labial ridge, although premolars have a similar-looking ridge called a buccal ridge.
- The measurement of a maxillary or mandibular canine crown is **greater labiolingually** than it is **mesiodistally**.

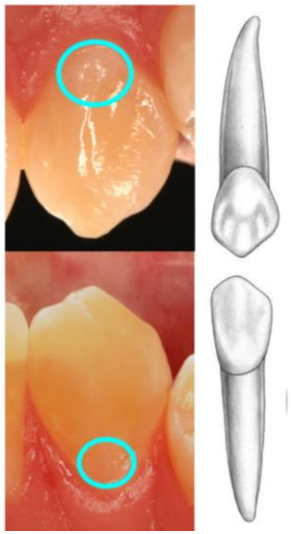


Canines from the oral view

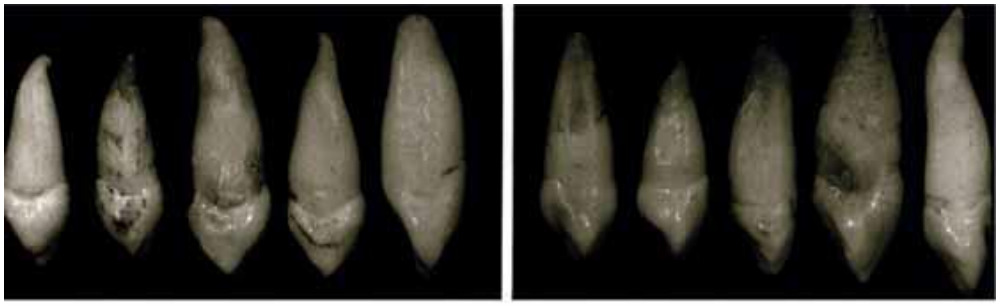
- The marginal ridges and lingual ridge of mandibular canines are not prominent.
- The **maxillary canine** has a **prominent central ridge** running cervicoincisally from the cusp to the cingulum. Mesial and distal lingual fossae lie on either side of this ridge and are usually shallow.
- The **cingulum** of the **mandibular canine** is low, less bulky, and **less prominent** than on maxillary canines.



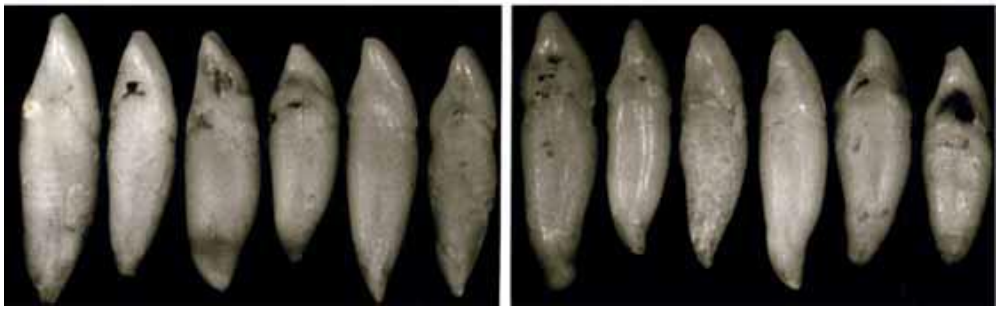




- From the **proximal views**, canine crowns are wedge, or *triangular*, shaped.
- The **height of contour** on the facial surface is in the **cervical third** and on the oral surface is also in the cervical third on the cingulum.

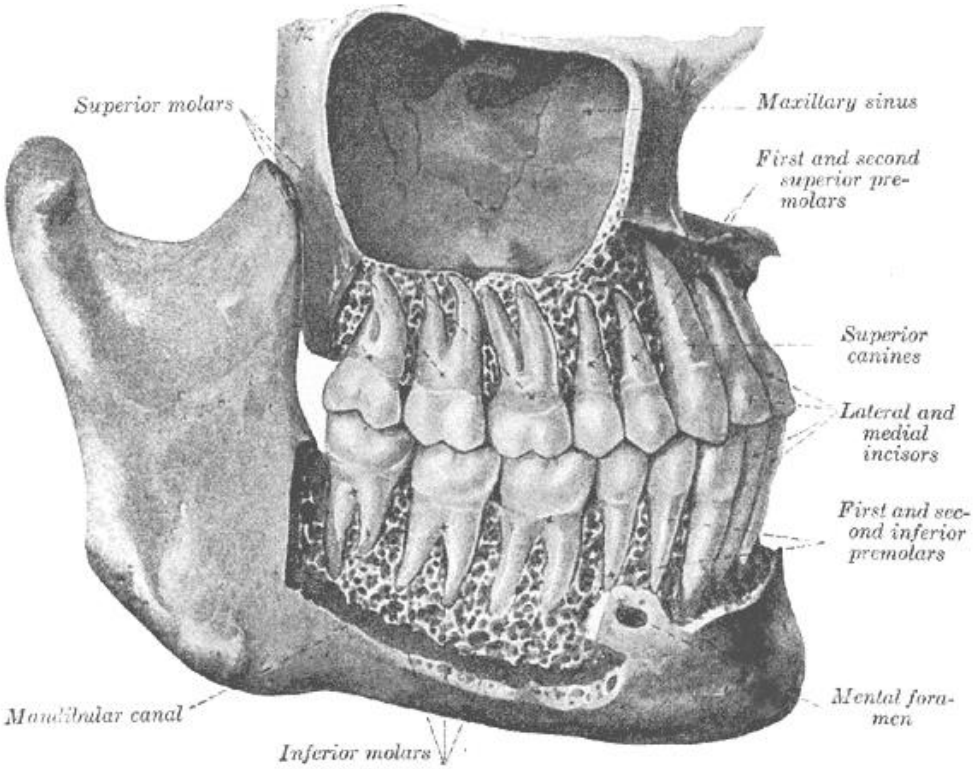


Maxillary canine



Mandibular canine

Anatomy (morphology) of permanent posterior teeth



Crown Convexities and Concavities

Convexities

1. *Lobe*
2. *Cingulum*
3. *Cusp*
5. *Ridge*
   - *Marginal ridge*
   - *Cusp ridge*
   - *Triangular ridge*
   - *Transverse ridge*
   - *Oblique ridge*

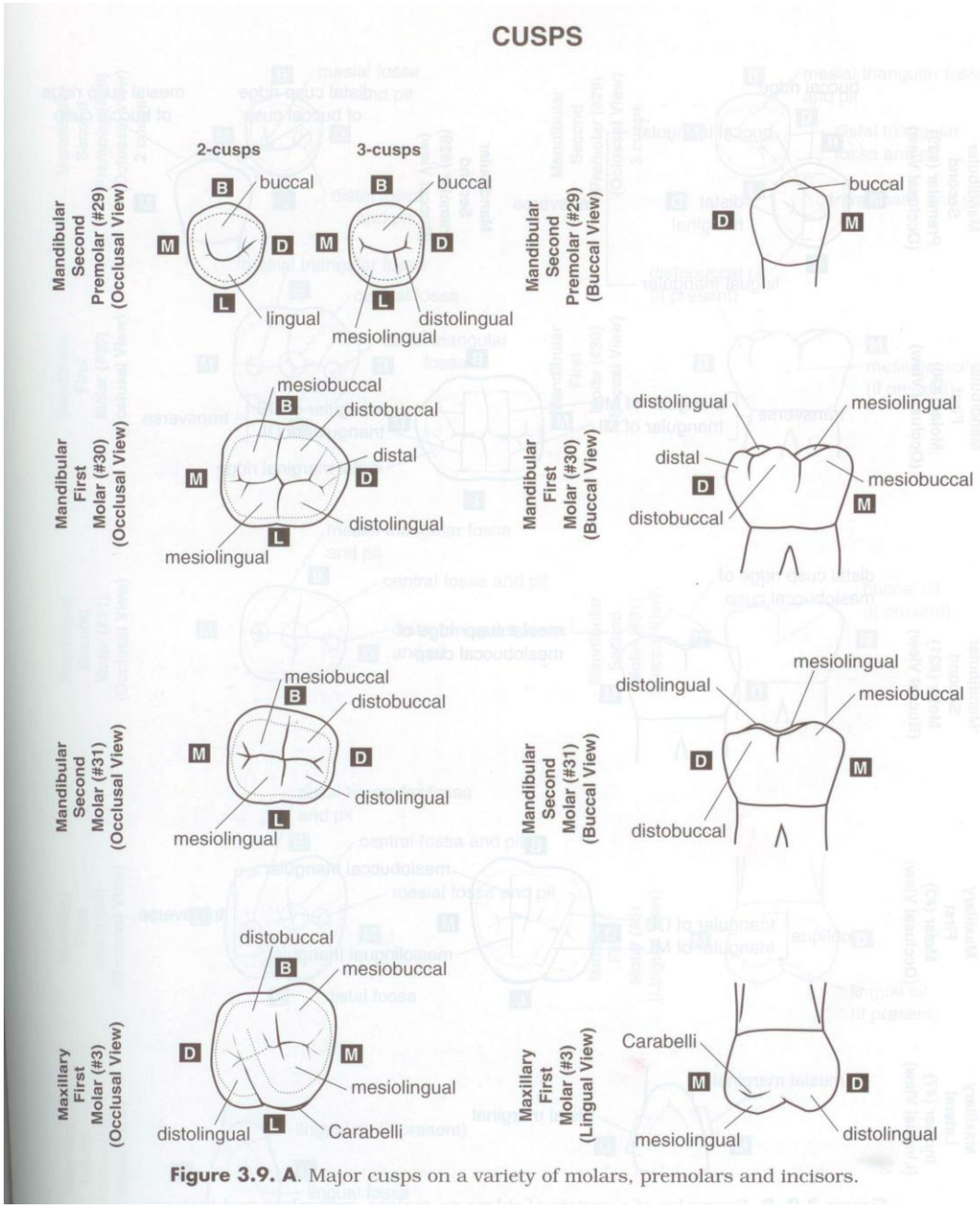
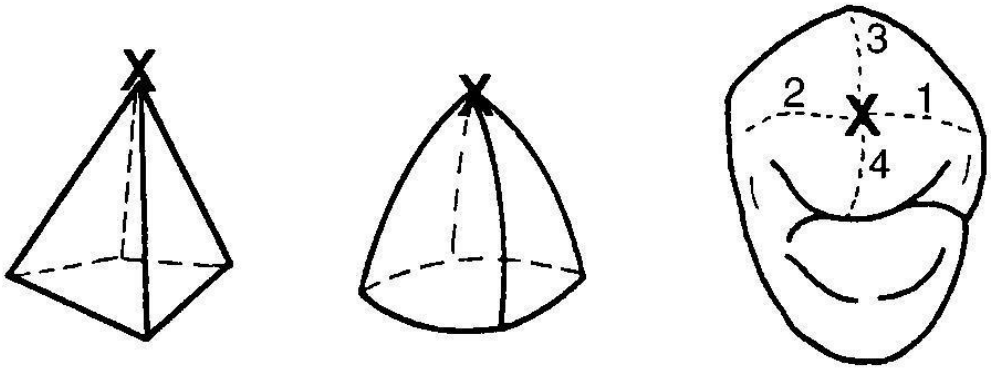


Figure 3.9. A. Major cusps on a variety of molars, premolars and incisors.

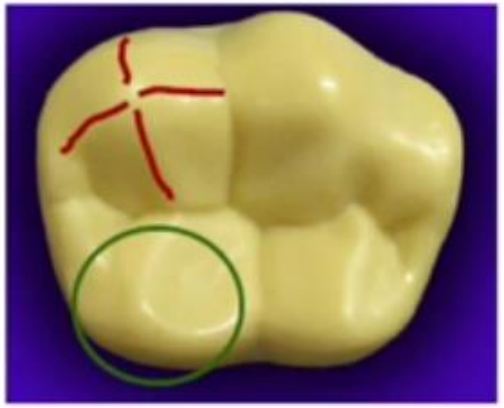
Marginal Ridges
Mesial and Distal Marginal Ridges

All cusps are basically a gothic pyramid



The cuspal gothic pyramid produces **4 ridges**:

1. **M**esial cusp ridge
2. **D**istal cusp ridge
3. **B**uccal cusp ridge
4. **Triangular ridge** on posterior teeth.



Cusp Ridge

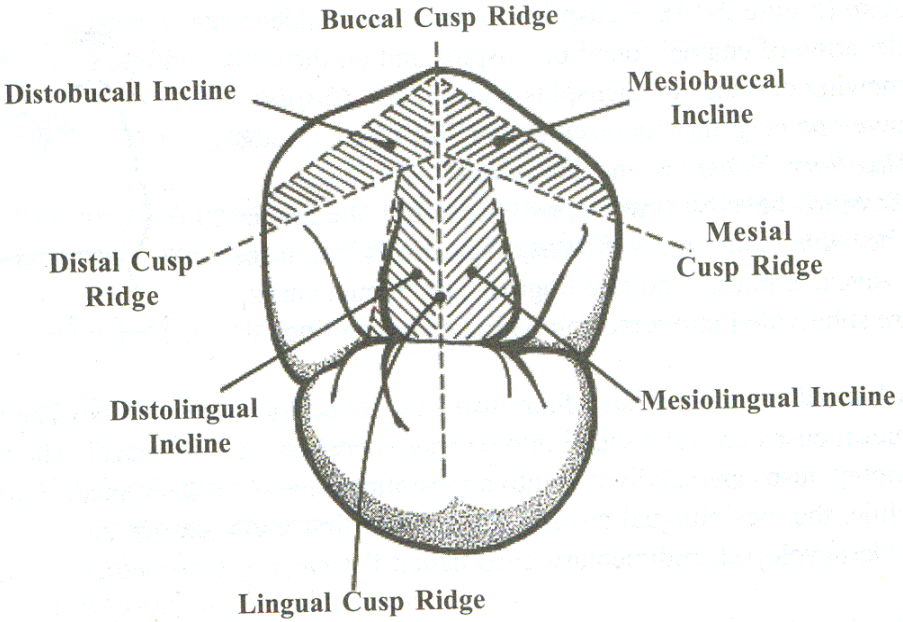


Figure 2-16. Cusp Ridges

Each cusp has four cusp ridges radiating from its tip. They are named according to the direction they take away from the cusp tip: M, D, V and O.

Cusp Inclines

- A cusp incline or inclined plane is the sloping area found between two cusp ridges.
- To name an incline, you must combine the names of the cusp ridges that define a large part of its borders.
- For example, the distobucal incline of the buccal cusp of a maxillary first premolar.

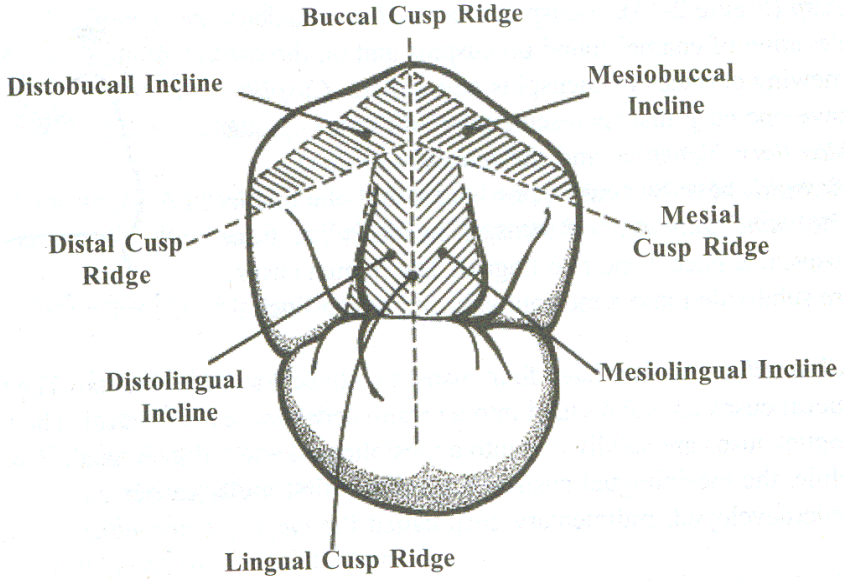


Figure 2-16. Cusp Ridges

Triangular Ridge

The occlusal surface of a cusp is composed of a mesial and a distal incline.
These two inclines meet to form a **triangular ridge** of enamel that descends from the tip of the cusp to the central portion of the occlusal surface.
A triangular ridge is either an **oral** or a **facial** cusp ridge, depending on where the cusp is located.

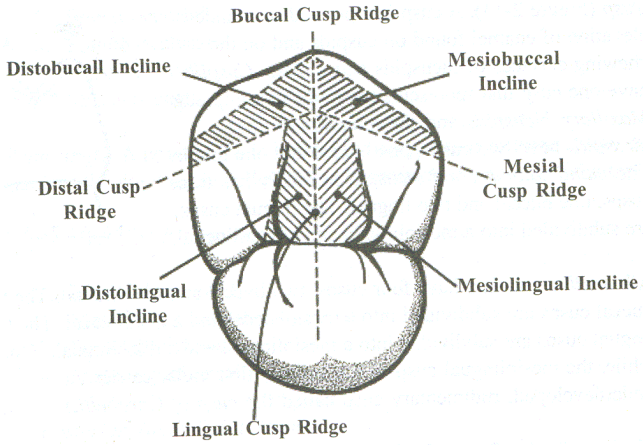
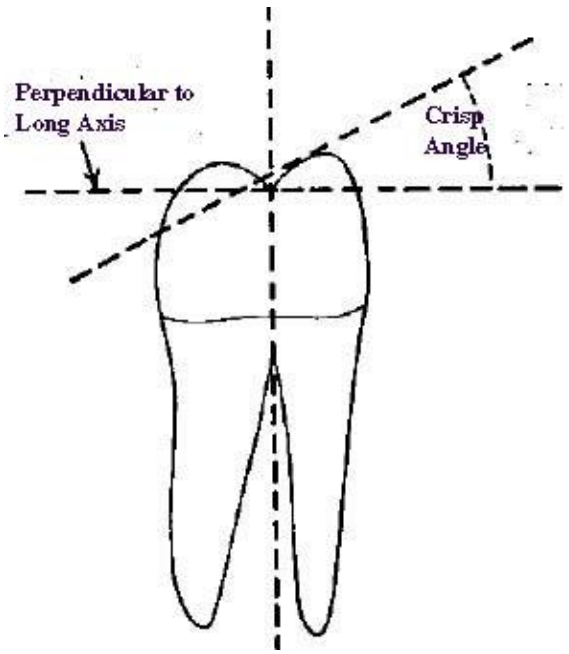


Figure 2-16. Cusp Ridges

Cusp Angle



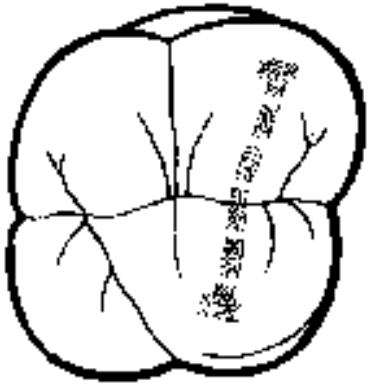
Cusps are described in some mouths as being "pointy" and in others as being "flat" or "blunt."
Most "pointy" posterior teeth have high cusp angle values.

A cusp angle is the angle that a **triangular ridge makes with a plane perpendicular to the long axis of the tooth**.

Transverse Ridge

Buccal

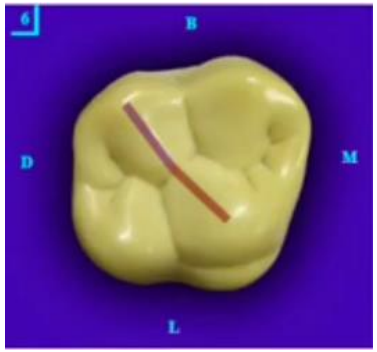
Distal



Mesial

Palatal

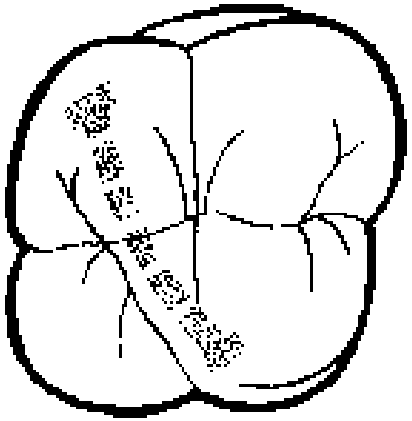
A transverse ridge is the **union of a buccal and oral triangular ridge** that crosses the surface of a posterior tooth ***transversely***.



Oblique Ridge

Buccal

Distal



Mesial

Palatal

The only teeth on which an oblique ridge is found are the maxillary molars, especially the first one.

An oblique ridge consists of a **union between the triangular ridge** of the distobuccal cusp and the mesiopalatal cusp.

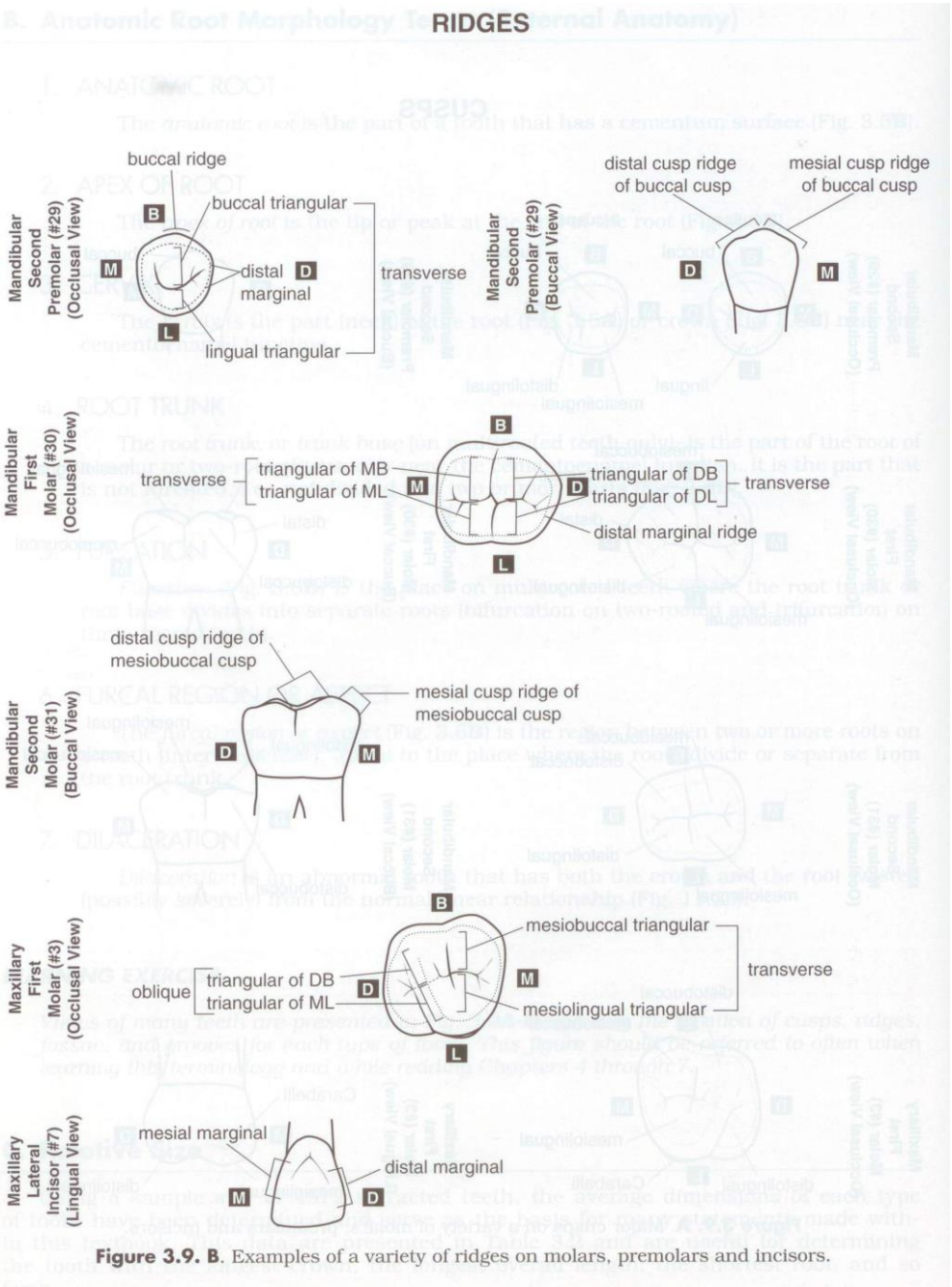


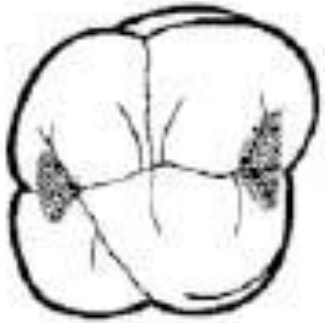
Figure 3.9. B. Examples of a variety of ridges on molars, premolars and incisors.

Concavities

1. *Fossae*
   - *Triangular fossa*
   - *Central fossa*
2. *Sulcus*
3. *Groove*
   - *Developmental groove*
   - *Supplemental groove*
4. *Fissure*
5. *Pit*

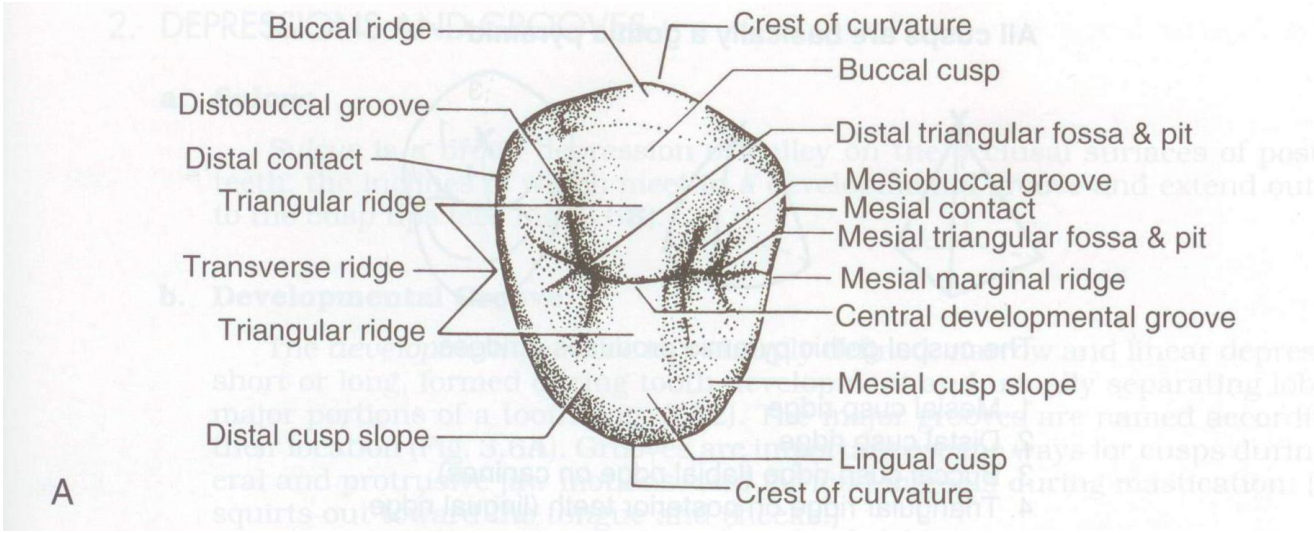
Triangular Fossa

Distal

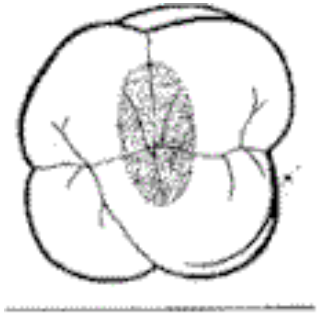


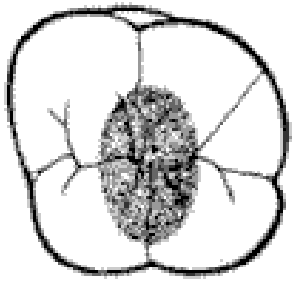
Mesial

Triangular fossae are located adjacent to marginal ridges on the occlusal surfaces of posterior teeth. There are two kinds of triangular fossae, a **mesial** and a **distal**.


Buccal ridge
Crest of curvature
Buccal cusp
Distobuccal groove
Distal triangular fossa & pit
Distal contact
Mesiobuccal groove
Triangular ridge
Mesial contact
Mesial triangular fossa & pit
Transverse ridge
Mesial marginal ridge
Central developmental groove
Triangular ridge
Mesial cusp slope
Distal cusp slope
Lingual cusp
Crest of curvature
A

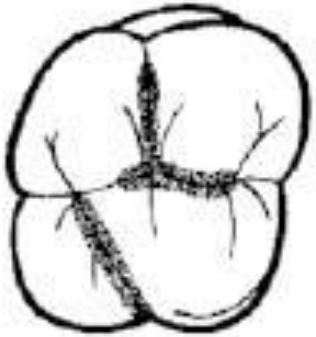
Central Fossa





A **central fossa** is a centrally located depression or concavity found on the occlusal surface of molars and mandibular second premolars.
The other premolars have mesial and distal triangular fossae, but do not have a central fossa.

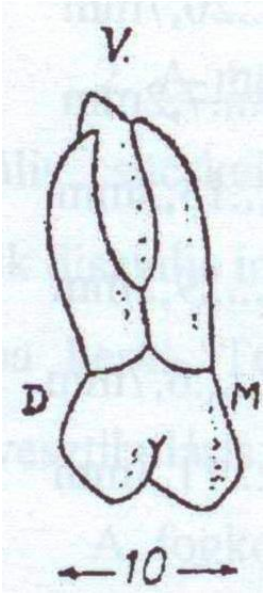
Sulcus

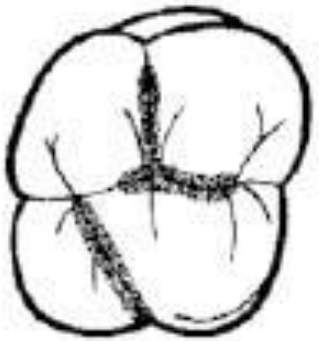


A **sulcus** is an elongated valley or depression in the surface of a tooth formed by the inclines of adjacent cusps or ridges.

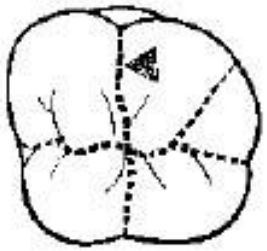
A central sulcus is a major linear depression that traverses the occlusal surface of a posterior tooth from mesial triangular fossa to distal triangular fossa.

Developmental grooves are found in the bottoms of sulci.


V.
D
M
10

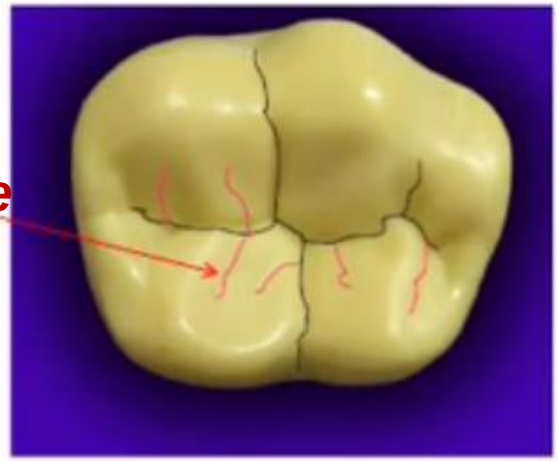


Developmental Groove



A developmental groove is the junction line between the inclined walls of a sulcus.
Developmental grooves represent lines of union between lobes of the crown during its formation.
These grooves appear on labial, occlusal, buccal, and oral surfaces, and are least apparent on the labial aspect of anterior teeth.

Supplemental groove



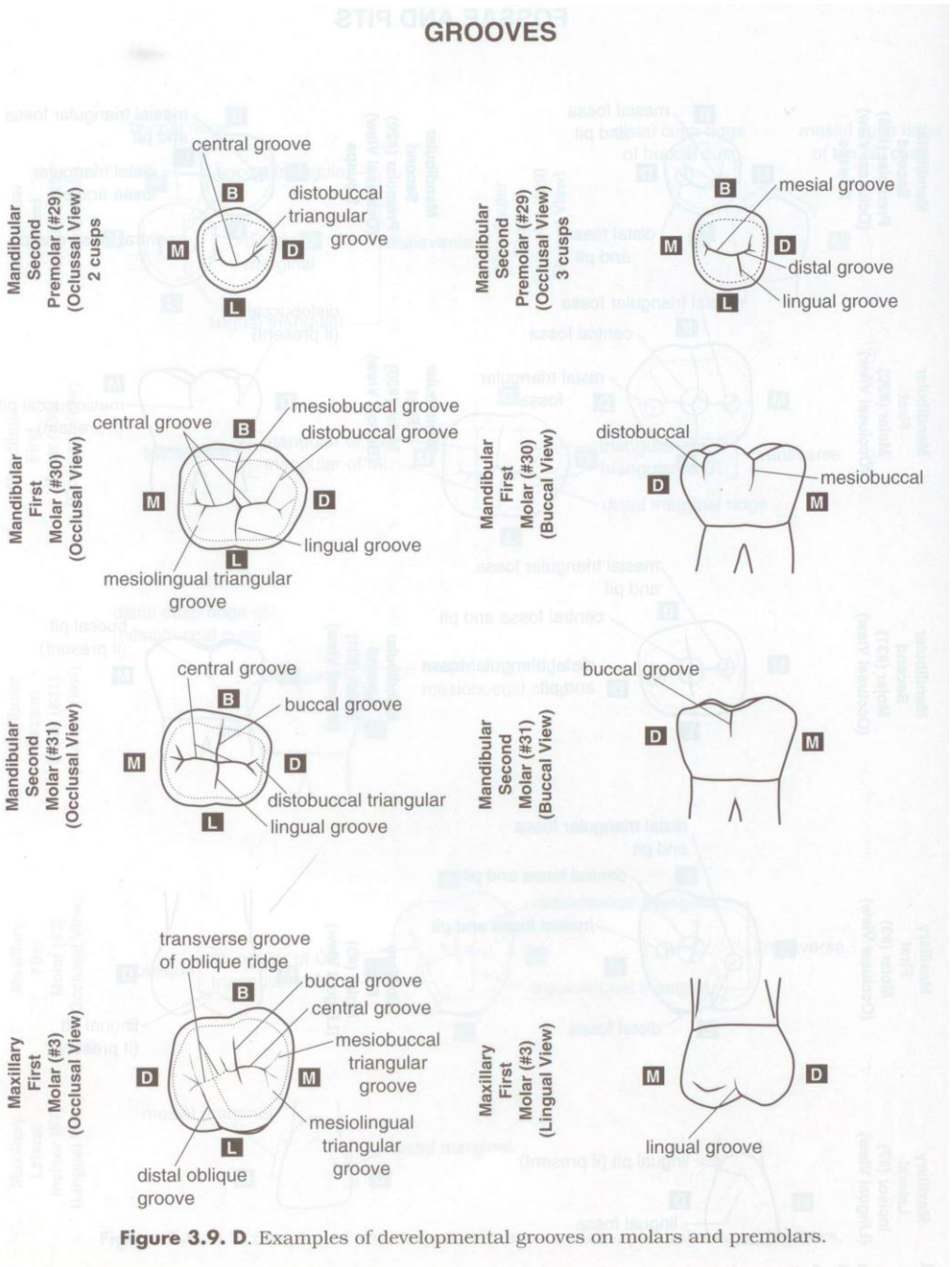


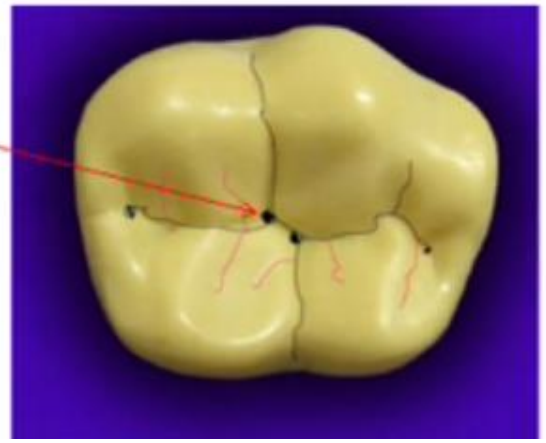
Figure 3.9. D. Examples of developmental grooves on molars and premolars.

Fissure

A **linear fault** that sometimes occurs **in a developmental groove**.
A fissure represents a lack of union between the inclined walls of a sulcus.

Pit

- A pit is a small, pinpoint fault on the surface of a tooth.
- A pit is usually found at the end of a developmental groove or at a place where two grooves intersect.



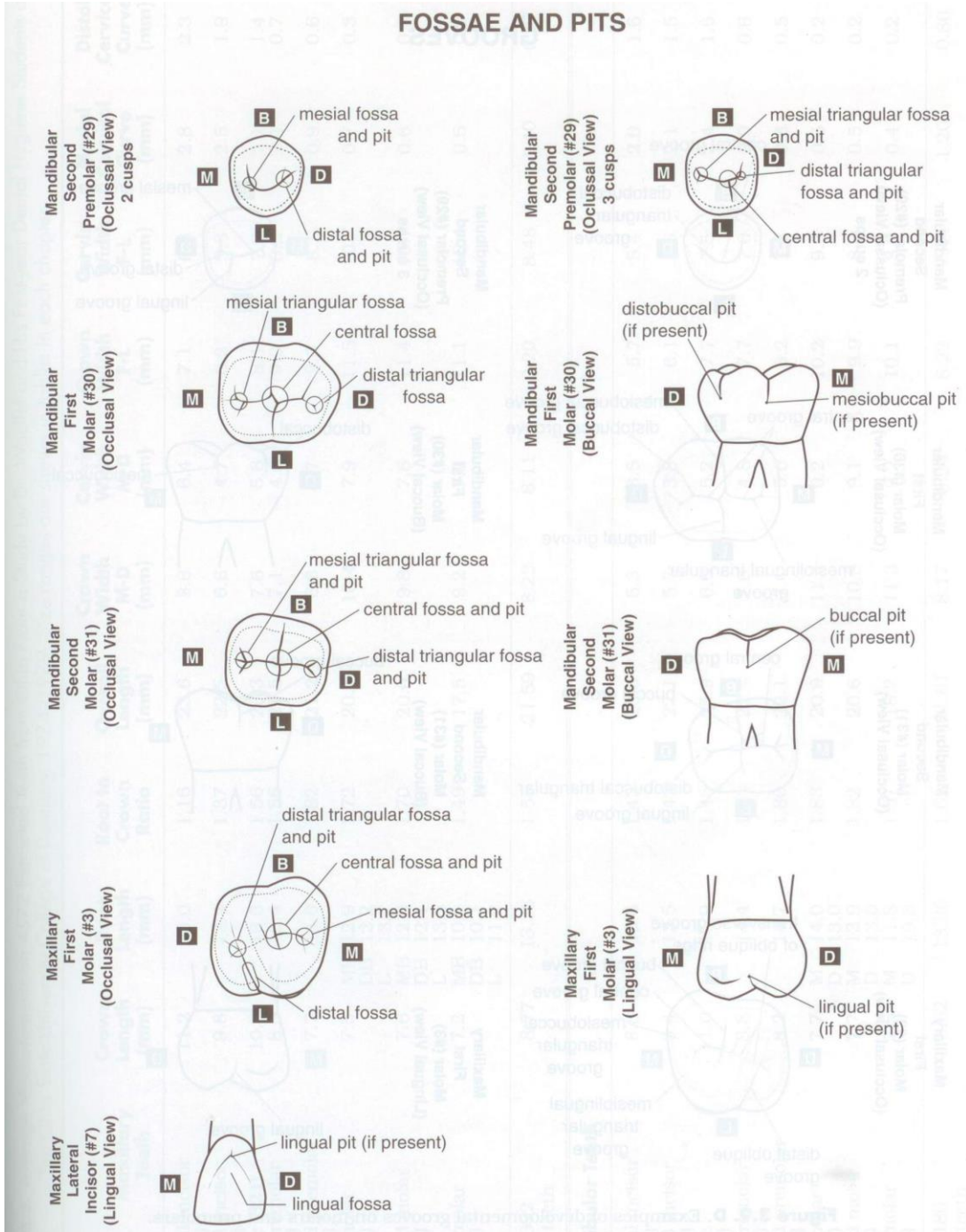


Figure 3.9. C. Examples of various fossae (often with associated pits) on molars, premolars, and in-
cisors.

Maxillary First Premolar (1.4, 2.4)

- The function of this premolar is like that of canines as tearing being the principal action during mastication (chewing).
- There are **two cusps** (bicuspid) on maxillary first premolars, and the **buccal cusp is sharp** enough to resemble the prehensile teeth found in carnivorous animals.

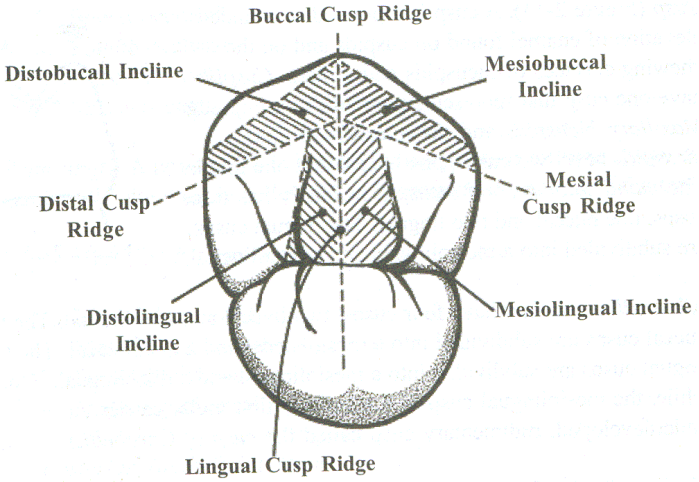


Figure 2-16. Cusp Ridges

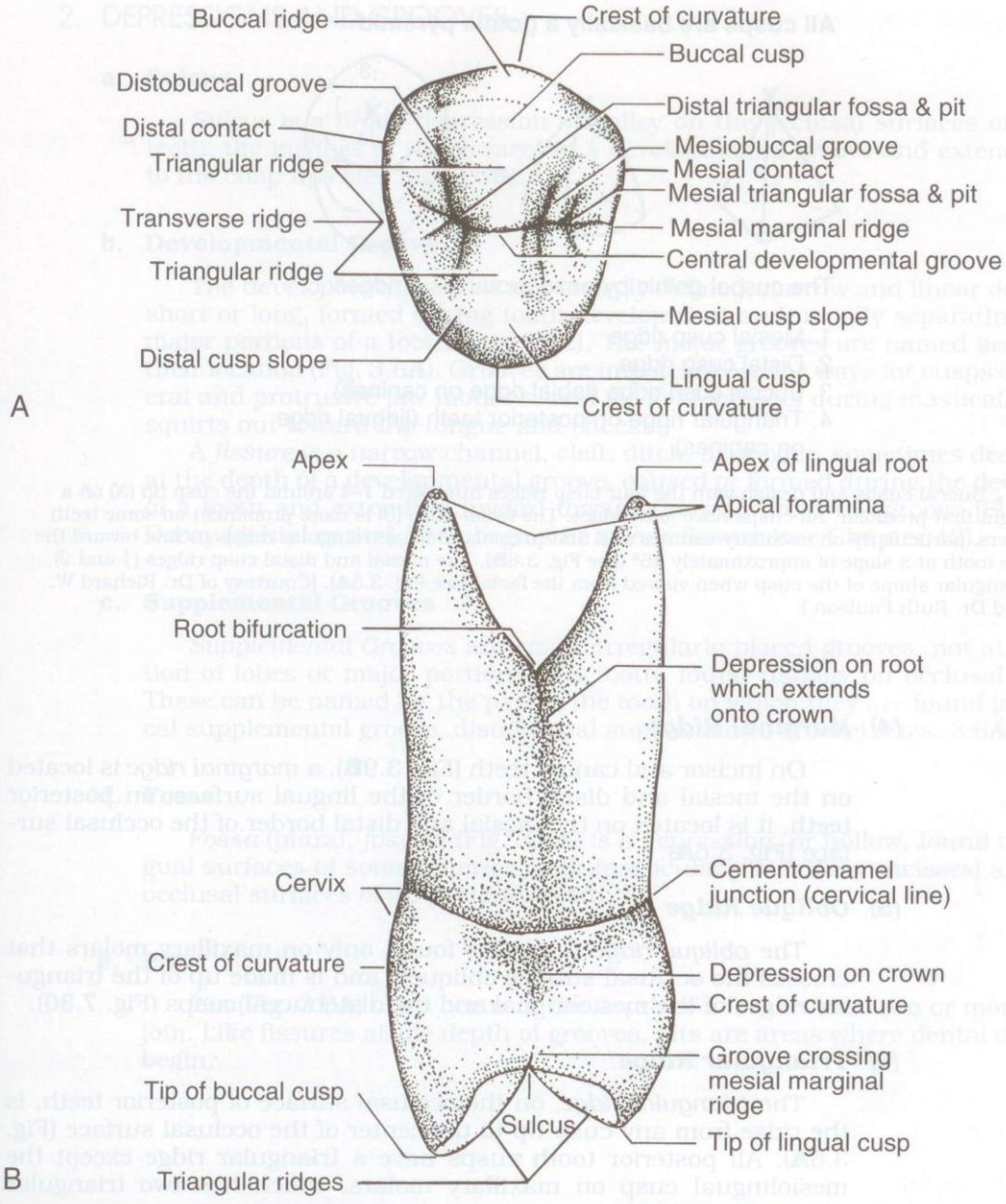
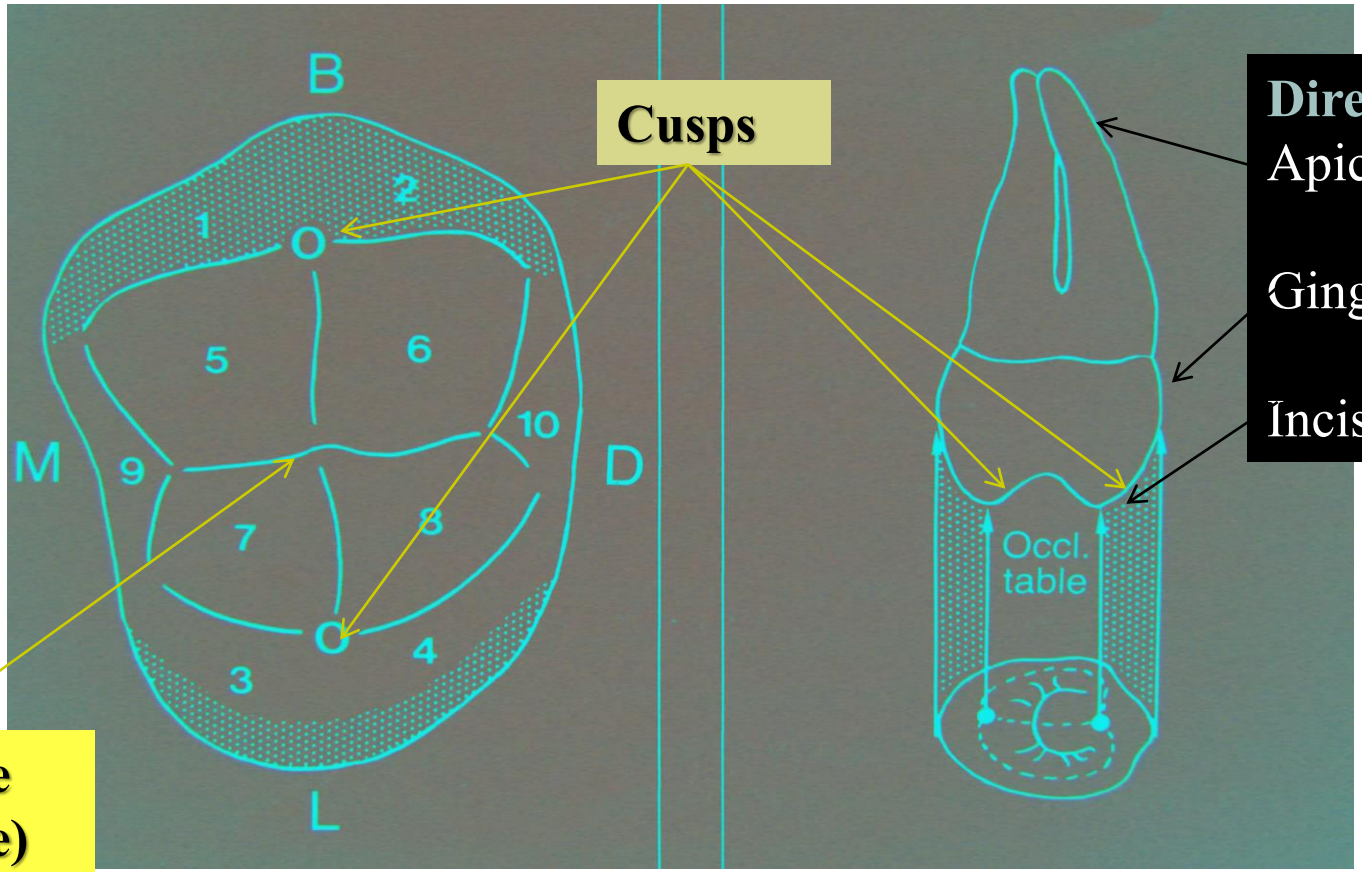


Figure 3.6. A. Maxillary right first premolar, occlusal surface. Notice proximal contact locations. **B**. Maxillary right first premolar, mesial surface. The sulcus is the occlusal depression between cusps (valley) that is seen on all posterior teeth. The space between the two roots is the furcal region, and the root area between the cervical line and root bifurcation is the root trunk.

Occlusal surface the maxillary first premolar



(1)mesial, (2) distal outer aspects of the buccal cusp B;
(3) mesial, (4) distal outer aspects of the oral cusp (lingual L);
(5) mesial, (6) distal inner aspects of the buccal;
(7) mesial, (8) distal inner aspects of the oral cusp;
(9) mesial, (10) distal marginal ridges.

Maxillary Second Premolar (1.5, 2.5)

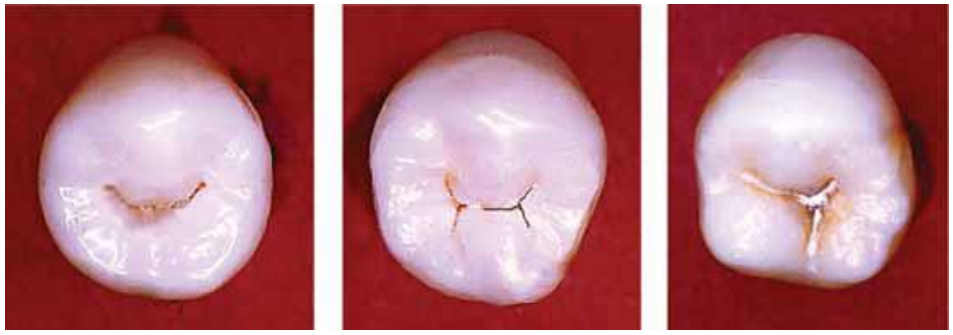
The function of this premolar is like that of first molars, **grinding** being the principal action **during chewing** (mastication). There are **two cusps** on maxillary second premolars, but both are **less sharp** than those of the maxillary first premolars.

Mandibular First Premolar (3.4, 4.4)

•The function of the premolar is like that of canines as **tearing** being the principal action during chewing.
•Mandibular first premolars have **two cusps**. The one **large** and **sharp** is located on the **buccal** side of the tooth. Since the **lingual cusp** is **small** and nonfunctional (which refers to a cusp not active in chewing), the mandibular first premolar **resembles a small canine**.

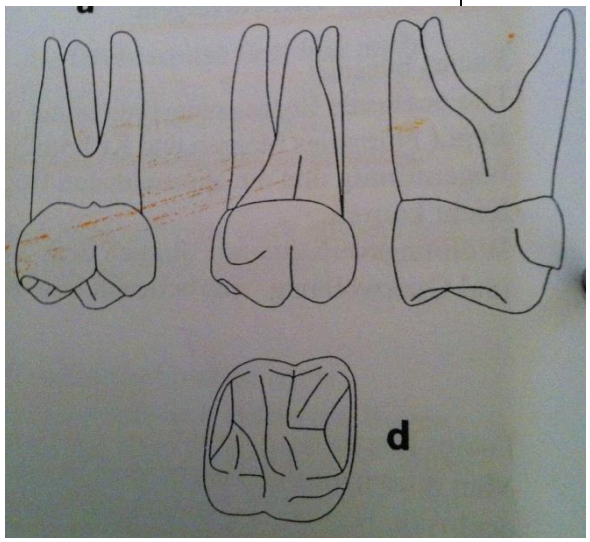
Mandibular Second Premolar

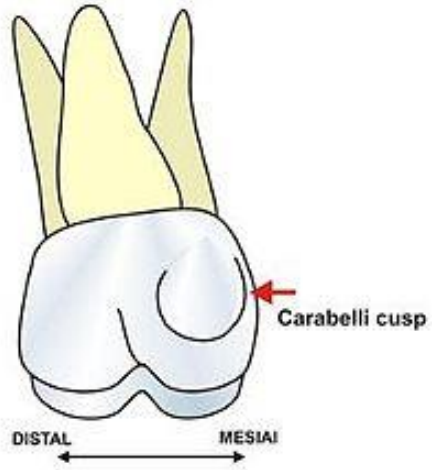
- The function of this premolar is to assist the mandibular first molar during **mastication**.
- Mandibular second premolars have **three cusps**. There is one **large cusp** on the **buccal** side of the tooth. The **lingual cusps** are well developed and functional (which refers to cusps assisting during chewing). Therefore, the mandibular second premolar is **more alike to the first molar**.



Maxillary Molars (1.6, 1.7, 1.8, 2.6, 2.7, 2.8)

The function of this molar is like that of all molars as **grinding** being the principal action during **mastication**.
There are usually **four cusps** on maxillary molars, **two** on the **buccal** and **two palatal**.
In maxillary first molars (less in second molars) there **may also be a fifth smaller cusp** on the palatal side known as the ***Cusp of Carabelli*** (*Karabély György*).






A


B

Two **maxillary right first molars** with differences in the mesial part of the palatal surface:

molar **A** has a ***very large cusp of Carabelli***, but

B has a ***slight depression*** in the same location.



Three maxillary left second molars showing variation in the size (or absence) of the **distopalatal cusp.**
A. Maxillary molar with moderate size D-P cusp.
B. Maxillary second molar with small D-P cusp.
C. Maxillary second molar with only one oral cusp.

Interactive, visual display of three different image protocols of the same actual tooth specimen.Photograph, 3-D computer model and x-ray data side-by-side to give a rich display of data and information about a particular specimen.

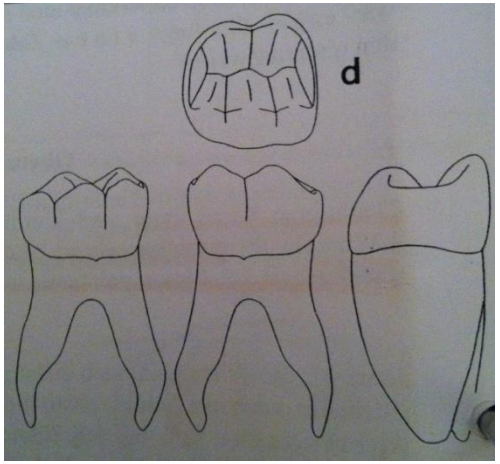
Also, view slice by slice the internal anatomy of the specimen using photographic images as well as density/x-ray images.

Mandibular First Molar (3.6, 4.6)

The **mandibular first molar** or ***six-year molar*** is located on the mandibular (lower) arch of the mouth, and generally opposes the maxillary (upper) first molars and the maxillary 2nd premolar in normal class I occlusion. The function of this molar is like that of all molars.

There are usually **five** well-developed **cusps**: **three buccal** and **two lingual** (two buccal, two lingual and one distal).

There are great differences between the deciduous (primary) mandibular molars and those of the permanent mandibular molars, even though their function are similar.



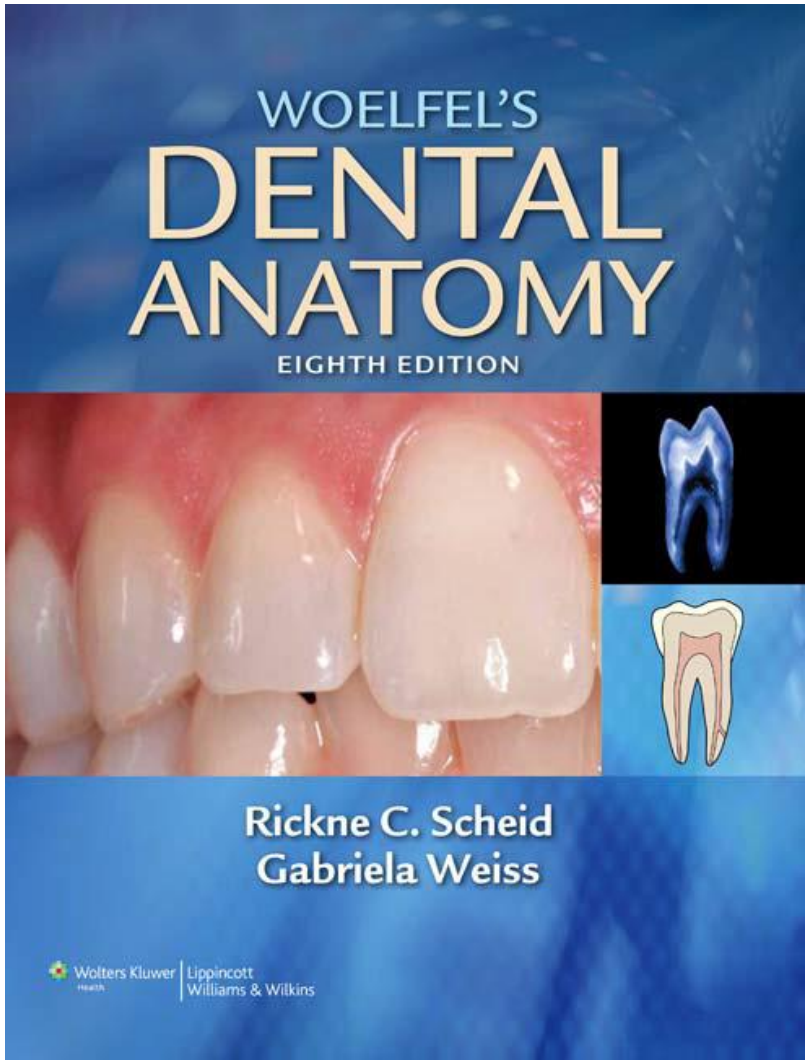
Mandibular second molars (3.7,4.7)

The **mandibular second molar** is the tooth located distally from the mandibular first molar, but mesial from mandibular third molar. Though there is more variation between individuals to that of the first mandibular molar, there are usually **four cusps** on mandibular second molars: **two** on the **buccal** side and **two** on the **lingual** side.

Wisdom Teeth (1.8, 2.8, 3.8, 4.8)

Wisdom tooth, in humans, is any of the four **third molars.**

Wisdom teeth usually appear between the ages of 17–25y. Most adults have four wisdom teeth, but it is possible to have fewer (**hypodontia**), or more, in which case they are called **supernumerary teeth**. Wisdom teeth commonly affect other teeth as they develop, becoming impacted or "coming in sideways."

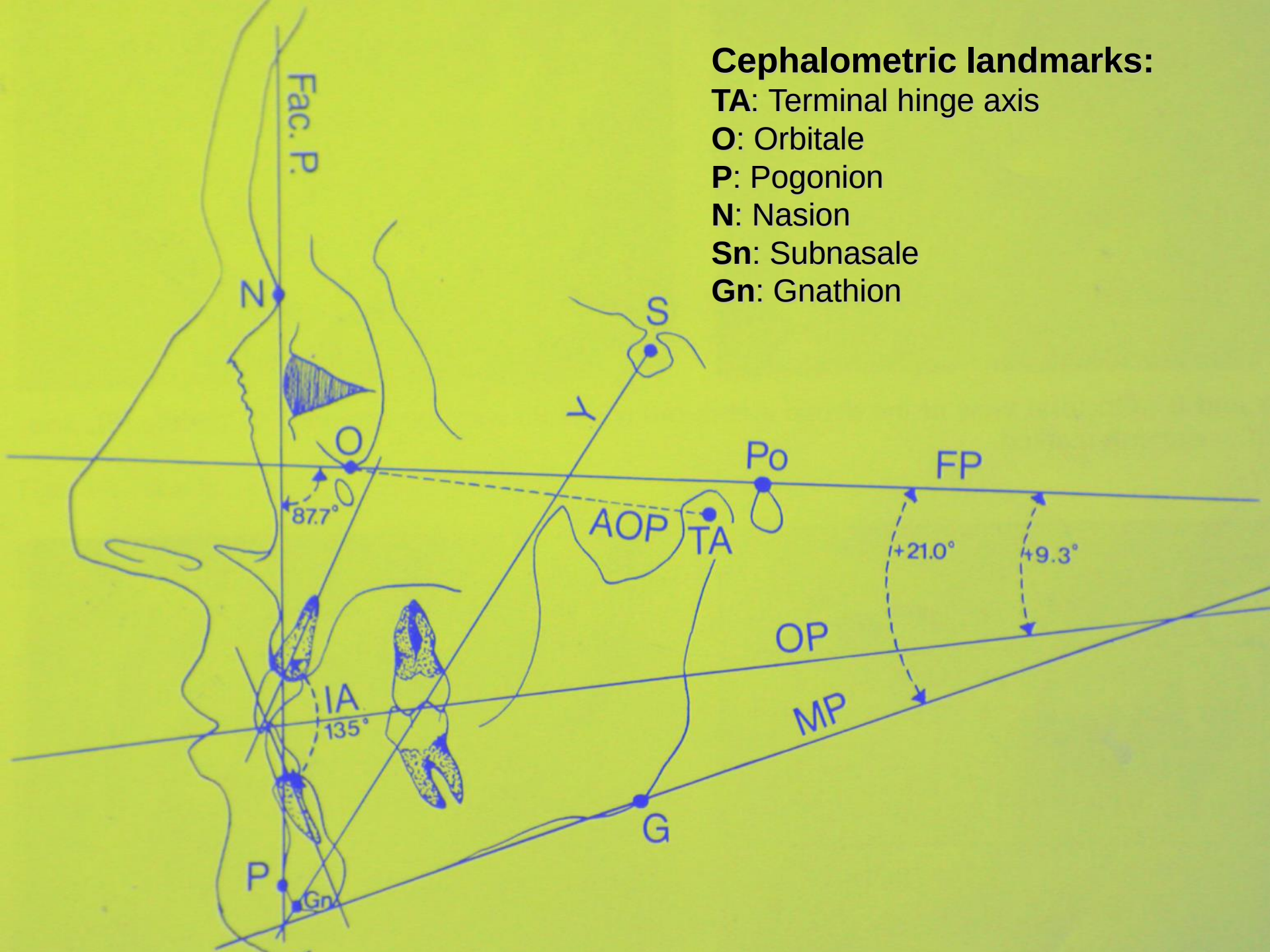


ebooksclub.org_Woelfel_039_s_Dental_Anatomy_Its_Relevance_to_Dentistry_8th_Ed

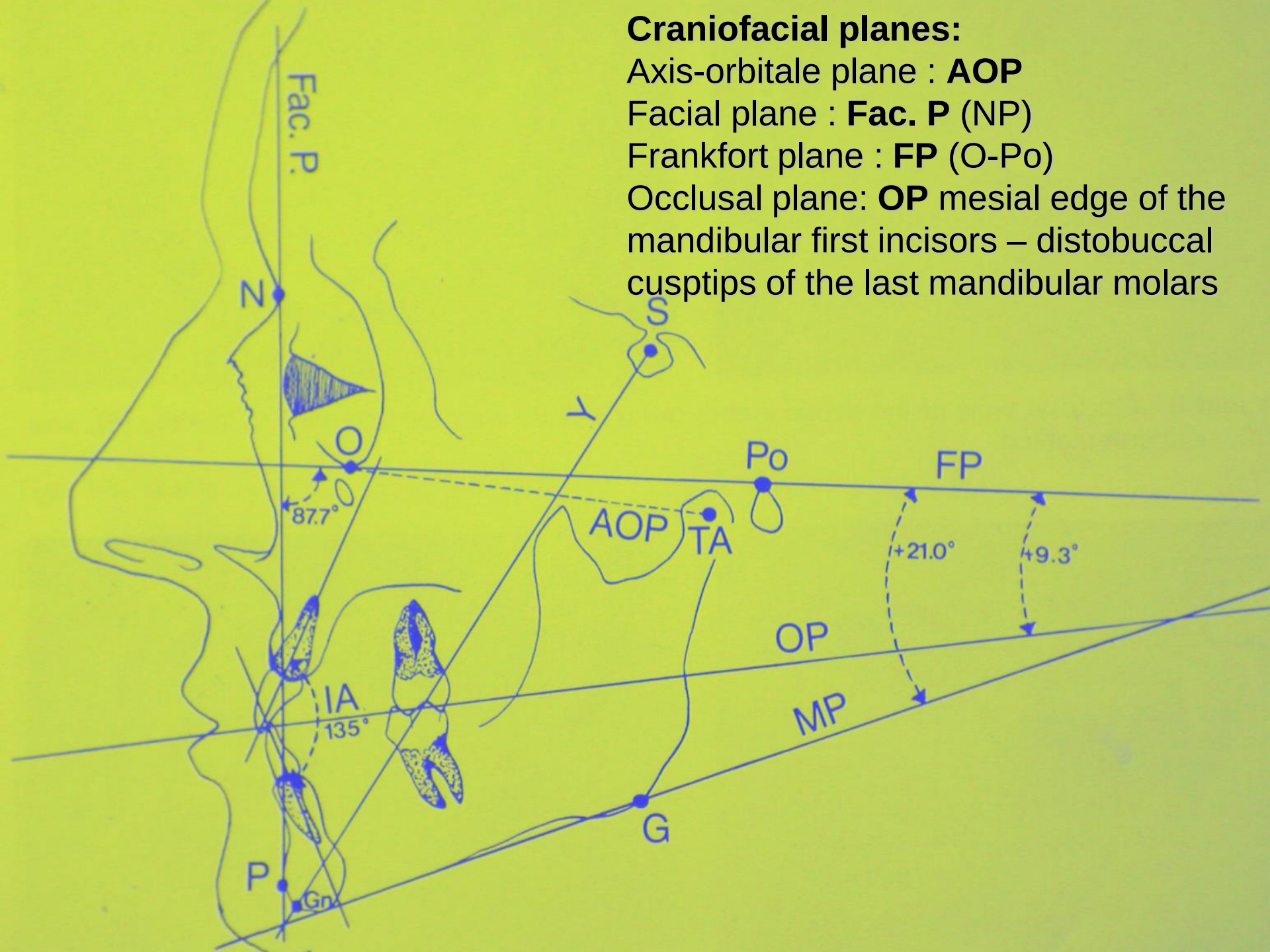
- Reference points, lines and planes are essential in the process of investigation of the masticatory system.
- Application of these points and planes are utilized in everyday dental practice, in treatment planning, diagnosis making, denture fabrication or for the purpose of other therapy.
- These points are also used for cephalometric measurements in orthodontic treatments.

Cephalometric landmarks:

TA: Terminal hinge axis
O: Orbitale
P: Pogonion
N: Nasion
Sn: Subnasale
Gn: Gnathion

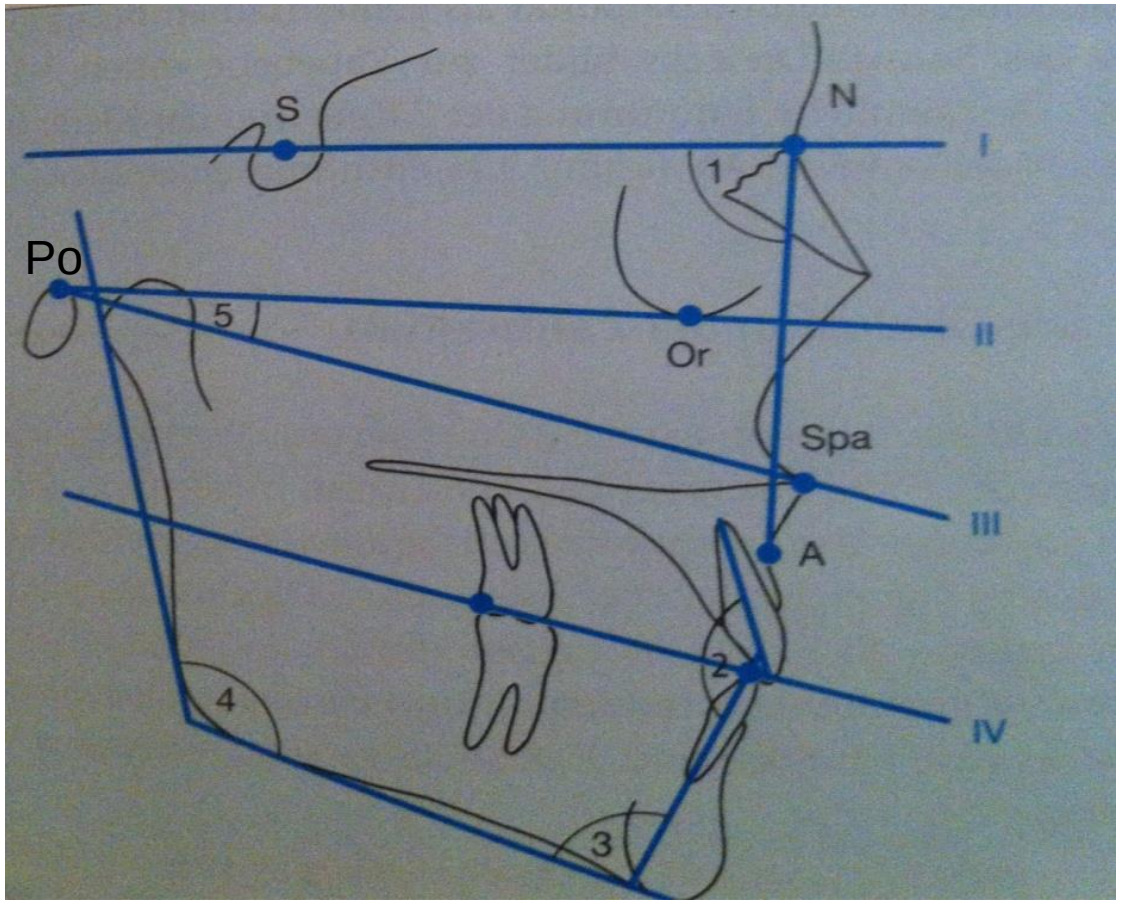


Craniofacial planes:
Axis-orbitale plane : **AOP**
Facial plane : **Fac. P** (NP)
Frankfort plane : **FP** (O-Po)
Occlusal plane: **OP** mesial edge of the mandibular first incisors – distobuccal cusptips of the last mandibular molars



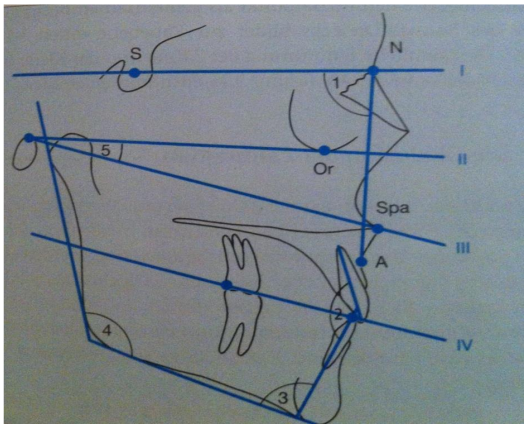
Cephalometric reference planes:

- **Sella – Nasion plane (I.)**
- **Frankfort plane (II.)**
- **Camper's plane (III.)**
- **Occlusal plane (IV.)**



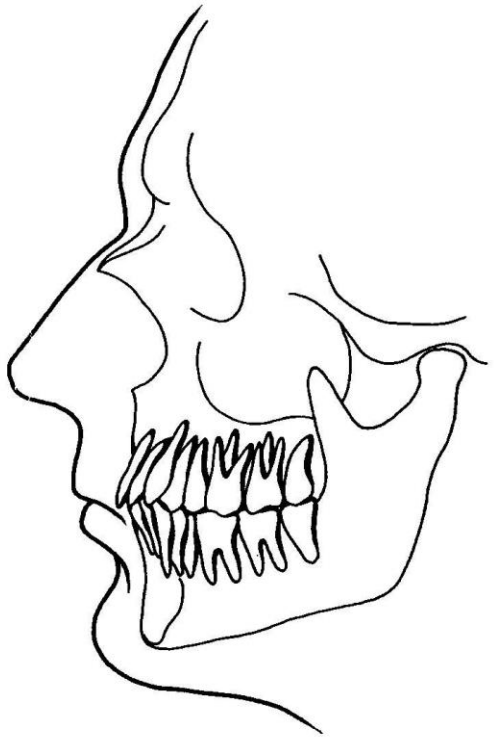
Most important planes determined by the reference points

- **Frankfort plane**: is between the left and right porion (Po), and the left orbitale (Or) points, parallel with the horizontal plane, when the head is in upright position (II).
- **Camper's plane**: is between the tragion (porion) of both sides and the subnasale point, parallel with the occlusal plane (III).
- **Occlusal plane**: is between the mesial angle of the left mandibular first incisor *(incision inferius point)* and distobuccal cusptips of the last mandibular molars (IV).



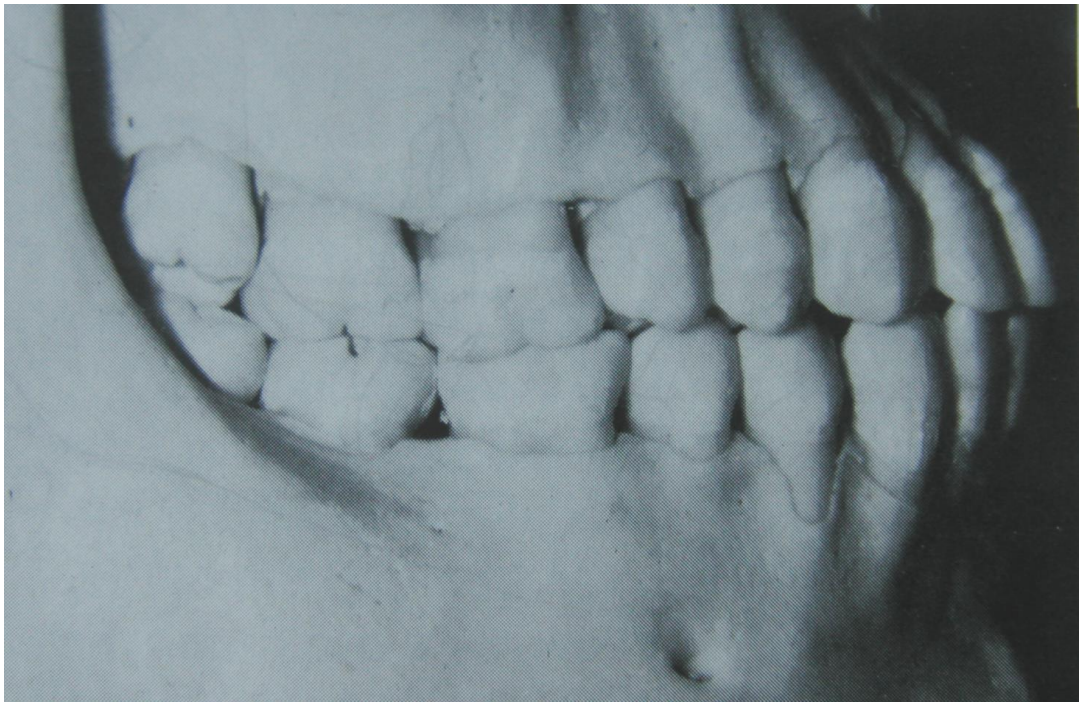
Maxillomandibular relationship

Maxillomandibular relationship or the **jaw relation** refers to the position of the mandible relative to the maxillae and can be described as a *tooth-to-tooth relationship* between maxillary and mandibular teeth.

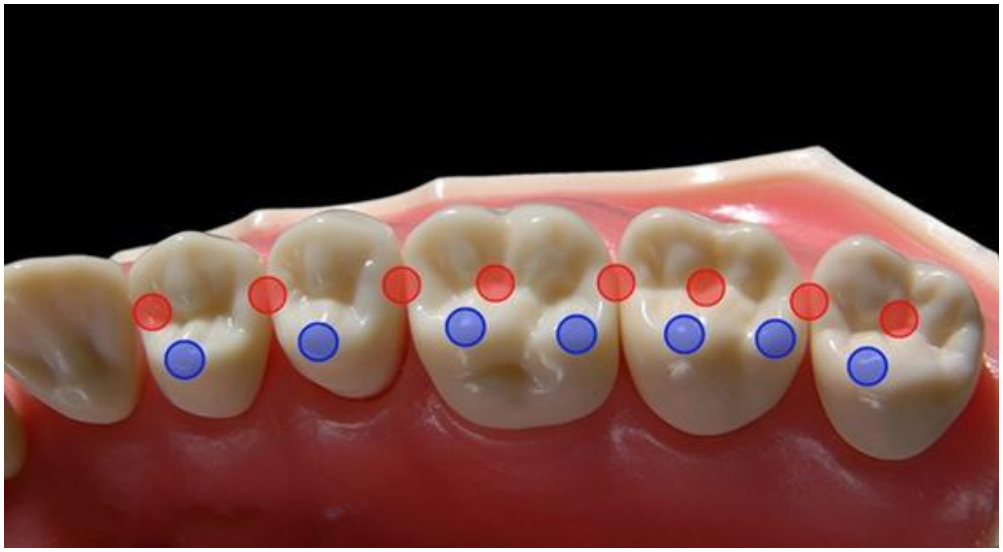


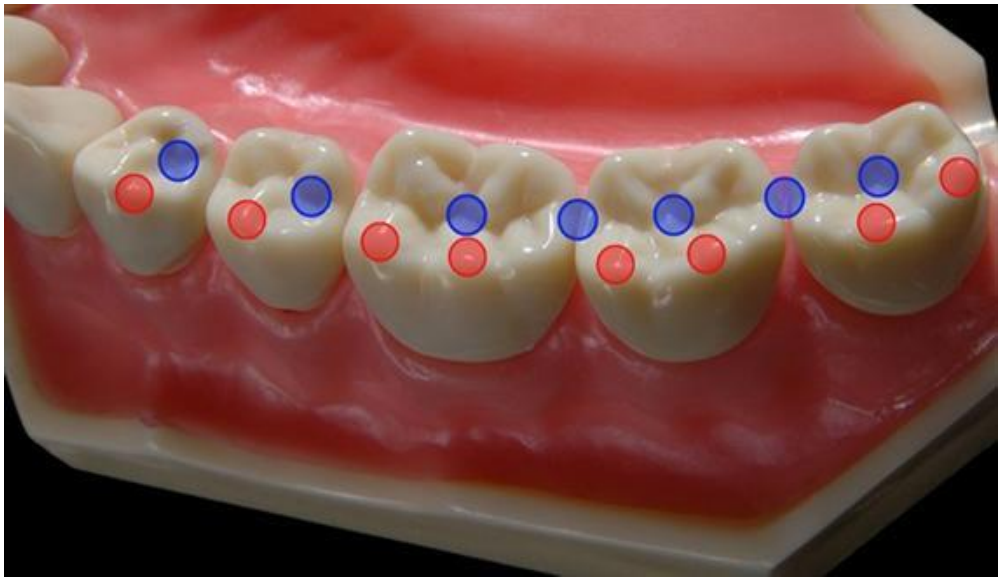
Maxillary and mandibular teeth of the permanent dentition are in the **maximum intercuspal position**.
Observe the **interproximal spaces** filled with the **interdental papillae** between each pair of teeth and how each tooth is in **contact** with its adjacent teeth.
Note how the incisal edges and cusp tips of maxillary teeth **overlap** and hide the incisal edges and cusp tips of the mandibular teeth, and how the wide maxillary central incisors overlap not only the mandibular central incisor, but also half of the mandibular lateral incisor.

Corresponding antagonistic teeth of a skull in Intercuspal Position (ICP)



Classical anatomical relationship in ICP

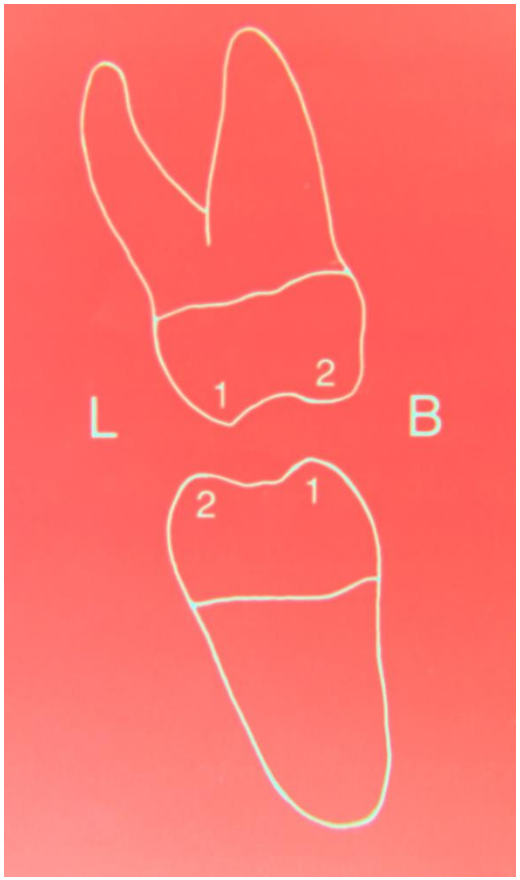




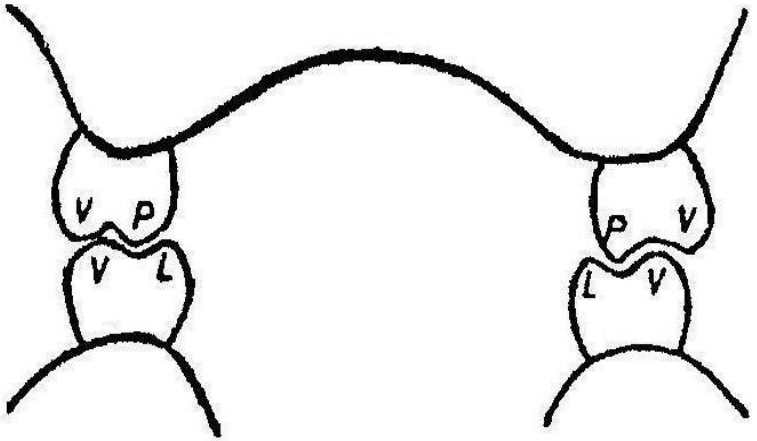
Palatal cusps of the maxillary teeth and the
Buccal cusps of the mandibular teeth have ***maximal, simultaneous contact*** on both sides of the arch.

Cusp contacts with marginal ridge except distobuccal (DB) cusps of the lower and mesiobuccal (MB) cusps of the upper molars (they occlude with the central fossae of their antagonists).

Supporting and guiding cusps

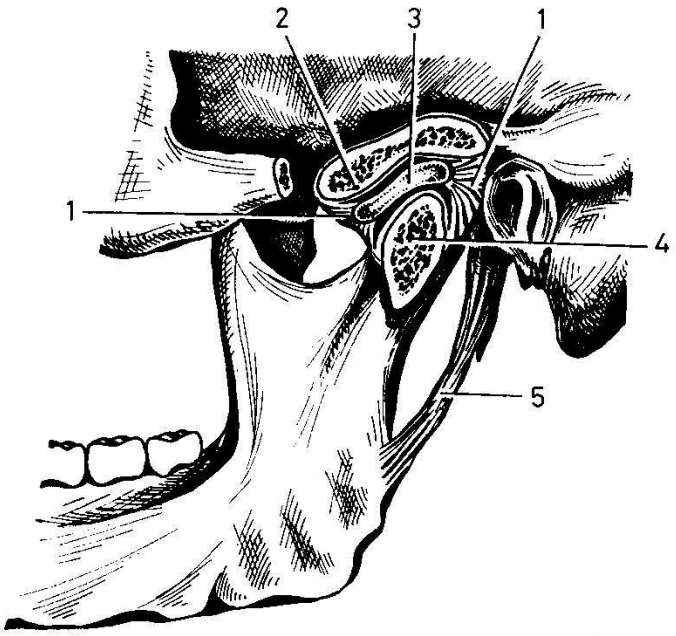


1: Supporting cusps
2: Guiding cusps
Buccal upper and **L**ingual lower cusps do not support occlusion they are the guiding cusps.



Functional Unit

- Occlusal surfaces
- Periodontium
- TMJ
- Muscles



Temporomandibular Joint (TMJ)

1: capsula articularis; 2: tuberculum articularis;
3: discus articularis; 4: caput mandibulae;
5: ligamentum stylomandibulare

The Temporomandibular Joint (TMJ)

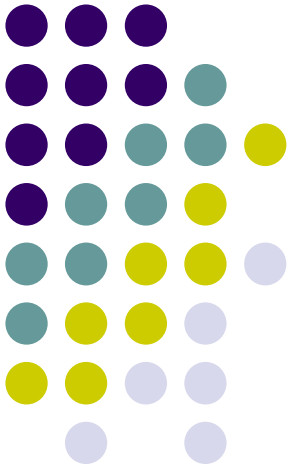
39 Sagittal relationships
Macroscopic anatomical preparation showing the relation of the fossa, disk, and condyle to one another in the sagittal plane. Because the shapes of fossae and condyles vary so greatly, it is not possible to determine a universally applicable measurement of the condylar position. Although the physiological (i.e. centric) condylar position is defined as the most anterosuperior position with no lateral displacement (arrows), this position depends upon the basic neuromuscular tonus.

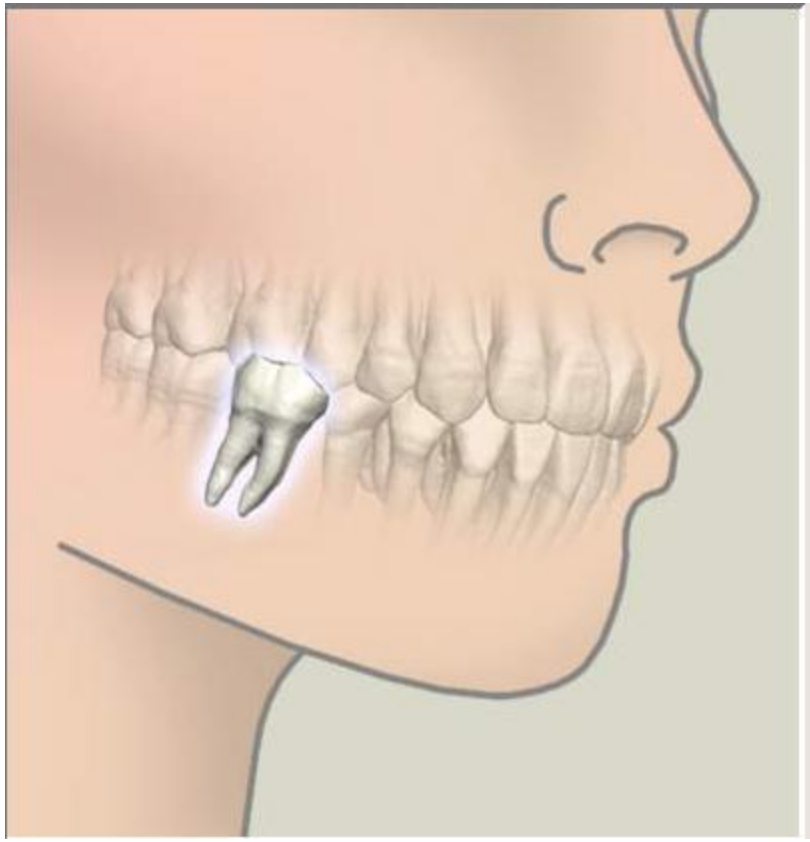

Thank you for your attention!

Waxing up

Occlusal Surface of the Mandibular First Molar

Wax modellation of the 46 Tooth





Mandibular First Molar

Nomenclature		
	Right	Left
Universal	30	19
Palmer	$\overline{6}\rfloor$	$\lfloor\overline{6}$
International	46	36

MANDIBULAR MOLARS (occlusal)

Mandibular left first molars

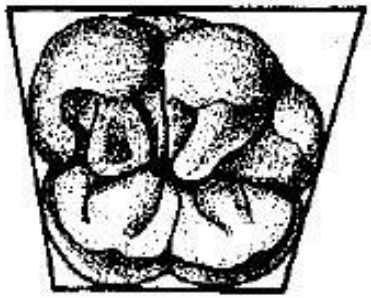
Mandibular right first molars

Mandibular left second molars

Mandibular right second molars

https://youtu.be/68htKXd22nw Permanent mandibular first molar 7’27”

Trapezoid occlusal surface



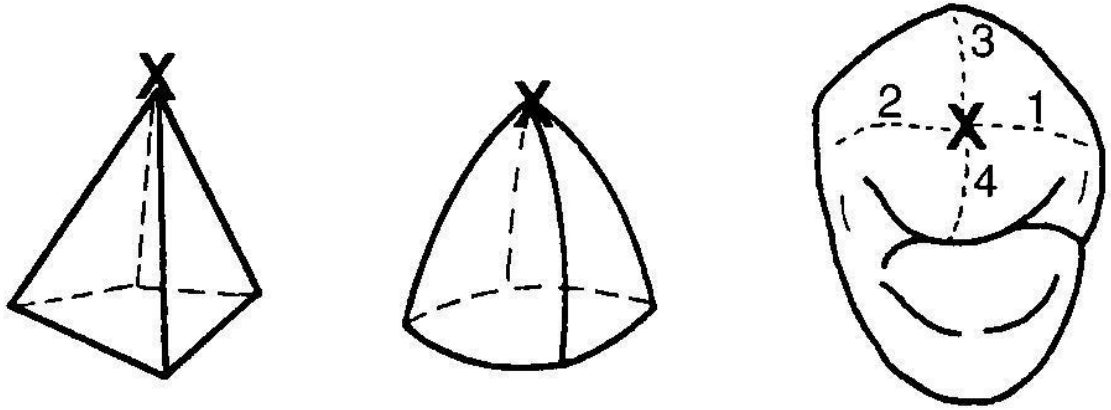
The occlusal surface of the **lower first molar** is said to be trapezoidal in outline.

Occlusal anatomy (morphology) and outline of a mandibular right first molar.

Number and size of occlusal cusps

- Most **mandibular first molars** have **five cusps**: three on the buccal (mesiobuccal, distobuccal, and the smallest distal cusp closest to the distal marginal ridge) and two on the lingual (mesiolingual and distolingual).
- The two mesial cusps (mesiobuccal and mesiolingual) are larger than the two distal cusps (distobuccal and distolingual) and the fifth, distal cusp is the smallest.

All cusps are basically a gothic pyramid



The cuspal gothic pyramid produces 4 ridges:

1. Mesial cusp ridge
2. Distal cusp ridge
3. Buccal cusp ridge
4. Triangular ridge

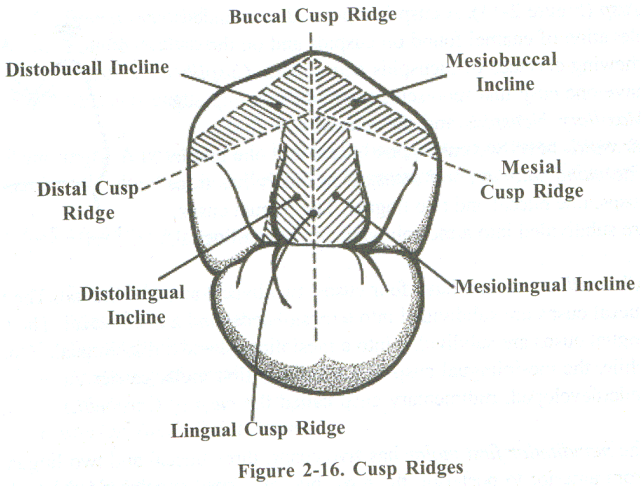
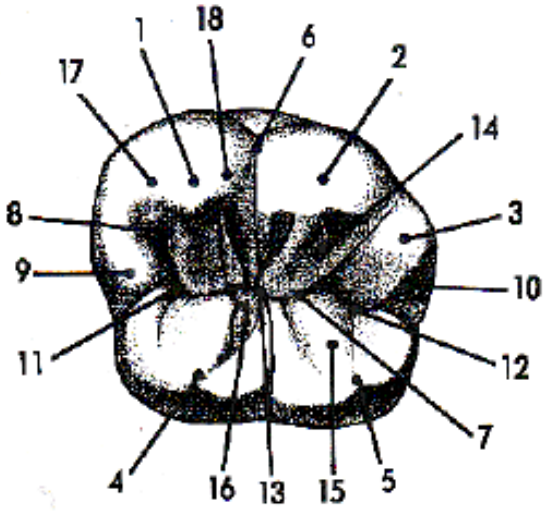
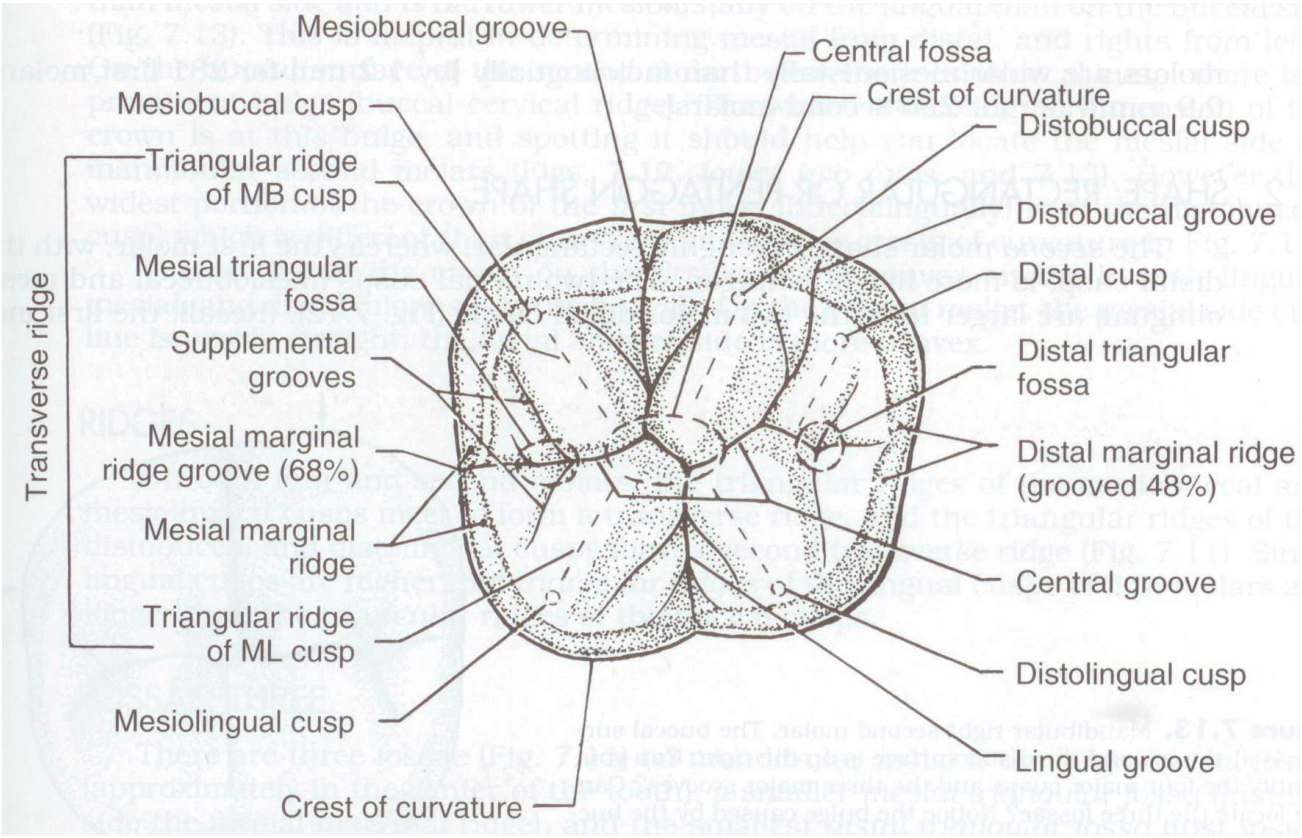


Figure 2-16. Cusp Ridges

Mandibular First Molar (occlusal view)



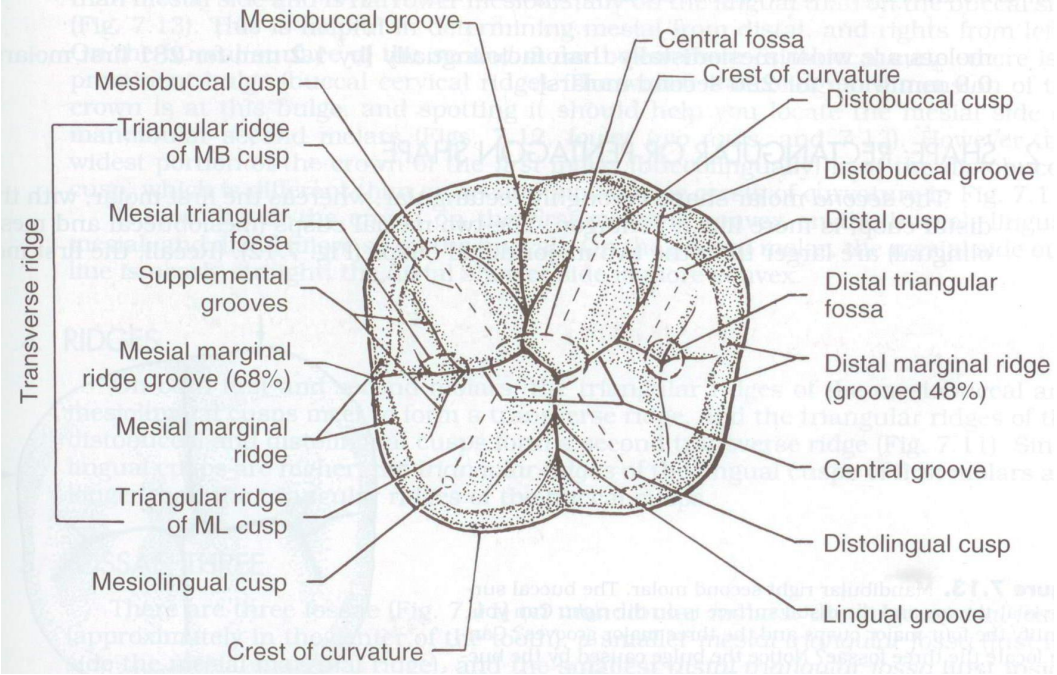
1. Mesiobuccal Cusp
2. Distobuccal Cusp
3. Distal Cusp
4. Mesiolingual Cusp
5. Distolingual Cusp
6. Mesiobuccal (Developmental) Groove
7. Central Sulcus
8. Supplemental Groove
9. Mesial Marginal Ridge
10. Distal Marginal Ridge
11. Mesial Triangular Fossa
12. Distal Triangular Fossa
13. Central Fossa
14. Distobuccal Triangular Ridge (Distal Incline)
15. Distolingual Triangular Ridge (Crest)
16. Tranverse Mesial Ridge
17. Mesial Cusp Ridge
18. Distal Cusp Ridge



Mandibular right first molar, occlusal view, showing how the ***triangular ridges*** of two cusps (mesiobuccal [**MB**] and mesiolingual [**ML**]) align to form one ***transverse ridge*** in the mesial half of the mandibular molar, and another two triangular ridges of the distobuccal (**DB**) and distolingual (**DL**) cusps align to form another transverse ridge in the distal half.

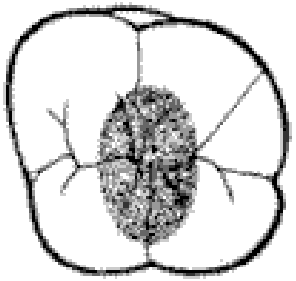
Mandibular first molar, occlusal view

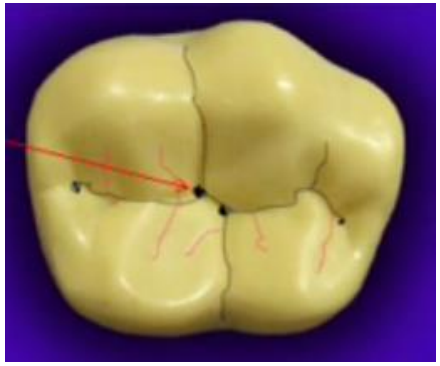
- The buccal height of contour (crest of curvature) is located close to the middle. There are three fossae.
- Note that the **central groove** zigzags in its course from mesial to distal fossa, and the mesiobuccal and lingual grooves are not continuous from buccal to lingual.

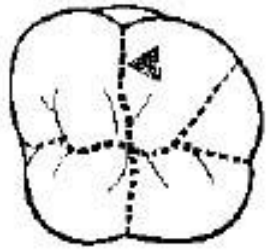


Fossae

- There are three fossae on the first mandibular molar: the largest **central fossa** (approximately in the center of the tooth), a smaller **mesial triangular fossa** (just inside the mesial marginal ridge), and the smallest **distal triangular fossa** (just inside the distal marginal ridge).
- There may be a pit at the junction of grooves in the deepest portion of any of these fossae.



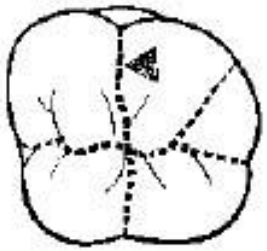




Groves

- Major grooves on the mandibular first molar separate five cusps.
- The **central groove** passes from the mesial triangular fossa through the central fossa to the distal triangular fossa.
- The **lingual groove** starts at the central groove in the central fossa and extends lingually between the mesiolingual and the distolingual cusps.

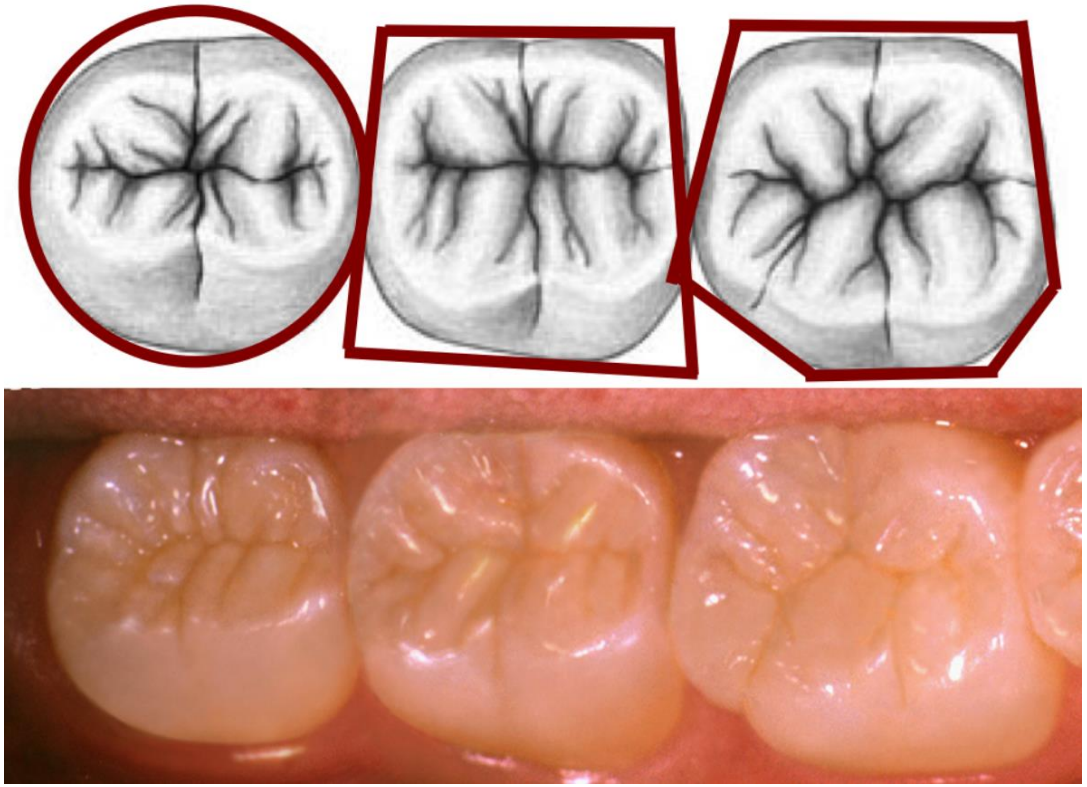
Groves



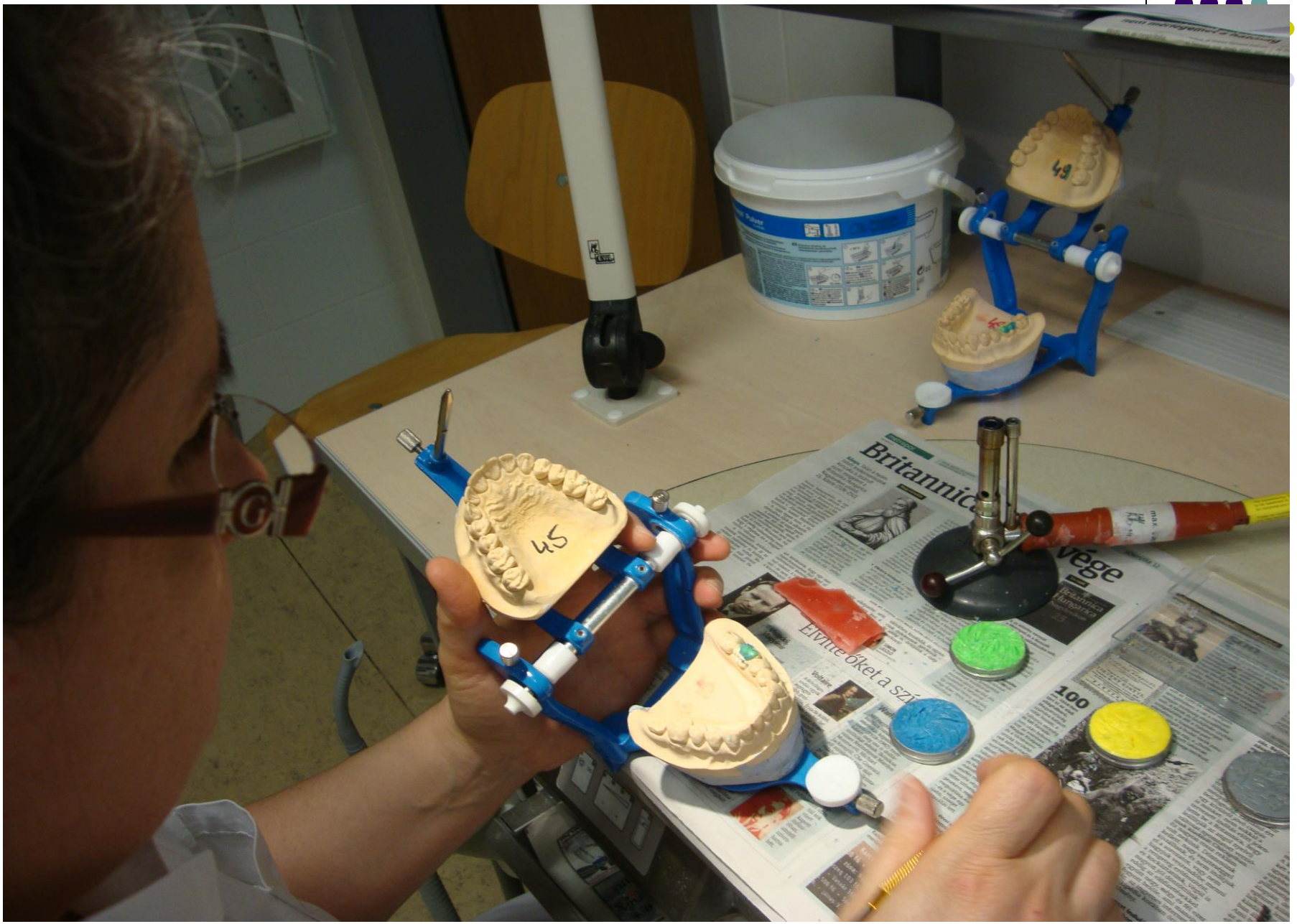
- The mandibular first molar has two buccal grooves.
- ***Mesiobuccal groove*** separates the mesiobuccal and distobuccal cusps.
- **Distobuccal groove** starts at the central groove between the central fossa and the distal triangular fossa, extends between the distobuccal and the distal cusps onto the buccal surface.

Outline shape and taper

- Mandibular molars are wider M-D than B-L.
- On the first molar the widest portion of the tooth may be in the middle third on the prominent buccal bulge of its distobuccal cusp, so the outline would be more like a **five-sided pentagon**.
- The crown outlines of mandibular molars taper lingually, so they are wider mesiodistally on the buccal half than on the lingual half.
- Mandibular molar crowns also taper narrower from mesial to distal, so they are wider buccolingually on the mesial half than on the distal half.



Mandibular Molars (occlusal view)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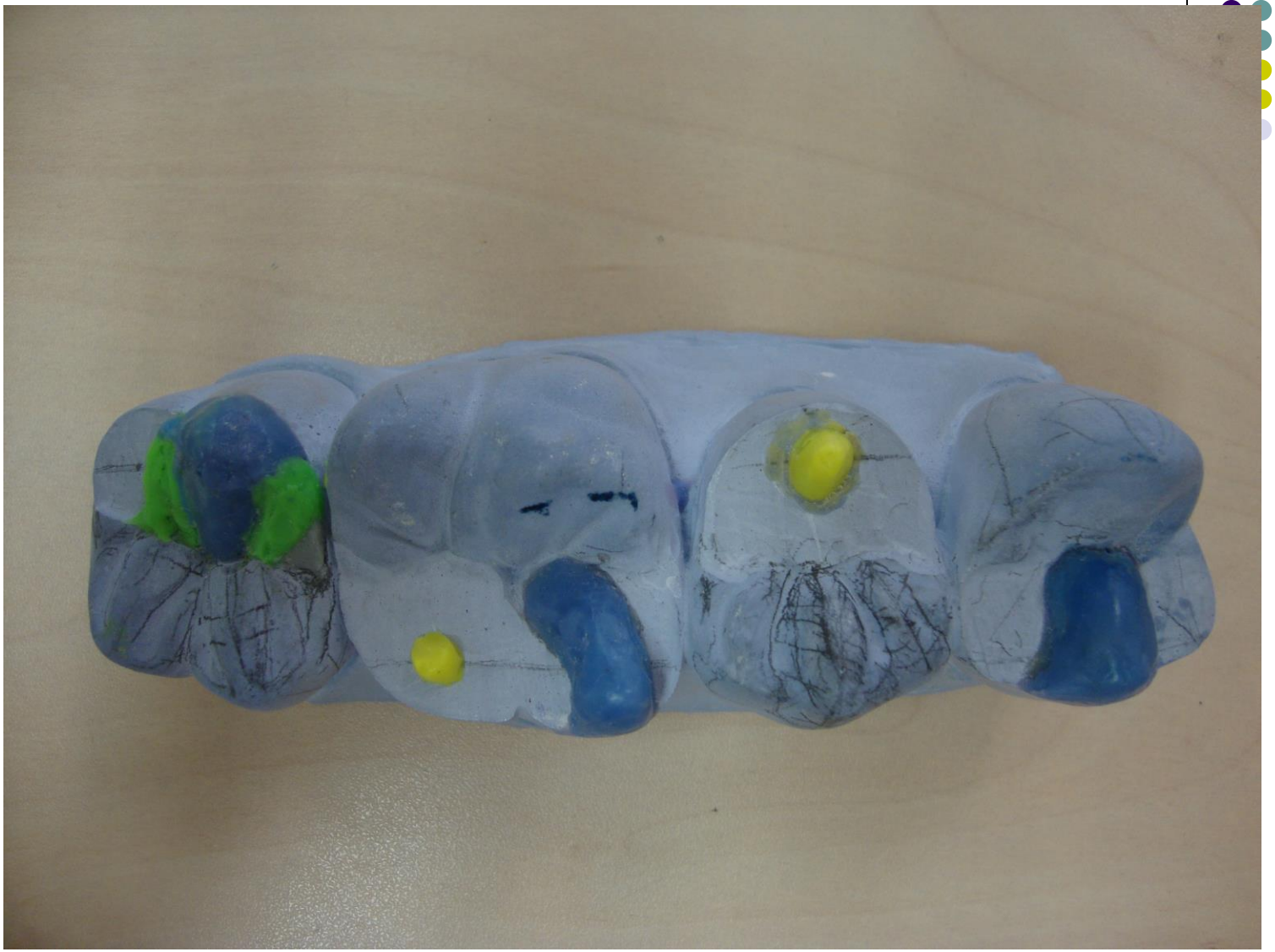

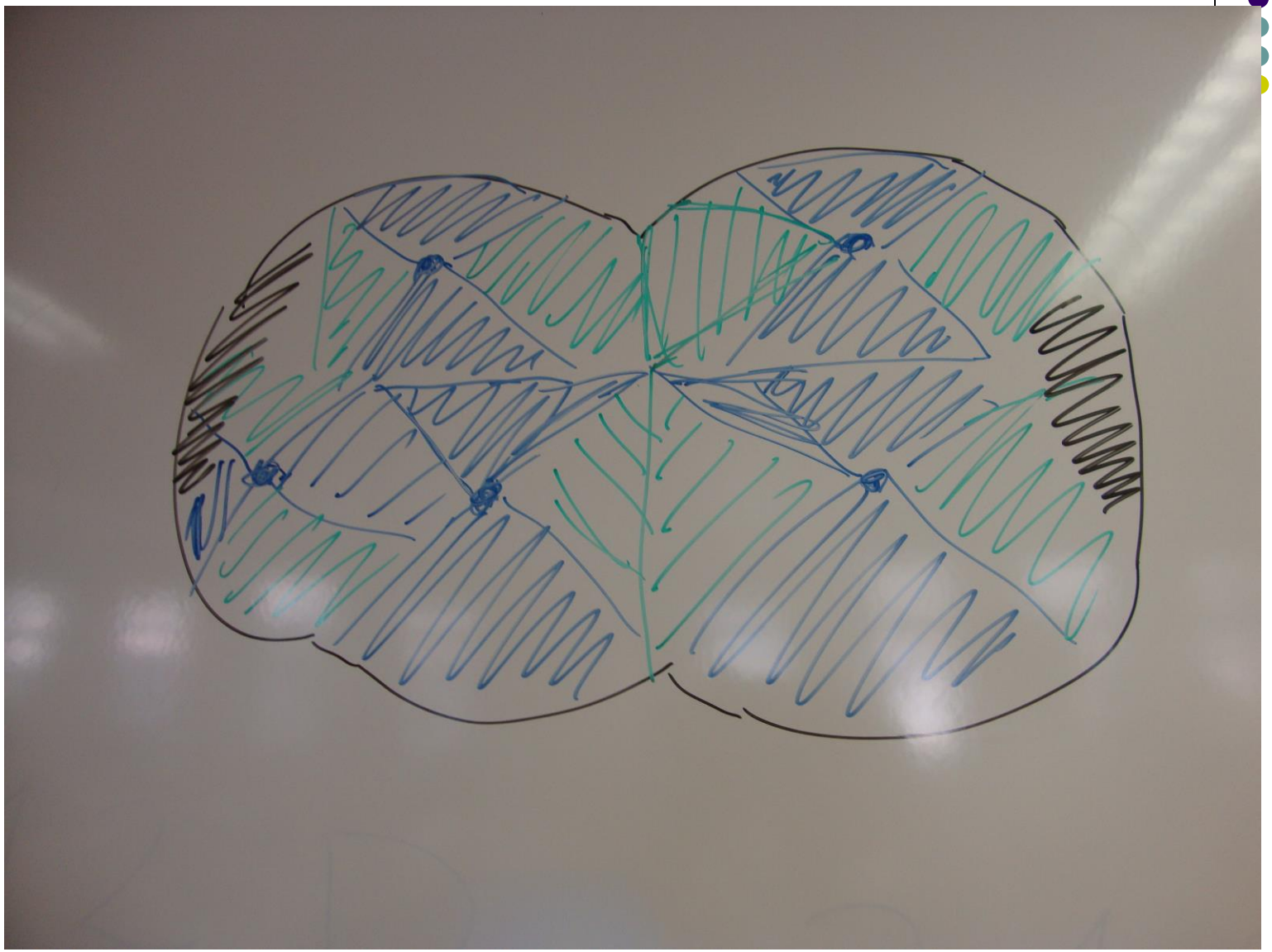


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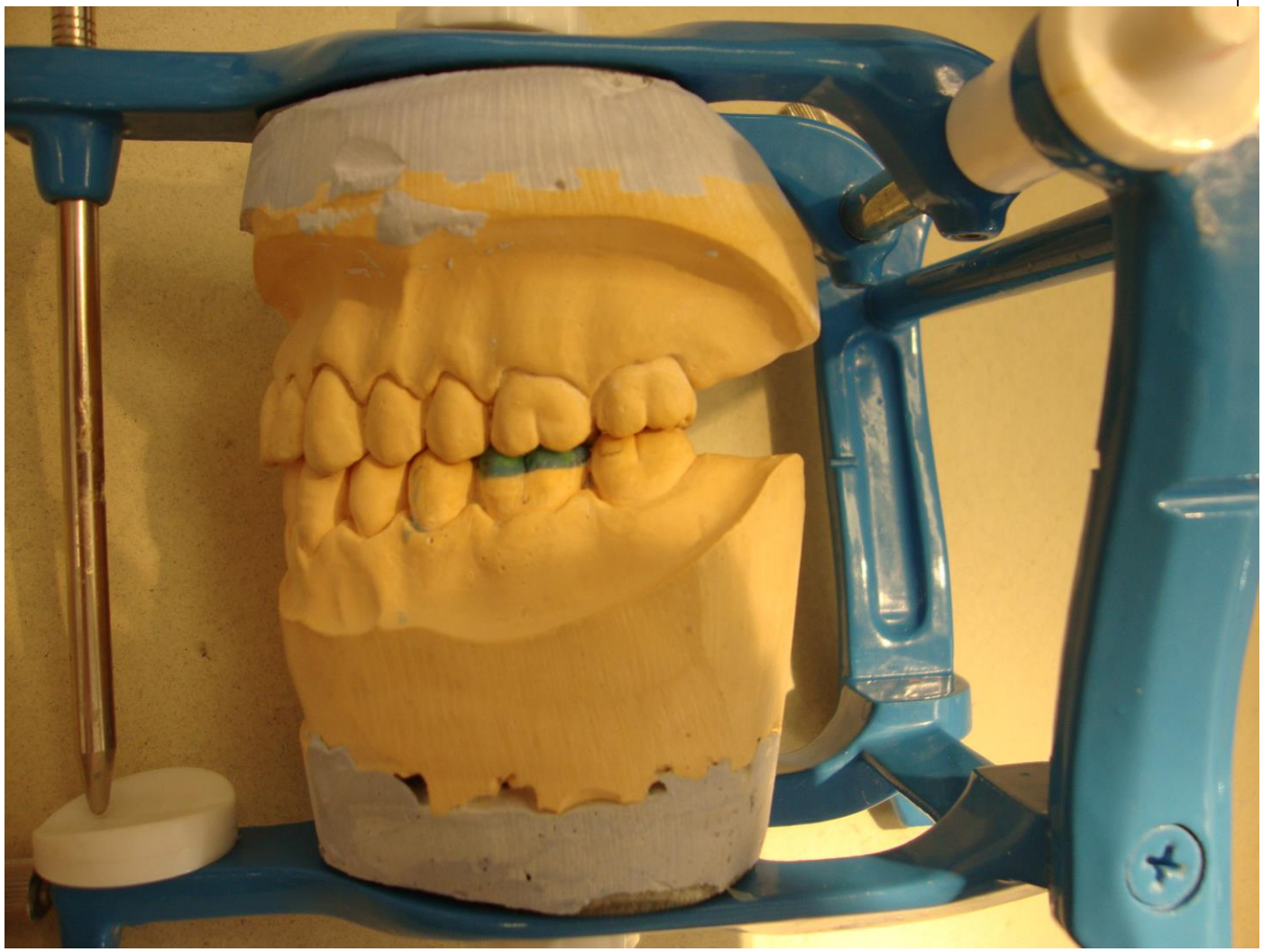

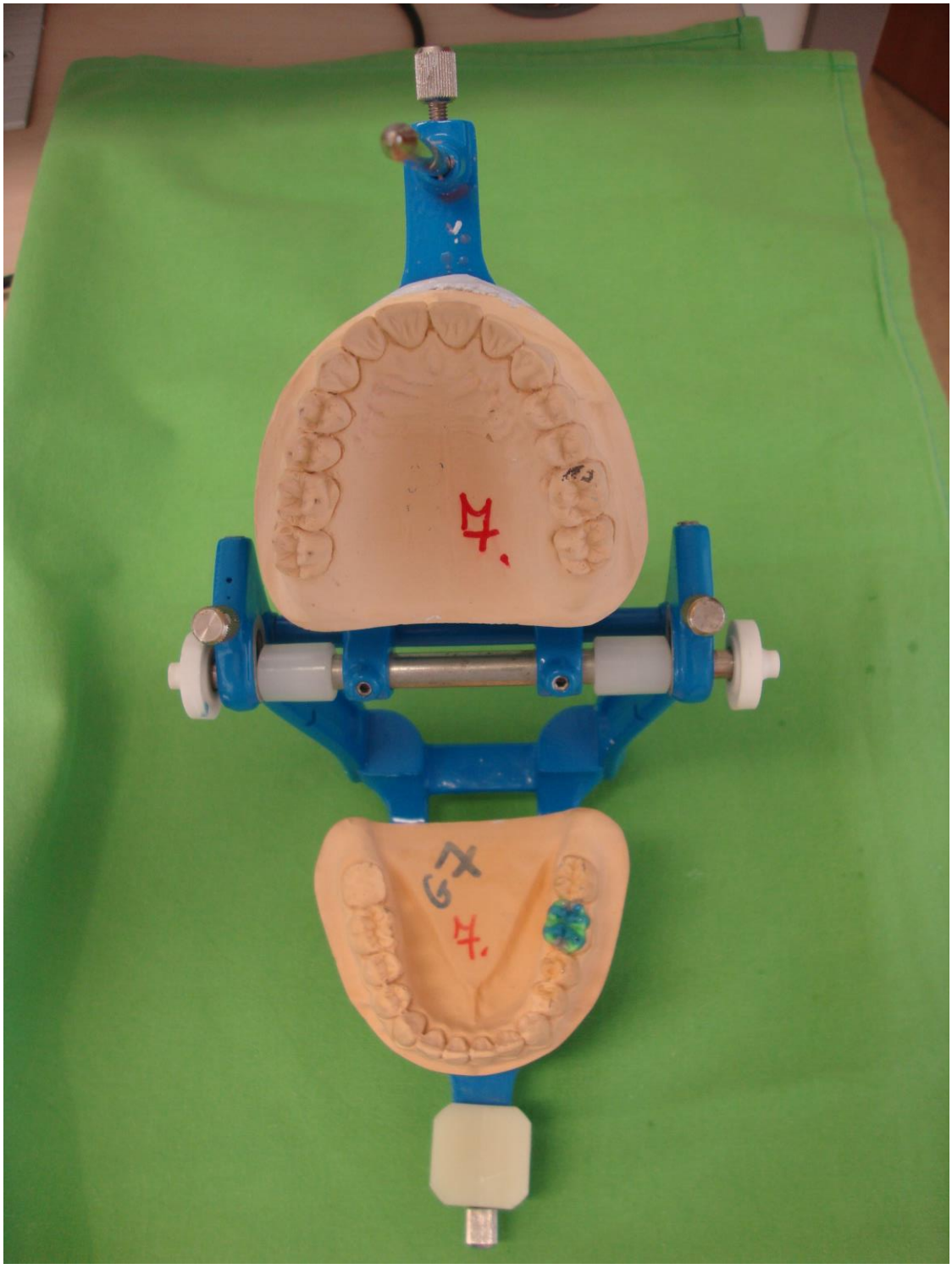
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