OCCLUSION

Dr. Gaurav Sapra MDS
Professor,
Dept of Oral pathology & Microbiology,
Institute of Dental Sciences, Bareilly (UP)

Occlusion

- Definition
  - STATIC & DYNAMIC contact relationship between the occlusal surfaces of the teeth during function. (GPT)
  - Includes the integrated system of functional units involving teeth, joints and muscles of the head and neck

Basic Terminologies

- Centric Occlusion
- Centric Relation or Centric Jaw Relation
- Occlusion incorporated in Dentures (centric relation coinciding with centric occlusion)
- Physiological Occlusion
- Functional Occlusion
- Concept of balanced occlusion

Basic Terminologies

- Overjet & Overbite
- Cross Bite
- Angle's Classification of Occlusion

Overlap of Anterior Teeth

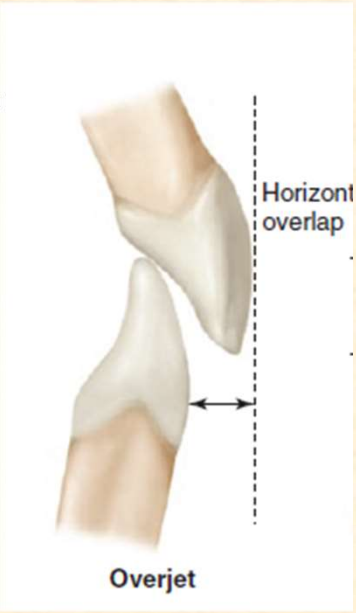
- The arch form of the maxilla tends to be larger than the mandible, which results in the maxillary teeth overlapping the mandibular teeth labially in anterior region.

Horizontal Overlap : OVERJET

Vertical Overlap : OVERBITE

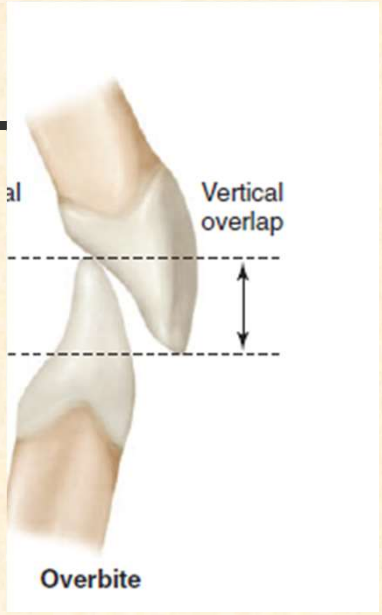
- The overlap as measured in the sagittal plane between the incisal edge of upper incisor and labial surface of lower incisor is known as the **horizontal overlap or overjet.**

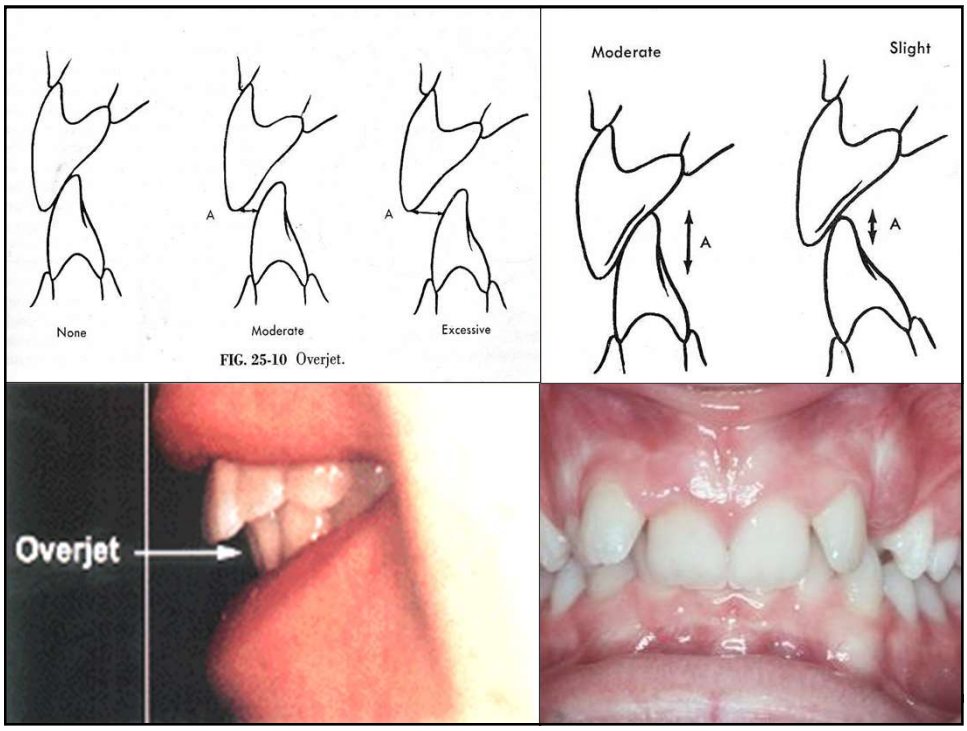
The normal horizontal overlap is 1–2 mm.



The overlap in the vertical plane as measured between the incisal edges of the upper and lower incisors is known as the **vertical overlap or overbite.**

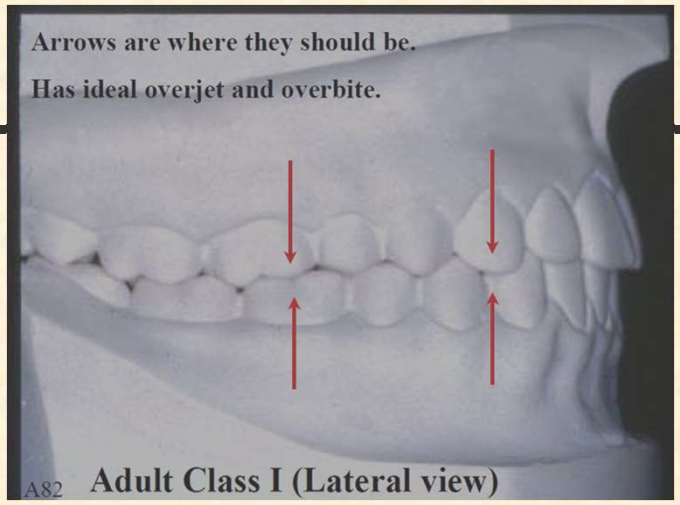
The normal vertical overlap is 2–3 mm



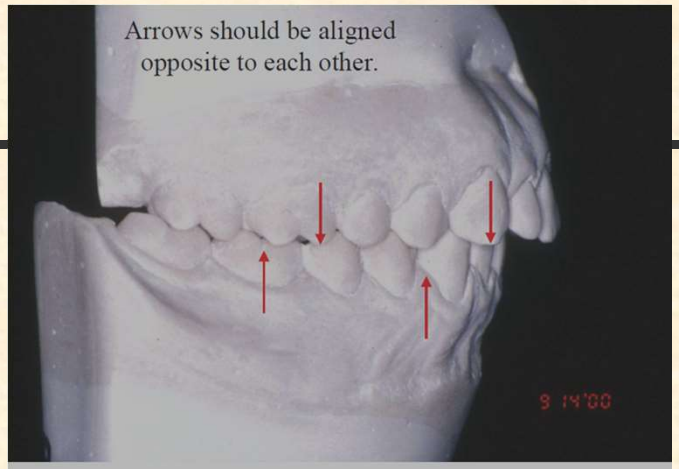


Angle's Classification of Occlusion

(In Permanent Dentition)

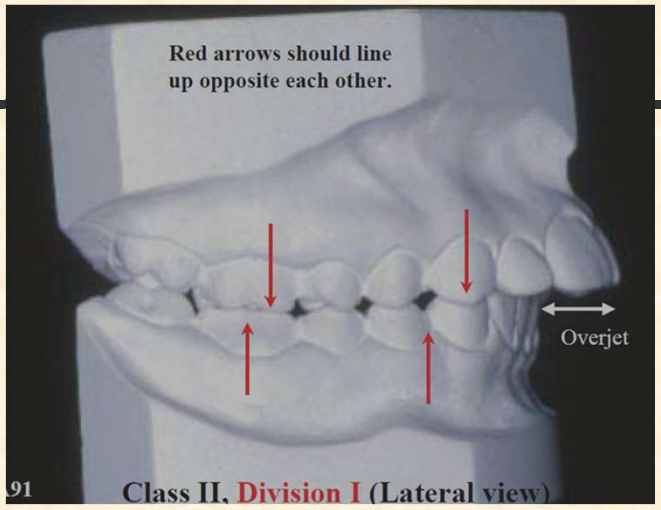


1. **Class I molar relationship:** Mesiobuccal cusp of maxillary first permanent molar occluding in the buccal groove of mandibular first molar

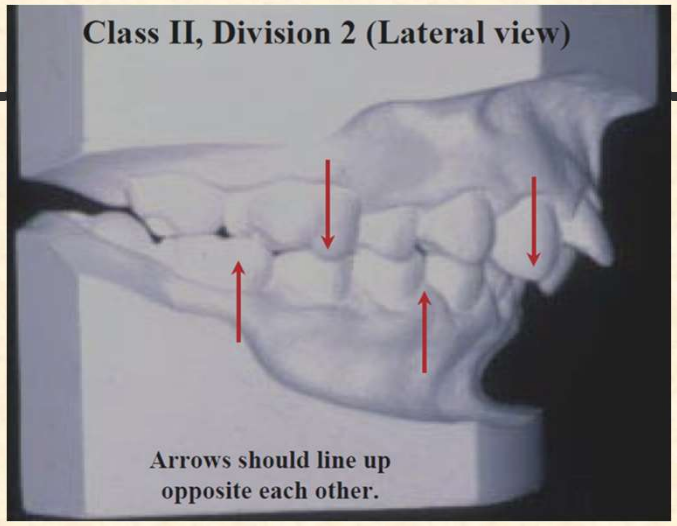


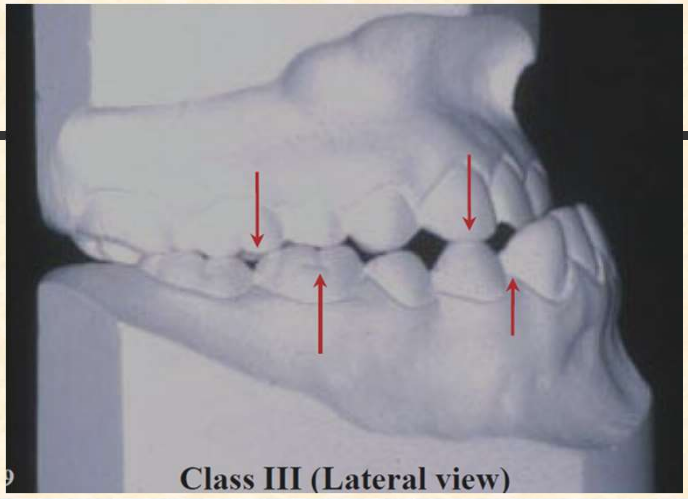
A89 Class II - retrognathic malocclusion

2. **Class II molar relationship:** Distobuccal cusp of maxillary first permanent molar occluding in the buccal groove of mandibular first molar

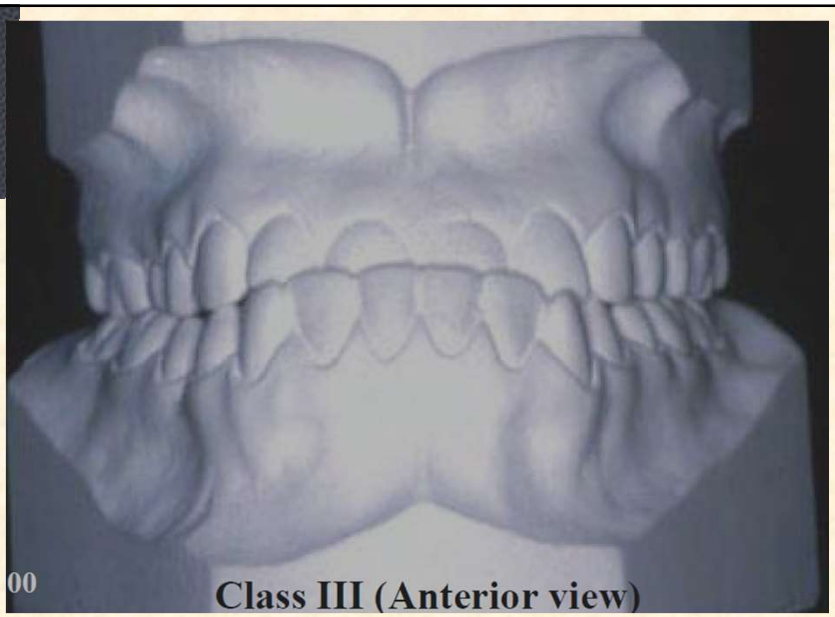


91 **Class II, Division I (Lateral view)**

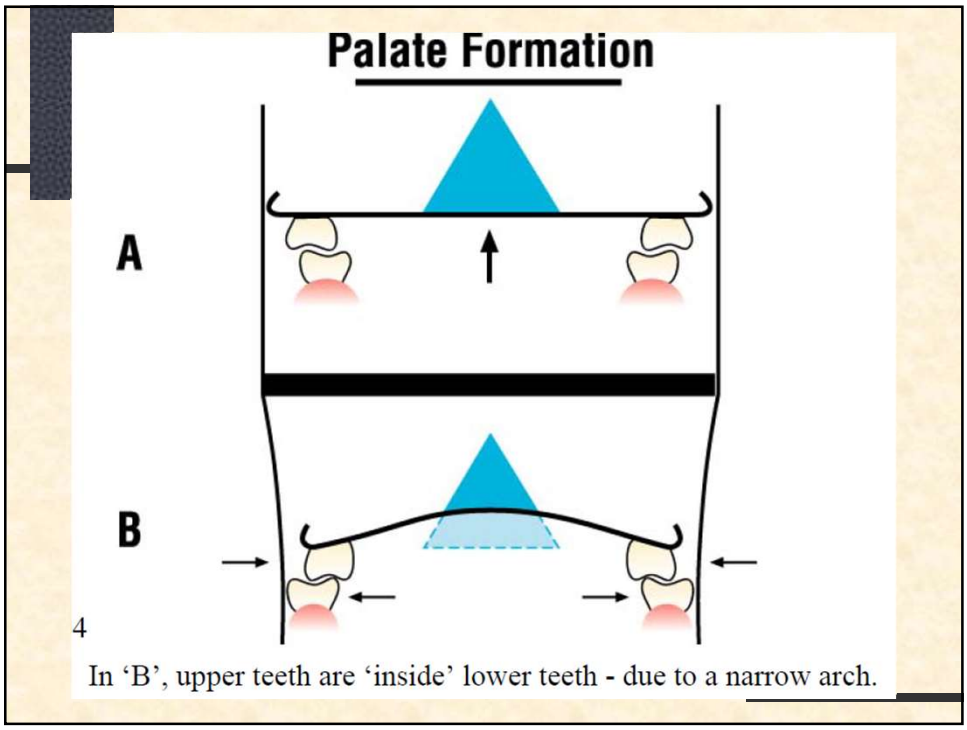


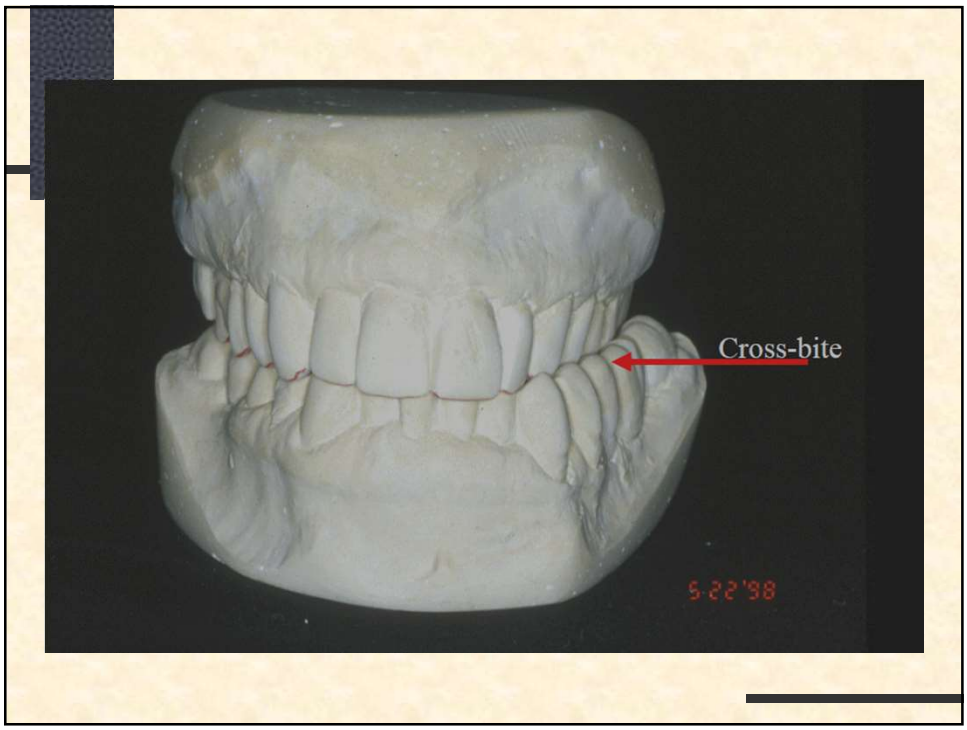


3. **Class III molar relationship:** Mesiobuccal cusp of maxillary first permanent molar occluding the embrasure between mandibular first and second molar



Cross-bite


Palate Formation
A
B
4
In 'B', upper teeth are 'inside' lower teeth - due to a narrow arch.


Cross-bite
5 22 '98

A107 Close-up of a cross-bite malocclusion.

Types of Cusps

- **Centric Holding / Stamp / Supporting Cusp**
  - **Lingual** cusp of **maxillary** posterior teeth
  - **Buccal** cusp of **mandibular** posterior teeth

- They occlude into the central fossa and marginal ridges of opposing teeth

- **Guiding / Shear / Non-Supporting / Non Centric cusp**
  - **Buccal** cusp of **maxillary** posterior teeth
  - **Lingual** cusp of **mandibular** posterior teeth

- They guide the mandible during lateral excursions and sheer food during mastication

Cusp-Fossa Occlusion

- The supporting cusp of one tooth occludes in a single fossa of a single opposing tooth.
- Also referred to as tooth to tooth arrangement

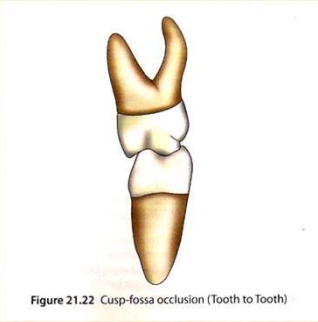


Figure 21.22 Cusp-fossa occlusion (Tooth to Tooth)

Cusp - Embrassure Occlusion

- When a tooth occludes with two opposing teeth.
- Also referred to as tooth to two teeth occlusion.

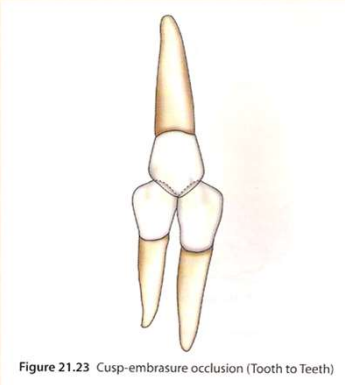


Figure 21.23 Cusp-embrasure occlusion (Tooth to Teeth)

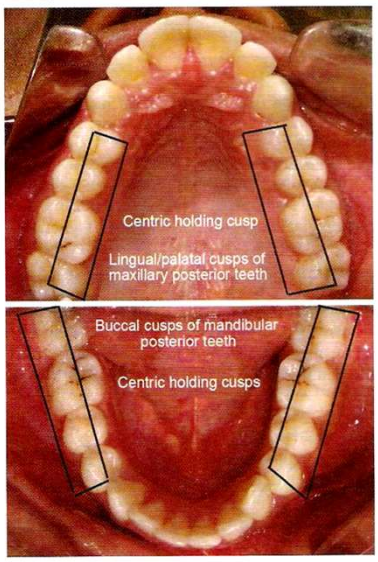


Figure 21.19 Supporting cusp/centric holding cusp /stamp cusp

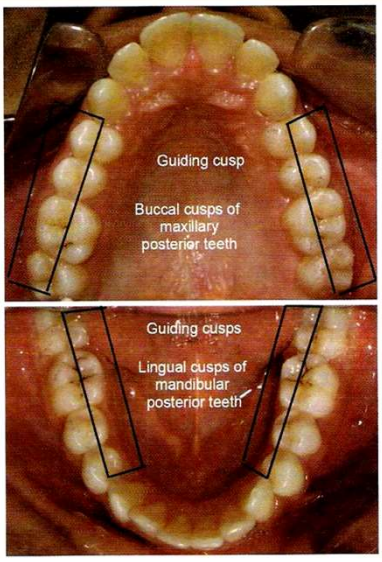
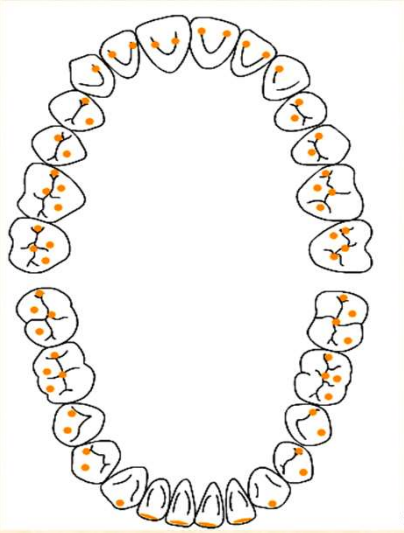


Figure 21.20 Non-supporting cusp /guiding cusp/shear cusp

CENTRIC STOPS

- The areas of the teeth that makes contact with the opposing teeth in centric occlusion are known as **Centric stops**.
- These are the areas on the supporting cusps and in the opposing arch with which the supporting cusps occlude in maximum inter-cuspation.

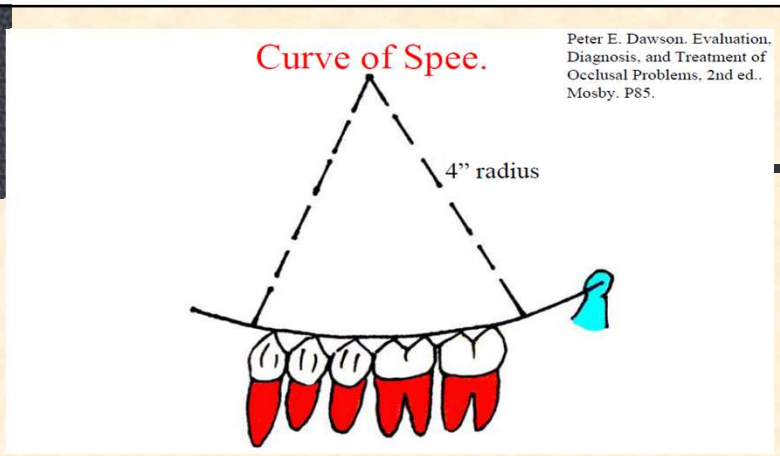


Compensatory Curves of Occlusion

- The occlusal plane is not a flat surface; there are curves incorporated conforming to the arrangement of the teeth in the dental arch. These curves of the occlusion compensate for the path of the condyle and permit maximum utilization of tooth contact during the functional movement of the mandible.
- Curve of spee (Anterio-posterior Curve)
- Concept of Bonwill's triangle and Curve of Monson.
- Curve of Wilson (Medio-lateral Curve)

Curve of Spee (Ant-Post Curve)

- Ferdin & Graf Von Spee.
- When viewed from buccal aspect, the mandibular occlusal plane follow a gradual **concave** curve anterio-posteriorly.
- Curvature begins at the incisal edge & tip of canine, follows the buccal cusp of premolar & molars and continues on the ramus.



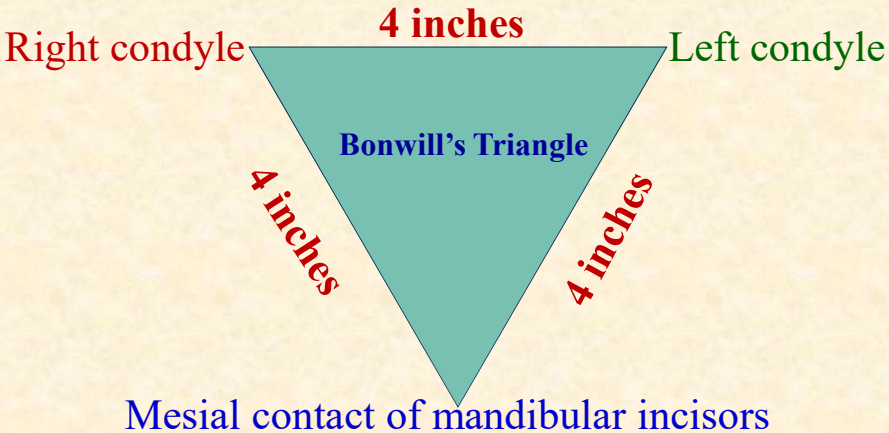
- An ideal curve of spee is aligned such that a continution of the arc of curve would extend through the condyles and forms a segment of circle with a 4 inches radius
- Normal depth 1.5mm (in 2nd premolar region)

Significance of Curve of Spee

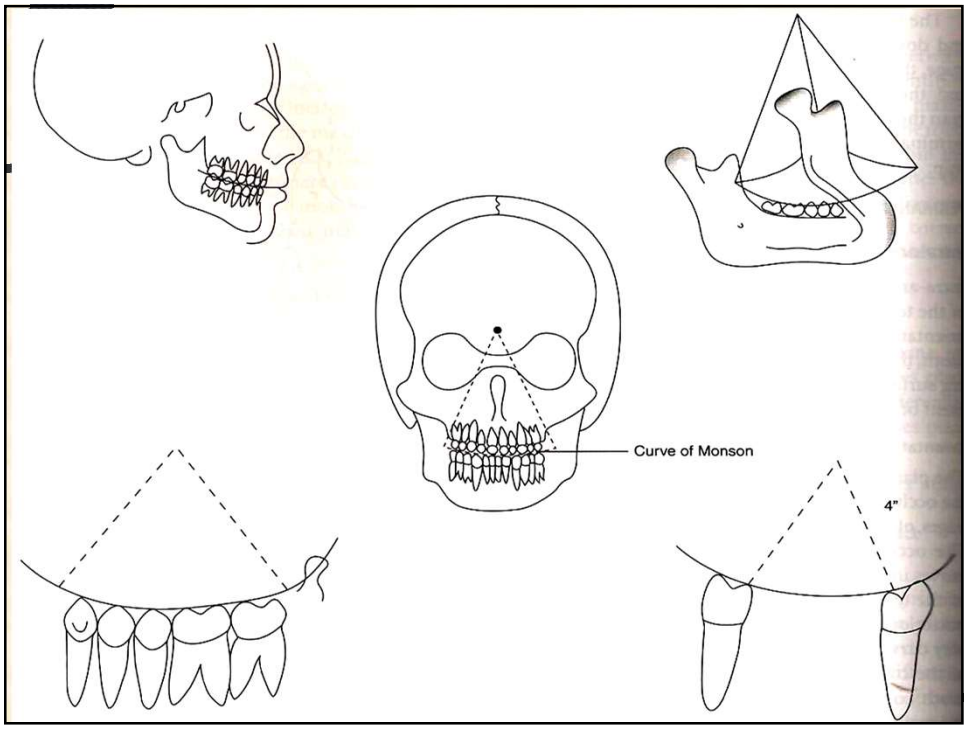
- Accomodates the vertical overlap of upper & lower anteriors and allows normal functional protrusive movements.
- The pull of masseter muscle is at a perpendicular angle with the curve of spee to adapt for favorable loading and distribution of force on the teeth.

Curve of Monson

- Based on Bonwill's observation:



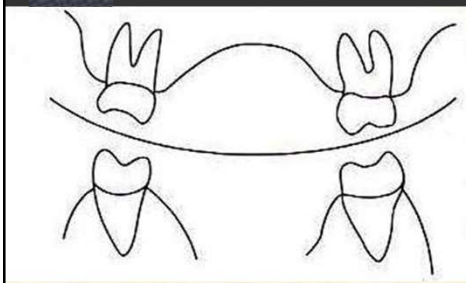
- Monsoon visualized the occlusal plane to be a three dimensional spherical curvature involving right & left incisors, cuspids, bicuspids, molars & condyles.
- Curve of monson is a segment of surface of sphere of 4 inches (10 cm) radius, with its centre in the region of the glabella.
- All buccal cusps and incisal edges of mandibular teeth conform to the segment of sphere, and the masticatory forces converse at the centre of the sphere.

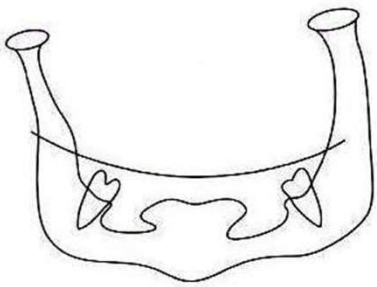


Curve of Wilson

- It is the mediolateral curve that contacts the buccal and lingual cusp tips of each side of the arch.
- Results from the inward inclination of the mandibular posterior teeth, making the lingual cusps lower than the buccal cusps on the mandibular arch.
- On the maxillary arch the buccal cusps are higher than the lingual cusps because of the outward inclination of the upper posterior teeth.

- Mandibular Arch: **Concave** curve of wilson
- Maxillary arch: **Convex** curve of wilson





- The lingual inclination of the lower posterior teeth positions the lingual cusps lower than the buccal cusps. This design permits easy access to the occlusal table.
- As the tongue lays the food on the occlusal surfaces, it is stopped from going past the chewing position by the taller buccal cusps.

Occlusion in Primary Dentition

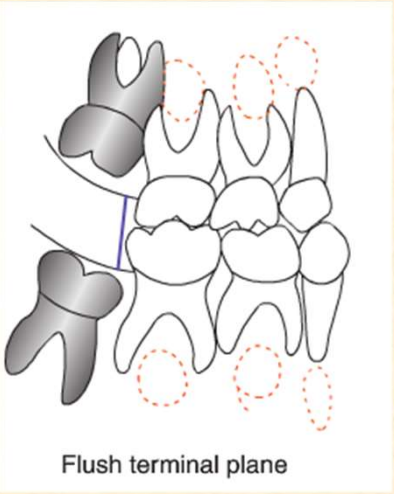
- **Terminal Plane relationship** i.r.t deciduous II molars
- Occlusion is supported and made more efficient after eruption of first permanent molars
- **Interdental spacing** is important for future sufficiency of space in permanent teeth
- Probability of crowding in permanent teeth is related to the amount of interdental spacing. in primary dentition

Primary Molar Relation (Terminal Plane Relationship)

- The mesio - distal relation between the **distal surfaces of the upper and lower second deciduous molars** is called the Terminal plane. Three Types:
  - Flush Terminal Plane
  - Mesial Step Terminal Plane
  - Distal Step Terminal Plane

Flush Terminal Plane

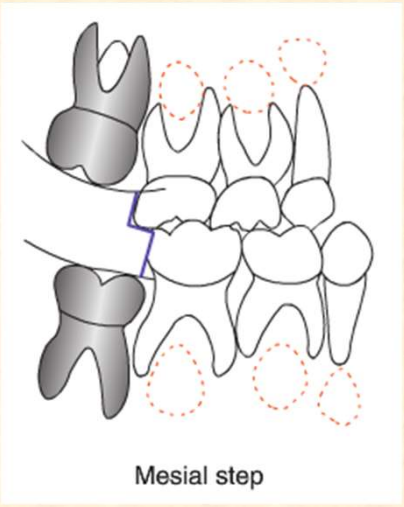
- The distal surface of the upper and lower second deciduous molars are in one vertical plane.
- This is a normal feature of the deciduous dentition.
- Thus the erupting first permanent molars may also be in a flush or end on relationship. Ultimately Class I molar relation develops later.



Flush terminal plane

Mesial Step Terminal Plane

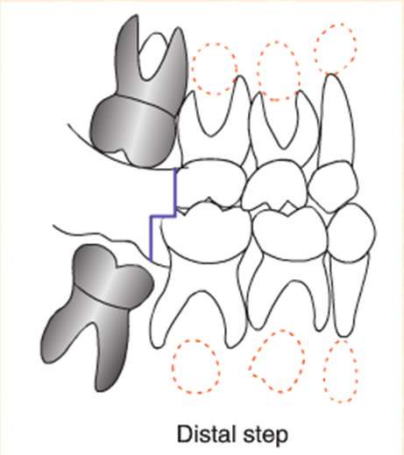
- The distal surface of the lower second deciduous molar is more mesial than that of upper.
- A mesial step in the deciduous dentition leads to a class I or class Ill molar relation in the permanent dentition.



Mesial step

Distal Step Terminal Plane

- The distal surface of the lower second deciduous molar being more distal to that of the upper.
- A distal step in the deciduous dentition leads to a class ll molar relation in the permanent dentition.



Distal step

DEVELOPMENT OF DENTITION

- Pre-Dental Period (Gum Pads)
- Deciduous Dentition Period
  - Deep Bite
  - Generalized & Localized Spacings
  - Flush terminal Plane
- Mixed Dentition Period
  - 1st Transitional Period
  - Inter-Transitional Period
  - 2nd Transitional Period
- Permanent Dentition Period

Please refer the Lecture notes for detailed description

Pre Dentate Period

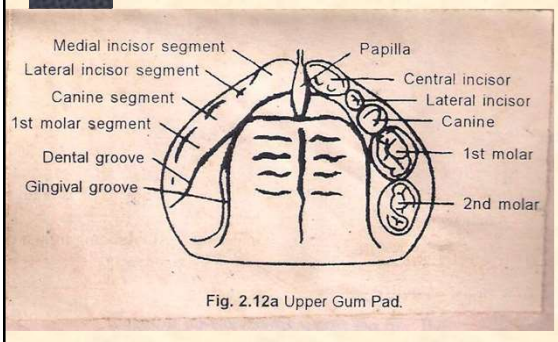
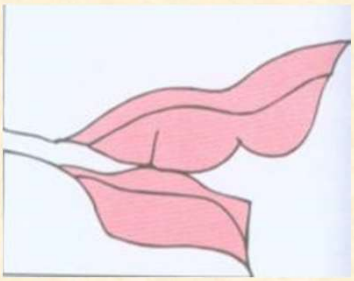
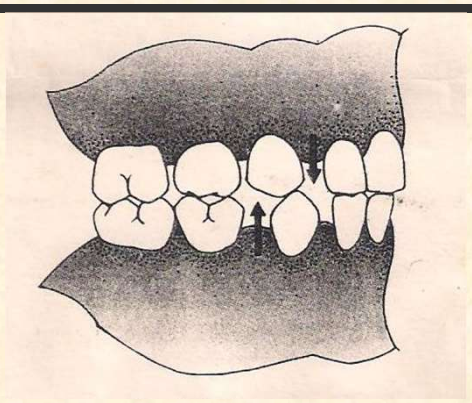
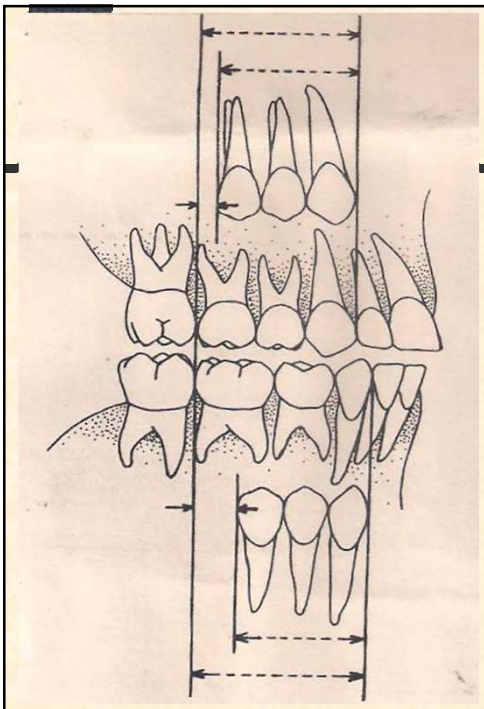


Fig. 2.12a Upper Gum Pad.





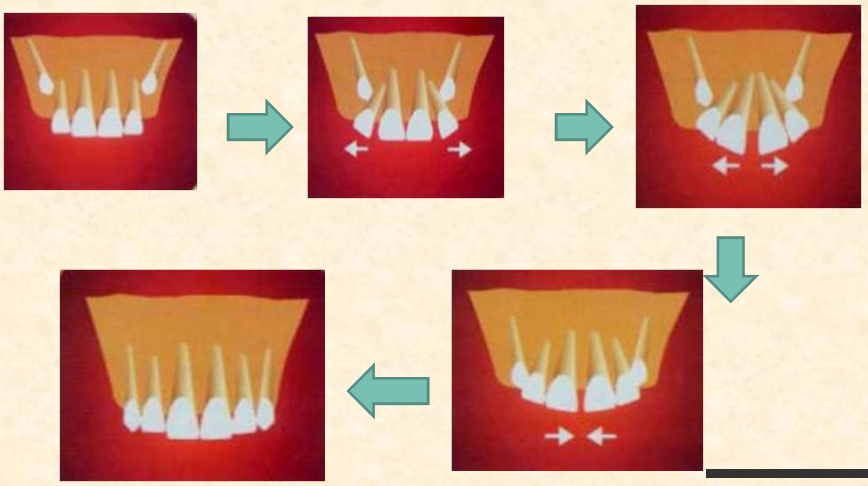
Primate or Anthropoid or Simian spaces



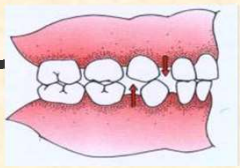
Leeway space of Nance

Ugly Duckling Stage

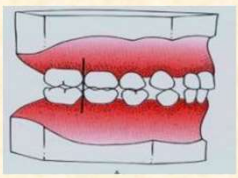
(Broadbent phenomena)



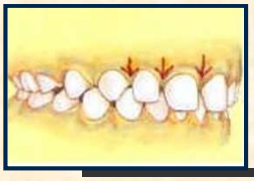
Self correcting anomalies of dentition



- **Primate spaces**
  - Corrected by early mesial shift



- **End on Molar relation**
  - Corrected by Early mesial shift or/and Late mesial shift
- **Generalized Physiologic spaces (if any)**
  - Corrected by Permanent incisor accommodation



- **Ugly duckling stage**
  - Corrected after eruption of canine

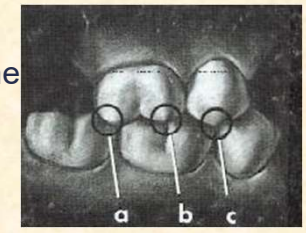
Andrews six keys to normal occlusion

- These are a set of six characteristics that were consistently present in collection of 120 casts of naturally optimal occlusion , identified by Dr. Lawrence F Andrews

#Andrew L.F. The six keys to normal occlusion . Am J Orthod.1972 ; 62 : 296-302.

Key I : Interarch Relationships

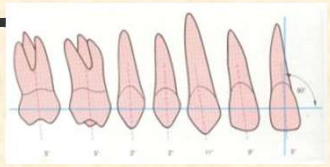
- The mesio-buccal cusp of the permanent maxillary first molar occludes in the groove between the mesial and middle buccal cusps of the permanent mandibular first molar – originally given by Angle

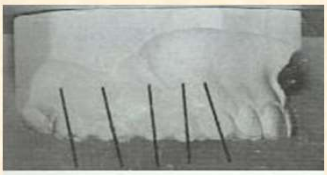


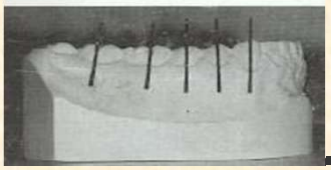
- The distal surface of the disto-buccal cusp of the upper first permanent first molar occludes with the mesial surface of the mesio-buccal cusp of the lower second molar

Key II : Crown Angulation

- The mesio-distal tip of the long axis of the crown
- Measured as the angle formed between the long axis of the crown and a line bearing 90 degrees from the occlusal plane.
- The gingival portion of the long axis of crown is more distal than the incisal portion

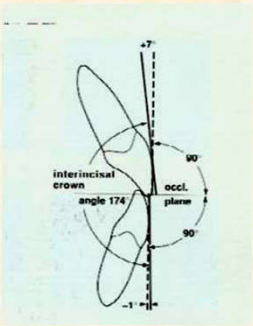




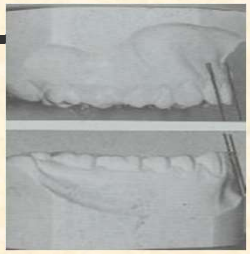


Key III : Crown inclination

- Labio-lingual or bucco-lingual inclination
- Measured as the angle formed by a line which bears 90 degrees to the occlusal plane and a line that is tangent to the bracket side



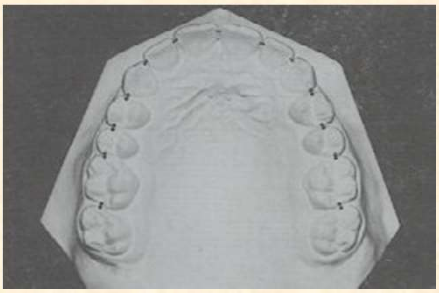
Key III : Crown inclination

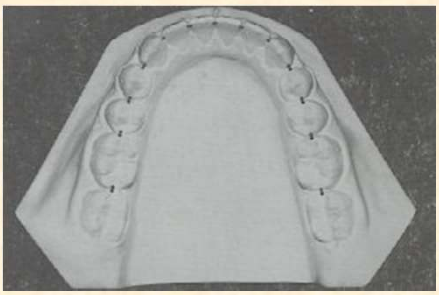


- Most maxillary incisors have a positive inclination; mandibular incisors have a slightly negative inclination
- For posterior teeth a progressively minus inclination is seen from canine through the second molars

Key IV: Rotations

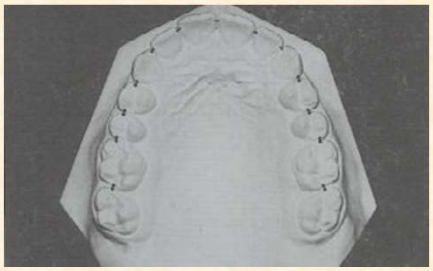
- Absence of rotations.

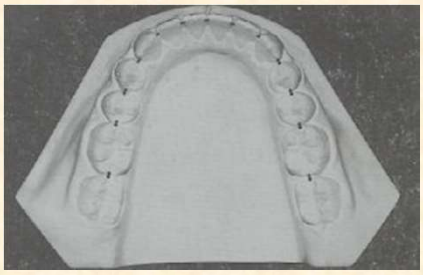




Key V: Tight Contacts

- Contact points should abut unless a discrepancy exists in mesio-distal crown diameter.





Key VI :Curve of spee not more than 1.5 mm

- The depth of the curve of Spee ranging from a flat plane to slightly concave surface
- Inter-cuspation of teeth is best when the plane of occlusion is relatively flat.

THANK YOU