Hard Dental Tissue Assessment
Objective

• Describe the normal occlusal relationships of the primary, mixed, and permanent dentitions.
• Discuss the ramifications of spacing and crowding in the primary, mixed and permanent dentition.
Normal eruption time

- By 30 months, all the deciduous teeth should have erupted.
- By 13 years, all the permanent teeth exclusive of the third molar should have erupted.
- Root formation of the primary tooth is completed by 1-11/2 years after tooth eruption while in the permanent this is completed by 21/2 - 3 years after eruption.
Normal eruption time - 2

- Certain factors affect the rate of eruption namely: nutritional status of the child, gender and genetic factors.
- Eruption tends to be earlier in the mandible in comparison to the maxilla.
Eruption of the deciduous teeth

- Four active phases of eruption are identified.
- The first phase comprised of the central and lateral incisors which erupted within 5.5 months.
- An interval of about 3.2 months in the mandible and 3.6 months in the maxilla is observed prior to the second phase of eruption.
Eruption of the deciduous teeth - 2

• The eruption of the first molars which constitute the second active phase.
• All four molars are out in the oral cavity within a period of less than one month.
• The four molars are seen in the mouth at the average age of 16.9 months.
Eruption of the deciduous teeth - 3

- A resting period of 3.0 months in the mandible and 2.5 months in the maxilla prior to the third phase
- The third phase commenced with the eruption of the canines
Eruption of the deciduous teeth - 3

• The third resting phase is for a period of 3.9 months in the mandible and 4.4 months in the maxilla.
• The last (fourth) phase of eruption leads to the eruption of the second molars.
Normal features of the deciduous dentition

- The primary dentition erupts upright unlike the permanent dentition where the teeth are proclined.
- The permanent teeth erupt proclined to assume a wider perimeter to accommodate the larger teeth size.
Normal features of the deciduous dentition - 2

• By 4 years, spacing between the teeth start to occur so as to accommodate the large size of the permanent dentition.
Normal features of the deciduous dentition - 3

- The normal overjet and is about 1-2mm while that of the permanent is about 2-3mm.
- By 4 years of age, due to wearing down of the incisal edge, an edge to edge incisal relationship may occur.
Normal features of the deciduous dentition - 4

- The anthropoid space is also present in the primary dentition.
- This is also called the primate space.
- This is mesial to the upper canine and distal to the lower canine.
Normal features of the deciduous dentition - 4

• There is also the Leeway space.
• It is the difference between the combined mesiodistal width of the D and E and the combined mesiodistal width of the 4 and 5.
• The 4 is the exact size of the D while the 5 is smaller than the E. In effect, the leeway space is actually the E space.
• The Leeway space is greater in the maxilla than in the mandible.
Normal features of the deciduous dentition - 5

• In the primary dentition, the molars occlude with a terminal flush.

• In the permanent dentition, the mesiobuccal cusp of the upper first molar should align with the buccal groove of the mandibular first molar. This is called an Angle’s class I molar relationship.
Normal features of the deciduous dentition - 6

- In the deciduous dentition, a deviation from the terminal flush is a mesial or distal step.
- In the permanent dentition, a deviation form the Angle’s class I molar relationship is a class II or class III molar relationship.
Normal features of the deciduous dentition - 7

• The Angle’s class I molar relationship in the permanent dentition arised from the 6 moving into the Leeway spaces
• This movement is greater in the maxilla than in the mandible.
Normal features of the deciduous dentition - 8

- In the class I canine relationship, the cusp tip of maxillary canine is in the embrasure between the mandibular canine and the mandibular first molar.
- In the permanent dentition, the cusp tip of maxillary canine is in the embrasure between the mandibular canine and the mandibular first premolar.
Normal features of the deciduous dentition - 9

• In the class II canine relationship, the cusp tip of maxillary canine is in the embrasure between the mandibular canine and the mandibular lateral incisor.
• This is what you also see in the permanent dentition.
Normal features of the deciduous dentition - 10

- In the class III canine relationship, the cusp tip of maxillary canine is distal to the embrasure between the mandibular canine and the mandibular first molar.
- In the permanent dentition, the cusp tip of maxillary canine is distal to the embrasure between the mandibular canine and the mandibular first premolar.
Features of deciduous tooth eruption

- There is no sexual difference in the eruption timing.
- Some evidence points to earlier eruption of the incisors in males and earlier completion of dentition in females.
- Eruption sequence is ABDCE.
Features of deciduous tooth eruption - 2

- Number of erupted teeth is associated with birth weight and current height of the child.
- There is a positive correlation between number of teeth erupted, birth weight and current height of the child.
Features of deciduous tooth eruption - 2

- There is a familiar trend towards early and late eruption.
- Severe malnutrition is associated with delayed eruption.
Eruption of the permanent teeth

- Tooth eruption begins with the completion of the crown and the beginning of root formation.
- At the time of tooth emergence into the oral cavity, only a quarter of the root has formed.
Eruption of the permanent teeth - 2

- There are variation in the eruption time of various teeth.
- The canine has the highest variation time followed by the 2\textsuperscript{nd} premolar and the 3\textsuperscript{rd} molar.
- The first molar has the least variation time.
Eruption of the permanent teeth - 3

- The toothless period is 0-6 days after exfoliation of the primary maxillary and mandibular molars.
Eruption of the permanent teeth - 4

In the mandible:
• The central canines starts to erupt 2 weeks after exfoliation of the predecessor.
• For the lateral incisor, it takes 6 weeks
• It is also 6 weeks for the canine.
Eruption of the permanent teeth - 5

In the maxilla:

• The central incisors starts to erupt 6 weeks after the exfoliation of the predecessor.
• For the lateral incisors and canines, it takes about 4 months. The toothless period may be as long as 1 year when there is crowding.
Eruption of the permanent teeth - 6

• Variation in timing of tooth eruption is lowest for the incisors and first molars. Variation is $\pm 0.5$ years.
• Variation in timing of tooth eruption is highest for the canines, premolars and second molars. This is $\pm 1.5$ years.
Eruption of the permanent teeth - 7

- Eruption of the permanent dentition appears to be ahead in girls.
- This sexual variation is more prominent with the canine.
Things to assess on dental tissue examination

- **Tooth**: number, shape, size, structure.
- **Intra-arch alignment**: crowding, spacing, rotation, tilting, displacement.
- **Inter-arch alignment**: molar relationship, canine relationship, incisal relationship, crossbite, open bite, scissor bite, any midline shift.
Eruption disorders

- Teething
- Natal and neonatal teeth
- Premature eruption
- Eruption cyst/eruption haematoma
- Supernumerary teeth
- Infraocclusion
- Eruption sequestrum
- Ectopic eruption
Teething

• Some believe teething is associated with local irritation, swelling of the gingiva over the erupting tooth, patches of erythema on the cheeks, general irritability and crying, loss of appetite, sleeplessness, increased salivation and drooling, increased thirst, circumoral rash.
A systematic review of the literature showed that no evidence is available to suggest that there are any symptoms or signs specific to teething. It is therefore not possible to make a clinical diagnosis of teething as a disease entity.
Teething - 3

Normal developmental process makes interpretation of research on teething more challenging.

- Normal salivary gland development which occurs at about 2 to 3 months of age; the salivary glands of infants begin functioning thus, contribute to constant drooling and may be misinterpreted as a sign of teething.
Teething - 4

• Night waking occur around 8 or 9 months of age, when infants develop a sense of object permanence and call out to their parents at night.
Teething - 5

- At about 6 months of age when the primary teeth are about to erupt, the maternal antibodies in the child begins to decrease while the child builds up own antibodies which is not sufficient enough to defend the child against infections.
Teething - 6

- At this same age, the child starts crawling, picks up objects and explore with the mouth. This predisposing to gastrointestinal disturbance such as diarrhea, vomiting with associated increase in temperature. This systemic disorder may be erroneously tagged teething.
Teething - 7

• There is also the possibility that symptoms related to teething might actually result from undiagnosed herpetic gingivostomatitis which is a common diagnostic entity at this age.
Causes of delayed eruption

• This can happen in both the deciduous and permanent dentition.

• A diagnosis of delayed eruption is made when the concurrent tooth in the adjacent quadrant has erupted or when there is a delay of over 6 months after the established eruption period.
Local causes of delayed eruption

- Ankylosis of the primary teeth
- Retained deciduous teeth
- Early loss of primary teeth
- Presence of odontome
- Presence of supernumerary teeth
- Malformed teeth
Local causes of delayed eruption - 2

- Root/crown dilaceration
- Missing tooth bud
- Malpositioning of the tooth bud
- Focal epithelial hyperplasia: gingiva scarification
- Tooth impaction
Systemic causes of delayed eruption

- **Hereditary causes**: ectodermal dysplasia, chondroectodermal dysplasia, heridictary gingiva fibromatosis, cleidocranial dysostosis, Garners syndrome, amelogenesis imperfecta.
Systemic causes of delayed eruption - 2

• **Chromosomal disorders**: Down syndrome, cri-du-chat.
• **Endocrine disorders**: hypopituitarism, hypothyroidism, achondroplasia.
• **Metabolic disorders**: vitamin D deficiency.
Exfoliation of the deciduous tooth

- The primary tooth all have successors and thus their lifespan is limited.
- Their exfoliation is as a result of pressure resorption of the root by the succedaneous tooth.
• Pre resorption, there is an initial reduction in the thickness of the bony crypts resulting in the tooth follicle having closer proximity to the root surface of the primary tooth.
Exfoliation of the deciduous tooth - 3

- Resorption proceeds crownwards and is effected by the osteoclasts which are found on the concavity of the root surface (Howship’s lacunae).
Exfoliation of the deciduous tooth - 4

• In the incisors, resorption starts from the lingual aspect of the root surface where the succedaneous tooth bud is located.
• As root resorption progresses, the tooth becomes positioned apical to the root.
• Subsequently, resorption affects the entire cross section of the root in an occlusal direction.
Exfoliation of the deciduous tooth - 4

- For the molars, the tooth bud are position apical to the root surface. Root resorption starts from here.
- Root resorption continues until the tooth exfoliates.
- In some cases however, root resorption occur at an uneven rate resulting in retention of the primary tooth.
- The vitality of the pulp tissue remains unaffected during root resorption.
Exfoliation of the deciduous tooth - 5

• Root resorption also takes place in phases – the active and quiscent phase.
• In the active phase, root resorption takes place.
• In the quiscent phase, there is some repair of the resorbed area with deposition of cementum.
Exfoliation of the deciduous tooth - 6

- In some cases, there is excessive deposition of cementum resulting in ankylosis.
- The ankylosed tooth appears submerged due to continued alveolar bone growth.
Disorders of exfoliation

• Exfoliation is dependent on root resorption.
• Masticatory forces play a secondary role in determining the rate of resorption. Resorption rate is faster where the masticatory force is higher.
Disorders of exfoliation - 2

- Exfoliation may be delayed leading to over retention of the deciduous tooth, or may be prematures.
Premature tooth loss

Local causes
• Trauma with root fracture, Ellis class III #
• Infection eg caries
Premature tooth loss - 2

- Metabolic and nutritional disorders: Avitaminosis D, scurvy, Gaucher’ disease, Takahara’s disease, hypophosphatasia, hypophostatemia.
Premature tooth loss - 3

- **Immunological disorders**: juvenile periodontitis, Down syndrome, cyclic neutropenia, Chediack Higashi syndrome.
Premature tooth loss - 4

- **Dental anomalies**: radicular dentine dysplasia, odontodysplasia.
Premature tooth loss - 5

- **Endocrine disorders:** juvenile diabetes mellitus, hyperparathyroidism, hyperthyroidism, hyperpituitarism
Premature tooth loss - 6

Others

• Papillon le fevre syndrome
• Familiar fibrous dysplasia
• Malignancies: Burkitt lymphoma, leukaemia
• Toxicity: acrodyinia
Causes of over retention

- Presence of supernumerary teeth
- Ankylosis
- Following pulp therapy (pulpotomy, pulpectomy)
- Defective osteoclastic activities resulting in poor root resorption
Post eruptive movement

- Eruption continues in the oral cavity until the erupting tooth makes contact with the opposing tooth. Post eruptive movement continues from hence.
Post eruptive movement - 2

• It is a passive process that continues throughout the lifetime of the tooth.
• It results from attrition of the occlusal/incisal and proximal surfaces of the tooth which then allows for continued occlusal movement and mesial drift of the teeth.
Systemic causes of delayed eruption:

- Chediack Higashi syndrome.
- Leukemia
- Hypopituitarism
- Gardner’s syndrome
Systemic causes of premature tooth loss:

- Gaucher’s disease
- Takahara’s disease
- Hyperpituitarism
- Cyclic neutropenia
Quiz 3

During hard tissue assessment:
• Check Intra-arch alignment such as scissor bite
• Check for Inter-arch alignment such as tooth rotation
• Check for molar relationship, canine relationship
• Check for tooth shape, size and intra-bony position
Acknowledgement

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