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Pediatric dentistry

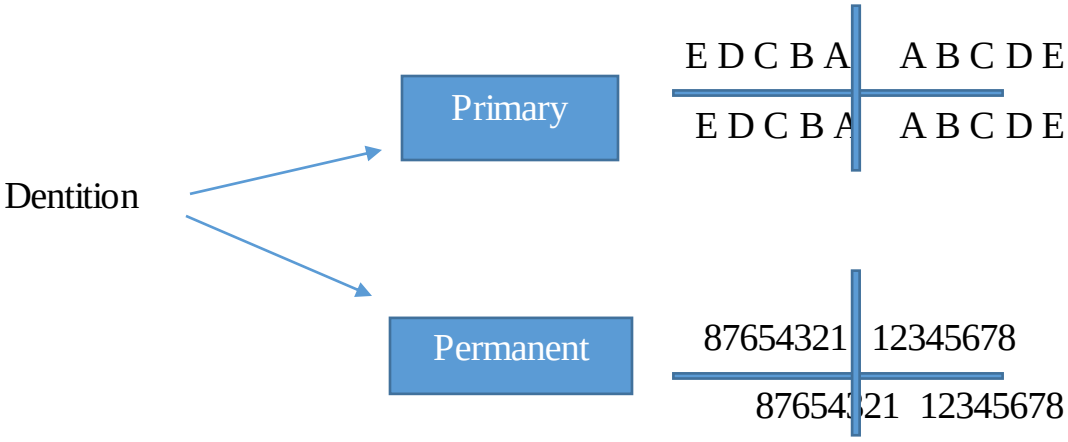
An age-defined specialty that provides both primary and comprehensive preventive and therapeutic oral health care for infants and children through adolescence, including those with special health care needs.

Pedodontics: is a branch of dentistry that is concerned with the dental care of children, its origin came from a Greek words (pedo-child + odous, odont- 'tooth').

Eruption of teeth

This process can be defined as the movement of the tooth through the tissues of the jaw towards occlusion into the oral cavity. The formation and eruption of teeth are two essential processes which may be influenced by:

1. Genetic factors 2. Environmental factors 3. Hormonal factors



** Each tooth starts to move toward occlusion at approximately the time of crown completion, and the interval from crown completion and the beginning of eruption until the tooth is in full occlusion is approximately 5years for permanent teeth.

Pattern of tooth movement

A considerable movement are required to bring the teeth to the occlusal plane and then into functional occlusion.

Types of tooth movements:

1. Pre- eruptive tooth movement: includes all movements of the deciduous and permanent tooth germs within the tissues of the jaw, from the time of early initiation and formation to the time of crown completion and this phase terminates with the initiation of root development, during this phase the growing tooth moves in two directions to maintain its position in the expanding jaws (outward and upward in the mandible and outward and downward in the maxilla).

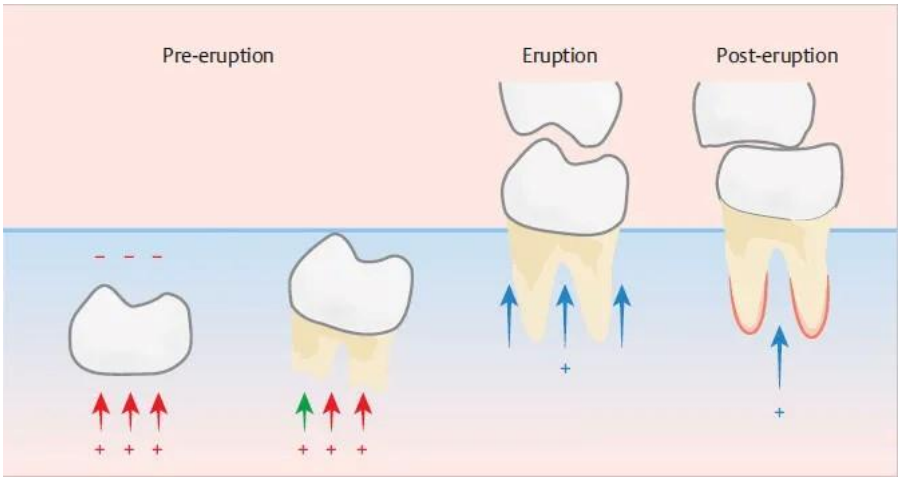
Bodily movement: it occurs continuously as the jaw grows by which the movement of the entire tooth germ cause bone resorption at the direction of tooth movement and bone apposition behind it.

Eccentric movement: one part of the tooth germ remains fixed while the rest continues to grow causing a shift in the center of the tooth germ.

**The root elongates when the crown does not increase in size.

2. Eruptive tooth movement: it is the axial movement of the tooth from its crypt within the bone of the jaw to its functional position in occlusion (to occlude with its antagonist).

3.Post - eruptive tooth movement: it occurs primarily to maintain the position of the erupted tooth while the jaw continues to grow and to compensate for the occlusal and proximal wear. This movement occur in axial direction.



Theories of Tooth Eroption

1. **Root formation**: It was believed that root formation is an obvious cause of tooth eruption because it causes an overall increase in length of the tooth that must be accommodated by the growth of the root into the bone, an increase in jaw height or by the occlusal movement of the crown (eruption). Root growth theory suggested the presence of the cushion hammock ligament at the base of the socket that transmits the force to cause eruption but the ligament was never found histologically.
2. **Bone remodeling**: An inherent growth pattern of the maxilla and mandible supposedly moves teeth by selective deposition and resorption of bone. This theory is not accepted. Bone resorption and formation occurred because of eruptive forces applied by tooth over the bone (there are some animal studies showed that bony remodeling occurs around the dental follicle regardless of the presence of a tooth).
3. **Vascular pressure**: The Vascular Pressure theory supposes that a local increase in tissue fluid or blood pressure in the periapical region is sufficient to move the tooth (the tissue pressure apical to the erupting tooth was greater than occlusally, theoretically generating an eruptive force). It means that the hydrostatic pressure on top of the tooth is less than hydrostatic pressure underneath the tooth. This difference in pressure will push the tooth occlusally. However, since surgical excision of the growing root and associated tissues eliminates the periapical vasculature without stopping eruption, this means that the local vessels absolutely are not necessary for tooth eruption.
4. **Periodotal ligament**: Eruptive force resides in the dental follicle-periodontal ligament complex. Formation and renewal of the PDL has been considered a factor in tooth eruption because of the traction power that fibroblasts have which may pull the tooth out during eruption.
   "The periodontal ligament, which is derived from the dental follicle, provides the force required for eruption mainly by fibroblast contraction" HOWEVER, in vitro tissue studies have limitations concerning this theory.
5. **Dental follicle theory**: It is clear that the dental follicle is essential to achieve the bony remodeling required to accommodate tooth movement, for it is from this tissue that the osteoblasts differentiate. Studies have shown that the reduced dental epithelium initiates a cascade of intercellular signals that recruit osteoclasts to the follicle. By providing a signal and

chemoattractant for osteoclasts, it is possible that the dental follicle can initiate bone remodeling which goes with tooth eruption. Teeth eruption is delayed or absent in animal's models and human diseases that cause a defect in osteoclast differentiation

Root Formation Theory

Depend on the idea that root elongation is the motive force behind tooth eruption"

☒ Rootless teeth can erupt

☒Teeth still erupt after completion of root formation

☒Some teeth erupt a greater distance more than the total length of their root

Bone Remodeling Theory

Depend on the idea that Bone remodeling that achieved by osteoclast &osteoblast around an erupting tooth are the motive force behind tooth eruption

☒Bone formation occurs after the tooth has been moved

THUS it is a result, not a cause of this process

PDL traction theory

Depend on Migration & traction of PDL fibroblasts are the motive force behind tooth eruption; Tooth movement is brought about by:

1) Fibroblast contractile properties.

2) Connection with extracellular collagen fibers "fibronexus (imp. In transmitting traction to the extracellular matrix)" 3) Oblique alignment of PDL collagen fibers"

☒Rootless teeth can erupt

☒ Impacted teeth with a well-developed PDL cannot erupt

Vascular Pressure Theory

Depend on the idea that Vascular tissue hydrostatic pressure within the PDL is the motive force behind tooth eruption."

☒ • Eruption can also occur independently of the vascular alteration

What actually happens when the tooth is erupting, there are certain genes codes certain proteins binds to certain cells of the dental follicle stimulating these follicle to differentiate into osteoclasts and osteoblasts where bone resorption and bone apposition occurs on both surfaces of the tooth occlusal

and apical, this actually will cause the tooth to erupt. **Therefore, the dental follicle is mainly responsible for the process of eruption.**

Development of teeth Tooth

development or o‘dontogenesis is the complex process by which teeth form from embryonic cells, grow, and erupt into the mouth (starts as early as 28 days of IUL and continues to the end of eruption of permanent molars). For human teeth to have a healthy oral environment, all parts of the tooth must develop during appropriate stages of fetal development. Primary (baby) teeth start to form between the sixth and eighth week of prenatal development, and permanent teeth begin to form in the twentieth week. If teeth do not start to develop at or near these times, they will not develop at all, resulting in hypodontia or anodontia. Development of teeth passes through the following stages:

A. Development in the prenatal period: in this period three overlapping phases occur:
    1. Beginning of the deciduous dentition development The development of teeth starts at 3 rd week of IUL, then the odontogenic epithelium proliferates in the 5th week to form the dental lamina which form invaginations that develop into tooth buds.

    2. The formation of the successional lamina It is the lingual extension of the dental lamina develops in the 5th months of IUL (permanent central incisor) to 10th months of age (2nd premolar).

    3. Initiation of the permanent dentition It is initiated in the 4th month of IUL.

B. Status of development at birth: the teeth are in different stages of development at birth.

C. Development in the postnatal period: it shows completion of the crowns of all primary teeth and initiation of root formation. The permanent teeth

continue to develop in different stages till their root formation is completed.

A number of physiological changes take place in the progressive development of teeth:

1. Growth: includes

a) Initiation (bud stage): first stage of tooth development occurs around 6-7 weeks IUL. One of the earliest signs in the formation of a tooth that can be seen microscopically is the distinction between the vestibular lamina and the dental lamina. The dental lamina connects the developing tooth bud to the epithelial layer of the mouth for a significant time.

- In this phase the location of teeth are established with the appearance of tooth germs (tooth buds) in both jaws (mandible and maxilla) to form primary teeth

So if any problem occurs at this stage or any interruption happened what do you think the outcome will be?

The initiation is to determine the space of the tooth germ, which appears in this stage so any problem occurred will result either be hypodontia (some of teeth will not be formed) or in hyperdontia (extra teeth will be formed, supernumerary teeth (SNT)). Any defect occurred during this stage result in either no teeth buds formed or extra buds will be formed.

b) Proliferation (cup stage): second stage of development known as the cap stage. It results from cellular division and multiplication of cells. As a result of unequal growth in the different parts of the bud, a cap is formed. A shallow invagination appears on the deep surface of the bud. The peripheral cells of the cap later form the outer and inner enamel epithelium.

As with a deficiency in initiation, a deficiency in proliferation results in failure of the tooth germ to develop and in less than the normal number of teeth. Excessive proliferation of cells may result in epithelial rests. If the cells become more fully differentiated or detached from the enamel organ,

they produce enamel and dentin, which results in an odontoma or a supernumerary tooth. The degree of differentiation of the cells determines whether a cyst, an odontoma, or a supernumerary tooth develops.

c) Histodifferentiation: The epithelium continues to invaginate and deepen until the enamel organ takes on the shape of a bell, during this stage there is a differentiation of the cells of the dental papilla into odontoblasts and of the cells of the inner enamel epithelium into ameloblasts. Histodifferentiation marks the end of the proliferative stage as the cells lose their capacity to multiply. This stage is the forerunner of appositional activity. Disturbances in the differentiation of the formative cells of the tooth germ result in abnormal structure of the dentin or enamel. One clinical example of the failure of ameloblasts to differentiate properly is amelogenesis imperfecta. The failure of the odontoblasts to differentiate properly, with the resultant abnormal dentin structure, results in the clinical entity dentinogenesis imperfecta.

d) Morphodifferentiation: At this stage, the shape of the teeth is determined. The formative cells are arranged to outline the form and size of the tooth. This process occurs before matrix deposition. The morphologic pattern of the tooth becomes established when the inner enamel epithelium is arranged so that the boundary between it and the odontoblasts outlines the future dentinoenamel junction.

-So if any disturbance happened what do you think the outcome will be?

Disturbances and aberrations in morphodifferentiation lead to abnormal forms and sizes of teeth. Resulting conditions include peg-shape laterals, microdontia, macrodontia, dens evaginatus, dens invaginatus), other types of microdontia, and macrodontia.

e) Apposition: appositional growth is the result of a layer-like deposition of a nonvital extracellular secretion in the form of a tissue matrix. This matrix is deposited by the formative cells, ameloblasts, and odontoblasts, which line up along the future dentinoenamel and dentinocemental junction at the stage of morphodifferentiation. These cells deposit the enamel and dentin matrix according to a definite pattern and at a definite rate.

Any systemic disturbance or local trauma that injures the ameloblasts during enamel formation can cause an interruption or an arrest in matrix apposition. which results in enamel hypoplasia. Hypoplasia of the dentin is less common than enamel hypoplasia and occurs only after severe systemic disturbances.

f) Calcification: This process starts between 14 and 16 weeks of intrauterine life for primary teeth. Calcification (mineralization) takes place following matrix deposition and involves the precipitation of inorgamc calcium salts within the deposited matrix. The process begins with the precipitation of a small nidus, and further precipitation occurs around it. The original nidus increases in size by the addition of concentric laminations. There is an eventual approximation and fusion of these individual calcospherites into a homogeneously mineralized layer of tissue matrix.

Notes:

✓It begins in cusp tips and incisal edges of teeth and continues cervicaly.

✓ Very sensitive process that takes place over a long period.

✓ If the calcification process is disturbed, there is a lack of fusion of the calcospherites. These deficiencies are not readily identified in the enamel, but in the dentin, they are evident microscopically and are referred to as **interglobular dentin.**

✓Any disturbances during the period of pregnancy as early as 14 or 16 weeks in utero might result in disturbances or anomalies in child's teeth as soon as the primary teeth erupt.

2. Eruption: includes two processes intrabony phase and intra oral phase. They take 5 years to be completed. The tooth emerge when **3⁄4 its root formation** has occurred. The tooth usually reaches the occlusal plane before its root development is completed, the teeth of girls erupt earlier than that of boys. When the tooth is not fully formed its root shape is funnel shaped.

3 Attrition: a physiological process characterized by wearing of a tooth during tooth - to - tooth contact as in mastication. The surfaces involved are incisal, occlusal and proximal. Basically, attrition is an aging process and it continues throughout the life.

What are the importance of the eruption time?

1. For the dentist in the diagnosis and treatment plan.
2. For the dental epidemiologist.
3. For the physicion. e.g. Malnutrition lead to delayed or retained primary teeth.
4. For the orthodontist. E.g. Ugly duckling stage.
5. For the psychologist. E.g. mentally retarded patient and the importance of the replacing the tooth or not.
6. For the forensic odontologist.
7. In the anthropologist.

Influence of Premature Loss of Early Molars On Eruption Time Of Their Successors

1. In children who lose primary molars at 4 or 5 years of age and before eruption of the premolar teeth will be delayed.

2. If extraction of the primary molars occurs after the age of 5 years, there is a decrease in the delay of premolar eruption.

3. At 8, 9, and 10 years of age, premolar eruption resulting from premature loss of primary teeth is greatly accelerated. Premature loss of teeth associated with systemic disease usually results from some change in the immune system or connective tissue. The most common of these conditions appears to be hypophosphatasia and early-onset periodontitis.

* EPSTEIN PEARLS, BOHN NODULES, AND DENTAL LAMINA CYSTS

Small, white or grayish white lesions on the alveolar mucosa of newborn may be incorrectly diagnosed as natal teeth. The lesions are usually multiple but do not increase in size. No treatment is indicated because the lesions are spontaneously shed a few weeks after birth.

- **Epstein pearls**: are formed along the mid-palatine raphe. They are considered remnants of epithelial tissue trapped along the raphe as the fetus grew.
- **Bohn Nodules** : are formed along the buccal and lingual aspect of dental ridges and on the palate away from the raphe. The nodules are considered remnant of salivary gland tissue.
- **Dental Lamina Cyst:** are found on the crest of maxillary and mandibular dental ridges. The cysts originated from remnant of dental lamina.

Shedding of the primary teeth :- - The human dentition like those of most mammals consists of two generations. The first generation is known as the deciduous or primary dentition and the second as the permanent dentition. The need and the necessity of two dentitions exists because :- 1. Infant jaws are small and the size and number of teeth they can support is limited. 2. Since the teeth, once formed, cannot increase in size, a second dentition, consisting of larger and more teeth, is required for the larger jaws of the adult. **The physiological process resulting in the elimination of the deciduous dentition is called shedding or exfoliation**

Pattern of shedding:

- **Resorption of anterior teeth**

The permanent anterior tooth germ position is lingual to the apical third of roots of primary teeth hence the resorption is on the occlusolabial direction, which correspond to the movement of permanent tooth germ. Later the resorption proceed horizontally because the crown of the permanent tooth lies directly apical to the roots of the primary tooth and this horizontal resorption will allows the permanent tooth to erupt into the position of the primary tooth

- **Resorption of posterior teeth**

Initially, the growing crown of premolars are situated between the roots of the primary molars, so the root resorption of the posterior teeth will start at the inter radicular bone area followed by the resorption of the adjacent root surfaces.

Remenant of deciduous teeth

Sometimes parts of deciduous tooth that are not in the path of eruption remain embedded in the jaw for considerable time. They mostly associated with the permanent premolars roots because the roots of lower deciduous molars are strongly curved or diverge.progressive resorption of the roots remnant will cause disappearance of these remnants.

Retained Deciduous Teeth

They may retained for long period of time beyond their shedding time. Such as teeth without permanent successor or their successor are impacted. Retained deciduous teeth are most often the upper lateral incisor, less frequently the mandibular second primary molars and rarely the lower central incisors .

*** Local Factors influence time of eruption**

1) Infection around the tooth

1. near the eruption time it cause tearing of tissues and sometimes resorption in the area resulting in early eruption. 2. If the infection occur before long period of time it will result in late eruption because infection for long period will healed with fibrosis in the area which aid in late eruption

2) Supernumerary tooth: may be of importance in late the eruption .

3)Trauma: any trauma may cause early shedding of primary teeth ,which lead to late eruption of permanent successor teeth .

4)Gingival fibromatosis: **Hereditary gingival fibromatosis (HGF)** is

characterized by a slow, progressive, benign enlargement of the gingivae. This dense fibrous tissue often causes displacement of the teeth and malocclusion, also it may prevent eruption of teeth and treatment usually is gingivectomy .

5)Ankylosed teeth:

The mandibular primary molars are the teeth most often observed to be ankylosed. The cause of ankylosis in the primary molar areas is unknown. It may follow a familial pattern. There is a relationship between the congenital absence of permanent teeth and ankylosed primary teeth .

Normal resorption of the primary molar begins on the inner or lingual surfaces of the roots. The resorption process is not continuous but is interrupted by periods of inactivity or rest. A reparative process follows periods of resorption. In the course of this reparative phase, a solid union often develops between the bone and the primary tooth .

Extensive bony union of the primary tooth may prevent normal exfoliation and the eruption of the permanent successor. If ankylosis occurs early, eruption of

the adjacent teeth may progress enough that the ankylosed tooth is far below the normal plane of occlusion .

The diagnosis of an ankylosed tooth It is not difficult to make .

Because :

1-Eruption has not occurred

2- .The ankylosed tooth is not mobile.

3-Ankylosis can be partially confirmed by tapping the suspected tooth and an adjacent normal tooth with a blunt instrument and comparing the sounds. The ankylosed tooth will have a solid sound, whereas the normal tooth will have a cushioned sound because it has an intact periodontal membrane that absorbs some of the shock of the blow .

4- The radiograph is often a valuable diagnostic aid. A break in the continuity of the periodontal membrane, indicating an area of ankylosis, is often evident radiographically .

The Management Of An Ankylosed Tooth

Early recognition and diagnosis are extremely important .

1-The eventual treatment may involve surgical removal .

2-A tooth that is definitely ankylosed may at some future time undergo root resorption and be normally exfoliated. When patient cooperation is good and recall periods are regular, a watchful waiting approach is best .

3-For primary teeth: In situations in which permanent successors of ankylosed primary molars are missing, attempts have been made to establish functional occlusion using stainless steel crowns on the affected primary molars .

4- For permanent teeth: The incomplete eruption of a permanent molar may be related to a small area of root ankylosis. The removal of soft tissue and bone covering the occlusal aspect of the crown to provide a pathway for the developing permanent tooth. Unerupted permanent teeth may become ankylosed by inostosis of enamel.

This process follows the irritation of the follicular or periodontal tissue resulting from chronic infection. The close association of an infected apex with an unerupted tooth may give rise to the process. In the unerupted tooth, enamel is protected by enamel epithelium. The enamel epithelium may disintegrate because of infection (or trauma)the enamel may subsequently be resorbed, and bone may be deposited in its place. The result is solid fixation of the tooth in its unerupted position.treatment should be attempted at this stage

Systemic (disease) Factors which cause late eruption :-

1) Trisomy 21 Syndrome (Down Syndrome DS) :-

- Trisomy 21 syndrome (Down syndrome DS) - that is, the presence of three number 21 chromosomes rather than the normal two (diploid). It is one of the congenital anomalies, in which **delayed eruption** of the teeth frequently occurs. The first primary teeth **may not appear until 2 years of ag**e, and the dentition may **not** be complete until 5 years of age.

- The eruption often follows an abnormal sequence, and some of the primary teeth may be retained until 15 years of age. DS occurs very early in embryonic development, possibly during the first cell divisions. Anomalies of the eye and external ear are seen, and congenital heart defects are often present.

- The occurrence of DS is frequently related to maternal age.

*** The diagnosis of DS** :- - In a child is not usually difficult to make because of the characteristic facial pattern :

- 1. The orbits are small,

2. The eyes slope upward,

3. The bridge of the nose is more depressed than normal.

4. Retardation in the growth of the maxillae and mandible was evident in those with DS.

5. The smaller jaws contribute to a tendency for protrusion of the tongue and dental crowding.

6. The tongue also tends to be larger than normal.

7. Individuals with DS have a higher prevalence of periodontal disease mainly in the anterior region. However, susceptibility to dental caries is low for both primary and permanent teeth.

2) Cleidocranial Dysplasia :-

A rare congenital syndrome. The diagnosis is based on the finding of an

1-absence of clavicles.

2. The fontanels are large, and radiographs of the head show open sutures.

3. The development of the dentition is delayed. Complete primary dentition at 15 years of age.

4. One of the important distinguishing characteristics is the presence of **supernumerary teeth.**

3)Hypothyroidism

❖ **Congenital Hypothyroidism (Cretinism)**

1. Congenital hypothyroidism is the result of an absence or underdevelopment of the thyroid gland and insufficient levels of thyroid hormone.

2. Child with congenital hypothyroidism is a small with abnormally short arms and legs.

3. The head is large.

4. Obesity is common.

5. The dentition of the child with congenital hypothyroidism is 8 delayed in all stages, including eruption of the primary teeth, exfoliation of the primary teeth, and eruption of the permanent teeth.

6. The teeth are normal in size but are crowded in jaws that are smaller than normal.

7. The tongue is large and may protrude from the mouth. The abnormal size of the tongue and its position often cause an anterior open bite and flaring of the anterior teeth.

❖ **Juvenile Hypothyroidism (Acquired Hypothyroidism)**

It results from a malfunction of the thyroid gland, usually between 6 and 12 years of age. In untreated juvenile hypothyroidism, delayed exfoliation of the primary teeth and delayed eruption of the permanent teeth are characteristic

4-Chondroplastic Dwarfism

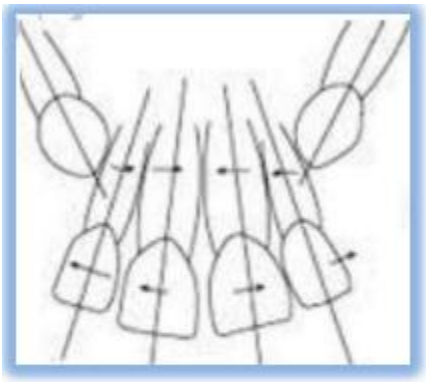
Easily diagnosed at birth. Growth of the extremities is limited because of a lack of calcification in the cartilage of the long bones.

The head is large.

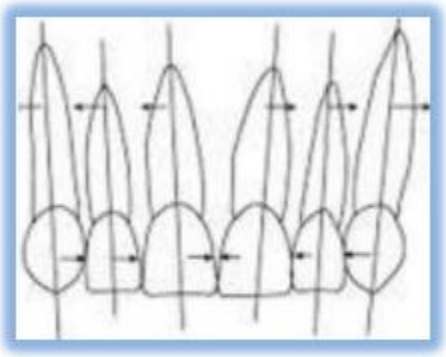
The fingers may be of almost equal length, and the hands are plump. There is some evidence that the condition is more likely to occur when the ages of the parents differ significantly.

Uckly Duckly stage

Also called Broadbent phenomenon, a self-correcting malocclusion is seen around 9-11 years of age or during eruptions of canine. As the permanent canines erupt, they displace the roots of lateral incisors mesially. This force is transmitted to the central incisors and their roots are also displaced mesially. Thus, the resultant force causes the distal divergence of the crown in an opposite direction, leading to midline spacing (diastema in the incisor region). The term ugly duckling stage indicates the anesthetic appearance of the child during this stage. This condition corrects itself after the canines have erupted when it apply pressure on the crowns of the incisors thereby causing them to shift back to original positions. No orthodontic treatment should be attempted at this stag



a. The ugly duckling stage



b. Final anterior alignment

Morphology of Individual Primary Teeth :-

Studying tooth morphology includes understanding the shape, configuration and parts of a tooth. It is very important for clinical application during performing various procedures. Cavity preparations must conform to the thickness of enamel and dentin, keeping in mind the location and size of the pulp. Restoration of natural contours and morphology of deciduous teeth is needed for function, which can be achieved only with a good knowledge of tooth morphology.

* Maxillary Central Incisors :-

- Labial aspect :-

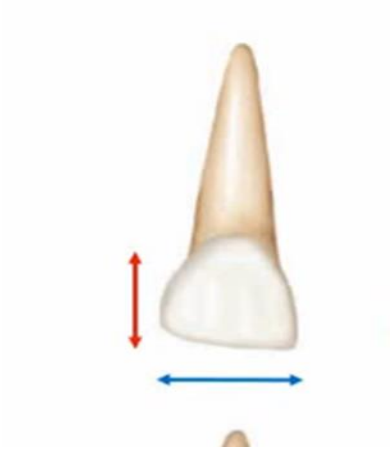
1. The mesiodistal diameter of the crown is greater compared to the cervicoincisal height.

2. The incisal edge is straight with sharp mesioincisal and rounded distoincisal angle.

3. The labial surface is smooth without developmental grooves or depressions.
4. The mesial outline is straight whereas the distal outline is convex.

5. The mesial contact area is near the mesioincisal angle and the distal contact area is in the incisal third.

6. The root is conical with evenly tapered side



Lingual aspect :- (Palatal aspect)

1. The cingulum and marginal ridges are well developed.

2. The lingual fossa is in the incisal third of the lingual surface.

Mesial and Distal aspects :-

1. The crown is wide labiolingually in the cervical third because of prominent cingulum.

2. The labial outline shows prominent cervical ridge.

- Incisal aspect :-

1. The labial surface is smooth.

2. Lingual surface tapers towards cingulum.

3. The crown is wider mesiodistally than faciolingually.

*** Maxillary Lateral Incisors :-**

1. The maxillary lateral incisor is similar to maxillary central incisor except.

2. Crown is smaller than central incisor.

3. The distoincisal angle is more rounded.

4. The crown height is greater than mesiodistal width.

5. The root is longer in proportion to crown height.

*** Maxillary Canine :-**

- Labial aspect

1. The crown shows marked cervical constriction.

2. The mesial and distal outlines are convex.

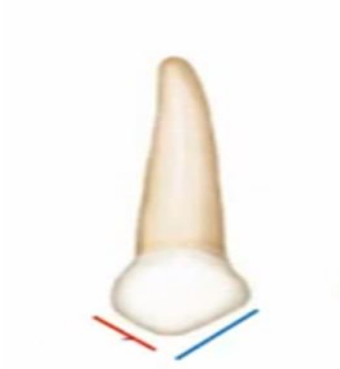
3. Maxillary canine has a long sharp cusp with two cusp ridges meeting at an acute angle.

4. The mesial cusp slope is longer and straighter than distal cusp slope.

5. The mesial and distal contact areas are near the center of the crown cervico-occlusally.

6. The root is long, slender and tapering.

7. The root length is approximately more than twice the crown height.



Lingual aspect :-

1. The lingual surface of canine shows a well-developed, prominent cingulum.
2. Well-developed mesial and distal marginal ridges.
3. The lingual ridge is somewhat distal to the midline of tooth.

Mesial and Distal aspects :-

1. The crown appears triangular from mesial and distal aspects.
2. The cervical third of the crown is much thicker than that of the incisors.
3. The cusp tip is labial to long axis of the tooth.
4. The cervical ridge on the labial surface is prominent.
5. The root is bulky in its middle and cervical third and tapered in the apical third.

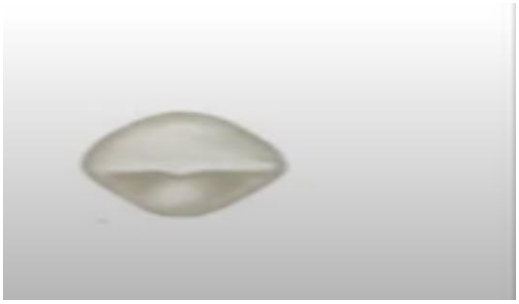
- Incisal aspect :-

1. The crown outline is somewhat angular and tapers considerably towards the cingulum.

2. The mesial outline is flat, tapered, angular and thicker faciolingually than in the distal half of the crown.

3. The cingulum is centered mesiodistally.

4. The crown is faciolingually broader than incisors



* Mandibular Central Inicisor:-

. The crowns **resemble the permanent mandibular incisor** but are much smaller

-The crown is smaller than that of the maxillary central incisor, but the labio-lingual measurement is usually only 1 mm less.

- Incisal edge is straight and bisects the crown labio-lingually.

- Labial surface is flat without developmental grooves.

-Lingual surface has marginal ridges and cingulum.

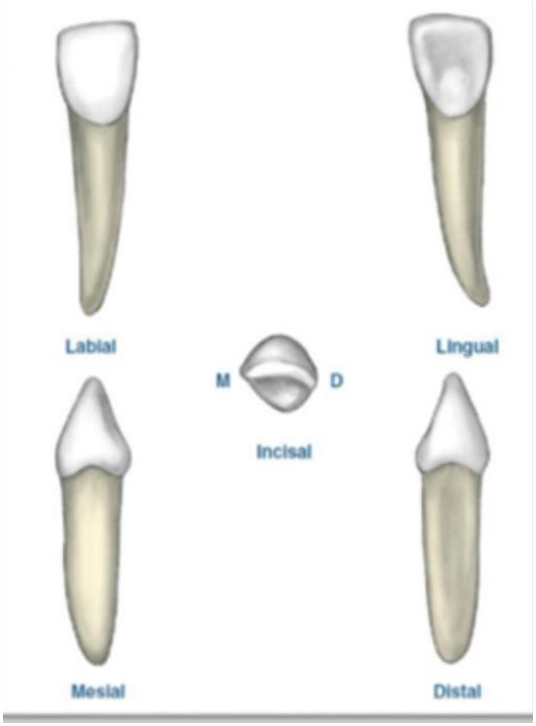
- The root is almost twice the length of the crown.

Mandibular lateral Inicisor

-resembles that of mandibular central incisor, but is somewhat larger in all dimensions except labio-lingually.

- The incisal edge inclines toward the distal aspect of the tooth.

- The lingual surface may have greater concavity between the marginal ridges.



* Mandibular Canine :-

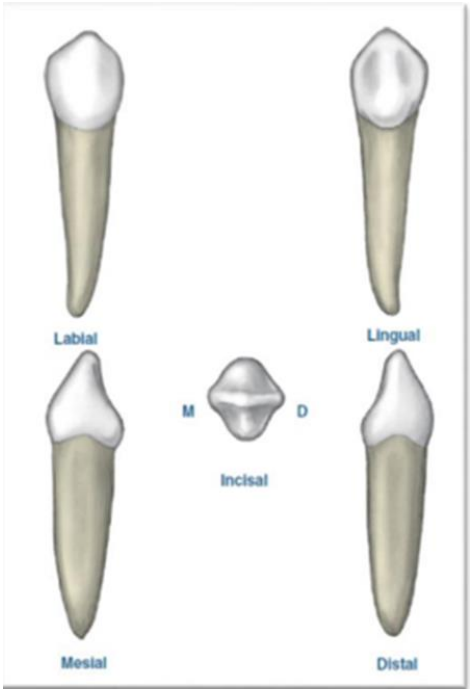
1. There is very little difference in functional form between this tooth and maxillary canine.

2. The mesiodistal dimension of mandibular canine at root trunk is greater than mesiodistal width at contact area.

3. Mandibular canine is smaller mesiodistally than maxillary canine.

4. Mesial cusp slope is shorter than distal cusp slope.

5. Cervical ridge is less prominent than maxillary canine.



*** MAXILLARY FIRST MOLAR** :-

- Buccal aspect :-

1. The occlusal outline is scalloped with no definite cusp form.

2. The crown height is more mesially than distally.

3. The crown shows marked cervical constriction.

4. The mesial outline is straight and the distal outline is convex.

5. The cervical third of crown has prominent cervical ridge.

6. The three roots are thin and widely spread.

- Lingual aspect :-

1. The crown is narrower on lingual aspect

2. The general outline of the crown is similar to the buccal aspect.

3. The mesiolingual cusp is the most prominent, largest and sharpest. 4. The distolingual cusp is poorly developed. 5. All three roots are seen from this aspect. 6. The palatal root is longer and larger than others.

- Mesial aspect :-

1. In the cervical third the crown is much wider buccolingually than the occlusal third.

2. The mesiobuccal and lingual roots are seen from this aspect.

3. The mesiobuccal root extends far beyond the outline of the crown.

4. Buccal outline shows cervical ridge.

5. Both the buccal and lingual outlines show occlusal convergence.

- Occlusal aspect :-

1. The tooth resembles permanent first molar.

2. The occlusal surface is rhomboidal with 4 well developed cusps i.e. mesiobuccal, distobuccal, mesiolingual and distolingual.

3. The buccal outline is flat with a developmental groove in between the cusps.

4. The occlusal surface shows :-

a. Central fossa with central pit

b. Mesial triangular fossa, distal triangular fossa

c. Central groove is seen connecting mesial and distal pits

. d. The oblique ridge is prominent connecting the mesiolingual cusp with distobuccal cusp.

e. Distal to oblique ridge, distal fossa with distal groove is present.

f. The distal groove separates two lingual cusps and continues on the lingual surface as lingual developmental groove.

MANDIBULAR FIRST MOLAR :-

- The anatomy of mandibular first molar **does not resemble** any tooth in permanent dentition –

Buccal aspect :-

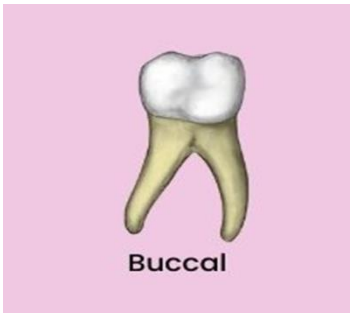
The mesiobuccal cusp is the largest and longest cusp.

The mesial outline is nearly straight whereas the distal outline is convex.

The mesial and distal roots are widely separated.

Roots are slender and the furcation is close to the cervical line.

. Buccal surface shows a prominent cervical ridge.



Lingual aspect :-

The crown and root converge lingually on the mesial side, part of mesial surface is visible from the lingual aspect.

The mesiolingual cusp is larger and longer than the distolingual cusp.

- Mesial aspect :-

1. Buccal outline shows prominent cervical ridge.

2. The crown appears to lean towards lingual surface.

3. From cervical ridge the buccal outline is straight.

5. The occlusal table is small buccolingually.

7. The mesial root is flat and square with a broad apex.

8. The mesial root has a depression along it lenght

Distal aspect :-

1. Buccal cervical ridge is less prominent from the distal side than from the mesial.

2. The distobuccal and distolingual cusps are nearly of the same height.

3. The distal marginal ridge is located more cervically than mesial marginal ridge.

4. The distal root is more rounded, less broad, thinner and shorter than the mesial root.

- Occlusal aspect :-

1. The general outline of this tooth from the occlusal aspect is rhomboidal.

2. **Four cusps** are present, they are mesiobuccal, mesiolingual, distobuccal and distolingual.

3. The mesiobuccal angle is acute and prominent.

4. The distobuccal angle is obtuse.

5. The crown shows lingual and distal convergence.

6. The mesiolingual cusp is the largest cusp.

7. The occlusal surface shows:

8. Transverse ridge is seen between the mesiobuccal and mesiolingual cusps.

9. Buccal developmental groove divides two buccal cusps and extends from between the buccal cusps to the central pit.

10. Central developmental groove separates the mesiobuccal and mesiolingual cusps.

11. Mesial and distal fossae contain mesial and distal pits respectively. *

MANDIBULAR SECOND MOLAR :- - The primary mandibular second molar resembles the permanentIt is **the largest tooth** in the deciduous dentition.

- Buccal aspect :-

1. The crown is wide mesiodistally.

2. The crown appears to be tilted distally on its root base.

3. There are 3 cusps of nearly equal size, namely mesiobuccal, distobuccal and distal.

4. These cusps are separated by mesiobuccal and distobuccal grooves.

5. The roots are widely separated.

6. Root trunk is short.

- Lingual aspect :-

1. Mesiolingual and distolingual cusps are about the same size and height.

2. Both the cusps are separated by lingual groove.

3. Root trunk is slightly longer.

- Mesial aspect :-

1. Buccal outline shows a prominent mesial cervical ridge giving the crown an appearance of lingual tilt.

2. The buccal and lingual outlines converge towards the occlusal surface.

3. The mesial marginal ridge is traversed by the mesial marginal groove.

4. The mesial surface is convex and flattens cervically.

5. The mesial root is broad and flat with a shallow depression.

6. Mesial root has two root canals.

- Distal aspect :-

1. Crown is narrower on the distal side than on mesial.

2. Distal root is broad and has less blunt apex.

3. Distal root may have I or 2 root canals.

- Occlusal aspect :-

- This tooth has 5 cusps with mesiobuccal cusp being the largest cusp. - Occlusal surface shows :-

1. Central fossa

2. Mesial and distal triangular fossa

3. Central groove, mesiobuccal groove, distobuccal groove and lingual groove.

Morphology of Individual Primary Teeth CONT :-

* Morphology of Individual Primary Teeth :-

*** MAXILLARY FIRST MOLAR :-**

- Buccal aspect :-

1. The occlusal outline is scalloped with no definite cusp form.

2. The crown height is more mesially than distally.

3. The crown shows marked cervical constriction.

4. The mesial outline is straight and the distal outline is convex.

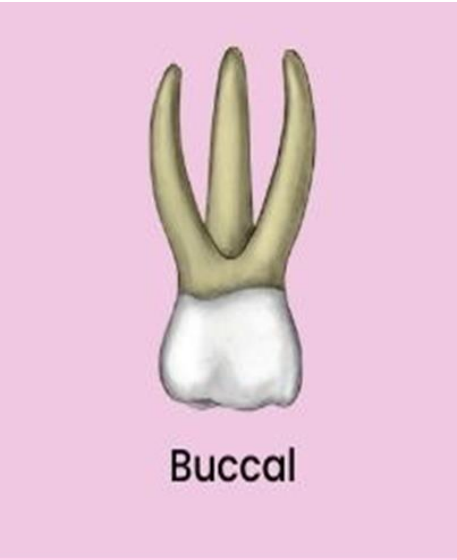
5. The contact area is in middle 1/3.

6. The buccal surface is smooth with little evidence of developmental grooves.

7. The cervical third of crown has prominent cervical ridge.

8. The three roots are thin and widely spread.

9. The root trunk is short.



- Lingual aspect :

- 1. The crown is narrower on lingual aspect

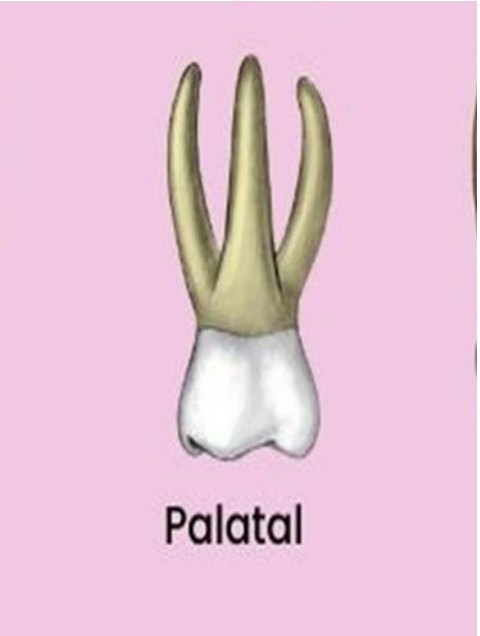
2. The general outline of the crown is similar to the buccal aspect.

3. The mesiolingual cusp is the most prominent, largest and sharpest.

4. The distolingual cusp is poorly developed.

5. All three roots are seen from this aspect.

6. The palatal root is longer and larger than others.



- Mesial aspect :-

1. In the cervical third the crown is much wider buccolingually than the occlusal third.

2. The crown tapers occlusally.

3. The buccal outline shows prominent cervical ridge.

4. The buccal outline is straight from the ridge to the occlusal margin.

5. The lingual outline is convex in cervical and middle thirds and straight in the occlusal third.

6. The mesial marginal ridge may show a developmental groove.

7. The root trunk is short.

8. Only palatal and mesiobuccal roots are visible from this aspect.

- Distal aspect :-

1. The crown is narrower buccolingually and shorter cervico-occlusally than on the mesial side.

2. The cervical ridge is less prominent than from the mesial aspect.

- Occlusal aspect :-

1. The occlusal surface bears four cusps: mesiobuccal, distolingual, distobuccal and mesiolingual.

2. The crown is broader buccally more than lingually and mesially more than distally.

3. The crown shows lingual and distal convergence.

4. The occlusal surface is rectangular with the short sides represented by the marginal ridges.

5. The occlusal surface shows :-

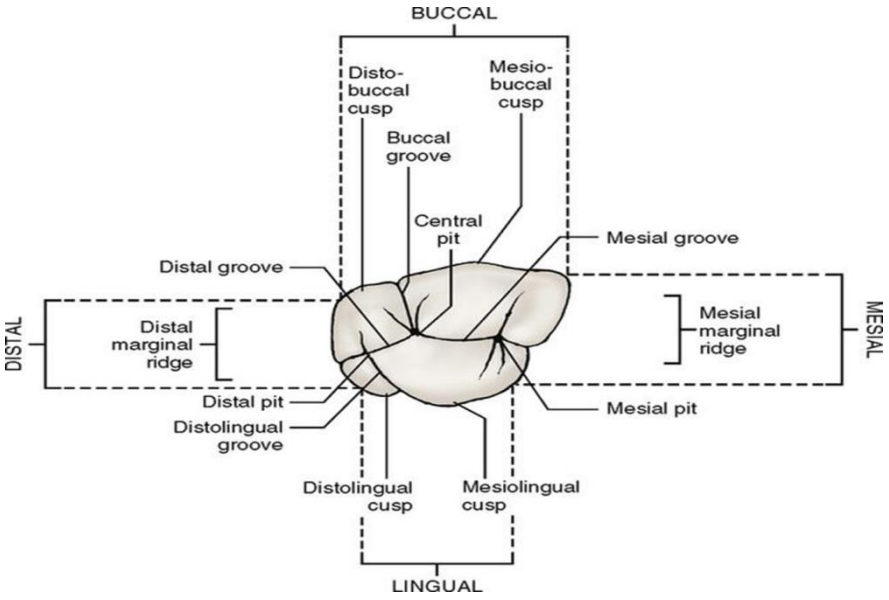
a. Central fossa

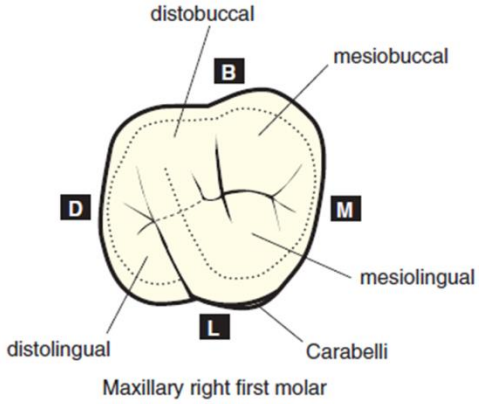
b. Central groove that connects the mesial and distal fossae, which are present just inside the mesial and distal marginal ridges respectively.

c. Buccal developmental groove separates mesiobuccal and e distobuccal cusps.

d. A well-defined triangular ridge connects mesiolingual and distobuccal cusps called as oblique ridge.

e. Supplemental grooves radiating from the central groove are present.





Maxillary right first molar

*** MAXILLARY SECOND MOLAR :-**

- Buccal aspect :-

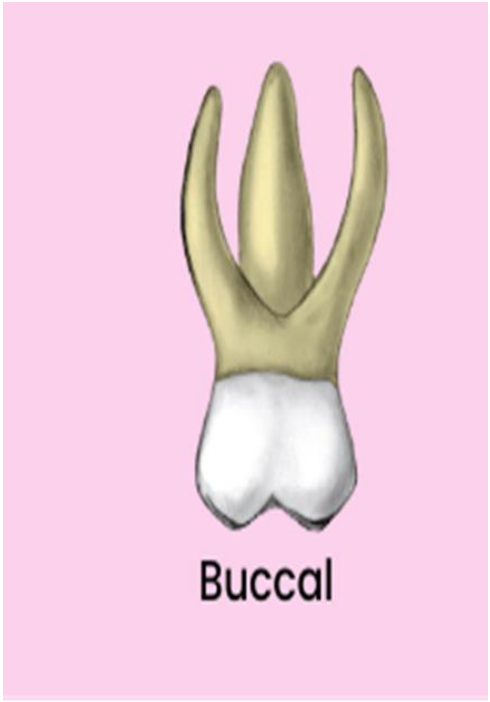
1. The primary maxillary second molar resemble the permanent maxillary first molar, but it is smaller in size

2. The buccal view show two well define buccal cusps with buccal developmental groove in between

3. The mesial and distal outlines converge cervically from contact areas

4. All three roots are longer, and thicker as compared to the maxillary first molar

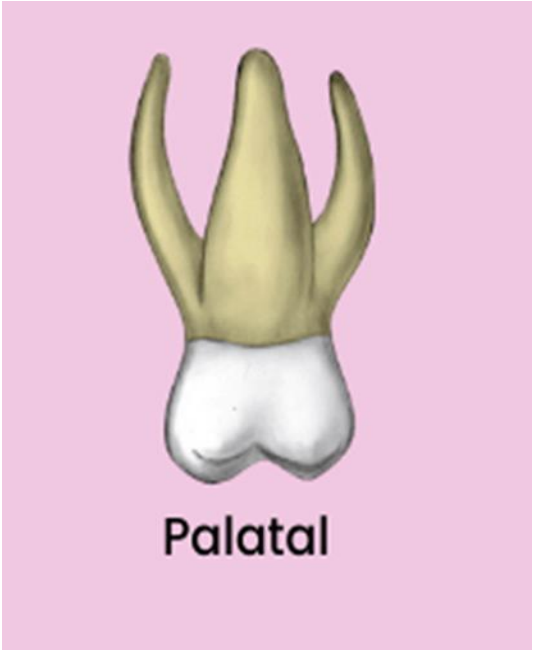
5. The root trunk is very short



- Lingual aspect :-

1. The crowns shows three cusp: mesiolingual cusp, distolingual cusp and a supplemental cusp.

2. Cusp present on the lingual surface of mesiolingual cusp is called the 'tubercle of Carabelli' or fifth cusp. –



Mesial and Distal aspects :-

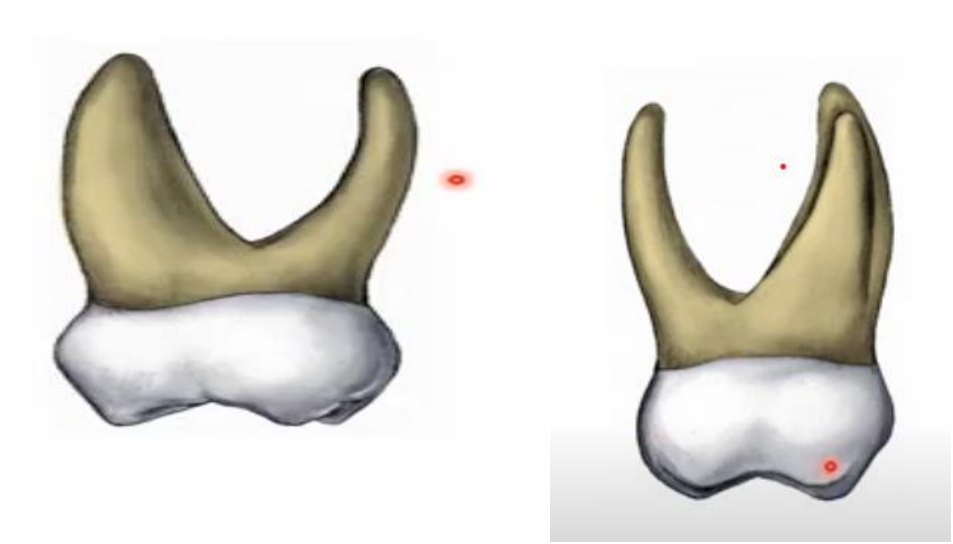
1. The buccolingual width is more as compared to crown height.

2. The mesiobuccal and lingual roots are seen from this aspect. 3

3. The mesiobuccal root extends far beyond the outline of the crown.

4. Buccal outline shows cervical ridge.

5. Both the buccal and lingual outlines show occlusal convergence.



- Occlusal aspect :-

1. The tooth resembles permanent first molar.

2. The occlusal surface is rhomboidal with 4 well developed cusps i.e. mesiobuccal, distobuccal, mesiolingual and distolingual.

3. The buccal outline is flat with a developmental groove in between the cusps.

4. The occlusal surface shows :-

a. Central fossa with central pit

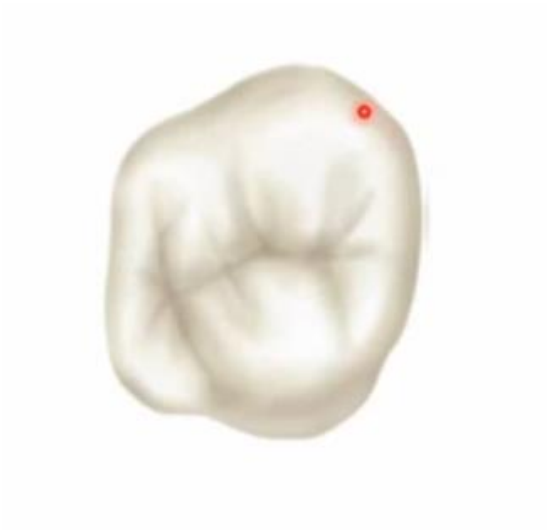
b. Mesial triangular fossa, distal triangular fossa

c. Central groove is seen connecting mesial and distal pits.

d. The oblique ridge is prominent connecting the mesiolingual cusp with distobuccal cusp.

e. Distal to oblique ridge, distal fossa with distal groove is present.

f. The distal groove separates two lingual cusps and continues on the lingual surface as lingual developmental groove.



*** MANDIBULAR FIRST MOLAR (D) :-**

- The anatomy of mandibular first molar does not resemble any tooth in permanent dentition –

Buccal aspect :-

1. The crown is wider mesiodistally

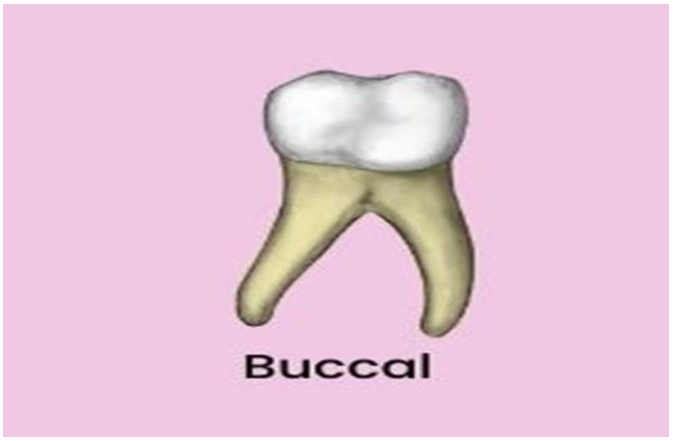
2. The mesiobuccal cusp is the largest and longest cusp.

3. The mesial outline is nearly straight whereas the distal outline is convex.

4. The mesial and distal roots are widely separated.

5. Roots are slender and the furcation is close to the cervical line.

6. Buccal surface shows a prominent cervical ridge.

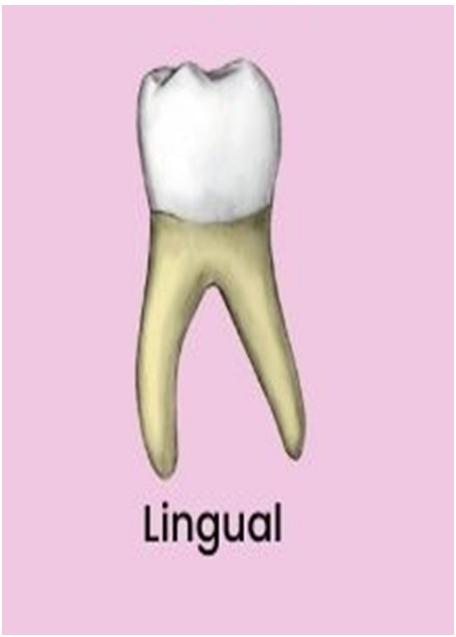


- Lingual aspect :-

1. The crown and root converge lingually on the mesial side, part of mesial surface is visible from the lingual aspect.

2. The mesiolingual cusp is larger and longer than the distolingual cusp.

3. The lingual groove extends between two lingual cusps and ends in a depression in cervical third



- Mesial aspect :-

1. Buccal outline shows prominent cervical ridge.

2. The crown appears to lean towards lingual surface.

3. From cervical ridge the buccal outline is straight.

4. The mesial marginal ridge is concave is located more occlusally than distal marginal ridge.

5. The occlusal table is small buccolingually.

6. The cervical portion of the crown is quite wide in comparison (cervical convergence),

7. The mesial root is flat and squarish with a broad apex.

8. The mesial root has a depression along most of its length.

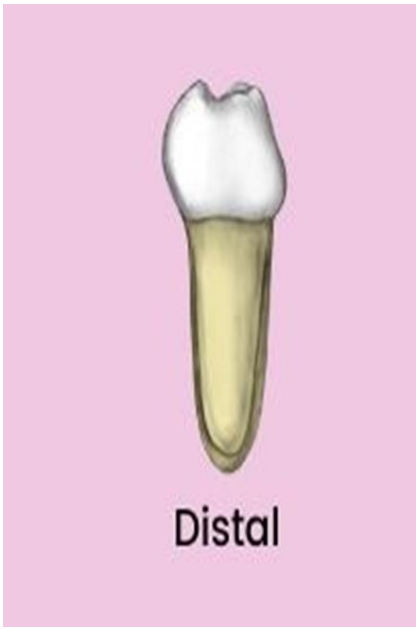
- Distal aspect :-

1. Buccal cervical ridge is less prominent from the distal side than from the mesial.

2. The distobuccal and distolingual cusps are nearly of the same height.

3. The distal marginal ridge is located more cervically than mesial marginal ridge.

4. The distal root is more rounded, less broad, thinner and shorter than the mesial root.



- Occlusal aspect :-

1. The general outline of this tooth from the occlusal aspect is rhomboidal.

2. Four cusps are present, they are mesiobuccal, mesiolingual, distobuccal and distolingual.

3. The crown shows lingual and distal convergence.

4. The mesiolingual cusp is the largest cusp.

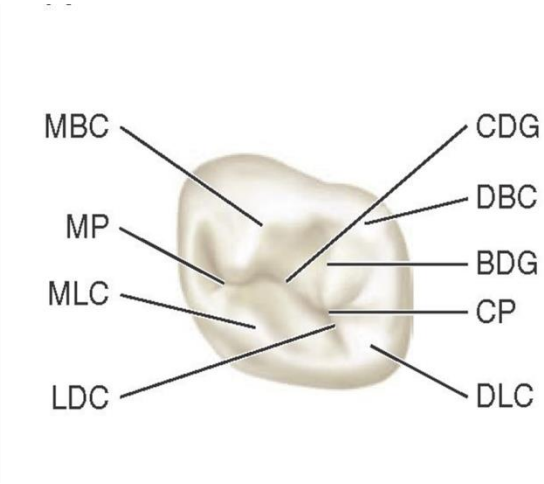
5. The occlusal surface shows:

6. Transverse ridge is seen between the mesiobuccal and mesiolingual cusps.

7. Buccal developmental groove divides two buccal cusps and extends from between the buccal cusps to the central pit.

8. Central developmental groove separates the mesiobuccal and mesiolingual cusps.

9. Mesial and distal fossae contain mesial and distal pits respectively.



*** MANDIBULAR SECOND MOLAR (E) :-** - The primary mandibular second molar resembles the permanent mandibular first molar. It is the largest tooth in the deciduous dentition.

- Buccal aspect :-

1. The crown is wide mesiodistally.

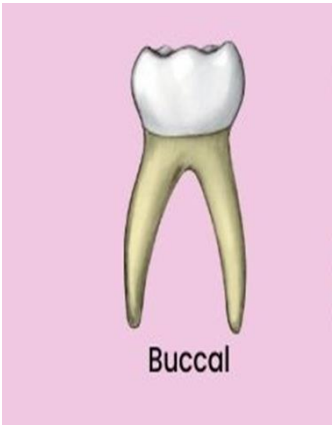
2. The crown appears to be tilted distally on its root base.

3. There are 3 cusps of nearly equal size, namely mesiobuccal, distobuccal and distal.

4. These cusps are separated by mesiobuccal and distobuccal grooves.

5. The roots are widely separated.

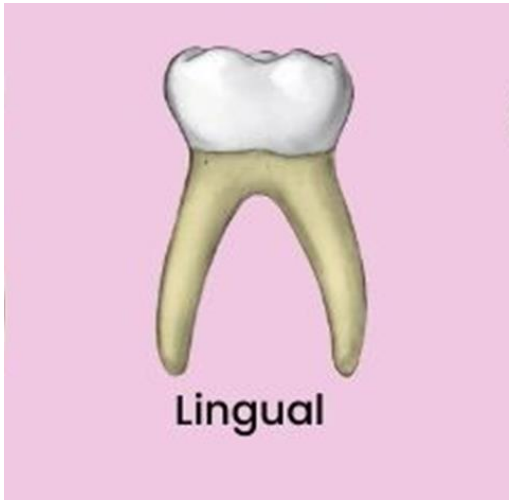
6. Root trunk is short.



- Lingual aspect :- 1. Mesiolingual and distolingual cusps are about the same size and height.

2. Both the cusps are separated by lingual groove.

3. Root trunk is slightly longer

. 

- Mesial aspect :-

1. Buccal outline shows a prominent mesial cervical ridge giving the crown an appearance of lingual tilt. 5

2. The buccal and lingual outlines converge towards the occlusal surface.

3. The mesial marginal ridge is traversed by the mesial marginal groove.

4. The mesial surface is convex and flattens cervically.

5. The mesial root is broad and flat with a shallow depression.

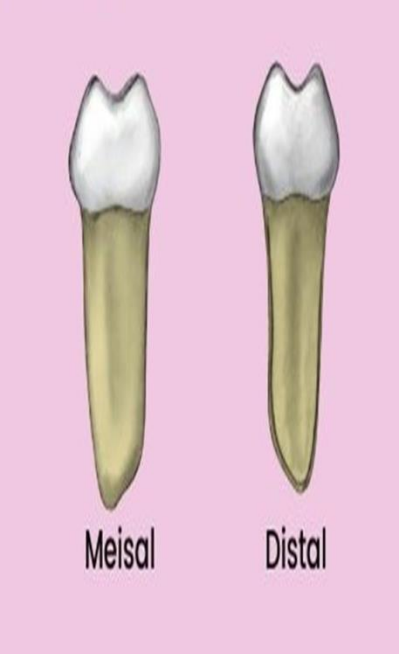
6. Mesial root has two root canals.

- Distal aspect :-

1. Crown is narrower on the distal side than on mesial.

2. Distal root is broad and has less blunt apex.

3. Distal root may have I or 2 root canals.



- Occlusal aspect :-

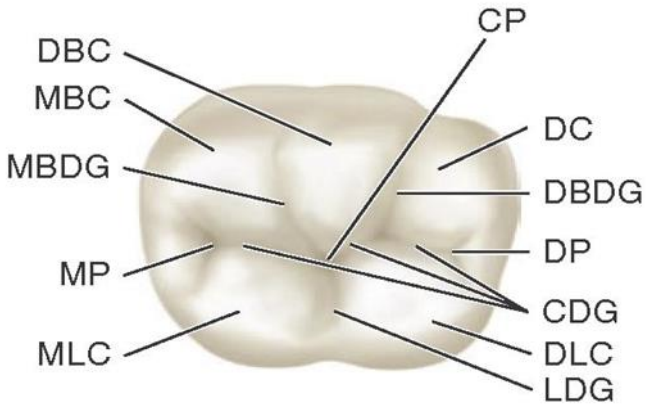
- This tooth has 5 cusps with mesiobuccal cusp being the largest cusp.

- Occlusal surface shows :-

1. Central fossa

2. Mesial and distal triangular fossa

3. Central groove, mesiobuccal groove, distobuccal groove and lingual groove.



*** Morphologic Differences between Primary and Permanent Teeth :-**

- The morphology of the primary dentition is different in many respects from that of the permanent dentition, and not only in the sizes of the crowns and roots. They have following morphologic difference :-

*** General differences** :

- 1-No. of teeth present for primary is 20 and permanent is 28-32.

2- Bicuspids and third molars are absent in the primary teeth.

3- Primary teeth are smaller in size when compare to permanent teeth.

4- First tooth to erupt into the oral cavity is mandibular incisor whereas in permanent teeth it is the mandibular first molar.

*** Features of a deciduous Crown** :-

1. The crown of the deciduous tooth is shorter than the permanent tooth.

2. The occlusal table of a deciduous tooth is narrower labiolingually than is the permanent tooth.

3. T"[[[[

he deciduous tooth is constricted in the cervical portion of the crown.

4. The enamel and dentin layers are thinner in the deciduous tooth.

5. The enamel rods in the gingival third extend in a slightly occlusal direction from the dentinoenamel junction in deciduous teeth but extend slightly apically in the permanent dentition.

6. The contact areas between the deciduous molars are very broad and flat.

7. The color of the deciduous tooth is lighter than permanent teeth.

*** Features of a deciduous Root :-**

1. The root of the deciduous anterior tooth is narrower mesiodistally than is that of the permanent anterior tooth.

2. The roots of the posterior deciduous tooth are longer and slenderer in relation to crown size than are those of the permanent tooth.

2 3. The roots of the deciduous molar flare more as they approach the apex (which affords the necessary room for the development of the permanent tooth buds) than do the permanent molar roots

*** Features of a deciduous Pulp :-**

1. The pulp of the deciduous tooth is larger than that of the permanent tooth in relation to the crown size.

2. The pulp horns of the deciduous tooth (especially the mesial horns) are closer to the outer surface of the tooth than are those of the permanent tooth.

3. The mandibular molar has larger pulp chambers than does the maxillary molar in the deciduous tooth.

4. The form of the pulp chamber of the deciduous tooth follows the surface of the crown.

5. Usually there is a pulp horn under each cusp.

6. Thin and slender roots pulp canals.

7. Accessory canals extend from floor of the pulpal chamber to the furcation or interradicular area.

8. Increased blood supply, due to which the deciduous pulp exhibits typical inflammatory response.

9. Responds by inflammatory process, resulting in increased internal resorption.

10. Reduced sensitivity to pain-due to less number of nerve fibers.

11. Increased reparative dentin formation.

12. Poor localization of infection and inflammation.

13. Multiple ramifications, making complete debridement impossible.

14. Ribbon shaped root Canal (hour glass appearance) that is narrower mesiodistally, discourages gross enlargement of the canal.

*** Size and morphology of the primary tooth pulp chamber** :-

- Considerable individual variation exists in the sizes of the pulp chambers and pulp canals of the primary teeth. Immediately after tooth eruption, the pulp chambers are large and generally follow the outline of the crown. They decrease in size as age increases, and under the influence of both function and abrasion of the occlusal and incisal surfaces of the teeth. Radiographs do not demonstrate completely the extent of the pulp horn into the cuspal area. - In addition, the cemento-enamel junction of primary teeth presents three interesting morphologic relationships, in which the cementum is over enamel, the cementum and enamel are edge to edge, or there is a gap between the cementum and enamel with dentin exposure.

This irregularity in the cemento-ena r nb gr4rxmel junction may indicate the need for care during restorative and other procedures to avoid damage

*** Primary root canal anatomy :-** - To treat the pulps of primary teeth successfully, the clinician must have a thorough knowledge of the anatomy of the primary root canal systems and the variations that normally exist in these 3 systems. To understand some of the variations in the primary root canal systems requires an understanding of root formation.

*** Root Formation :-** - The roots begin after enamel and dentin formation has reached the future CEJ. The epithelial dental organ forms Hertwig's epithelial root sheath, which initiates formation and molds the shape of the roots. Hertwig's sheath takes the form of one or more epithelial tubes (depending on the number of roots of the tooth, one tube for each root). - During root formation the apical foramen of each root has a wide opening. The dentinal walls diverge apically, and the shape of the pulp canal is like a wide open tube.

Each root contains one canal at this time, and the number of canals is the same as the number of roots. When root length is established, the sheath disappears but dentin deposition continues internally within the roots. As growth proceeds, the root canal is narrowed by continued deposition of dentin and the pulp tissue is compressed.

- Additional deposition of dentin and cementum closes the apex of the tooth and creates the apical convergence of the root canals common to the completely formed tooth. **Root length is not completed until 1 to 4 years after a tooth erupts** into the oral cavity. In the primary teeth the root length is completed in a shorter period of time than in the permanent tooth because of the shorter length of the primary roots. The primary tooth is unique in so far as resorption of the roots begins after a short period of complete root length formation.

- At this time the form and shape of the root canals roughly correspond to the form and shape of the external anatomy of the teeth. Root resorption or the deposition of additional dentin within the root canal system, however, significantly changes the number, size, and shape of the root canals within the primary tooth.

*** Root Completion of Primary Teeth** :- - Primary tooth roots are completed between the ages of 18 months to 3 years. The complete primary dentition (with 20 teeth) is in the mouth from about 2 years of age to about 6 years, during which no permanent teeth are visible in the mouth, but permanent teeth are forming within the jaws.

* **Exfoliation (Shedding) of Primary Teeth :-** - The roots of primary teeth are complete for only a short period of time. Only about 3 years after completion, primary tooth roots begin to resorb, usually at the apex or on one side near the apex. Resorption of a primary tooth root is the gradual dissolving away of the root due to the underlying eruption of the succedaneous tooth that will replace it. - Root resorption continues as succedaneous teeth move closer to the surface until deciduous teeth eventually become loose and finally ‘’ fall off ‘’ (like leaves fall off deciduous trees). This process of shedding is called exfoliation. When a primary tooth is shed, the crown of the succedaneous tooth is close to the surface and ready to emerge.

Root canal anatomy of primary anterior teeth :-

- The form and shape of the root canals of the primary anterior teeth resemble the form and shape of the roots of the teeth. The permanent tooth bud lies lingual and apical to the primary anterior tooth. Owing to the position of the permanent tooth bud, resorption of the primary incisors and canines is initiated on the lingual surface in the apical third of the roots.

* **Maxillary incisors :-** - The root canals of the primary maxillary, central, and lateral incisors are almost round but somewhat compressed. Normally these teeth have one canal without bifurcations. Apical ramifications or accessory canals and lateral canals are rare, but they do occur.

*** Mandibular incisors** :- - The root canals of the primary mandibular central and lateral incisors are flattened on the mesial and distal surfaces and sometimes grooved, pointing to an eventual division into two canals. The presence of two canals is seen less than 10% of the time. Occasionally lateral or accessory canals are observed.

*** Maxillary and mandibular canines :-** - The root canals of the maxillary and mandibular canines correspond to the exterior root shape, a rounded, triangular shape with the base toward the facial surface. The canines have the simplest root canal systems of all the primary teeth and offer few problems when being treated endodontically. Bifurcation of the canal does not normally occur. Lateral canals and accessory canals are rare.

*** Root canal anatomy of primary molars :-** - Normally the primary molars have the same number and position of roots as the corresponding permanent molars. The maxillary molars have three roots: two buccal and one palatal; the mandibular have two roots: mesial and distal. In the primary molars, resorption usually begins on the inner surfaces of the roots next

to the inter-radicular septum. When full length of the roots of the primary molars has just been completed, only one root canal is present in each of the roots. The continued deposition of dentin internally may divide the root into two or more canals. - During this process, communications exist between the canals and may remain in the fully developed primary tooth. Subsequent deposition of secondary dentin may produce a complete separation of the root canal into two or more individual canals. Many fine- connecting branches or lateral fibrils form a connecting network between the facial and lingual aspects of the root canals. Accessory canals, lateral canals, and apical ramifications of the pulp in primary molars occur in 10% to 20%.

*** Maxillary first primary molar :-** - It has three to four canals that roughly correspond to the exterior root form with much variation. The palatal root is often rounded; it is often longer than the two facial roots. In most of these teeth three separate canals are present, with a very narrow isthmus connecting them especially between 5 the palatal and distal. Islands of dentin may exist between the canals, with many connecting branches and fibrils.

*** Maxillary second primary molar** :- - It has three to five canals roughly corresponding to the exterior root shape. The mesiofacial root usually bifurcates or contains two distinct canals. This occurs in approximately 85% to 95% of maxillary second primary molars. Fusion of the palatal and distofacial roots may occur. These fused roots may have a common canal, two distinct canals, or two canals with a narrow connecting isthmus of dentin islands between them and many connecting branches or fibrils.

*** Mandibular first primary :-** - It usually has two canals roughly corresponding to the external root anatomy, but it may have two to four canals. It is reported that approximately 75% of the mesial roots contain two canals, whereas only 25% of the distal roots contain more than one canal.

*** Mandibular second primary molar** :- - It may have two to four canals, but it usually has three. The mesial root has two canals approximately 85% of the time, whereas the distal root contains more than one canal only 25% of the tim

Lec-7- Pediatric Dentistry Dr. Aseel Taha

*** Functions of primary teeth :-**

- Function of Primary teeth are essential in the development of the mouth. The primary teeth maintain the arch length within the jaw, the bone and the permanent teeth replacements develop from the same tooth germs as the primary teeth. The primary teeth provide guides for the eruption pathway of the permanent teeth.

- Well deciduous teeth are important and they are required to serve a number of functions above and beyond simply biting and chewing. This is why the children and parents need to take care of them and make sure they last until the permanent teeth are ready to come through.

- Many opinions have been expressed about the features that characterize a normal primary dentition, but three features are seen frequently enough for them to be considered normal :-

1. 'Straight' or 'mesial step second molar relationship' :-

- In most dentitions the maxillary and mandibular primary second molars are in cusp-to-cusp occlusion so that their distal surfaces are in the same distal plane. Frequently, however, there is a mesial step in this vertical plane. This can also be considered normal. Distal „step" indicate a class II arch relationship.

2. Incisor spacing :- - Spacing among the primary incisors is normal, and indicates that the permanent successors will probably have adequate space into which to erupt. Lack of spacing or imbrication of primary incisors are signs that permanent incisors will probably be crowded when they erupt.

3. Anthropoid (primate space) :- - The most common sites for spaces in the primary teeth are in the canine regions. The anthropoid spaces are mesial to the maxillary canines and distal to the mandibular canine.

*** The major functions of primary teeth :-**

1-Speech production and development :- Learning to speak clearly is crucial for cognitive, social, and emotional development. The proper positioning of primary teeth facilitates correct syllable pronunciation and prevents the tongue from straying during speech formation.

2-Eating and nutrition :- The ability to bite and chew also helps to break up food into more easily digestible pieces and allow for better digestion of food. As the food is being broken up by the teeth, it is also mixed with saliva containing enzymes that begin the digestive process. A child that swallows too rapidly without chewing the food adequately will prolong the digestive process. - Children with malformed or severely decayed primary teeth are more likely to experience dietary deficiencies, malnourishment, and to be underweight. Proper chewing motions are acquired over time and with extensive practice. Healthy primary teeth promote good chewing habits and facilitate nutritious eating.

3-Self-confidence :- Even very young children can be quick to point out ugly teeth and crooked smiles. Taking good care of primary teeth can make social interactions more pleasant, reduce the risk of bad breath, and promote confident smiles and positive social interactions.

4- Place Holder (space maintainer) :- One of the major functions of primary teeth is to hold an appropriate amount of space for developing adult teeth. In addition, these spacers facilitate the proper alignment of adult teeth and also promote jaw development. Left untreated, missing primary teeth cause the remaining teeth to "shift" and fill spaces improperly. For this reason, pediatric dentists often recommend spacemaintaining devices.

5-Excellent oral health :- Badly decayed primary teeth can promote the onset of childhood periodontal disease. As a result of this condition, oral bacteria invade and erode gums, ligaments, and eventually bone. If left untreated, primary teeth can drop out completely – causing health and spacing problems for emerging permanent teeth. To avoid periodontal disease, children should practice an adult-guided oral care routine each day, and infant gums should be rubbed gently with a clean, damp cloth after meals.

6-Development of the Jaw Bones and Facial Muscles :- The presence or absence of teeth will affect the way in which the jaw bones and facial muscles develop. The growth of the jaw bones is affected by the facial muscles. Teeth and the chewing function help to exercise the facial muscles and facilitate the development of the jaw bones.

3 * Types and Function of Individual Primary Teeth :-

* **Incisors :- -** Incisors are the eight teeth in the front of the mouth (four on top and four on bottom). These are the teeth that are used to take bites of eaten food. Incisors are usually the first teeth to erupt - at around 6 months for the baby teeth, and between ages 6 and 8 for the adult.

*** Function of primary incisors :-**

1. Incisors cut and slice food when the child takes a bite. The incisors are the main teeth used for cutting pieces of food, for example when eating a whole apple, the incisors are the teeth that slice through the apple and help to get the piece of apple into the mouth to be fully chewed by other teeth.

2. Incisors support the lips and face. The sides of the lips are probably resting right up against the front teeth. Because of this, incisor teeth help to form the overall appearance of the face.

3. Help in speech. As in pronunciation of some sounds, the tongue touches the upper incisors. It touches near the top of the incisors for the "t" sound and near the bottom for the "th" sound. Many sounds need the incisor teeth to be pronounced. It's also why denture wearers have to re-learn how to speak clearly when they get their dentures.

4. They can make the smile beautiful. The first thing that most people notice in the smile will be the teeth. Since the incisors are the front teeth, they have a tremendous effect on how the smile looks.

5. Incisors help to guide the jaw when closing the mouth.

*** Canines :-** - The four canines are the next type of teeth to develop. These are the sharpest teeth and are used for tearing food apart. Primary canines generally appear with the upper canines coming in just ahead of the lower canines. In permanent teeth, the order is reversed.

*** Molars :-** - Molars are used for chewing and grinding food. Primary molars are replaced by the first and second premolars. The permanent molars do not replace any primary teeth, but come in behind all of them, further back in the jaw

Lec-8- **Pediatric Dentistry** **Dr. Aseel Taha**

Dental Caries

- Definition :-

- The term dental caries is used to describe the signs and symptoms of a localized demineralization of the mineral portion of these tissues followed by the disintegration of their organic material, caused by metabolic events taking place in the biofilm (dental plaque) caused by the action of microorganisms on fermentable carbohydrates covering the affected area.

- The destruction can affect enamel, dentin and cementum. The disease can result in bacterial invasion and death of the pulp and the spread of infection into the periapical tissues, causing pain. In its early stages, however, the disease can be arrested since it is possible for remineralization to occur.

• Sequence of caries in primary dentition :-

- First to be attacked are the mandibular molars followed by maxillary molars, then the maxillary anterior teeth.

- Only rarely are mandibular anterior teeth affected or the lingual/buccal surfaces of the primary teeth generally, except in cases of rampant caries.

- First primary molars in both the mandibular and maxillary arches are less susceptible to caries than the second primary molars, though the first primary molars erupt earlier than the second. Difference is thought to be due to differences in morphology of occlusal surfaces as the pits and fissures in second primary molars are deeper, and less completely coalesced.

- Proximal caries progress more rapidly than occlusal caries and cause higher percentage of pulp exposure. Therefore, regular bitewing radiographs are essential for children once there are no spaces between the teeth or after proximal contact is established.

2• Sequence of caries in permanent dentition :-

- Once the first permanent molars erupt, one should expect frequent occurrence of caries in the occlusal pits and fissures.

- The maxillary and mandibular permanent incisors are not highly susceptible to caries attack except in children with rampant caries (RC).

- The mandibular second permanent molars are more susceptible to caries than the maxillary second permanent molars?

*** The Caries Diagnosis** :-

1. Visual examination :-

The clinical visual examination consisting of **five** stages form the basis of caries diagnosis.

A-Systematic :- Always start at the same place in the mouth – there is logic in making this the most distal surface in the upper right quadrant and working clockwise to the lower right, as these ties in with the FDI tooth notation. For every tooth, work round its surfaces in a systematic manner.

B- Clean :- Dental plaque is not translucent, so to diagnose even quite advanced lesions it must be removed. Polish the patient's teeth prior to attempting to diagnose caries.

C-Illumination :- The dentist requires a light source to make diagnosis possible. In addition to good illumination provided by a suitable positioned operating light, the use of a light source will facilitate trans-illumination.

D- Dry :- The detection of caries in its early stages relies on the differences in the porosity and therefore refractive index of caries versus sound dental hard tissue. When we dry the teeth we will have the ability to detect disease at its earliest visible stage (the white spot lesion). - Drying the teeth helps with caries

activity assessment :- A white spot enamel lesion has a matt enamel (acid-etched appearance) surface; this frequently indicates an active lesion. A lesion with a glossy surface is often arrested.

e- Put the sharp probe away :- For many years a visual-tactile examination rather than a purely visual examination was the mainstay of caries diagnosis. This should no longer be the case for a number of reasons :-

- The use of a probe does not improve the accuracy of caries diagnosis.
- Probing of a demineralized site (which has the potential to remineralise) will further destroy the enamel structure creating an iatrogenic cavity and preventing any possibility of remineralization.
- There is the possibility of inoculating other sites with cariogenic bacteria. However, a blunt probe, such as a periodontal probe, can be used to remove plaque from fissures using a dredging motion. As it can be problematic determining if a brown spot lesion is cavitated or not, the side of a blunt probe may also be used to confirm if a surface has broken down.

3- **Radiographs** :- The views that are of value for caries diagnosis are :

- **a- Bitewing** :- is the 1st choice of caries diagnosis, provide information on both occlusal dentine caries and proximal enamel and dentine caries.

b- Orthopantomogram (OPG) :- can detect the presence of an occlusal dentine carious lesion with a high degree of accuracy. Proximal surface lesions can also be seen on OPG but with much lower accuracy than with bitewings.

c-Bimolar view :- Bimolars are not as useful a view as bitewings because there is often overlap of structures. However, they are of use in the pre-cooperative child who will not cope with bitewings or an OPG.

d- Periapical view :- are as accurate as bitewings for caries diagnosis, but obviously less information is available on any one film. The key role of the periapical view is in the diagnosis of periodontal disease, periapical disease and the diagnosis and monitoring of dental traumatic injuries.

3. Adjuncts Aids to Caries Diagnosis :-

a- Magnification :- During restorative treatment, dentists are increasingly using magnification to assist with the preparation of teeth. Magnification can also help with the detection and diagnosis of caries.

b- Fibre-Optic Trans-illumination (FOTI) :- FOTI helps with the detection of proximal enamel and dentinal lesions, and occlusal dentinal caries. Clinically, FOTI can be used in a number ways – for example, the dentist can use it routinely at every examination helping to decide if radiographs are indicated. - It can also be used to provide further information when, despite a thorough clinical visual examination and radiographs, the clinician still remains unsure. One particular use of FOTI is to help differentiate between staining and caries on the occlusal surface.

c- Temporary Tooth Separation (TTS) :- The placement of an orthodontic separator for about three to four days to move the teeth apart allows direct visual access to a surface for diagnosis. The tooth returns to its original position following removal of the separator within hours. - This approach has two significant advantages over bitewing radiography :- - The avoidance of exposure to ionizing radiation. - The ability to detect whether the surface is cavitated. The drawbacks of TTS :- the patient may experience some discomfort while the separator is in place, and this discomfort is likely to be greater if all contacts are separated.

a- **Laser Fluorescence** :- The currently available commercial device (Diagnodent, KaVo Germany) measures the fluorescence of the

porphyrins made by bacteria in the caries. This device is designed for the diagnosis of occlusal caries but it can be used on accessible smooth surfaces. -It is not designed to be a screening tool, where it is likely to generate a number of false positive diagnoses, but to aid the dentist with equivocal lesions. In use, the dentist applies the probe tip to 4 the tooth surface under investigation and a digital reading indicates the status of the surface through sound to deep dentin caries.

e- Electric Caries Meter (ECM) :- Enamel is a very poor conductor of electricity. However, following carious attack the enamel becomes more porous and the ions present in the pores in the lesion will conduct electricity with much less resistance than sound enamel. This is the principle behind the working of the ECM (ECM Lode Netherlands).

- Like the laser fluorescence devices, the ECM is principally of use on occlusal surfaces. ECM is technique-sensitive. Of particular relevance to pediatric dentistry is that the ECM is not reliable on immature teeth. - All of the above methods have both advantages and disadvantages, but they should be considered a toolkit from which the dentist selects to improve the accuracy of caries detection and diagnosis.

*** The Caries Classification :-**

- Carious lesions can be classified according to their **anatomical site**. There is nothing chemically special about these sites.

1. Lesions may commonly be found in pits and fissures or on smooth surfaces. Smooth surface lesions may start on enamel (enamel caries) or on the exposed root cementum and dentin (root caries).

2. Primary caries is used to differentiate lesions on natural, intact tooth surfaces from those that develop adjacent to a filling, which are commonly

referred to as recurrent or secondary caries. As such, the etiology of both is similar

3. Residual caries, as the term implies, is demineralized tissue that has been left behind before a filling is placed. - An important classification is whether a lesion is cavitated or noncavitated, as it impinges directly on the management of the lesion.

- Caries lesions may also be classified according to their activity. This is a very important concept and one that impinges directly on management, although it will be evident from the text that the clinical distinction between active and inactive (arrested) lesions is sometimes difficult. - Clinically, if in doubt the dentist should always react as though he or she is dealing with an active lesion. A lesion considered to be progressing (the lesion would have developed further at a subsequent examination if not interfered with) would be described as an active carious lesion. In contrast to this is a lesion that may have formed years previously and then stopped further progression. Such lesions are referred to as arrested carious lesions or inactive carious lesions.

- The first sign of a carious lesion on enamel that can be detected with the naked eye is often called a white-spot lesion. This appearance has also been described as an early, initial or incipient lesion, but not all white-spot lesions are incipient! These terms are meant to say something about the stage of lesion development.

5 - Rampant caries is the name given to multiple active carious lesions occurring in the same patient. This frequently involves surfaces of teeth that do not usually experience dental caries.

- These patients with rampant caries can be classified according to the assumed causality, e.g. bottle or nursing caries, early childhood caries, radiation caries or drug-induced caries.

- Hidden caries is a term used to describe lesions in dentin that are missed on a visual examination but are large enough and demineralized enough to be detected radiographically. It should be noted that whether a lesion is actually hidden from vision depends on how carefully the area has been cleaned and dried and whether an appropriate clinical examination has been performed.

*** The Caries Etiology :-**

• Dental caries is a multifactorial disease

–The primary factors are :-

1- The tooth
2- The microorganisms
3- Fermentable Carbohydrates
4- Time

–**The secondary factors are** :- A. Local factors :-

- Anatomy of the teeth in early eruption

-Crowding or irregular teeth (makes cleaning difficult)

-Presence of dental appliances, e.g. partial denture , space maintainer, orthodontic appliances

B. Systemic factors :- Such as :

- . Childhood Fever and Caries Susceptibility :- - Common childhood illnesses such as :- (chickenpox, measles, middle ear infections, fevers caused respiratory or urinary tract infections, and other fevers that cause skin rashes because enamel and skin share a common ectodermal origin) all can affect the

coincidental dental hardtissue formation. This can result in hypomineralization and discoloration, due to :

- a- Altered tooth morphology

b- Enamel porosity

c- Difficulties in maintaining good oral hygiene due to sensitivity.

- An example of this is molar incisor hypomineralization (MIH), in which the permanent incisors and first permanent molars are affected (and possibly also the tips of the canines). The affected teeth appear to be prone to posteruptive enamel loss.

2. Inherited defects :- Children with congenital enamel defects such as amelogenesis imperfecta or disease of the other dental hard tissues (e.g. dentinogenesis imperfecta) may be more susceptible to caries, but these conditions are rare. 6

3. " Family " caries :- Families do tend to pass on their dietary habits through generations. Therefore, granny losing her teeth early could be an indication of a "sweet tooth" being a family phenomenon. - Furthermore; Streptococcus mutans, the main pathogen responsible for caries, is transmissible and there is very good evidence to show that it is passed from mother to baby.

4. Medicines :- in particular, elixirs, CAN cause caries BUT only if they contain sugar. Some medicines are sucrose-free, but may contain other sugars such as glucose syrup. "Sugars-free" means no sugar at all. - Dentists and their teams should advise parents and medical and pharmacy colleagues to add the letters '' SF '' for sugars-free to written prescriptions – this is particularly important in cases in which repeated prescriptions are required

LEC -10 – PEDIATRIC DENTISTRY DR.ASEEL TAHA

RESTORATIVE DENTISTRY FOR CHILDREN

Today the dentist devotes more time to preventive procedures and less time to the routine restoration of carious teeth. Nevertheless, the restoration of carious lesions in primary and young permanent teeth continues to be among the important services that pediatric dentists and general practitioners provide for the children in their practices. Patients and fellow practitioners often judge dentists on the effectiveness of their preventive programs and the skill with which they perform routine operative procedures.

Guideline on Pediatric Restorative Dentistry

Restorative treatment should be based upon the results of an appropriate clinical examination and ideally be part of a comprehensive treatment plan.

The treatment plan should take into consideration:

1. The developmental status of the dentition
2. A caries-risk assessment
3. Patient's oral hygiene
4. Anticipated parental compliance and likelihood of timely recall
5. Patient's ability to cooperate for treatment

The restorative treatment plan must be prepared in conjunction with an individually tailored preventive program. Restoration of primary teeth differs significantly from restoration of permanent teeth, due in part to the differences in tooth morphology.

The selection of teeth for restorative dentistry according to certain basic consideration

• Child age:

child at 12 years cannot have filling for his teeth until concluded if it retained or not.

- Amount of tooth structure remain with consideration for space loss and construction of space maintainer.
- Exfoliation time of deciduous teeth.
- General health of the child.
- Present of draining fistula or history of swelling.
- Radio graphical examination, root resorption, radiolucent area at the end of root and especially at bi or trifurcation areas.
- Degree of tooth mobility.
- Childs oral condition and degree of parent s education.
- The condition of occlusion and the amount of space required for ideal occlusion.

Morphological consideration in cavity preparation of primary teeth

* The crowns of the primary teeth are smaller but more bulbous than those of the corresponding permanent teeth, and the molars are bell shaped, with a definite constriction in the cervical region.

* The sharp constriction at the neck of the primary molar necessitates special care in the formation of the gingival floor during class II cavity preparation.

* The buccal and lingual surfaces of the molars, sharply converging occlusally, form a narrow occlusal surface or food table; this is especially true of the first primary molar.

*The pulpal outline of the primary teeth follows the dentino-enamel junction more closely than that of the permanent teeth. The pulpal horns are longer and more pointed than the cusps would indicate.

*The dentin also has less bulk or thickness, so the pulp is proportionately larger than that of the permanent teeth.

*The enamel of the primary teeth is thin but of uniform thickness. The enamel surface tends to be parallel to the dentino-enamel junction

MAINTENANCE OF A CLEAN FIELD

The maintenance of a clean operating field during cavity preparation and placement of the restorative material helps ensure efficient operation and development of a serviceable restoration that will maintain the tooth and the integrity of the developing occlusion.

The rubber dam aids in the maintenance of a clean field. It is generally agreed that the use of the rubber dam offers the following advantages:

1. Saves time. The dentist who has not routinely used the rubber dam needs only to follow the routine or a modification of it for a reasonable period to be convinced that operating time can be appreciably reduced. The time spent in placing the rubber dam is negligible, as long as the dentist works out a definite routine and uses a chairside assistant.

2. Aids management.

It has been found through experience that apprehensive children can often be controlled more easily with a rubber dam in place. Because the rubber dam efficiently controls the patient's tongue and lips, the dentist has greater freedom to complete the operative procedures.

3. Controls saliva. Control of saliva is an extremely important consideration when one is completing an ideal cavity preparation for primary teeth. Small pulp exposures may be more easily detected when the tooth is well isolated. It is equally important to observe the true extent of the exposure and the degree and type of hemorrhage from the pulp tissue. Thus the rubber dam aids the dentist in evaluating teeth that are being considered for vital pulp therapy

ARMAMENTARIUM FOR RUBBER DAM PLACEMENT

The armamentarium consists of 5×5-inch sheets of medium latex, a rubber dam punch, clamp forceps, a selection of clamps, a flat-blade instrument, dental floss, and a rubber dam frame. As experience is gained in applying the dam, the dentist and assistant will soon learn the proper location for punching the holes. If the holes are punched too far apart, the dam will not readily fit between the contact areas. In addition, the greater bulk of material between the teeth will greatly increase the possibility that the rubber will become a barrier to proximal surface preparation. Conversely, if the holes are punched too close together, salivary leakage will contaminate the operating field. In general, the holes should be punched the same distance apart as the holes on the cutting table of the rubber dam punch. The large punch hole is used for the clamp-bearing tooth and for most permanent molars, the mediumsized punch hole generally is used for the premolars and primary molars, the second smallest hole is used for maxillary permanent incisors, and the smallest hole is adequate for the primary incisors and lower permanent incisors.

RECENT MODIFICATIONS

Quick Dam or Insta-Dam

♦ These are new types of rubber dams that have preattached frame

♦ Ease of application

♦ Minimal time consumption in placement

♦ Use of X-ray is more simplified with this type of dam

♦ They can either have a rectangle or circle pattern.

OPTRA DAM

- This is a type of quick dam for anterior segment where it can be fixed directly without use of any retainer clamps or for a posterior segment by the aid of clamp for retention.
- Its method of application is quiet simple by punching the holes corresponding to the size of the expected teeth. The rubber dam is stretched over the rubber dam clamps or the teeth. The exposed area between the teeth is then sealed with a caulking agent like Oraseal. This ensures that there is no leakage.

The Isolite system

The Isolite system has also been recommended for achieving an isolated field. This dental isolation device is designed to function as a vacuum suction and to provide intraoral illumination. The system helps retract the tongue and has an integrated six-foot-long vacuum/power silicone hose that connects easily to most standard high volume ports.

BASIC PRINCIPLES IN CAVITY PREPARATION IN PRIMARY TEETH

*Traditional cavity preparations for class I and class II lesions include areas that have caries involvement and may be areas that retain food and plaque material and considered areas of potential caries involvement.

*A flat pulpal floor is generally advocated. However, a sharp angle between the pulpal floor and the axial wall of a two-surface preparation should be avoided.

* Rounded angles throughout the preparation will result in less concentration of stresses and will permit better adaptation of the restorative material into the extremities of the preparation.

* Although the traditional class I cavity preparation and restoration may occasionally be the most practical treatment for a tooth in certain circumstances, such treatment is currently obsolete for most class I lesions. The traditional treatment has been replaced, for the most part, by rconservative caries excavation and restoration with a combination of bonding restorative and sealant materials.

* Likewise, the traditional class II cavity preparation and restoration, although not yet considered obsolete, are currently used less frequently as steadily improving restorative materials with therapeutic and bonding capability are developed. In the traditional class II cavity preparation for amalgam, the buccal and lingual extensions should be carried to self-cleansing areas. The cavity design should have greater buccal and lingual extension at the cervical area of the preparation to clear contact with the adjacent tooth. This divergent pattern is necessary because of the broad, flat contact areas of the primary molars and because of the distinct buccal bulge in the gingival third.

* Ideally the width of the preparation at the isthmus should be approximately one-third the inter-cuspal dimension. The axio-pulpal line angle should be beveled or grooved to reduce the concentration of stresses and to provide greater bulk of material in this area, which is vulnerable to fracture

CAVITY PREPARATION IN PRIMARY TEETH

The steps in cavity preparation in a primary tooth are not difficult, but they do require precise operator control. Many authorities advocate the use of small, round-ended carbide burs in the high-speed hand-piece which allow for conservative cavity preparations with rounded line angles and point angles. Alternatively, cavity preparations may be made with aluminum oxide air abrasion systems or with laser systems approved for hard-tissue procedures, when indications allow.

INCIPENT CL I CAVITY PREPARATION

For patients younger than 2 years with a small but definite carious lesion in the central fossa of first primary molars, A No. 329 or No. 330 bur is used to open the decayed area and extend the cavo-surface margin only to the extent of the caries lesion. If the patient is resistant (usually), completing the preparation with an air abrasion or laser system would be inconvenient. The preparation can be completed in just a few seconds. Restoring the tooth with amalgam or a resin-modified glass ionomer arrests the decay and at least temporarily prevents further tooth destruction without a lengthy or involved dental appointment for the child.

DEEP-SEATED CLASS I CAVITY

If an amalgam restoration is planned, the first step in the preparation of an extensive class I cavity is to the enamel. The caries-affected dentin should next be removed with large, round burs or spoon excavators. If a caries exposure is not encountered, the cavity walls should be finished first. With deep carious lesions and near pulp exposures, the depth of the cavity should be covered with a biocompatible base material to provide adequate thermal protection for the pulp. If a resin-based composite and/or glass-ionomer restoration is planned, any disease-free pits and grooves may be sealed as part of the bonded restoration. The restorative material also provides thermal insulation to the pulp.

CLASS II CAVITY

Proximal lesions in a preschool child indicate excessive caries activity; a preventive and restorative program should be undertaken immediately.

SMALL LESION

Very small incipient proximal lesions may be chemically restored with topical fluoride therapy provided by the dentist, along with the judicious use of fluoride products designed for topical application at home, improved diet and improved oral hygiene, and periodic examinations; some incipient proximal lesions may remineralize or remain in an arrested state indefinitely. As bonded restorations have improved, especially those restorations capable of fluoride release, more conservative cavity preparation designs have also been advocated. In otherwise sound teeth free of susceptible pits and fissures, accessing small class II caries lesions via small openings in the marginal ridges or in the facial surfaces of the teeth are becoming popular techniques. Gaining access to the lesion with openings only large enough to allow

caries excavation is the goal. Using resin-modified glass ionomer materials result in excellent restorations for this conservative procedure.

Lesions with Greater Dentin Involvement

The first step in the traditional preparation of a class II cavity in a primary tooth involves opening the marginal ridge area. Extreme care must be taken to prevent damage to the adjacent proximal surface.

Amalgam

*The gingival seat and proximal walls should break contact with the adjacent tooth.

* The angle formed by the axial wall and the buccal and lingual walls of the proximal box should approach a right angle.

* The buccal and lingual walls necessarily diverge toward the cervical region, following the general contour of the tooth.

* The occlusal extension of the preparation should include any cariessusceptible pits and fissures. If the occlusal surface is sound and not caries-susceptible, then a minimal occlusal dovetail is still often needed to enhance the cavity retention form.

* If caries affected tooth structure remains after the preparation outline is established, it should be removed next. The appropriate liner or intermediate base, and a snug-fitting matrix should be placed before the amalgam is inserted. intermediate base, and a snug-fitting matrix should be placed before the amalgam is inserted

Aesthetic Materials

The preparation and restoration may be similar to those for amalgam when significant caries exists on both the occlusal and proximal surfaces.

However, little or no occlusal preparation may be required when the occlusal pits and fissures are caries-susceptible but sound or incipient. The proximal restoration may then be combined with the application of an occlusal sealant (with or without enameloplasty). Whenever composite restorative materials are used, enamel beveling, etching, and application of bonding agents are recommended.

It has been demonstrated that the placement and finishing of posterior composite restorations are significantly more time consuming than those for comparable amalgam restorations. In addition to increasing the cost of care, the extra time required for treatment may complicate patient management for some young patients.

CL III CAVITY

Carious lesions on the proximal surfaces of anterior primary teeth sometimes occur in children whose teeth are in contact and in children who have evidence of arch inadequacy or crowding. Caries involvement of the anterior primary teeth, however, may be interpreted as evidence of excessive caries activity requiring a comprehensive preventive program.

If the carious lesion has not advanced appreciably into the dentin and if removal of the caries will not involve or weaken the incisal angle, a small conventional class III cavity may be prepared and the tooth may be restored with the dentist's choice of bonding materials. Primary incisors with small proximal carious lesions may not require conventional restorations at all. Enameloplasty of the affected proximal surface (usually described as "disking") to open the proximal contact and remove most, if not all, of the cavitation, followed by topical fluoride varnish, will often suffice until the teeth exfoliate naturally. Extraction is usually indicated when primary incisors have extensive caries.

MODIFIED CLASS III CAVITY PREPARATION

The modified class III preparation uses a dovetail on the lingual or occasionally on the labial surfaces of the tooth. A lingual lock is normally considered for the maxillary canine, whereas a labial lock may be more conveniently prepared on the mandibular teeth, for which the aesthetic requirement is not as important. The preparation allows for the additional retention and access necessary for proper insertion of the restorative material. It is indicated for the distal surface of the primary canine in which the position of the tooth in the arch, the characteristically broad contact between the distal surface of the canine and the mesial surface of the primary molar, and the height of the gingival tissue sometimes make it difficult to prepare a typical class III cavity and restore it adequately.

CLASS IV CAVITY PREPARATION

One type of preparation used for the aesthetic restoration of primary incisors in which dental caries approximates or involves the incisal edge of the teeth. As with other operative procedures for the pediatric patient, the use of the rubber dam is helpful. The preparation includes a proximal reduction through the incisal angle and the caries lesion, and ends at the established cervical seat. Labial and lingual locks are then prepared in the cervical third of the tooth. The remaining caries is removed, the tooth is etched, and a bonding agent is applied. A properly placed matrix tightly wedged at the cervical seat aids the operator in placing, shaping, and holding the resin-based composite during the curing process. A good matrix also simplifies the finishing procedures. Beveling the enamel margins slightly before etching, to further improve the marginal bonding of the restoration had been recommended. Final polishing may be

accomplished with the rubber cup and a fine, moist abrasive material or one of the composite polishing systems.

Lec-9- **Pediatric Dentistry** **Dr. Aseel taha**

Rampant Dental Caries-:

-Rampant caries has been defined by Massler as a "suddenly appearing, widespread, rapidly burrowing type of caries, resulting in early involvement of the pulp and affecting those teeth usually regarded as immune to ordinary decay".

-There is no evidence that the mechanism of the decay process is different in rampant caries or that it occurs only in teeth that are malformed or inferior in composition. On the contrary, rampant caries can occur suddenly in teeth that were previously sound for many years .

-The sudden onset of the disease suggests that an overwhelming imbalance of the oral environment has occurred, and some factors in the caries process seem to accelerate it so that it becomes uncontrollable; it is then referred to as rampant caries.

-Young teenagers seem to be particularly susceptible to rampant caries, although it has been observed in both children and adults of all ages.

-Etiology-:

1 .It is usually due to poor oral hygiene and taking frequent cariogenic snacks and sweet drinks between meals.

2 .Patient behavioral pattern and/ or parent overindulgence /parent ignorance.

3- There is considerable evidence that emotional disturbances may be a causative factor in some cases of rampant caries .

-Repressed emotions and fears, dissatisfaction with achievement, a traumatic school experience ,and continuous general tension and anxiety have been observed in children and adults with rampant caries .

-An emotional disturbance may initiate an unusual craving for sweets or the habit of snacking ,which in turn might influence the incidence of dental caries.

4-Additional Factors-:

A. SALIVA :- Any patient with a salivary deficiency, from any cause, is at a higher risk for caries activity. It is generally accepted that the dental caries process is controlled to a large extent by a natural protective mechanism inherent within the saliva .

-A reduction in the salivary flow may be temporary or permanent. A pronounced reduction or

complete absence of saliva, however, results in an acidic environment with rampant caries.

-It has long been suggested that the viscosity of saliva is related to the rate of dental decay. Both thick, ropy saliva and thin, watery saliva have been blamed for rampant dental caries.

B. SOCIOECONOMIC STATUS :- Children and adolescents living in poverty suffer twice as much tooth decay as their more affluent peers, and that their disease is more likely to go untreated

C. ANATOMIC CHARACTERISTICS OF THE TEETH :- Certain teeth of many patients ,particularly permanent teeth, seem vulnerable to dental caries as they emerge, and in caries-active mouths, they may show evidence of the attack almost coincident with their eruption into the oral cavity .

-Because enamel calcification is incomplete at the time of eruption of the teeth and an additional period of about 2 years is required for the calcification process to be completed by exposure tosaliva, the teeth are especially susceptible to caries formation during the first 2 years after eruption.

-Permanent molars often have incompletely coalesced pits and fissures with or without hypoplasia that allows the dental plaque material to be retained at the base of the defect.

-In addition to occlusal surfaces, lingual pits on the maxillary permanent molars, buccal pits on the mandibular permanent molars, and lingual pits on the maxillary permanent lateral incisors are vulnerable areas in which the process of dental caries may proceed rapidly

***CLINICAL FEATURES-:**

-Seen in primary and permanent dentition-:

•In primary teeth features are related to order of tooth eruption. Initial lesions appear on labial surface of maxillary incisors near the gingival margin as a white area/ pitting on enamel surface.

•In permanent teeth

–Related to the eruption of teeth.

–Buccal and lingual surface of premolar and molar are involved.

–Proximal and labial surface of maxillary incisors and proximal surface of mandibular incisors are involved.

***COMPLICATIONS-:**

1-Affects maxillary anteriors which may lead to psychological problem

2-Minimal trauma can lead to fracture of teeth

3- Difficulty in speech.

4- Development of abnormal habits

5- Orthodontic problems

6-Multiple abscess formation

7- General health impaired and hospitalization may be required.

*EARLY CHILDHOOD CARIES-:

*DEFINITION-:

-The American Academy of Pediatric Dentistry (AAPD) defines early childhood caries (ECC) as the presence of one or more decayed (noncavitated or cavitated), missing (as a result of caries), or filled tooth surfaces in any primary tooth in a child 71 months of age or younger. OR it is the occurrence of any sign of dental caries on any tooth surface during the first 3 years of life.

-AAPD also specifies that, in children younger than 3 years of age, any sign of smooth-surface caries is indicative of severe early childhood caries (SECC)

-Caries affects the maxillary primary incisors and first primary molars in a way that reflects the pattern of eruption. The longer the tooth has been present and exposed to the caries challenge, the more it will be affected .

-The upper incisors are most vulnerable, while the mandibular incisors are protected by the tongue and saliva from submandibular and sublingual glands. Common terms for rampant caries in infants or preschool children have been „bottle caries" or „nursing caries", but the terms ECC, and S-ECC in severe cases, are now more commonly used.

-The lesions progress rapidly; they can be extensive and typically affect free smooth surfaces .Often the lesions cover many surfaces in each affected tooth. In severe cases front teeth break down during eruption and parents may associate this with developmental defects rather than caries .The pulp may be involved and thus a need for extraction in these very young children is the result.

" ***ECC": WHERE THE NAME CAME FROM AND WHY?**

-Human breastfeeding in infants has many advantages and has not been epidemiologically

associated with caries in the absence of other factors such as poor oral hygiene or a carbohydrate diet. Frequent nighttime bottle feeding with milk is associated with, but not consistently implicated in, SECC.

-Breastfeeding more than seven times daily after 12 months of age is associated with increased risk for ECC. Bovine milk, milk formulas and human breast milk have all been implicated in nursing caries because of their lactose content. Additional sweeteners in form of juice, honey

dipped pacifiers can also cause this type of caries. Nursing bottle can effectively block the salivary access to the tooth surface, thereby increasing the cariogenicity of oral flora.

-Nighttime bottle feeding with juice, repeated use of a sippy or no-spill cup, and frequent

between-meal consumption of sugar-containing snacks or drinks (e.g., juice, formula, soda) will increase the risk of caries.

-The child falls asleep, and the liquid becomes pooled around the teeth (the lower anterior teeth tend to be protected by the tongue). The carbo-hydrate-containing liquid provides an

excellent culture medium for acidogenic microorganisms. Salivary flow is also decreased during sleep, and clearance of the liquid from the oral cavity is slowed.

*ETIOLOGY-:

-1Exposure for long periods of time to cariogenic substrates (usually sugary drinks, sweetened or fruit-based drink) in nursing bottles and/or feeder cups given as pacifiers or dinky feeder.

2- Nursing bottle given at bedtime.

3-Low salivary rates at night.

4-Reduced buffering capacity.

5- Parental history of caries (especially mother.(

6-Associated with low socio-economic status , low educational level of parents and ethnic minorities

7-Enamel defects and malnutrition may also play a role.

8-Overindulgence of parents, and crowded homes.

9- Malnutrition and low-birth weight infants (less than 2500 gm(

10- Recently, it has been seen that salivary gland function is impaired by iron deficiency, excess of lead exposure, which makes the oral environment more caries susceptible.

***Some of the key biologic correlates of ECC-:**

.1Breast-feeding and bottle-feeding-:

-What is clear from the literature is that some children nurse in ways that either correlate with or lead directly to ECC, while the majority of breast-fed children do not experience ECC .

-Similarly, the majority of children who present with the nursing habit–associated pattern have a positive history of inappropriate bottle or sippy cup usage while the converse (that the majority of children who have a positive history of inappropriate bottle or sippy cup usage have ECC) is not true.

2 .Diet-:

-Children in a “high-carbohydrate soft drink” group had higher caries experience than children in a high-juice group, high-water group, and high milk group, with the last having the least caries experience.

-Other indicators of poor diet and nutrition have also been correlated with cavities in young

children. For example, not eating breakfast on a daily basis and not consuming the recommended five fruits and vegetables daily are associated with overall ECC experience.

3 .Salivary mutans streptococci levels and visible plaque-:

-As with high-sugar diets, the associations between mutans streptococci, plaque, and caries are very well established. Multiple studies since the mid-1970s relate mutans levels in children to mutans levels in the mouths of their primary caregivers, suggesting that managing adult reservoirs and interfering with transmission may hold strong promise to reduce disease onset and experience.

***PROGRESSION OF LESION-:**

-1Initially a demineralized dull, white area is seen along gum line on the labial aspect of maxillary

incisors, which is undetected by parents.

-2These white lesions become cavities which involve the neck of tooth in a ring-like lesion.

-3Finally, the whole crown of incisors is destroyed leaving behind brown black root stumps.

-This unique pattern and unequal severity of the lesion is **due to three factors-:**

-1Chronology of primary tooth eruption

-2Duration of deleterious habits of feeding

3- Muscular pattern of infant sucking.

*** IMPLICATIONS (CONSEQUENCES) :-**

1- The child who has nursing caries has an increased risk of caries in permanent dentition

2- Children with caries are susceptible to other health hazards

3- The treatment of nursing caries may be a financial burden to some parents.

4- Loss of the upper primary incisors does not result in space loss.

5- Speech develops normally.

6- Loss of primary molars may lead to space loss and a space analysis should be performed to determine whether a space maintainer is needed. This is especially the case for the second primary molars whose early loss can lead to mesial positioning of the first permanent molars.

*** DIFFERENTIAL DIAGNOSIS :-**

1- Rampant caries 2- Radiation caries 3- Enamel hypoplasia.

* **MANAGEMENT :-**

- Aims :-

• Management of existing emergency

• Arrest and control of caries process

• Institution of preventive procedures

• Restoration and rehabilitation.

*** Factors Affecting Management :-**

• Extent of lesion

• Age of patient and its related behavioral problems of child

i. Prevention :-

1- The main strategies for prevention is to aware and alert the parents, prospective new parents about the condition and its cause

2- Information on nursing caries can be distributed to new parents through; obstetricians or gynecologists, pediatrics, paramedical staff, health workers, maternal and child health care centers
3- Sealing of all caries free pits and fissures
4- Topical fluoride application and antimicrobial therapy
5- Water fluoridation in suboptimal fluoride water level areas
6- Supervised home care should be taught
7- Broad committees at government level to address the issue of caries and risk factors in young children and how to recognize the early signs of the condition and promote early intervention.

8- Caries vaccine :- A vaccine to prevent the disease of dental caries has been an anticipated scientific breakthrough since at least the early 1940s.

- Research efforts assume that MS is the principal etiologic organism of dental caries, and the development of a method of immunization specifically targeted at neutralizing MS has been a major thrust of caries vaccine research.

- Bowen reported that monkeys remained caries-free for more than 6 years after the animals received intraoral injections of killed MS, even though the monkeys were fed highly cariogenic diets and had severe malocclusion that would predispose them to caries. The route of administration of the vaccine is usually mucosal absorption by intraoral or intranasal tissues.

ii. Proper treatment :- Divided **into 3 visits** :-

*** First Visit :-** - This phase of treatment constitutes treatment of the lesion, identification of cause for counseling of parents.

- All lesions should be excavated and restored

1- Assess cooperation of child and decide on whether treatment will be conducted using local anaesthesia, sedation or general anaesthesia.

2- If abscess is present it is treated through drainage

3- Restoration of primary molars depending on extent of caries and cooperation of child with either composite, glass ionomer cement, pulpotomy, pulpectomy and preformed metal crowns (SSCs).

4- Antibiotics should be prescribed where acute soft tissue swelling or signs of systemic involvement (e.g. pyrexia) are present.

5- X-rays are advised to assess the condition of succedaneous teeth

6- Collection of saliva for determining salivary flow and viscosity

*** Parent Counseling** :-

1- The parents are questioned about the child's feeding habit, especially regarding the use of nocturnal bottles

2- The parent should be asked to try weaning the child from using the bottle as pacifier while in bed

3- In case, considerable emotional dependence on bottle, suggest the use of plain or fluoridated water

4- The parent should be instructed to clean child's teeth after every feed.

5- Parents are advised to maintain a diet record of the child for one week which include time, amount of food given, the type of food, number of sugar exposure.

* Second Visit :-

- It should be scheduled one week after the first visit.

1- Analysis of diet chart and explanation of disease process of child's teeth should be undertaken by simple equation

2- Isolate the sugar factors from diet charts and control sugar exposure by intelligent use
3- Reassess the restoration or redo if needed

4- Caries activity test can be started and repeated at monthly interval to monitor the success of treatment.

* Third and Subsequent Visits :-

1- Restoring all grossly decayed tooth and Endodontic treatment

2- Crowns can be done for grossly destructed teeth or endodontically treated teeth

3- Extraction of unrestorable teeth, followed by space maintainers are used

4- Review and recall after 3 months.

	Rampant caries	Early childhood caries
1	Acute, burrowing type of caries and showed early involvement of pulp. Involving those surfaces which are usually immune to decay.	It is a specific form of rampant caries
2	It occurs in all age group including adolescence	It occurs in infants toddler or preschoolers
3	It occurs in both primary and permanent dentition	Affect the primary dentition only
4	Mandibular incisors are Usually, affected	mandibular incisors are not affected
5	Multifactorial etiology like frequent snacking excessive sticky refined carbohydrate intake, decrease, salivary flow and genetic background.	Primarily associated to improper feeding practice such as bottle feeding or breast feeding or pacifier feeding during sleep.
6	If pulp is exposed, it requires pulp therapy or RCT	If diagnosed in early stage it can be managed by topical fluoride application and dental education.

Lec 12 **Pediatric dentistry** **Dr.Aseel Taha**

Restorative Materials Used in Paediatric Dentistry . . . . . (2)

- Glass Ionomer Cements :-

- Glass ionomer cements (GICs) were developed in an attempt to capitalize on the favorable properties of both silicate and polycarboxylate cements. Unfortunately, the first generation materials had severe limitations.

- Excessive opacity, limited shade selection, mixing and handling problems, quickly doused the enthusiasm surrounding this new product. As a result, it has struggled to gain popularity, even though continued research has produced clinically useful restorative materials.

- Properties of Glass Ionomer Cement :-

1- Low solubility

2- Coefficient of thermal expansion similar to dentin

3- Fluoride release and fluoride recharge

4- High compressive strengths

5- Bonds to tooth structure by primarily chemical, micromechanical way.

6- Low flexural strength and shear strength

7- Dimensional change (shrinks on setting, expands with water sorption)

8- Brittle

9- Lacks translucency

10- Rough surface texture

11- Biocompatible to tissues.

- Indications :-

1- Non-stress bearing areas

2- Teeth that are not expected to be long lasting

3- Class III and V restorations in adults 2

4- Class I and small cl II restorations in primary dentition

5- Temporary or “caries control” restorations

6- Crown margin repairs

7- Cement base under amalgam, resin, ceramics, direct and indirect gold

8- Core build-ups when at least 3 walls of tooth are remaining after crown preparation.

- Contraindications :-

1- High stress applications

2- Class IV and class II restorations

3- Cusp replacement

4- Core build-ups with less than 3 sound walls remaining.

- Advantages :-

1- Bonds to enamel and dentin

2- Significant fluoride release, can be recharged

3- Coefficient of thermal expansion similar to tooth structure

4- Tooth colored

5- Low thermal conductivity.

- Disadvantages :-

1- Opacity higher than resin

2- Less polish-ability than resin

3- Poor wear resistance

4- Brittle, poor tensile strength

5- Poor longevity in xerostomic patients.

- Recent Developments of Glass Ionomer Cement :-

• Modified powder — liquid system :-

– This system has improved wetting of the powder by the liquid rendering the mixing process much easier and faster.

• Capsules :- – The glass ionomer cement in the form of capsule system is a modern application method, which simplifies and allows procedures to be performed with greater ease and efficiency.

– These capsules contain premeasured glass ionomer powder and liquid, which ensures correct ratio, consistency of mix and a predictable result.

– These capsules have angled nozzles that act as a syringe for accurate placement of the material into a cavity or a crown for cementation.

• Paste-paste dispensing system :- – This is the latest development in the glass ionomer cement technology. This dispensing system was designed with the objectives of providing optimum ratio, easy mixing, easy placement, total reliability, using a specially designed cartridge and an easy-to-use material dispenser.

– In order to provide the material in a paste–paste consistency, an ultra-fine glass powder was designed specifically. The low particle size provides the mixed cement with a thixotropic creamy consistency.

- Modifications of Glass Ionomer Cement :-

• Metal modified glass ionomer :-

- Silver alloy admix (silver amalgam alloy particles mixed with glass particles). The addition of metal powders or fibers to glass ionomer cements can improve strength; however, their esthetics are poor and they do not burnish.

- Cermet (glass sintered with silver) Cermet–ionomer cements have greatly improved resistance to abrasion when compared with glass ionomer cements and their flexural strength is also higher; however, their strength is still insufficient to replace amalgam alloys and their use should be confined to low stress-bearing cavity preparations.

• Resin modified glass ionomer :-

- Resin modification of glass ionomer cement was designed to produce favorable physical properties similar to those of resin composites while maintaining the basic features of the conventional glass ionomer cement.

- In their simplest form, these are GICs with the addition of a small quantity of a resin in the liquid.

• "High strength," "packable," or "high viscosity" glass Ionomers :- – These glass ionomers are particularly useful for atraumatic restorative treatment technique (ART). They were designed as an alternative to amalgam for posterior preventive restorations. These cements set only by a conventional neutralization reaction but have properties that exceed those of the resin modified systems. Setting is rapid, early moisture sensitivity is considerably reduced and solubility in oral fluids is very low.

Calcium Hydroxide :-

- Calcium hydroxide was introduced in United States by Teuscher and Zander in 1938, and is since then being used as a pulpal medicament. Although the overall mechanisms of action of calcium hydroxide are not fully understood, many articles have been published describing its biological properties, role of the high pH and the ionic activity in the healing process, diffusion through dentinal tubules and influence on apical microleakage.

- Uses of Calcium Hydroxide :-

• Calcium hydroxide as an intracanal medicament :-

– It is the most commonly used dressing for treatment of the vital pulp.

– It also plays a major role as an inter-visit dressing in the disinfection of the root canal system.

• Calcium hydroxide as an endodontic sealer :-

– In the root canal obturation, sealer plays an important role, as it fills the gap between the walls of the prepared dentine and the gutta-percha. Examples of calcium hydroxide sealers :- Sealapex (Kerr), Apexkit (Vivadent).

• Calcium hydroxide as a pulp capping agent :- – Calcium hydroxide is generally accepted as the material of choice for pulp capping. – When calcium hydroxide is applied directly to pulp tissue there is necrosis of adjacent pulp tissue and an inflammation of contiguous tissue. Dentinal bridge formation occurs at the junction of necrotic tissue and vital inflamed tissue. – Three main calcium hydroxide products for pulp capping are Pulpadent, Dycal, Hydrex (MPC).

• Calcium hydroxide in apexification :- – Apexification technique is recommended in non-vital young permanent tooth with incomplete apices; it is cleaned and disinfected, then if tooth is free of signs and symptoms of infection, the canal is dried and filled with stiff mix of calcium hydroxide. – Commercial paste of calcium hydroxide like Calasept, Pulpdent, Metapex may be used to fill the canals.

• Calcium hydroxide in pulpotomy :-

– It is the most recommended pulpotomy medicament for pulpally involved vital young permanent tooth with incomplete apices. – It is acceptable because it promoted reparative dentin bridge formation and thus pulp vitality is maintained.

• Calcium hydroxide in weeping canals :- – Sometimes a tooth undergoing root canal treatment shows constant clear or reddish exudate associated with periapical radiolucency. Tooth can be asymptomatic or tender on percussion, exudates stops but when opened in next appointment, it again reappears, this is known as “weeping canal”.

– In these cases tooth with exudates is not ready for obturation. Since culture reports normally show negative bacterial growth, so antibiotics are of no help. For such teeth, dry the canals with sterile absorbent paper points and place calcium hydroxide in canal which helps in controlling the exudates because pH of periapical tissues is acidic in weeping stage which gets converted into basic pH by calcium hydroxide.

- Advantages of calcium hydroxide :-

1- Initially bactericidal then bacteriostatic

2- Promotes healing and repair

3- High pH stimulates fibroblasts

4- Neutralizes low pH of acids

5- Stops internal resorption

6- Inexpensive and easy to use

- **Disadvantages of calcium Hydroxide** :-

1- Associated with primary tooth resorption

2- Dissolve after one year

3- May degrade during acid etching

4- Degrades upon tooth flexure

5- Marginal failure with amalgam condensation

6- Does not adhere to dentin or resin restoration

- Matrices :-

- Matricing is a procedure where by a temporary wall is created in the areas of tooth structure lost during preparation. The appliance used for building these walls is called matrix.

- Rationale for Using Matrix :-

1- Accurate reproduction of contour of teeth

2- To prevent interproximal excess

3- To establish tight contact areas

4- To maintain integrity of normal gingival papillae

5- To maintain arch dimensions in primary dentition.

- **Functions of Matrix** :-

1- To replace the missing wall

2- Close adaptation of restorative material

3- Retain restorative material during placement

4- Allows restoration of contact point and external crown contour

5- Isolation of cavity.

- Ideal Requirements of Matrix :-

1- Rigid to allow condensation

2- Promote desired contour

3- Should form positive contact with tooth

4- Should be of minimal thickness

5- Compatible with restorative material

6- Ease of application

7- Economic.