

Dental Anatomy

Posterior Teeth



This study guide will help you review the characteristics of permanent posterior teeth.

Maxillary 1st Premolar- Facial View

Crown: root (and ratio)	8.6 : 13.4 (1: 1.6 ratio)
FL:MD	FL>MD; FL is 9.0 and MD is 7.0
Facial cusp vs root axis	Slightly distal
Facial cusp sharpness compared to PM2	Sharper than PM2
Facial cusp M vs D slope	M slope > D slope
Facial ridge	Prominent- usually have M and D depressions on either side of Facial ridge
Facial cusp cutting arms	M cutting arm longer than D cutting arm
CEJ (basis of breadth)	Narrow compared to strong shoulders (2mm difference)
Mesial outline	Convex at contact; concave below contact
Distal outline	Convex at contact; concave below contact
Mesial contact	Junction
Distal contact	Junction

Maxillary 1st Premolar- Lingual View

Crown taper	Prominent taper to lingual, so proximal surfaces are visible
MMR vs DMR	MMR more occlusal (higher elevation) than DMR
Lingual cusp	Towards mesial and is shorter by about 1mm than the facial cusp

Maxillary 1st Premolar- Proximal View

Geometry	Trapezoidal
Facial cusp vs Lingual cusp	F>L (height)
Cusps location vs root	Both are centered over root
Occlusal table	Centered over root
Facial height of contour	Cervical third
Lingual height of contour	Middle third
Root description	Has bifurcation (arch between the two roots), intra-radicular depression, and root trunk
Root: mesial view	More depression
Root: distal view	Depression
Crown (Mesial view)	Mesial marginal groove and mesial coronal depression (coronal concavity is not good for the tooth because it's harder to keep clean)
Number of roots	2
Number of root canals	Usually 2 but can have 1-3

Maxillary 1st Premolar- Occlusal View

Geometry	Tapered hexagon
Cusp tip	Located over crown/root
Facial cusp	Slightly distal
Lingual cusp	More mesial
MR Taper	Tapers to lingual
MMR vs. DMR (length)	MMR < DMR (length)
Occlusal table perimeter	Cutting arms + MR
Occlusal table geometry	Trapezoidal
Occlusal table location	Over root
Ridges	2 triangular ridges and 1 transverse ridge
Fossae	1 M and 1 D
Grooves	Central groove- runs from mesial pit to distal pit Mesial marginal groove- from mesial pit over MMR

Maxillary 2nd Premolar- Facial View

Crown:root (and ratio)	7.7 : 14 (1:1.8 ratio) root almost 2x crown length
FL vs MD	FL > MD; FL is 9.0 and MD is 7.0
Facial cusp vs root axis	Slightly mesial
Cusp sharpness	Not as sharp
Facial ridge	Less prominent- less likely to have M and D depressions
M slope vs. D slope	M slope < D slope
CEJ breadth	Broader than PM1; less prominent shoulders
Mesial outline	Convex at contact; concave below contact
Distal outline	Convex at contact; concave below contact
Mesial contact	Junction
Distal contact	Junction

Maxillary 2nd Premolar- Lingual View

Crown taper	Tapers less to lingual; little of proximal surfaces visible
MMR vs. DMR	MMR more occlusal than DMR
Lingual cusp	Towards mesial, shorter than facial cusp, but not as short as PM1

Maxillary 2nd Premolar- Proximal View

Geometry	Trapezoidal
Facial cusp vs Lingual cusp	F>L (height)
Cusps location	Both are centered over root
Occlusal table	Centered over root
Facial height of contour	Cervical third
Lingual height of contour	Middle third
Number of Roots	1
Root description	No bifurcation
Root- mesial view	Depression
Root- distal view	More depression
Crown	No marginal groove or coronal depression

Maxillary 2nd Premolar- Occlusal View

Geometry	Oval
FL vs. MD	FL > MD
Cusp tip location	Located over crown/root
Facial cusp location	Slightly mesial
Lingual cusp location	Mesial
MR taper	Less taper to lingual
MMR vs. DMR	MMR ~ DMR
Occlusal table geometry	Slightly trapezoidal / rectangular
Ridges	2 triangular ridges and 1 transverse ridge
Fossae	1 M and 1 D
Grooves	Central groove (no MMG)
Other features	Wrinkled; supplemental grooves

Mandibular 1st Premolar- Facial View

Crown: root (and ratio)	8.8: 14.4 (1:1.6 ratio)
FL vs. MD	FL > MD, less than maxillary 7.5 and MD is 7.0
Facial cusp vs. Root axis	Slightly mesial
Facial cusp M slope vs. D slope	M slope < D slope (almost bilaterally symmetrical; Notches on M cutting arm of facial cusp)
Facial cusp sharpness compared to PM2	Sharper than PM2
Facial ridge	Prominent; has a M notch
CEJ breadth	Narrow cervix
Crown tilt	Crown tilts distal
Mesial contact	Junction
Distal contact	Junction

Mandibular 1st Premolar- Lingual View

Crown taper	Tapers to lingual
MMR vs. DMR	MMR more cervical than DMR MMR < DMR (elevation) MMR is 45 degrees to long axis DMR is perpendicular to long axis
Lingual cusp	Very small and pointy
Grooves	ML groove present most of the time
Facial cusp	Almost centered over root; huge triangular ridge

Mandibular 1st Premolar- Proximal View

Geometry	Rhomboidal- tilts lingually
Facial cusp vs. Lingual cusp	F > L
Facial cusp location	Centered
Lingual cusp location	In line with root
Facial cusp and Lingual cusp height difference	3mm
Crown tilt	Over root to lingual
Transverse ridge	Prominent
Triangular ridge of facial cusp	Slopes 45 degrees to long axis
Triangular ridge of lingual cusp	Parallel to horizontal
Occlusal table	Not centered over root- more on lingual
Root numbers	1
Root description	Furcation possible
Root: mesial view	Depression (not common)
Root: distal view	Depression (more often)
Grooves	Usually have ML groove

Mandibular 1st Premolar- Occlusal View

Geometry	Diamond
Cusp tip	Facial cusp centered FL
MR taper	Taper to lingual
Occlusal table geometry	Triangular
Ridges	2 triangular ridges and 1 transverse ridge
Fossae	1 M and 1 D
Grooves	No central groove; ML groove
Cross-sectional shape	Ovoid
Shape of pits	Snake eyes

Mandibular 2nd Premolar- Facial View

Crown: root (and ratio)	8.2: 14.7 (1:1.8) root almost 2x crown length
FL vs MD	FL>MD, less than maxillary FL is 8.0 and MD is 7.0
Facial cusp location	Slightly mesial
Facial cusp M slope vs D slope	M slope < D slope
Facial cusp sharpness compared to PM1	Not as sharp as PM1
Facial ridge	Almost no facial ridge
CEJ breadth	Wider cervix
Mesial contact	Junction
Distal contact	Junction

Mandibular 2nd Premolar- Lingual View

Crown taper	(2 cusp) tapers to lingual (3 cusp) taper to facial or no taper
MMR vs. DMR	MMR > DMR (elevation) for both
Lingual cusp(s) and locations	(2 cusp) mesially located (3 cusp) ML cusp is more prominent than DL cusp)
Root taper	Lingual for both
Grooves/depression	(2 cusp) lingual depression sometimes between DMR and lingual cusp (3 cusp) wide MD and has lingual groove (not fissured, more like a depression)

Mandibular 2nd Premolar- Proximal View

Geometry	Rhomboidal- less than PM1
Facial cusp vs Lingual cusp	F>L
Facial cusp location	Facial cusp not centered (1/3)
Lingual cusp location	Lingual cusp in line with root
Number of roots	1
Root: mesial view	Depression (not common)
Root: distal view	Depression (more often)
Number of root canals	1

Mandibular 2nd Premolar- Occlusal View

Geometry	Oval (2 cusps) and square (3 cusps)
Cusp tips	F cusp in facial 3rd (2) Lingual cusp is mesial or centered (3) ML > DL
MR taper	(2) Tapers lingually (3) Tapers facially/parallel
Occlusal table geometry	(2) ovoid and (3) square
Ridges	(2) 2 triangular and 1 transverse (3) 3 triangular
Grooves	(2) Central groove; H and U patterns (3) Central fossa, central pit; Y pattern
Cross sectional shape	Ovoid (for both)

Maxillary Molars

General characteristics

- Maxillary molars make up a maximum of 44% of the Max quadrant
 - If our M1 were gone, we would lose 80 mm squared of chewing surface
- Occlusal view
 - Shaped like parallelograms- with **MD < FL**
 - M1 is larger than M2 (both MD and FL lengths)
 - All **taper to lingual except Max M1**
- All **taper distally**
- Usually 4 major cusps with an **oblique ridge “mother loves dear boy” → ML to DB**
 - Sometimes M2 has 3 cusps, but still has what appears to be an oblique ridge (not an oblique ridge, but a triangular ridge and DMR)
- 3 Roots: Palatal (L) > MF > DF
 - Roots are about 2 times longer than the crown
 - **Root trunks** are longer on the maxillary molars than on the mandibular molars
- Crown tilts
 - **Crowns do not tilt to the distal or lingual**
- When the cusp of Carabelli is large, it can have pulpal content.
- The trigon contains the majority of the pulpal content. It usually gets smaller as you move proximally

Cross Sections

- 3 roots
- 4 canals
- MB root- M + D depression
- Lingual root- L depression
- M2 root trunk > M1
- Max root trunk > Mand root trunk
- Note: on Max M1 and Max M2
 - L root canal is centered in the root
 - MF root canals are more F than DF root canal
 - The 2 canals of MF cusp are oriented F-L of each other
 - **Furcal depression** on the D surface of the MF root is more pronounced than its M root surface depression

Maxillary Molars- Facial View

	Max M1	Max M2	Max M3
Geometry	Trapezoidal	Trapezoidal	Trapezoidal
Crown: Root	(L) 7.5: 13.7 (MF) 7.5: 12.9 (DF) 7.5: 12.2 Crown width ~ root width unless roots don't follow rules	(L) 7.5: 13.5 (MF) 7.5: 12.9 (DF) 7.5: 12.1	Very variable Max M3 is the most variable tooth in the mouth
Cusps	3 out of 4 cusps visible ML > MF > DF > DL (length) ML cusp sometimes visible DL cusp not visible	4 cusps (can have 3 cusps) MF > DF ML cusp sometimes visible	3 cusps (can have 1-8 cusps) L > MF > DF
Roots	L > MF > DF Difference in root length is 0.75 mm each time MF and DF look like plier handles MF root apex is aligned with or distal to the F groove	L > MF > DF MF and DF roots have a distal sweep and are closer together than in M1 "Ballerina Tooth"	3 roots are fused near apex with a distal bend
CEJ	Straight or dipped apically	Straight or dipped apically	
Root trunk	Slight depression	Depression Size of trunk: larger than M1	Largest root trunk
F groove	Longer than M2 Sometimes ends in a pit	Shorter than M1 Rarely ends in a pit	Short Rarely ends in a pit
Contact Area	M- occlusal D- middle	M- occlusal D- middle	M- middle/junction
D surface	Flat at CEJ Convex surface towards occlusal		

Maxillary Molars- Lingual View

	Max M1	Max M2	Max M3
Taper	Either parallel or tapers to the F MD (L) $\geq$ MD (F)	Tapers to L since DL cusp is so small	
Cusps visible	ML, DL, cusp of Carabelli (not always present) ML is the largest and most occlusal (Cusp of Carabelli- 2 mm cervical to ML cusp tip)	ML and DL ML > DL Less likely to have cusp of Carabelli	L cusp
L groove	In line with root depression Can end in a pit Is part of the D oblique groove from the occlusal	Distally located Rarely ends in a pit	No groove
Root	Palatal Root Depression	No depression	Fused roots- variable
CEJ	Straight or dipped apically Can have a slight depression on the D cervical surface	Straight or dipped apically	

Maxillary Molars- Proximal View

	Max M1	Max M2	Max M3
Geometry	Trapezoid	Trapezoid	Trapezoid
Cusps visible	From M: only MF, ML, and cusp of Carabelli From D: all cusps are visible	From M: MF and ML From D: all cusps are visible (both 4 and 3 cusp types)	From D: most of the occlusal surface is visible
Root visibility	From M: MF and L From D: all roots visible	From M: MF and L From D: all roots visible	Furcation may be missing. Fused roots taper to D
MF Root	Wide FL Has 1 depression and 2 root canals	Less broad than M1	
L root	Extends beyond crown outline	More in line with crown	
MMR	Many tubercles	Fewer tubercles than M1	
DMR	Few tubercles	Fewer tubercles than MMR	More apical than MMR
Heights of contour	F: cervical L: middle	F: cervical L: middle Less pronounced than M1	F: cervical L: middle
Notes	No lingual and distal tilt of crown to root	L root is more in line with the crown compared to M1	From D: most of the F surface can be seen because of the small DF cusp CEJ on D surface is more straight than M surface

Maxillary Molars- Occlusal View

	Max M1	Max M2	Max M3
Geometric outline	Rhomboidal ML- obtuse angle MF- acute angle	4 cusp: square/twist rhomboid 3 cusp: heart shaped; no talon	Heart shaped- very wrinkled
Cusps	4 cusps + cusp of Carabelli	4 cusp or 3 cusp (L, MF, DF)	3 cusps usually (talon usually missing) (L, MF, DF)
MR	MMR > DMR	MMR ~ DMR	
Occlusal table	Trigon- MB + DB + ML cusps + oblique ridge Talon- DL cusp + DMR	Trigon- MB + DB + ML cusps + oblique ridge Talon- not necessarily present on M2 Trigon on 3 cusp type too	Not necessarily has a talon
Triangular ridges	1 ridge: MF, DF, DL 2 ridges: ML Total= 5	4 cusp type: Total= 5 1 ridge: MF, DF, DL 2 ridges: ML 3 cusp type: Total= 4 1 ridge: MF, DF 2 ridges: L	
Oblique ridge	ML-DF	ML-DF (4 cusp) Is the DMR (3 cusp)	Not pronounced, often missing
Transverse ridge	ML-MF	ML-MF (4 cusp) L-MF (3 cusp)	
Fossae	A= Mesial fossa (with M pit) B= Central fossa (with central pit) C= Distal triangular fossa (with D pit) D= Distal oblique fossa (elongated; no pit) Size: B > D > A > C	4 cusp type: A= Mesial fossa (with M pit) B= Central fossa (with central pit) C= Distal triangular fossa (with D pit) D= Distal oblique fossa (elongated; no pit) Size: B > D > A > C 3 cusp type: Central, Mesial, and Distal fossae with pits	
Grooves	Facial: from central pit to facial surface Central: from mesial pit to central pit Distal oblique- from distal oblique fossa to lingual groove Transverse groove of the oblique ridge- from central pit to distal oblique fossa Groove of the cusp of Carabelli- is only present when the cusp of Carabelli is significantly large	4 cusp type: Facial: from central pit to facial surface Central: from mesial pit to central pit Distal oblique- from distal oblique fossa to lingual groove Transverse groove of the oblique ridge- from central pit to distal oblique fossa 3 cusp type: Facial groove: from central pit to facial surface Central groove: from mesial pit to central pit	Central groove, facial groove A lot of supplemental anatomy
M proximal contact	Facial	Facial	Facial
D proximal contact	Middle	Middle	

Mandibular Molars

General characteristics of mandibular molars

- Mandibular molars make up 51% of the mandibular arch
- Occlusal view- “oblong teeth” with **MD > FL**
- All **taper to lingual and distal**
- Generally 4 major cusps (can have 5th minor cusp)
 - Mandibular M1 can have 4-6 cusps. The 6th cusp is named differently depending on its location:
 - **Tuberculum sextum**- 6th cusp is on DMR
 - **Tuberculum intermedium**- 6th cusp between 2 lingual cusps
 - Mandibular M3 can also have a 6th cusp
- **2 roots** oriented M and D
 - We also find 2 roots in Max PM1, but they are oriented F and L
 - Note: Mandibular molars have shorter root trunks than the Max molars
- **Crown tilts distal and lingual (same in mandibular premolars)**
- **Root tilts distal**

Cross sections

- 2 roots and 3 root canals (mesial root has 2)
 - **M1- 4 canals 35%**
 - **M2- 4 canals 8%**
- Root trunk: M1 < M2
- Furcation closest to cervical line of M1

Mandibular Molars- Facial View

	Mand M1	Mand M2	Mand M3
Geometry	Trapezoidal	Trapezoidal	Trapezoidal
Crown: Root	Roots are 2x crown length	Roots are 2x crown length	
Cusps	5 cusps visible (usually) $ML > DL > MF > DF > D$ (length) Note: when you bite down and run tongue along the lingual surface, the lingual cusps are not in occlusion, so they aren't worn down	4 cusps: $ML > DL > MF > DF$ (length)	Can have 4-6 cusps $MF > DF$ Resembles Mn M2 when it has 4 cusps, but M3 has a more bulbous form
Roots	2 roots: $M > D$ length (1 mm difference) M and D roots are widely separated	2 roots: M root is longer and wider than D root Roots are closer together than Mand M1 and are almost parallel	Roots are close together and pointed, if not fused (can have up to 8 roots) Roots are very short
CEJ	Straight or dipped apically	Straight or dipped apically	Straight or dipped apically
Root trunk	Depression Shorter than Max molars Shorter than Mand M2	Depression Longer than Mn M1	Long root trunk
Grooves	MF groove- separates MF cusp and DF cusp (A)- in line or D to apex of M root; often ends in a pit DF groove- separates DF cusp from D cusp (B)- less likely to end in a pit	Facial groove- can end in a pit	Facial groove
Contact Area	M- junction D- middle	M- junction D- middle	M- junction
D surface	More convex than mesial surface		
Notes	AKA "6 year molar" Longest MD of all teeth (11mm) Twist on M root allows you to see its distal surface Can have 4-6 cusps	AKA "12 year molar"	

Mandibular Molars- Lingual View

	Mand M1	Mand M2	Mand M3
Taper	Tapers to L Along roots and crown	Tapers to L Less taper than M1	Tapers to L
Cusps visible	ML, DL, and D	ML and DL	Lingual cusps (rounded)
L groove	Rarely fissured; more like a depression Does not in a pit Almost in line with root depression You don't normally need to protect it with sealants or restoratives	Rarely fissured; more like a depression Does not end in a pit	No groove
Root	L root trunk > F root trunk CEJ is more occlusal on the L Depression	L root trunk > F root trunk Depression	
CEJ	Straight or dipped apically	Straight or dipped apically	

Mandibular Molars- Proximal View

	Mand M1	Mand M2	Mand M3
Geometry	Rhomboidal	Rhomboidal	Trapezoidal (?)
Cusps visible	From M: MF and ML From D: all 5 cusps (Since crown tilts D and L)	From M: MF and ML From D: all 4 cusps	Cusps are close together FL
Root visibility	From M: only M root From D: both roots visible	From M: only M root From D: both roots visible	From M: only M root From D: both roots visible
M Root	Broad FL Depression (2 root canals) Blunt root apex	Broad, but less than M1 Depression (2 root canals) More pointed root apex than M1	Broad, but short
D root	Less depression More convex than M root Can have 2 root canals (35%)	D is more convex than M root	Narrower and shorter than M root
MR groove	MMR usually has a groove	MMR can have a groove DMR less likely to have a groove	
Heights of contour	F: cervical L: middle L cusp is more likely to be in line with root outline	F: cervical L: middle Less pronounced than M1 L cusp is more likely to be in line with root outline	F: middle L: middle

Mandibular Molars- Occlusal View

	Mand M1	Mand M2	Mand M3
Geometric outline	Pentagonal	Rectangular	Ovoid (occlusal table also ovoid)
Cusps	5 cusps (MF, DF, D, ML, DL) MF and DF cusps are aligned D cusp is more L than MF and DF	4 (F cusps are aligned; L cusps are aligned)	Can have various number of cusp tips (usually 4)
MR	MMR is two times longer than DMR because D cusp takes up some room	MMR ~ DMR	
Taper	Tapers to D and L	Tapers to D and L	Tapers to D and L
Triangular ridges	1 ridge: MF, DF, D, ML, DL Total= 5	1 ridge: MF, DF, ML, DL Total= 4	
Transverse ridge	MF-ML and DF-DL Total= 2 (Slight curve towards crown center)	MF-ML and DF-DL Total= 2	
Fossae	A= distal fossa B= central fossa C= mesial fossa	A= distal fossa B= central fossa C= mesial fossa	
Grooves	MF groove= extend from central groove to between the MF and DF cusps DF groove= extend from central groove to the between DF and D cusps Central= zigzag line connecting ABC Lingual= extends from central fossa to between ML and DL cusps	Facial groove= separates MF and DF cusps Central groove= connects ABC Lingual= separates ML and DL cusps	Very wrinkled occlusal surface
Overall groove patterns	Grooves have overall Y-pattern: MF + DF + L groove, or Central groove + L groove	Grooves have overall + pattern	
Note		MF line angle is very prominent	When M3 has 5 cusps, MF, DF, and D cusp can be aligned or semicircular