Premolars

There are four maxillary and four mandibular premolars.

Relations:

3 & 3 contact:
- 3 & 3 mesially and
- 5 & 5 distally

5 & 5 contact:
- 4 & 4 mesially and
- 6 & 6 distally.
General Features of Premolars

They are transitional teeth located between the canine and molar teeth.

By definition: Premolar teeth are permanent teeth distal to the canines, successors to deciduous molars.

There are two premolars per quadrant and are identified as first and second premolars.
They have at least two cusps:

- One large buccal cusp,
- Smaller lingual cusp

The lower second premolar may-sometimes-have two lingual cusps.
**MAXILLARY FIRST PREMOLAR**

**Chronology:**
- Enamel organ appearance: 7 mIU.
- Beginning of calcification: $1\frac{1}{2} - 1\frac{3}{4}y$
- Crown completed: 5 – 6y
- Eruption: 10 – 11y
- Root completed: 12 – 13y

**Number of lobes:** four lobes:
- Three buccally
- One lingually
Geometric Outline of the Crown

Facial and lingual aspects have trapezoid outline.

The smallest of the uneven sides cervically.
Buccal Aspect

- **Outlines:**
  - Mesial and distal outlines: are nearly concave and both become convex at contact areas.
  - Mesial and distal cusp slopes: are also slightly concave

- **Contact areas:**
  - **Mesially** at the middle third
  - **Distally** it’s occlusally positioned which is an exception from other permanent posterior teeth i.e. $M.\text{slope} > D.\text{slope}$

- **Cervical line:**
  - Convex root wise.

Bucc. cusp pointed, long and the tip is slightly distal to the vertical axis
Surface Anatomy of the Crown

Elevations:

- The surface is convex with maximum convexity at cerv. 1/3 representing cervical ridge.

  - The middle lobe is prominent buccally forming BUCCAL ridge.

Depressions:

- Shallow depressions are present mesial and distal to the buccal ridge.
Outline and Surface Anatomy of the Root

The M and D outlines of the root taper to a pointed apex curved distally.

If two roots:

The buccal root hides the lingual root as it’s shorter and narrower than the buccal root.

The surface of the root is convex and smooth.
• **Lingual convergence:**
  Ling.s. is narrower than buccal s.

- **Outlines:**
  - M and D outlines are convex
  - The L cusp is shorter by 1 mm but sharper than the B cusp
  - The M and D slopes meets at an angle about 90 degrees.

- **Surface Anatomy:**
  - The surface is convex with maximum convexity at the middle 1/3.
  - The root is convex.
The surface of the root is convex and smooth. The M and D outlines of the root taper to a pointed apex that curves distally.

**If two roots:**

The lingual root appears **shorter** (by about 0.8mm) and **narrower** than the buccal root.

The surface of the root is convex and smooth.
Proximal Aspects

Mesial aspect  Distal aspect

Proximal aspects have trapezoid outline.

The smallest of the uneven sides occlusally.
Outlines of Proximal Aspects

Mesial aspect

Distal aspect

Buccal outline: Convex with maximum convexity at cervical 1/3 representing cervical ridge.

Lingual outline: convex with maximum convexity at middle 1/3

Cervical line: curves occlusally and less curved distally
Occlusal outline:

Bucc. cusp is longer than Ling. cusp by 1mm.
Bucc. cusp tip is below the center of Bucc root.
Ling. cusp tip is on line with Ling. root.

MMR concave, at the junction of occ. & middle thirds.

DMR more cervical.
Surface Anatomy of Proximal Aspects

Contact areas:

At the middle 1/3, bucc. to midline

- **Mesial marginal developmental groove** crossing MMR and located lingual to the contact area.

- **Mesial Developmental depression** in the crown & continues on the root ➞ *(canine fossa)*.

Curves occlusally

More occlusally positioned & more buccally.

Smooth and convex surface except for a small flat area cervical to contact area.

**Cervical line curvature:**

Less curved
In case of two roots (more common).

Root trunk about half the root length.
Surface is smooth and convex except deep developmental depression below bifurcation that continue with the mesial dep. on the crown.

Root trunk is longer as bifurcation is near apical 1/3
Surface is smooth and convex except shallow devlop. depr. on the root trunk
In case of one root
(less common)

The B and L outlines taper to a blunt apex in line with the center of the crown.

The surface is smooth and convex except for a shallow depression in the center that is deeper mesially than distally.
Hexagonal

- 2 equal buccal sides (MB, DB)
- M side shorter than D side.
- ML side shorter than DL side.

Thickness is greater than width

The crown is wider buccally than lingually, due to lingual convergence of the crown
Surface anatomy

Elevations:
- Bucc. triangular ridge.
- Ling. triangular ridge.
- M & D marginal ridges

Depressions:
- Central developmental groove
- M and D triangular fossae.
- M marginal developmental groove
The most characteristic identifying feature of the max. first premolar is the **Mesial marginal developmental groove**.
MAXILLARY
FIRST PREMOLAR
PULP CAVITY

Root canals:
2 root canals (B&L) but rarely 3 canals
lingual canal is larger & more accessible

Cervical cross sec.
oval or kidney shaped

Pulp chamber:
Narrow
Wide
Maxillary Second Premolars
Comparison between Maxillary First and Second Premolars

- Geometric Shape of the Crown
  - Trapezoid shape.
  - The smallest of the uneven sides cervically.

Facial & Lingual Aspects:
### Buccal Aspects

<table>
<thead>
<tr>
<th>Maxillary First Premolar</th>
<th>Maxillary Second Premolar</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1" alt="Maxillary First Premolar" /></td>
<td><img src="image2" alt="Maxillary Second Premolar" /></td>
</tr>
</tbody>
</table>

- **B cusp is long and pointed**
- **Longer M slope than D**
- **Mesial contact: in the middle 1/3 distally more occlusal.**
- **Cervical line curved root wise.**

- **B cusp is short and less pointed**
- **Shorter M slope than D**
- **Mesial contact: in the occ. 1/3 while distally more cervically.**
- **Cervical line less curved.**
### Buccal Aspects

<table>
<thead>
<tr>
<th>Maxillary First Premolar</th>
<th>Maxillary Second Premolar</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Prominent B ridge</strong></td>
<td><strong>Less prominent B ridge</strong></td>
</tr>
<tr>
<td><strong>Narrow cervical portion.</strong></td>
<td><strong>Wider cervical portion.</strong></td>
</tr>
<tr>
<td>Maxillary First Premolar</td>
<td>Maxillary Second Premolar</td>
</tr>
<tr>
<td>--------------------------</td>
<td>---------------------------</td>
</tr>
<tr>
<td>• The L cusp is shorter by 1 mm than the B cusp.</td>
<td>• The L and B cusps are nearly of same height.</td>
</tr>
<tr>
<td>• 80% has 2 roots with</td>
<td>• Rarely has 2 roots</td>
</tr>
<tr>
<td>• L root is shorter than B root and its apex is pointed.</td>
<td>• In case of two roots the L root is shorter &amp; its apex more blunt.</td>
</tr>
</tbody>
</table>
Geometric Shape of the Crown

Trapezoid in shape

Smallest of the uneven sides: occlusally
**Maxillary First Premolar**

- B cusp is longer than L cusp by 1mm
- The occlusal table is wide.
- Mesial marginal dev.
- Groove in crown & canine fossa extending on root surface.

**Maxillary Second Premolar**

- The cusps are nearly at the same level.
- The occlusal table is narrow.
- The crown surface is smooth & convex. The root has shallow dev. dep.
### Mesial Aspects

#### Maxillary First Premolar

- **MMR at the junction of M1/3 & O1/3**

- **Contact area:**
  - At the middle third (OC dimension) and slightly buccal to midline (BL dimension)

#### Maxillary Second Premolar

- **MMR positioned more occlusal.**

- **Contact area:**
  - At the occlusal third (OC dimension) and slightly buccal to midline (BL dimension)
<table>
<thead>
<tr>
<th>Maxillary First Premolar</th>
<th>Maxillary Second Premolar</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>DMR</strong> more occlusal than <strong>MMR</strong></td>
<td><strong>DMR</strong> more cervical than <strong>MMR</strong></td>
</tr>
<tr>
<td>CA occlusally positioned and more buccally than MCA.</td>
<td>CA cervically positioned and more buccally than MCA.</td>
</tr>
<tr>
<td>Smooth and convex surface except for a small flat area cervical to contact area.</td>
<td>Smooth and convex surface.</td>
</tr>
</tbody>
</table>
### Distal Aspects

<table>
<thead>
<tr>
<th>Maxillary First Premolar</th>
<th>Maxillary Second Premolar</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1.png" alt="Image of Maxillary First Premolar" /></td>
<td><img src="image2.png" alt="Image of Maxillary Second Premolar" /></td>
</tr>
</tbody>
</table>

**Maxillary First Premolar**

- Root trunk is long as the bifurcation is near apical 1/3.
- Surface is smooth and convex except shallower DD on the root trunk than mesially.

**Maxillary Second Premolar**

- One root and if 2 the bifurcation will be more apically.
- Surface is smooth and convex except deeper DD in the middle of the root than mesially.
<table>
<thead>
<tr>
<th>Maxillary First Premolar</th>
<th>Maxillary Second Premolar</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Occlusal Aspect</strong></td>
<td></td>
</tr>
<tr>
<td>It's hexagonal</td>
<td>It's oval (less angular)</td>
</tr>
<tr>
<td>Thin M &amp; D marginal</td>
<td>Thicker M &amp; D marginal</td>
</tr>
<tr>
<td>ridges</td>
<td>ridges</td>
</tr>
<tr>
<td>Maxillary First Premolar</td>
<td>Maxillary Second Premolar</td>
</tr>
<tr>
<td>--------------------------</td>
<td>---------------------------</td>
</tr>
<tr>
<td><strong>Long Central dev. gr.</strong></td>
<td><strong>Shorter Central dev. gr.</strong></td>
</tr>
<tr>
<td><em>M</em> marginal dev. groove</td>
<td>Not present.</td>
</tr>
<tr>
<td><em>M</em> and <em>D</em> (\triangle) fossae.</td>
<td>Few supplemental grooves</td>
</tr>
<tr>
<td>Thin marginal ridges</td>
<td><em>M</em> and <em>D</em> (\triangle) fossae.</td>
</tr>
<tr>
<td></td>
<td>Thick marginal ridges</td>
</tr>
</tbody>
</table>
MAXILLARY SECOND PREMOLAR
PULP CAVITY of maxillary second premolar

MD section

Root canals:
2 root canals
one B & one L

BL section

Dentin island

Cervical cross sec.

Narrow

Oval

Wide
THANKS
Geometric Outline of the Crown

Facial and lingual aspects have trapezoid outline.

The smallest of the uneven sides cervically.
Contact areas:

Mesially: at the junction of occ. and middle thirds

Distally: it's cervically positioned.

Cervical line:

convex root wise.
Surface anatomy of the crown

Elevations:
- The surface is convex with maximum convexity at C 1/3 representing cervical ridge.
- The middle lobe is convex buccally forming prominent buccal ridge.

Depressions:
- Shallow depressions are present mesial and distal to the buccal ridge.
The surface of the root is convex and smooth.

The M and D outline of the roots tapered to a pointed apex that curved distally.

The surface of the root is convex and smooth.
Lingual convergence: Lingual s. is narrower than buccal s.

Outlines:
• M and D outlines are convex
• The L cusp is short and small reaching 2/3 the crown length and has a pointed tip.

Cervical line: is convex root wise.

Surface Anatomy:
Elevations: The lingual surface is convex with maximum convexity at middle 1/3
Depressions: ML developmental groove at the ML line angle.
Proximal aspects have rhomboid shape.

- With narrow occlusal table
- Prominent lingual inclination
Outlines of proximal aspects

Buccal outline is convex with maximum convexity at C 1/3 representing cervical ridge.

Lingual outline is convex with maximum convexity at middle 1/3

Cervical line curves occlusally and less curved distally
Occlusal margin:

The two cusps are not on the same level.

The lingual cusp is shorter by $\frac{1}{3}$ length of crown.

The B cusp centered over the root. This is due to the prominent lingual inclination.

The L cusp tip in line with lingual border of the root.
**MMR** inclined from B to L surface // to B cusp ridge. (unique characteristic of this tooth).

**DMR** is straight and at right angle to the axis of the tooth.

DMR is occlusal than MMR
M & D surfaces are smooth & convex except for a concave area cervical to contact area.

**Contact areas:** nearly at same level

**Mesio-ling. dev.gr.** present at the junction of Lg and M surfaces.

Contact area is broader, more cervically and facially positioned.
B & L outlines are nearly straight cervically then taper to apically to a pointed apex.

The surface is more convex

The surface is smooth and flat with deep developmental groove
It’s diamond-shaped.

Lingual convergence is sharp.

Mesial outline is slightly curved.

Distal outline is more convex.
Surface anatomy of occlusal aspect:

Elevations:

- B triangular ridge.
- L triangular ridge.
- M & D marginal ridges
- Transverse ridge
Depressions:

Central dev. groove

M and D triangular fossae.

Mesio-lingual developmental groove
PULP CAVITY

Buccal p. horn: more Pronounced than the lingual.

Cross sec. At the cervix: rounded or oval
MANDIBULAR FIRST PREMOLAR
Mandibular
Second Premolar
Mandibular Second Premolar: Two Cusp Type

Buccal

Lingual

Mesial

Distal

occlusal
Mandibular Second Premolar: Three Cusp Type

Buccal  Lingual  Mesial  Distal

occlusal
Comparison between Maxillary First and Second Premolars

Geometric outline of the crown

Facial and lingual aspects have trapezoid shape

But wider cervically than 4.
### Facial Outlines and Surface Anatomy

<table>
<thead>
<tr>
<th>Mandibular First Premolar</th>
<th>Mandibular Second Premolar</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>B cusp</strong></td>
<td><strong>B cusp</strong></td>
</tr>
<tr>
<td>pointed and long</td>
<td>short and less pointed</td>
</tr>
<tr>
<td>Prominent B ridge</td>
<td>Not well prominent B ridge</td>
</tr>
<tr>
<td>Pointed apex</td>
<td>Blunt apex</td>
</tr>
</tbody>
</table>
### Lingual outline and surface anatomy

<table>
<thead>
<tr>
<th>Mandibular First Premolar</th>
<th>Mandibular Second Premolar</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1.png" alt="Image" /></td>
<td><img src="image2.png" alt="Image" /></td>
</tr>
</tbody>
</table>

The **L cusp** is short and small reaching 2/3 the crown length and has a pointed tip.

The lingual surface is convex with maximum convexity in middle 1/3.

**ML developmental groove** at the ML line angle.

---

**Two cusp type**

L cusp is shorter and smaller than B cusp but larger than of 4.

The surface is convex with maximum convexity in Occ. 1/3.

No **MLDG**
Three cusp type:

ML cusp is longer and larger than DL cusp. They both shorter than B cusp and less pointed.

The surface convex with maximum convexity at Occ.1/3.

The L developmental groove between the 2 cusps.
**Proximal outlines**

<table>
<thead>
<tr>
<th>Mandibular First Premolar</th>
<th>Mandibular Second Premolar</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1" alt="Teeth Diagram 1" /></td>
<td><img src="image2" alt="Teeth Diagram 2" /></td>
</tr>
<tr>
<td>Rhomboid in shape with narrow occlusal table.</td>
<td>Rhomboid in shape with narrow occlusal table. <em>(wider than lower 4)</em></td>
</tr>
<tr>
<td>Prominent lingual inclination</td>
<td>Lingual inclination less prominent</td>
</tr>
</tbody>
</table>
Mandibular First Premolar

- Maximum convexity at M1/3
- The L cusp is short and small reaching 2/3 the crown length
- The B cusp centered over the root.
- The mesial MR is oplique while distally is straight

Mandibular Second Premolar

- Maximum convexity at O 1/3
- L cusp is shorter and smaller than B cusp but larger than that of 4
- B cusp tip on line with junction of B & M 1/3 of the root.
- The mesial and distal marginal ridges are straight
Three Cusp Type of Mandibular Second Premolar:

ML cusp is longer and larger than DL cusp.

DL cusp is shorter and smaller than ML cusp.

Both lingual cusps are shorter than the buccal cusp and less pointed.
**Occlusal Aspect**

<table>
<thead>
<tr>
<th>Mandibular First Premolar</th>
<th>Mandibular Second Premolar</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Diamond-shaped.</strong></td>
<td><strong>Two cusp type:</strong></td>
</tr>
<tr>
<td>Lingual convergence is</td>
<td><strong>U-shaped</strong></td>
</tr>
<tr>
<td>sharp.</td>
<td>Slight lingual convergence</td>
</tr>
</tbody>
</table>

**Mandibular Second Premolar**

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>H-shaped</strong></td>
<td>The outline is square</td>
</tr>
<tr>
<td><strong>Three cusp type:</strong></td>
<td></td>
</tr>
<tr>
<td>The outline is oval</td>
<td></td>
</tr>
</tbody>
</table>
Surface Anatomy of Occlusal Aspect:

<table>
<thead>
<tr>
<th>Lower 4</th>
<th>Lower 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>B triangular ridge.</td>
<td>Two cusp type</td>
</tr>
<tr>
<td>L triangular ridge.</td>
<td></td>
</tr>
<tr>
<td>Transverse ridge</td>
<td></td>
</tr>
<tr>
<td>M &amp; D marginal ridges</td>
<td></td>
</tr>
<tr>
<td>Lower 4</td>
<td>Lower 5</td>
</tr>
<tr>
<td>---------</td>
<td>---------</td>
</tr>
<tr>
<td>![Image](68x274 to 241x480)</td>
<td>![Image](479x276 to 654x474)</td>
</tr>
</tbody>
</table>

**Depressions:**

- **Central developmental groove**
- **M and D triangular fossae.**
- **Mesiolingual developmental groove**

**Lower 5**

- **Two cusp type**
- **Central developmental groove**
- **H or U shaped.**
- **M and D triangular fossae.**
Lower 5:

**Elevations:**
- Buccal triangular ridge.
- Lingual triangular ridges of lingual cusps (ML & DL).
- M & D marginal ridges

**Depressions:**
- Central developmental groove
  - Y shaped
- M and D triangular fossae.

Three cusp type:
MANDIBULAR SECOND PREMOLAR

3 cusp type

2 cusp type
PULP CAVITY
Thank you