Development of Normal Occlusion
Why do we have to study this?

To familiarize the normal developmental changes of occlusion from infancy to adulthood.

To differentiate between normal and abnormal in occlusion that need intervention to prevent development of more severe forms of malocclusion.
**Stages of dental development**

* Gum pad stage. (0-2 1/2 years)
* Deciduous dentition stage (2 1/2 - 6)
* Mixed dentition stage (6-12)
* Early permanent stage (12-thereafter)
* Adult dentition (17-21)
* Gum pad stage. (0-2 1/2 years)

**Maxillary Gum Pads:**
- Horse-shoe
- Shallow vault
- gingival groove.

**Mandibular Gum Pads**
- U shaped
- continuous groove
* Gum pad stage. (0-2 1/2 years)

- Maxillary gum pad
- Mandibular gum pad
- Elevated ridge
- GINGIVAL groove
- Transverse groove
- Lateral sulcus
- Dental groove
* Gum pad stage. (0-2 1/2 years)

Relationship between upper and lower gum pads

- At rest, gum pads separated by the tongue over lower gum pad.

- Variable overjet with contact only at molar segment.

- Lateral sulcus of lower is distal to upper.

- The upper gum pads are wider than lower.

- The upper lip appear short and flaccid.
Gum pads are not wide enough to accommodate the developing incisors

Later gum pads grow rapidly in the lateral direction increasing arch width

which finally allows the incisors to erupt in good alignment

The molding effect of the lips and cheeks on one side and the tongue on the other side.

* Gum pad stage. (0-2 1/2 years)
Calcification of the deciduous teeth

In the 4th month of I.U.L, calcification of the deciduous teeth begins.

At birth, 1/4 to 1/2 of the deciduous crowns have been calcified and the tips of the 1st permanent molar cusps

* Gum pad stage. (0-2 1/2 years)

<table>
<thead>
<tr>
<th>Calcification</th>
<th>At birth</th>
<th>All primary teeth and 6</th>
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</thead>
<tbody>
<tr>
<td>6 months</td>
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<td>1 and 3</td>
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<td>1 year</td>
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<td>2 years</td>
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<td>3 years</td>
<td>5 and 7</td>
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<td>9 years</td>
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The sequence of eruption

* Gum pad stage. (0-2 1/2 years)

The eruption starts at six months with a wide limit from 4-10 months being normal.
Stages of dental development

* Gum pad stage. (0-2 1/2 years)
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* Deciduous dentition stage (2 1/2 - 6)

It starts from completion of eruption of the deciduous dentition till the eruption of permanent teeth either the first molar or lower central incisor (2 1/2 - 6 years).

Arch shape:
Mostly ovoid and usually with no crowding or malocclusion
No curve of Spee.
Shallow cuspal digitation.
Slight overjet/overbite.
Vertical incisors.
* Deciduous dentition stage (2 1/2 - 6)

**Spacing in deciduous teeth**

1- **Generalized spacing**

Allow the difference between the size of deciduous incisor and their permanent successors

2) **Primate space**

Present between:

- Lateral incisor & canine in the maxilla
  - Closed by the eruption of permanent maxillary incisors
- Canine & first molar in the mandible
  - Closed by the eruption of permanent mandibular molar
Deciduous dentition stage (2 1/2 - 6)

Changing occlusion of deciduous teeth

Anterior teeth

Vertical with minimal overbite (2.5mm) and overjet (0-3mm)

At 3 years

There may be excessive overbite
This overbite is reduced by rapid attrition of the incisors

At 6 years

There may be edge to edge incisor relationship that facilitates the forward shift of the mandible
Deciduous dentition stage (2 1/2 - 6)

Posterior teeth

The mesial cusp of the mandibular D is ahead of the maxillary D

The mandibular E is usually wider mesio-distally than the maxillary E

Flush terminal plane of the distal surfaces of upper and lower E
Deciduous dentition stage (2 1/2 - 6)

Correction of flush terminal plane

a- The natural occlusal wear of the cusps and edges of the deciduous teeth allow the mandible to shift forward by growth.

b- Closure of the primate space distal to the mandibular canine.
* Deciduous dentition stage (2 1/2 - 6)

- Flush terminal
- Mesial step
- Distal step
What if there is no spacing in deciduous dentition?
ANY QUESTIONS
Stages of dental development

* Gum pad stage. (0-2 years)
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* Adult dentition (17-21)
Mixed dentition stage (6-12)

From the eruption of the 6/6 till the shedding of the E/E (6-12 years).

Calcification of permanent dentition starts after birth except for the MB cusp of the 6/6.

The eruption start when crowns are completed and 1/2 of their root start to form

Pierce the oral mucosa → 2/3 of root
* Mixed dentition stage (6-12)

Formation of permanent teeth

Permanent incisors develop lingual to their predecessors

Premolars develop lingual but migrate between roots of deciduous molars

Upper permanent molars develop in maxillary tuberosity

Lower permanent molars develop in the ascending ramus
* Mixed dentition stage (6-12)

Eruption of permanent incisors

**Difference in size**

Spaces

Proclination of permanent incisors

Increase in the inter-canine width

1-2mm (deciduous incisors)

3-5mm in maxilla (eruption of canines)

2-3mm in mandible (start earlier than maxilla)
* Mixed dentition stage (6-12)

Eruption of permanent canines and premolars:

**LEEWAY SPACE**

Leeway space in the mandible is
- unilateral: 1.7
- bilaterally: 3.4

Leeway space in the maxilla is
- unilateral: 0.9
- bilaterally: 1.8

**WHY THEY ARE NOT THE SAME**

Late mesial shift
* Mixed dentition stage (6-12)

**Early mesial shift Vs Late mesial shift**

**Early mesial shift**

With open primary dentition, the mandibular 1\textsuperscript{st} molars close the **primate space** distal to canine.

Thereby, the flush terminal plain gets converted into a mesial step.

This allows the permanent maxillary first molars to erupt into class 1 molar relationship.
* Mixed dentition stage (6-12)

Eruption of permanent canines and premolars:

Ugly Duckling pattern

At 9-10 years
* Mixed dentition stage (6-12)
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* Early permanent stage (12-thereafter)

Good intercuspsation
Normal molar relation
Some proclination of incisors
Lip fullness

**Tongue growth**

Bring the apices of incisors forward
More upright to the incisors
Decrease lip convexity

**Jaws growth**
* Early permanent stage (12-thereafter)

Late teen crowding

The mandible continues to grow

Anterior teeth tip lingually

Crowding of lower teeth
Stages of dental development

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After eruption of the 8’s there is little change in size and relations of the dental arch.

Anterior component of force closes residual spaces.
* Adult dentition (17-21)

**Dimensional arch changes**

Arch circumference or perimeter

*In maxilla*

Increase arch length between 6-10 years

Eruption of permanent incisors

Decrease arch length

Replacement of premolars
* Adult dentition (17-21)

**Dimensional arch changes**

Arch circumference or perimeter

*In mandible*

No increase in arch length

- **Decrease arch length at 10 Y**

- Replacement of premolars ➔ leeway space ➔ late mesial shift

- Mesial drifting tendency of posterior teeth throughout life

- Slight amounts of interproximal wear of teeth

- Lingual positioning of the incisors as the differential mandibulomaxillary growth
* Adult dentition (17-21)

**Dimensional arch changes**

**Arch length or depth**

Corresponding to Arch circumference or perimeter

**Arch width**

- **Intercanine width**
  - Maxillary I.C.W increase from 3-14 y. by 5mm.
  - Mandibular I.C.W increase from 3-14 y. by 2-3mm.

- **Intermolar width**
  - Less increase in width than I.C.W
Stages of dental development

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