

TERMINOLOGY

Dental anatomy investigates the structure and function of teeth. The permanent dentition can consist of up to 32 teeth from the upper and lower arch. Each tooth is unique, but also shares similarities with other teeth within the arch. Thus, it is important to learn dental anatomy in order to differentiate each tooth and spot any abnormalities of teeth.

1

Glossary of Dentistry

Surfaces/Direction

- **Facial**
 - **Labial** - anterior
 - **Buccal** - posterior
- **Lingual**
 - **Palatal** - maxilla
- **Mesial**
- **Distal**
- **Occlusal** - posterior
- **Incisal** - anterior
- **Internal** - inside the tooth



Figure 1.01 Blue = Mesial, Red = Distal,
Yellow = Occlusal, Orange = Apical, F =
Buccal/Facial, L = Palatal/Lingual

Tooth Types

- **Anterior teeth** - "front teeth."
 - **Incisor** - cutting force, speaking (phonetics), smile esthetics
 - **Canine** - tearing forces
- **Posterior teeth** - "back teeth."

- **Premolar** - holding food, helping chew and grind food (to a lesser extent than molars)
- **Molar** - chewing and grinding forces

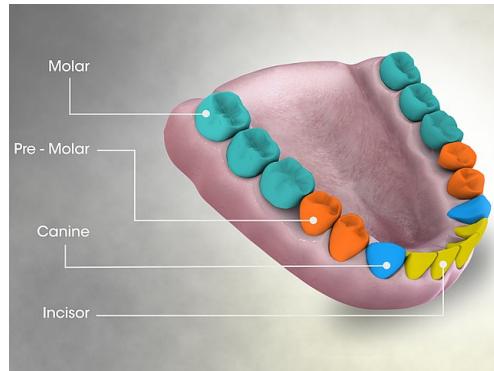


Figure 1.02 Tooth Types

Tooth Nomenclature

- **Fossa** - round-shaped or angular depression
 - Forms when grooves meet
- **Groove** - linear depression
 - Developmental grooves - form when lobes fuse
- **Supplemental grooves** - shallower grooves
- **Cingulum** - convex protuberance found on lingual surfaces of anterior teeth
- **Ridge** - linear elevation of the tooth crown
 - **Marginal ridge** - form mesial or distal borders of a tooth
 - **Triangular ridge** - on cusp tips
- **Pit** - pin-point depression at the intersection of grooves and fissures
- **Fissure** - deep grooves
 - Form when developmental lobes fuse imperfectly

- **Embrasuré** - spaces around teeth, often V-shaped
 - Function to prevent food trapping between teeth
- **Proximal contact** - where two adjacent, within the same arch, teeth contact
- **Cusp** - mound or elevated point located on the tooth crown
- **Tubercle** - small elevation on tooth crown due to extra enamel formation, deviation from normal
- **Mamelons** - small bumps on the incised edge
 - Appear when the tooth first erupts but wears away over time
 - Indication of anterior open bite if they remain after 10 years of age
- **Lobe** - individual calcification center of the tooth
 - Lobes come together to form the full tooth
 - Often become individual cusps on a molar
- **Height of contour** - widest circumference of tooth
- **Imbrication lines** - small grooves seen between imbrication lines
- **Perikymata** - mesiodistal ridges/wrinkles on labial cervical third of anterior teeth
 - Caused by enamel deposition during crown formation, which occurs in increments

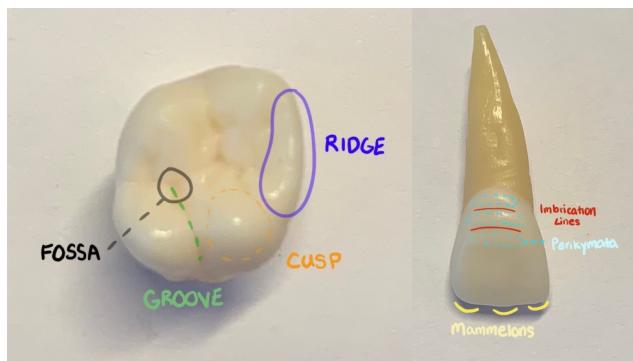


Figure 1.03 Crown Terminology

Root Terminology

- **Furcation** - dividing point of tooth roots
 - Bifurcation - for double-rooted teeth
 - Trifurcation - for triple-rooted teeth
- **Cemento-enamel junction (CEJ)** - the cervical line where enamel and cementum meet
- **Root trunk** - between the furcation and CEJ
- **Apex** - the tip of the tooth root
- **Apical foramen** - opening of root at the apex
 - Where nerve and blood vessels travel

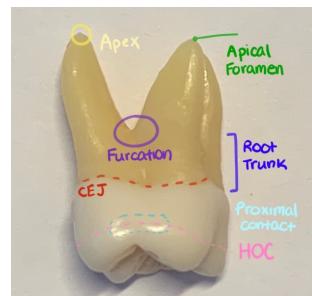


Figure 1.04 Root Terminology

2 Patterns and Trends

- For every tooth
 - The height of contour on the facial side is located in the cervical third
 - Mandibular molars in the middle third
 - Height of contour on the lingual side
 - Cervical third - anteriors
 - Middle third - posteriors
 - Occlusal third - mandibular 2nd premolars
 - It is wider buccolingually than it is mesiodistally
 - except max incisors and mandibular molars
- Crown height decreases for the more distal tooth
- Root trunk length increase for the more distal tooth
- Lingual embrasures are larger than buccal embrasures
- Longest teeth
 - Mand canine > max central > max canine

- Missing teeth
 - 3rd molar > mand 2nd premolar > max lateral

MAXILLARY CENTRAL INCISOR

1 Anatomy

Development

- 4 lobes
 - Mesial-facial
 - Middle-facial
 - Distal-facial
 - Lobe that forms the cingulum
 - 3 mamelons are present when permanent incisors first erupt
 - Wear away by the ten-years-old
 - Correspond to the 3 facial lobes
- Developmental depressions between the lobes

Facial View

- Widest anterior tooth
- Second longest crown
- Trapezoid shaped crown
- Incisal edge approximately perpendicular to the long axis of the tooth
- Mesioincisal corner is 90 degrees
- Distoincisor corner is rounded
- Root distally inclined
- Imbrication lines and perikymata located on the cervical third of the crown (near gumline)
- Root and crown are flat
 - Except at the cervical third of the crown
- Height of contour
 - Distal - junction of incisal and middle third
 - Mesial - incisal third
 - Often where the contact points are

INBDE Pro-Tip:

The following rules apply for all permanent anterior teeth:

- Incisocervical dimension longer than mesiodistal dimension
- Develop from 4 lobes
- Mesial and lingual height of contour is always in the cervical third of the crown

Lingual View

- Narrower than facial view
- CEJ
 - Deeper than facial view
 - Convex relative to the apex
- Pronounced distal and mesial marginal ridge
- Cingulum
- Variable
 - It can be very flat, bulbous, with abnormal grooves, etc.

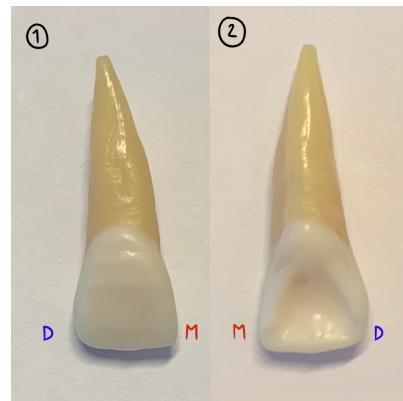


Figure 2.01 Maxillary Central Incisor

1 - Facial View, 2 - Lingual View

Mesial View

- Crown appears wedge-shaped
 - Tapers toward the incisal edge
- CEJ concave relative to the apex
- The following falls along the long axis from mesial and distal views:
 - Incisal edge
 - Height of CEJ
 - Root apex
 - Proximal contact

Distal View

- CEJ is flatter compared to the mesial view
 - Generally, the cervical line is flatter for the tooth that is more distal and posterior from the midline.

Incisal View

- Mesiodistal dimension longer than faciolingual dimension
- Cingulum is positioned slightly distal.

Pulp

- 3 pulp horns in the pulp chamber
- One pulp canal (100% incidence)

Root

- Triangular cross-section

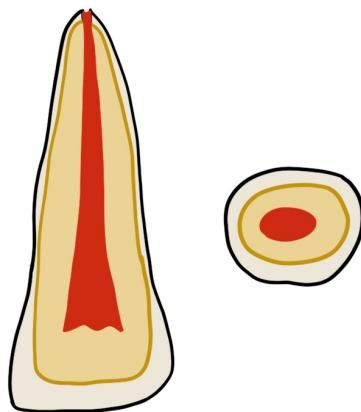


Figure 2.02 Pulp Morphology

2 Trends**Occlusion**

- Teeth with the greatest axial inclination in the arch
- The incisor crown is positioned more facial than the root
- Inclination decreases the more posterior
 - Flatter CEJ
 - Proximal contacts more cervical
 - Decreasing axial inclination

MAXILLARY LATERAL

1

Anatomy

Development

- 4 lobes
 - Mesial-facial
 - Middle-facial
 - Distal-facial
 - Lobe that forms the cingulum
- Significantly developed middle facial lobe —> very convex crown and root
- Convexity makes the mid-root cross-section shape oval
- 3 mamelons are present when permanent incisors first erupt
 - Wear away by the 10 years-old
 - Correspond to the 3 facial lobes
- Developmental depressions between the lobes

Facial View

- Trapezoid shaped crown
- Incisocervical dimension wider than mesiodistal dimension
- Distoincisal corner is more rounded
- Root distally inclined (more than the central incisor)
- Height of contour
 - Distal - middle third
 - Mesial - junction of incisal and middle third
- Narrowest tooth in the upper dentition

Lingual View

- Most prominent marginal ridges out of all anterior teeth
- Deepest lingual fossa out of all anterior teeth

Mesial View

- Crown appears wedge-shaped
 - Tapers toward the incisal edge
- CEJ concave relative to the apex
- HOC of facial and lingual seen in the cervical third
 - This applies to all anterior teeth

- The following falls along the long axis from mesial and distal views:
 - Incisal edge
 - Height of CEJ
 - Root apex
 - Proximal contact

Distal View

- CEJ is flatter compared to the mesial view
- Proximal contact is more cervical compared to mesial



Figure 3.01 Facial/Lingual View

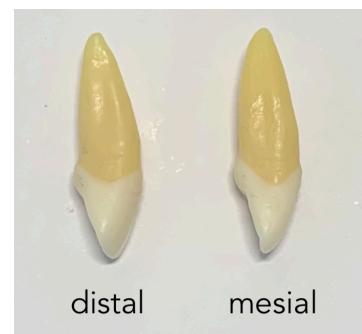


Figure 3.02 Mesial/Distal View

Incisal View

- The mesiodistal dimension is about the same as the faciolingual dimension

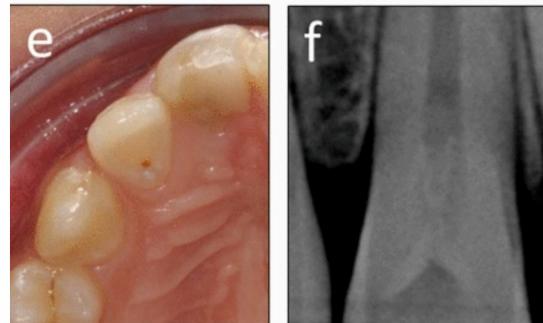
- The facial surface is mostly seen due to convexity

Pulp

- 3 pulp horns in the pulp chamber
- If peg lateral = 1 pulp horn
- One pulp canal (100% incidence)

Root

- Oval cross-section



2

Dental Anomalies

Common Anomalies

All of the following anomalies are most commonly observed in maxillary lateral teeth.

- Microdents/peg laterals
- Talon cusp/dens evaginatus
 - Extra Cusp on the lingual surface
- Dens in dente/dens invaginatus
 - Enamel is caved into the tooth
 - Diagnosis requires radiograph
 - High risk for caries
- Hawkbill
 - The incisal edge is aligned more lingual than the long axis of the tooth
 - Often appear more mandibular incisor-like
- Lingual pit
 - Occurs when mesial and distal marginal ridges extend further than normal and meet at the cingulum
 - High risk of caries development in the pit
 - Sealants often applied
- Palatal gingival groove
 - The groove that starts from the lingual fossa and runs down the root
 - Difficult for hygiene
 - often causes periodontal issues

Figure 3.03 Maxillary lateral incisor with lingual pit and dens invaginatus

MANDIBULAR INCISORS

1

Mandibular Central Incisor

Development

- 4 lobes
 - Mesial-facial
 - Middle-facial
 - Distal-facial
 - Lobe that forms the cingulum

Facial View

- Smallest tooth in the mouth
- Most symmetrical tooth in the mouth
- Shortest root in the mouth
- Most narrow tooth in the mouth
- 2/3 width of the maxillary central incisor
- Trapezoid shaped crown
- Mesioincisal and distoincisal corners are sharpest
- The distal surface is slightly more convex

Lingual View

- Less distinct marginal ridges and cingulum

Mesial View

- Developmental depression on the root surface
- The facial surface curved back towards the lingual

INBDE Pro-Tip:

For the mandibular central incisor, the incisal edge is lingual to the long axis of the tooth. This is a common asked concept on the INBDE.

Distal View

- Developmental depression on the root surface
 - Deeper compared to mesial
- CEJ is flatter compared to mesial

Incisal View

- Faciolingual dimension wider than mesiodistal dimension
 - Opposite in Maxillary incisor

Pulp

- 3 pulp horns in the pulp chamber
- One pulp canal (70% incidence)
- Two pulp canals (30% incidence)

Root

- Ribbon shape at the cross-section
 - Indents correspond to root depression

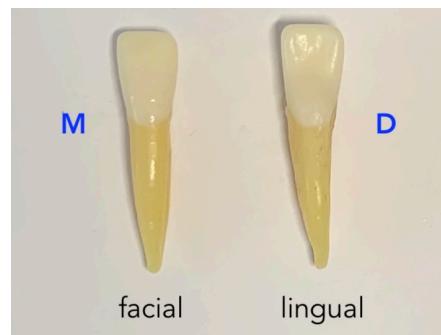


Figure 4.01 Mandibular Central Incisor
Facial/Lingual View



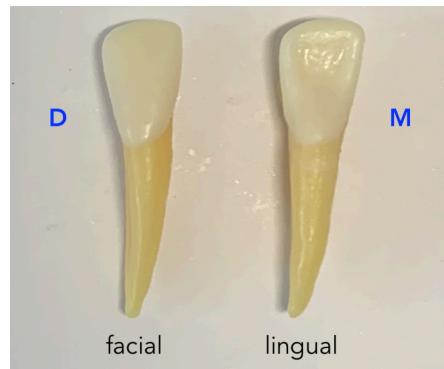
Figure 4.02 Mandibular Central Incisor
Mesial/Distal View

2 Mandibular Lateral Incisor

The mandibular lateral incisor is very similar to the central incisors. Despite these similarities, there are few ways to differentiate the two.

Facial View

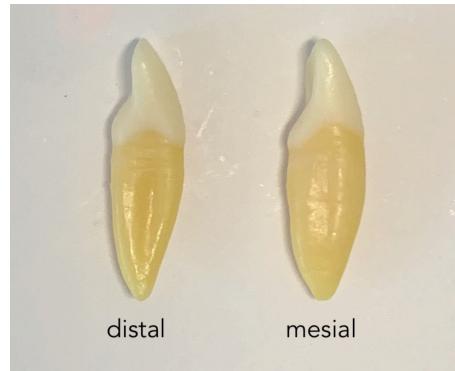
- Compared the mandibular central incisor
 - Wider
 - Longer



**Figure 4.03 Mandibular Lateral Incisor
Facial/Lingual View**

Mesial View

- Can observe some of the distal marginal ridge
 - Due to the crown twisting around the root base
 - Called a "distal twist."



**Figure 4.04 Mandibular Lateral Incisor
Mesial/Distal View**

Incisal View

- Faciolingual dimension wider than mesiodistal dimension
- Contact two opposing teeth
 - Maxillary central incisor
 - Maxillary lateral incisor

Pulp

- 3 pulp horns in the pulp chamber
- One pulp canal (55% incidence)
- Two pulp canals (45% incidence)
 - Highest incidence out of all the maxillary and mandibular incisors

Root

- Ribbon shape at the cross-section
 - Indents correspond to root depressions

CANINES

1

Maxillary Canine

Development

- Erupts around 11-12 years-old
 - Last succedaneous tooth to erupt
- 4 lobes
 - Mesial-facial
 - Middle-facial
 - Distal-facial
 - Lobe that forms the cingulum

General Characteristics

- Longest tooth
- Longest root
 - Good support tooth for orthodontic movement and supporting prosthodontics
- At corners of dental arches = vital for occlusion and esthetics
- Canine eminence
 - Caused by its bulky root
- Positioned under the orbit
- Usually, 1 full shade is darker than incisors
- Ideally, contacts opposing mandibular canine and mandibular premolar
- Used as reference for golden ratio for ideal esthetic smile
 - The canine is 2/3 width of the lateral incisor
 - The lateral is 2/3 width of the central incisor

Facial View

- The pentagonal shape of crown
- Dominant middle facial lobe = Very convex crown
 - Marks the corners of the mouth
 - Marks the turning point in the dental arch
- Convex root
- Distal cusp ridge longer than mesial cusp ridge
- The cusp tip aligns with the long axis of the tooth
- Root tip distally inclined
- Concave at CEJ
- **Distal bulge** - convex distal contour

- Height of contour

- Mesial = junction of incisal and middle third
- Distal = middle third

- Developmental depressions represent the division of the three facial lobes



Figure 5.01 Maxillary Canine Facial/Lingual View

Lingual View

- Narrower than facial aspect
- Tapers toward lingual
- Large and pronounced cingulum and lingual ridge
- 2 Triangular fossa
 - Fossa are bordered by lingual ridge and cusp ridges

Mesial View

- Cusp tip and root apex facial to the long axis of the tooth
- Long root flute - long linear depression

Distal View

- Root flute deeper than mesial
- CEJ is flatter compared to mesial

Incisal View

- Diamond shape crown
- The faciolingual dimension is slightly wider than mesiodistal dimension

- Widest anterior tooth in faciolingual dimension

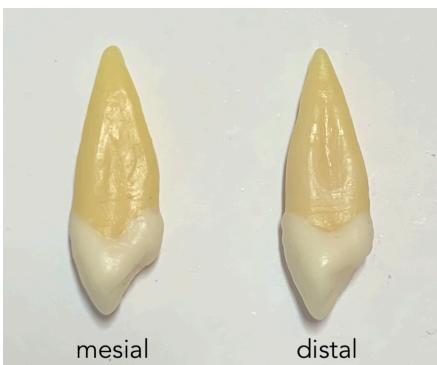


Figure 5.02 Maxillary Canine
Mesial/Distal View

- Imbrication lines
 - Located approximately at the junction of the cervical and middle third of the crown



Figure 5.03 Mandibular Canine
Facial/Lingual View

Pulp

- 1 pulp horn in the pulp chamber
- One pulp canal (100% incidence)

Root

- Ribbon shape at a cross-section at mid-root
 - Indents correspond to root depression

2 Mandibular Canine

The mandibular canine shares similarities to the maxillary canine. Despite these similarities, there are few ways to differentiate the two.

Facial View

- Longest crown of all the teeth
- The mesial surface of the crown and root form a straight line
- Cusp tip mesial to the long axis of the tooth
- Distal cusp ridge longer than mesial cusp ridge
 - Same as the maxillary canine
- Height of contour (same as maxillary canine)
 - Mesial = junction of incisal and middle third
 - Distal = middle third
- Root often straight (45%)
 - Mesial inclined (29%)
 - Distal inclined (26%)
- Developmental depression lines similar to the maxillary canine

Lingual View

- Similar anatomy to maxillary canine, but is less distinct/flatter.

Mesial View

- Share arc - continuous convex facial surface extending from crown to root
- Cusp tip and root apex lingual to the long axis of the tooth
 - Common to all mandibular anterior teeth

Distal View

- The root flute is deeper than mesial
- CEJ flatter
- Concave distofacial line angle



Figure 5.04 Mandibular Canine
Mesial/Distal View

Incisal View

- Faciolingual dimension wider than mesiodistal dimension
- Cingulum is slightly more distal
- The cusp tip positioned slightly lingual and mesial
- Slight distal twist



Figure 5.05 Mandibular Canine
Occlusal View

Pulp

- 1 pulp horn in the pulp chamber
- One pulp canal (70% incidence)
- Two pulp canals (30% incidence)
 - Associated with deep root flutes

Root

- The oval shape at the cross-section
- Bifurcation possible
- The longest root of all mandibular teeth

MAXILLARY PREMOLARS

In general, both maxillary premolars shared the following characteristics:

- More oval-shaped from occlusal view compared to mandibular premolars

1 Maxillary 1st Premolar

Development

- 4 lobes
 - Mesial-facial
 - Middle-facial
 - Distal-facial
 - Lingual lobe

Facial View

- Pentagonal shape of crown
- The cusp tip is distally inclined
- Mesial cusp ridge longer than distal cusp ridge
- Concavity on the mesial side of the CEJ

INBDE Pro-Tip:

For all premolars, the height of contour is at the following locations

- Mesial = junction of occlusal and middle third
- Distal = middle third

Lingual View

- Narrower than facial aspect
- The lingual cusp inclined more mesial
- Lingual cusp shorter than the buccal cusp
 - Usually 1mm shorter
- Large and pronounced cingulum and lingual ridge
- 2 Triangular fossa
 - Fossa bordered by lingual ridge and cusp ridges

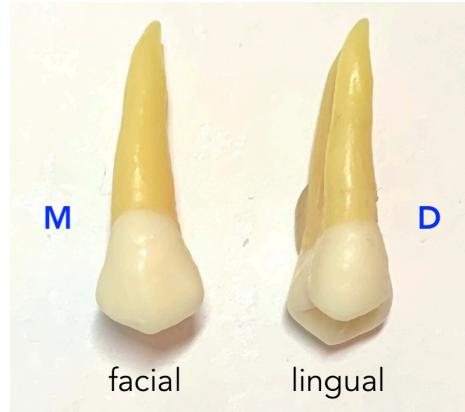


Figure 6.01 Maxillary 1st Premolar Facial/Lingual View

Mesial View

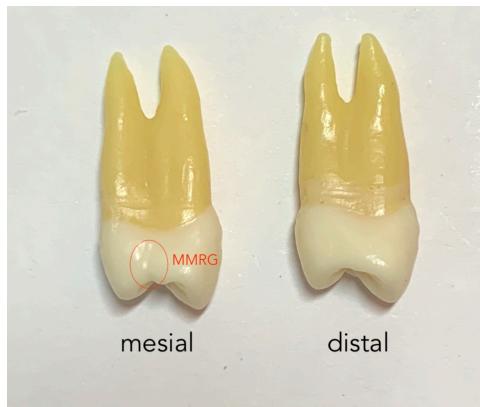
- Trapezoid crown shape
- Buccal and lingual cusp tips line up with the corresponding root tips
- Height of contour
 - Facial = cervical third
 - Lingual = middle third
- Proximal contact located more distally = lingual embrasure larger than buccal
- The mesial marginal ridge is flat and nearly perpendicular to long axis
- **Mesial marginal ridge groove**
 - exclusively seen on maxillary 1st premolars*
- Observe root bifurcation
- Deep root flute

INBDE Pro-Tip:

All maxillary posterior tooth crown's are trapezoid shaped

Distal View

- Root flute deeper on mesial*
- CEJ is flatter compared to mesial
- Distal marginal ridge groove very small/absent



**Figure 6.02 Maxillary 1st Premolar
Mesial/Distal View**

Occclusal View

- Crown tapers lingually
- The faciolingual dimension is slightly wider than mesiodistal dimension
- Distofacial line angle more sharp, and the Mesiofacial line angle is more rounded
- Cusp tip position relative to the midline of the tooth
 - Facial cusp tip = slightly distal
 - Lingual cusp tip = slightly mesial
- **Occlusal table** - area of occlusal surface within cusp tips that contacts with opposing tooth
 - Boundaries = mesial + distal cusp ridges, marginal ridges (all 4 sides)
 - ~55% of occlusal surface
 - The distal marginal ridge is longer than the mesial marginal ridge
- **Central groove** - connects mesial and distal pits, developmental groove
 - Always more linguinally positioned
- Triangular ridge
- Triangular fossa

Pulp

- 2 pulp horns in the pulp chamber
- One pulp canal (10% incidence)
- Two pulp canals (85%)
 - The only non-molar tooth that has 2 roots
- Three pulp canals (5%)

Root

- Kidney-bean shape at a cross-section at mid-root
 - Corresponds to deep root flute on the mesial surface

2

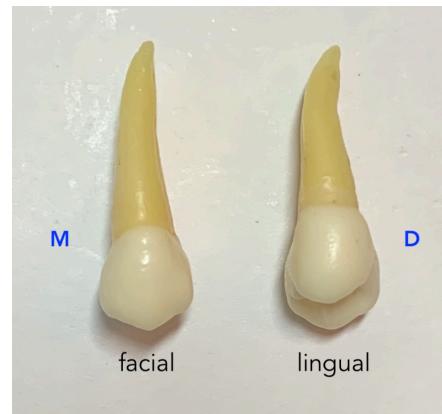
Maxillary 2nd Premolar

Facial View

- Flatter compared to maxillary 1st premolar
 - Buccal cusp
 - Cervical line
- No mesial concavity

Lingual View

- Less lingual taper compared to other teeth



**Figure 6.03 Maxillary 2nd Premolar
Facial/Lingual View**

- The lingual cusp is nearly as tall as the buccal cusp

Mesial View

- No mesial marginal ridge groove
- No root bifurcation (single root)

Distal View

- The distal marginal ridge is shorter than the mesial marginal ridge.

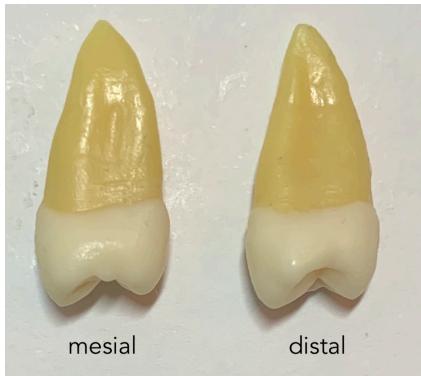


Figure 6.04 Maxillary 2nd Premolar
Mesial/Distal View



Figure 6.05 Maxillary Premolar
Occlusal View

Occlusal View

- Shorter central groove
 - Makes marginal ridges appear thicker
 - More centrally positioned
- Wrinkly appearance
 - More secondary anatomy/supplemental grooves

Pulp

- 2 pulp horns in the pulp chamber
- One pulp canal (~53% incidence)
- Two pulp canals (~47% incidence)

Root

- The oval shape at the cross-section

MANDIBULAR PREMOLARS

1

Mandibular 1st Premolar

Facial View

- Smallest out of all the premolars
- The crown is a pentagon shape

Lingual View

- **Mesiolingual developmental groove**
 - Appears at linguomesial line angle
 - Defining characteristic of mandibular first premolar

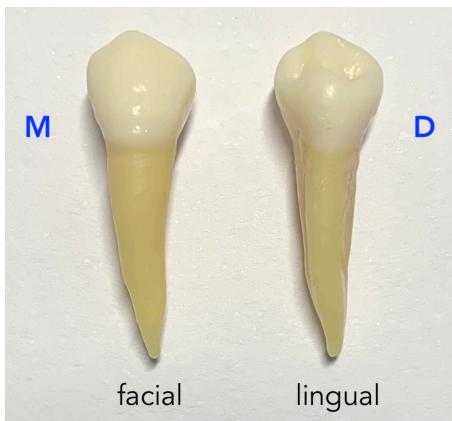


Figure 7.01 Mandibular 1st Premolar Facial/Lingual View

Mesial View

- The lingual cusp is much shorter than buccal
 - The biggest difference in cusp height out of all the teeth.
- Parallelogram-shaped crown that leans toward lingual
- The buccal cusp tip lines up with the root apex
- Facial surface curves backward

INBDE Pro-Tip:

All mandibular posterior tooth crown's are parallelogram-shaped crown

Distal View

- Root flute flatter than mesial
- CEJ is flatter compared to mesial
- Distal marginal ridge groove shorter than mesial

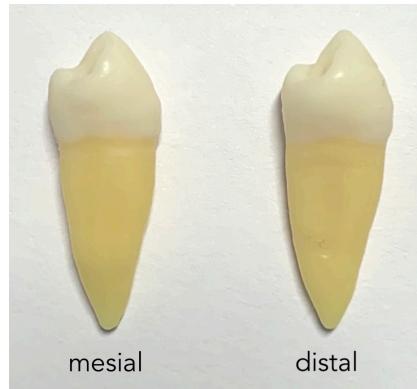


Figure 7.02 1st Mandibular Premolar Mesial/Distal View

Occlusal View

- **Transverse ridge**
 - Very prominent
 - Unique to this tooth
 - Creates distant mesial and distal pits
- **Mesiolingual developmental groove**
 - Can observe from an occlusal view too

Pulp

- 1 or 2 pulp horns in pulp chamber
 - 1 pulp horn often occurs when the lingual cusp is very short
- One pulp canal (~70% incidence)
- Two pulp canals (~30% incidence)

Root

- Bean shape at cross-section at mid-root
 - Corresponds to deep root flute on the mesial surface

2 Mandibular 2nd Premolar

Facial View

- Compared to the other premolars
 - Wider
 - Less tapered
 - Cusp tips flatter
- Looks more like a molar compared to the additional premolars

Lingual View

- 2 lingual cusp
 - Mesial taller than distal
 - Lingual groove** - separates the two cusps

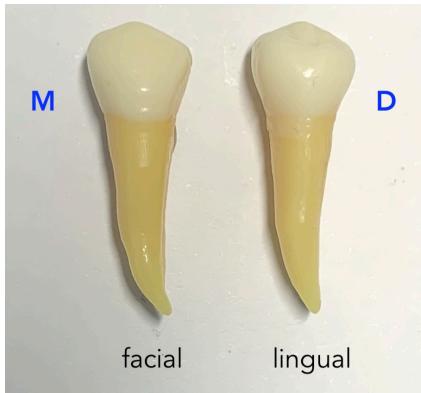


Figure 7.03 Mandibular 2nd Premolar Facial/Lingual View

- Central pit
- Lingual groove**
- Crown forms
 - Y-type** - most common
 - 1 facial cusp, 2 lingual cusps, 3 pits
 - Develops from 5 lobes
 - U-type** - less common
 - 1 facial cusp, 1 lingual cusp, crescent groove
 - Develops from 3 lobes
 - H-type** - less common
 - 1 facial cusp, 1 lingual cusp, flat groove
 - Develops from 3 lobes



Figure 7.04 Mandibular 2nd Premolar Mesial/Distal View

Mesial View

- Parallelogram-shaped crown
- Buccal cusp tip not entered over root apex
- Lingual cusp tip larger than 1st premolar
- Root depression absent

Distal View

- The distal marginal ridge is shorter than the mesial marginal ridge
- CEJ flatter
- Root flute present

Occlusal View

- Pentagon-shaped
- Unique to this premolar
 - Multiple lingual cusps**



Figure 7.05 Mandibular Premolar Occlusal View

Pulp

- 2 or 3 pulp horns in pulp chamber
 - 2 - U or H type
 - 3 - Y-type
- One pulp canal (85% incidence)
- Two pulp canals (15% incidence)
- Premolar most likely to have 1 root and 1 canal

Root

- Oval shape at the cross-section
- Apex is closest to the mental foramen

MAXILLARY MOLARS

1

Maxillary 1st Molar

Facial View

- Trapezoid-shape of crown
- MB cusp wider than DB cusp
- DB cusp is taller than MB cusp
- Buccal groove
 - Aligns with the center of the tooth
 - Aligns with palatal root
- Roots diverge outward/ spread out

INBDE Pro-Tip:

For molars, the buccal and lingual groove migrates more distally for the more posterior molar

Lingual View

- **Cusp of Carabelli**
 - Unique to maxillary first molar
 - Attached to ML cusp
 - From 5th developmental lobe
 - It may not be present on the tooth
- Lingual groove
 - Aligns with palatal root along the center of the tooth

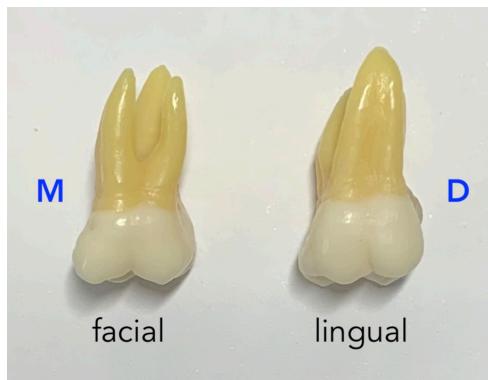


Figure 8.01 Maxillary 1st Molar Facial/
Lingual View

Mesial View

- Trapezoid-shaped crown
- P root longest
- MB root widest
 - Associated with spaces needed for 2 pulp canals
- DB root shortest

Distal View

- Shorter marginal ridge
- Flatter CEJ
- DB root is shorter than MB root

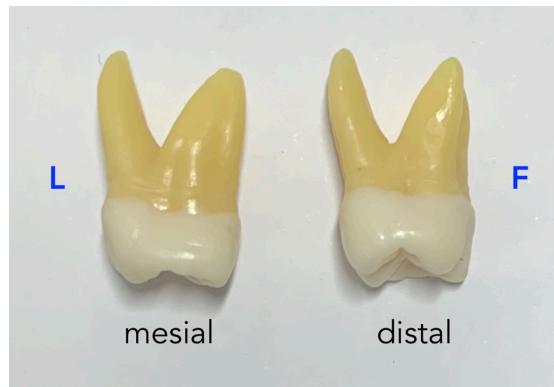


Figure 8.02 Maxillary 1st Molar Mesial/
Distal View

Occlusal View

- Parallelogram-shaped occlusion table (leans mesial)
- **Oblique ridge**
 - Connect DB cusp to ML cusp
 - Provides strength to the tooth
 - Preference to avoid breaking through during cavity preparations
- **Primary cusp triangle**
 - ML cusp, DF, MF cusp
- The lingual side is wider than buccal
 - Due to convergence towards buccal
 - Often the only tooth wider in lingual than buccal

- The mesial side is wider than the distal side
- Fossa
 - Central fossa
 - Mesial triangular fossa
 - Distal triangular fossa
 - Distal fossa
- Grooves
 - Central groove
 - Runs from mesial pit to central pit
 - Buccal groove
 - Runs from the central pit down to the buccal surface
 - Lingual groove connect to distal oblique grooves and end at the distal pit
 - Transverse groove
 - Connect central and distal pit
 - Not a distinct groove

Cusps

- Maxillary posterior teeth
 - Buccal cusps = non-holding cusp, push cheek outward
 - Shorter, flatter, more tooth structure
 - Lingual cusps = holding cusp
- Mandibular posterior teeth
 - Buccal cusps = holding cusp
 - Shorter, flatter, more tooth structure
 - Lingual cusps = non-holding cusp push the tongue out of the way

Pulp

- 4 pulp horns in pulp chamber
- Four pulp canals (70% incidence)
- Three pulp canals (30% incidence)
 - The only non-molar tooth that has 2 roots
- Canal orifices located on the mesial side of the tooth
 - MB2 canal hard to locate

Root

- Root trunk height
 - Distal > Buccal > Mesial
- Root apices located around the floor of the maxillary sinus
- Parallelogram shape at cross-section at mid-root

- Corresponds to deep root flute on the mesial surface

2

Maxillary 2nd Molar

The maxillary first and second molars have very similar anatomy. The following are some ways to differentiate the second molar from the first molar.

Facial View

- Compared to the maxillary first molar:
 - The facial groove is more distally positioned (due to the smaller distal cusp)
 - Root more vitally inclined
 - Root trunk is longer
 - Roots closer together and more parallel with each other

Lingual View

- Less lingual, more distally positioned
- Palatal root convex



Figure 8.03 Maxillary 2nd Molar Facial/Lingual View

Mesial View

- The palatal root is shorter than the first molar
- The palatal root stays within the periphery of the crown

Distal View

- The distal marginal ridge is shorter than the mesial marginal ridge
 - CEJ flatter

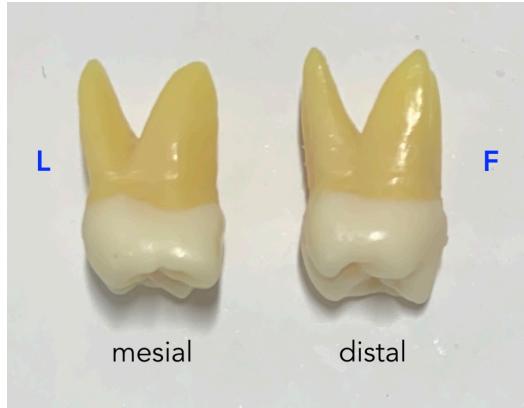


Figure 8.04 Maxillary 2nd Molar Mesial/ Distal View

Occlusal View

- Primary cusp triangle (similar to the first molar)
- No cusp of Carabelli
- 3-cusp variant possible
 - No DL cusp
 - Heart-shaped tooth
- DL groove longer than 1st molar
- Transverse groove more distinct than 1st molar

Pulp

- 3 or 4 pulp horns in pulp chamber
- One pulp canal (~10% incidence)
- Two pulp canals (~12% incidence)
- Three pulp canals (~60% incidence)
- Four pulp canals (~18% incidence)

Root

- Triangle or parallelogram shape at the cross-section

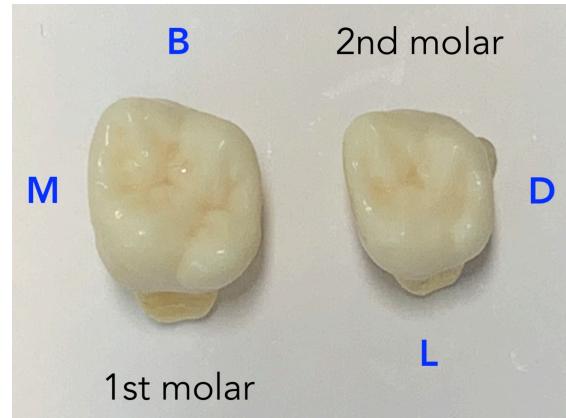


Figure 8.05 Maxillary Molars Occlusal Anatomy

MANDIBULAR MOLARS

1 Mandibular 1st Molar

Facial View

- Double-rooted, spread out
- Cervical ridge
- Two buccal grooves (MB, DB)
 - Unique to this tooth
 - Facial pits often present at the end of the groove
 - It can be deep (opportunity for sealant)
- Flatter buccal cusps
- Tall lingual cusps

Lingual View

- Height of contour
 - Higher than buccal surface
 - Prominence allows the tongue to be held back
- Lingual groove
 - Short and shallow
 - Lingual pit uncommon



Figure 9.01 Mandibular 1st Molar
Facial/Lingual View

Mesial View

- Biconcave root - deep root flute on both distal and mesial sides of the mesial root

Distal View

- Shorter marginal ridge

INBDE Pro-Tip:

For the mandibular first molar, there are 3 cusps on the buccal side. For the maxillary first molar, there are 3 cusps on the lingual side



- Narrower distal root compared to the mesial

Figure 9.02 Mandibular 1st Molar
Mesial/Distal View

root

Occlusal View

- Pentagon-shaped occlusal table
- Buccal half wider than lingual half
- The mesial half is wider than the distal half
- The occlusal table has the largest area out of all teeth
- 3 buccal cusps
- Crown forms
 - Y5 - most common
 - Grooves - buccal, distobuccal, lingual, central

Pulp

- 5 pulp horns in pulp chamber
- Three pulp canals (70% incidence)
- Four pulp canals (30% incidence)

Root

- Longest roots out of all the molars
- Root trunk height
 - Lingual > Buccal
- Rectangular shape at cross-section at CEJ (includes both roots)

2 Mesial root cross-section in ribbon-shaped

Mandibular 2nd Molar**Facial View**

- Smaller than the first molar
- Two buccal cusps
 - Buccal groove dividing the cusps
- Root less divergent, more parallel
- Cervical enamel projection
 - Enamel extends into the furcation
 - Most likely tooth to have one



Figure 9.04 Mandibular 2nd Molar
Mesial/Distal View

Lingual View

- Lingual cusps are taller than buccal cusps
- Short lingual groove in line with furcation



Figure 9.03 Mandibular 2nd Molar
Facial/Lingual View

Mesial View

- Parallelogram-shaped crown leaning lingual
- Height of contour
 - Buccal = cervical third
 - Lingual = middle third

Distal View**Occlusal View**

- Rectangular
- Mesiobuccal cervical bulge
 - Helps indicate if the molar is on the right or left side of the arch
- The mesial side is wider than the distal side
- Mesial surface more square
- Distal surface round/convex
- Crown forms
 - +4 - most common
 - 4 cusps
 - Grooves make a + shape
 - 3 pits - mesial, central, distal

Pulp

- 4 pulp horns in pulp chamber
- Two pulp canals (23% incidence)
- Three pulp canals (71% incidence)
- Four pulp canals (6% incidence)

Root

- Root trunk height
 - Lingual > Buccal
- Rectangular-shaped cross-section at CEJ
- The mesial root cross-section is ribbon-shaped

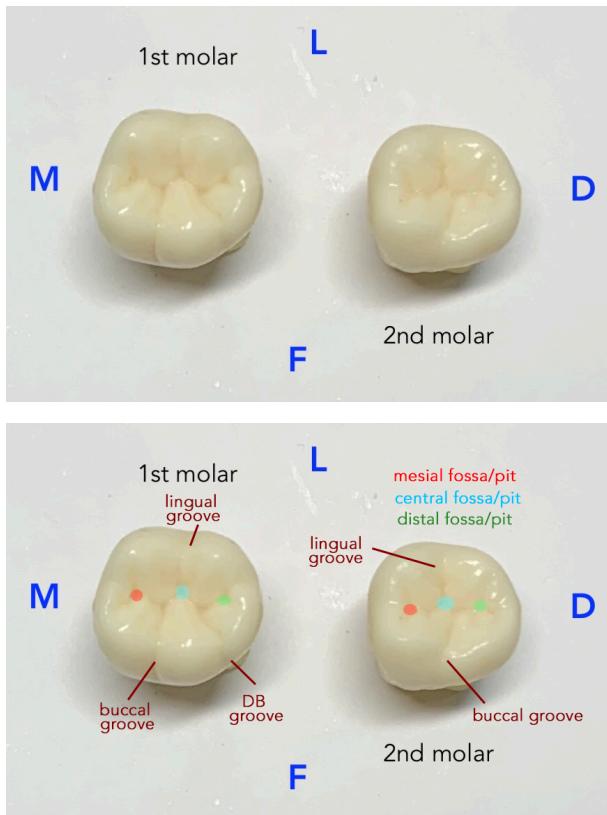


Figure 9.05 Mandibular Molars
Occlusal View

THIRD MOLARS

The 3rd molars are often referred to as "wisdom teeth." It is the most common missing tooth, with up to **35%** of people missing at least 1 wisdom tooth. On the other hand, up to **90%** of patients have at least one wisdom that is impacted.

1

Maxillary 3rd Molar

Features

- Most frequently 3 cusps
- Heart-shaped occlusal table
- Shortest crown of all the molars
- Convergent and tapered roots

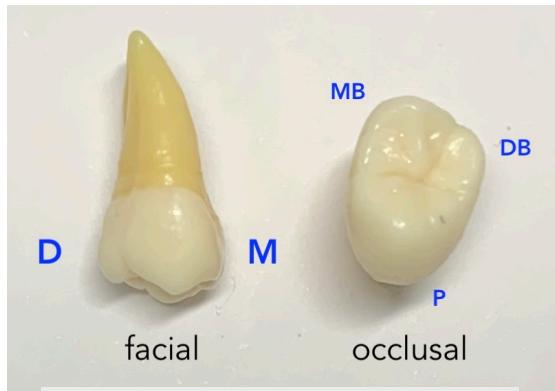


Figure 10.01 Maxillary 3rd Molar

2

Mandibular 3rd Molar

Features

- Most variable morphology out of all the teeth of the mouth
- Roots
 - Shortest roots out of all the posterior teeth
 - Most distally inclined of all the teeth
 - Convergent and tapered



Figure 10.02 Maxillary 3rd Molar

OCCLUSION

Now that we have discussed each permanent tooth individually, it is important to understand how all the teeth function together. **Occlusion** refers to the relationship between teeth when the mandible and maxilla come together. A good way of understanding occlusion is by looking at it in 3-dimensions along the 3 planes of spaces. The planes of space can be explained by the following picture:

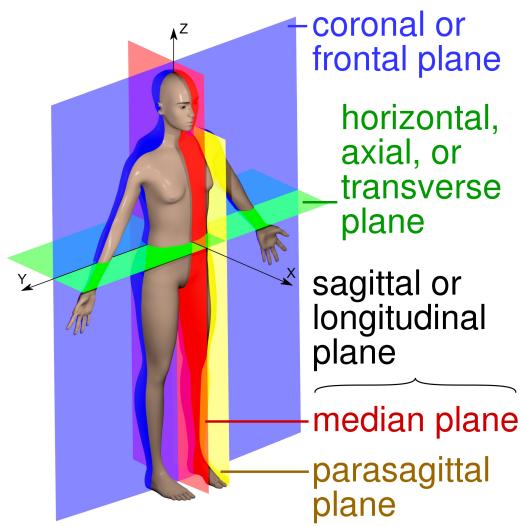


Figure 11.01 Planes of Spaces

1

Coronal Plane

The following occlusal observations can be seen from the coronal plane:

- Functional cusps are contacting the opposing tooth
 - Maxilla - lingual cusp
 - Mandible - buccal cusp
- Non-functional cusps are not contacting the opposing tooth.
 - Maxilla - buccal cusp

- Mandible - lingual cusp
- taller and sharper
- Hold cheeks and tongue away from the bite
- The following are seen more frequently when non-functioning cusps are in occlusion (ex., Posterior crossbite)
 - TMD
 - Recession
 - Abfraction

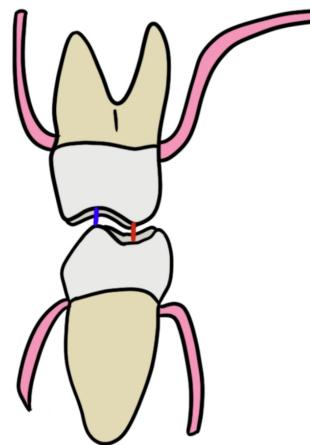


Figure 11.02 Coronal Plane of Occlusion

INBDE Pro-Tip:

The acronym BULL can be used to remember the non-functional cusps.
Buccal Upper Lingual Lower

- Cheek biting

2

Axial Plane

The axial plane allows us to see the occlusal surfaces of each tooth in one arch (upper or lower).

- **Facial range of occlusion**

- Arch of occlusion that represent facial cusps of the lower arch

- **Lingual range of occlusion**

- Arch of occlusion that represent the lingual cusps of the upper arch

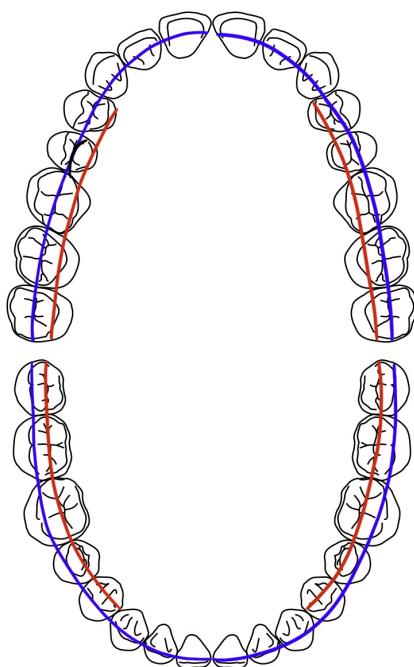


Figure 11.03 Axial Plane of Occlusion

- One zig-zag between the lines
- Represent the lingual side of the maxillary arch
- Lower arch - 9 parallel lines
 - First, parallel in line with most posterior cusp tip from the upper arch, then skip one cusp and draw the next parallel line on the adjacent cusp tip
 - 3rd parallel line before the cusp tip of the 1st upper molar
 - Next 5 lines in line with premolar and anterior cusp tips of the upper arch
 - The last parallel line is flush with the parallel from the upper
 - Represent the buccal side of the mandibular arch

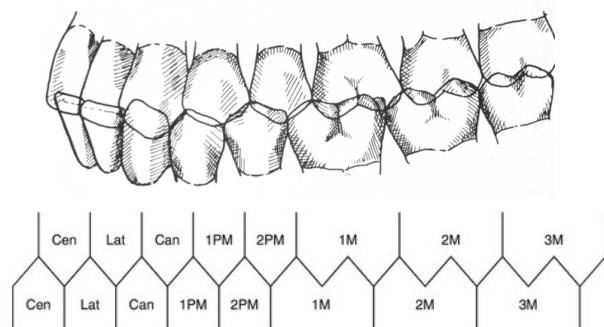


Figure 11.04 Picket Fence Method

Sagittal Plane

3

The sagittal plane in ideal occlusion can be memorized by the **picket fence method**.

- Upper arch - 9 parallel lines

- First 4 farther apart (molars)
 - Two zig-zags between the lines
- Next 5 closer together (premolars + anteriors)

- Can use the diagram to identify the ideal occlusal relationships between teeth
 - Example #1: Central fossa of mandibular second molar contacted by ML cusp of the maxillary second molar
 - Example #2: Distal marginal ridge of mandibular canine contacted by the mesial marginal ridge of maxillary canine

INBDE Pro-Tip:

The Maxillary canine is the only tooth that contact an anterior and posterior opposing tooth in ideal occlusion (this is a high yield question).

WORKING MOVEMENT

The maxilla is fixed to the skull and cannot move independently. On the other hand, the mandible is not attached to the skull. Therefore, the lower arch can move together independently on the maxilla. The side the mandible shifts towards is called the “**working side**,” and the side it is shifting away from is the “**non-working side**” or “**balancing side**.” This is important because the way the teeth contact is different between the two movements.

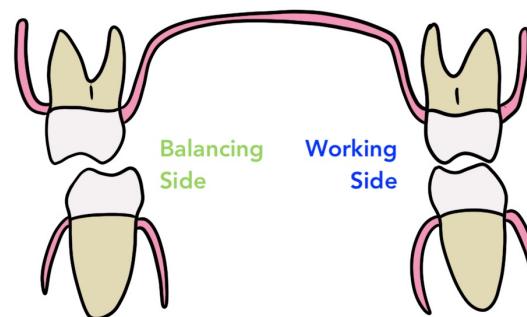


Figure 12.01 Coronal View of Working Movement

1 Coronal Plane

The following occlusal observations can be seen from the coronal plane during working movement:

- Movement to one side (left or right)
 - Working side contacts

Maxilla	Mandible
Buccal cusp (lingual incline)	Buccal cusp (buccal incline)
Lingual cusp (lingual incline)	Lingual cusp (buccal incline)

- Balancing side contacts

Maxilla	Mandible
Lingual cusp (buccal incline)	Buccal cusp (lingual incline)

- During the occlusion, check for restoration, crown, etc.
 - Contact between functional cusps is very desirable
 - Working side contacts are desirable
 - Balancing side contacts are not desirable
 - Contact between non-functioning cusps is strongly undesirable

INBDE Pro-Tip:

Common tested concept: The common balancing side interference comes from the palatal cusps of maxillary second molars.

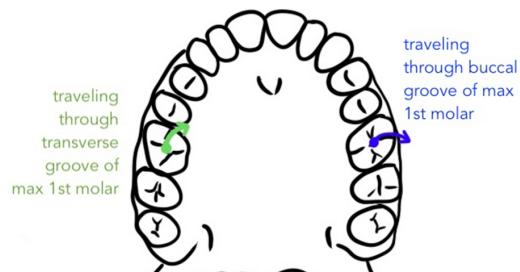
2 Axial Plane

Lateral Movement

- Working side
 - Condyle rotates towards the working side
 - Bennett movement takes place
 - DB cusp of mandibular first molar travels from the central fossa of maxillary first molar to its buccal groove
- Balancing side
 - Condyle slides down the articular eminence
 - Bennett angle
 - DB of the mandibular first molar travels through the transverse groove of the oblique ridge of the maxillary first molar.

Protrusive movement

- Both condyles are moving forward.
- DB cusp of mandibular first molars traveling through central groove and mesial marginal ridge of the maxillary first molar



Balancing Side

Working Side

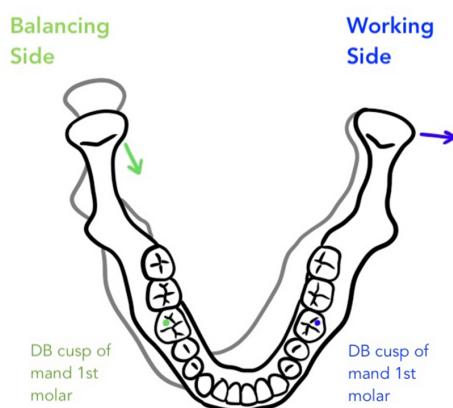


Figure 12.02 Axial View of Working Movement