

# Local Anesthesia and Pain Control for the Children

It is generally agreed that one of the most important aspects of child behavior guidance is the control of pain. If children experience pain during restorative or surgical procedures, their future as dental patients may be damaged. Therefore it is important at each visit to reduce discomfort to a minimum and to control painful situations. There are many pharmacologic pain control strategies to help children cope with these situations, both preoperatively and postoperatively. Most of these strategies involve the use of local anesthetics or analgesics.

Because there is usually some discomfort associated with the procedure, use of a local anesthetic is generally indicated when operative work is to be performed on the permanent teeth, and the same is true of cavity preparations in primary teeth. Dental procedures can be carried out more effectively if the child is comfortable and free of pain. The local anesthetic can prevent discomfort that may be associated with placing a rubber dam clamp, ligating teeth, and cutting tooth structure. Even the youngest child treated in the dental office normally presents no contraindications for the use of a local anesthetic.

## TOPICAL ANESTHETICS

Topical anesthetics reduce the slight discomfort that may be associated with the insertion of the needle before the injection of the local anesthetic. Some topical anesthetics, however, present a disadvantage if they have a disagreeable taste to the child. Also, the additional time required to apply them may allow the child to become apprehensive concerning the approaching procedure.

Topical anesthetics are available in gel, liquid, ointment, and pressurized spray forms. However, the pleasant-tasting and quick-acting liquid, gel, or ointment preparations seem to be preferred by most dentists. These agents are applied to the oral mucous membranes with a cotton-tipped applicator. A variety of anesthetic agents have been used in topical anesthetic preparations, including ethyl aminobenzoate, butacaine sulfate, cocaine, dyclonine, lidocaine, and tetracaine.

Ethyl aminobenzoate (benzocaine) liquid, ointment, or gel preparations are probably best suited for topical anesthesia in dentistry. They offer a more rapid onset and longer duration of anesthesia than other topical agents. They are not known to produce systemic toxicity as oral topical anesthetics, but a few localized allergic reactions have been reported from prolonged or repeated use.

The mucosa at the site of the intended needle insertion is dried with gauze, and a small amount of the topical anesthetic agent is applied to the tissue with a cotton swab. Topical anesthesia should be produced in approximately 30 seconds.

During the application of the topical anesthetic, the dentist should prepare the child for the injection. The explanation should not necessarily be a detailed description but simply an indication that the tooth is going to be put to sleep so that the treatment can proceed without discomfort.

### **Newer Techniques in Local Anesthesia:**

The traditional aspirating syringe is still the most common method by which local anesthetics are administered. Newer techniques have been developed that can help the dentist administer the local anesthetic with minimum injection pain and adverse effects.

#### **Computer Controlled Local Anesthetic Delivery system (CCLADS):**

In the mid-1990s, work began on the development of local anesthetic delivery systems that incorporated computer technology to control the rate of flow of the anesthetic solution through the needle. This concept is now called computer-controlled local anesthetic delivery (CCLAD).

#### **Wand/ Compu Dent System:**

The Wand system enables the operator to accurately manipulate needle placement with fingertip accuracy and deliver the LA with a foot-activated control. It consists of a disposable hand piece component and a computer control unit. The hand piece is an ultra-light pen-like handle which is linked to a conventional anesthetic cartridge with plastic micro tubing. A growing number of clinical trials in medicine also demonstrate measurable benefits of CCLAD technology.

#### **Comfort control syringe**

The Comfort Control Syringe has two main components: A base unit and a syringe. Several functions of the unit- most importantly injection and aspiration- can be controlled directly from the syringe, possibly making its use easier to master for practitioners accustomed to the traditional manual syringe. The Comfort Control Syringe has five pre-programmed speeds for different injection techniques and can be used for all injection techniques. A comparison between the traditional dental syringe and the Comfort Control Syringe revealed no meaningful differences in ease of administration, injection pain and efficacy, and acceptance by patients.

#### **Jet Injectors**

This technique is based on the principle of using a mechanical energy source to create a release of pressure sufficient to push a dose of liquid medication through a very small orifice, creating a thin column of fluid with enough force that it can penetrate soft tissue into the subcutaneous tissue without a needle. Jet injectors are

believed to offer advantages over traditional needle injectors by being fast and easy to use, with little or no pain, less tissue damage, and faster drug absorption at the injection site.

### **Vibro tactile Devices:**

pain reduction due to non-noxious touch or vibration can result from tactile-induced pain inhibition within the cerebral cortex itself and that the inhibition occurs without any contribution at the spinal level, including descending inhibitory actions on spinal neurons.

### **VibraJect**

It is a small battery-operated attachment that snaps on to the standard dental syringe which delivers a high-frequency vibration to the needle that is strong enough for the patient to feel.

### **DentalVibe**

This is a cordless, rechargeable, hand held device that delivers soothing, pulsed, percussive micro-oscillations to the site where an injection is being administered. Its U-shaped vibrating tip attached to a microprocessor -controlled Vibra-Pulse motor gently stimulates the sensory receptors at the injection site, effectively closing the neural pain gate, blocking the painful sensation of injections. It also lights the injection area and has an attachment to retract the lip or cheek.

### **Accupal**

The Accupal (Hot Springs, AR, USA) is a cordless device that uses both vibration and pressure to precondition the oral mucosa. Accupal provides pressure and vibrates the injection site 360° proximal to the needle penetration, which shuts the “pain gate,” according to the manufacturer. After placing the device at the injection site and applying moderate pressure, the unit light up the area and begins to vibrate. The needle is placed through a hole in the head of the disposable tip, which is attached to the motor.

## **LOCAL ANESTHESIA BY CONVENTIONAL INJECTION**

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The injections that are most commonly used in the treatment of children are described in the following sections.

### **ANESTHETIZATION OF MANDIBULAR TEETH AND SOFT TISSUE**

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#### **INFERIOR ALVEOLAR NERVE BLOCK (CONVENTIONAL MANDIBULAR BLOCK)**

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When deep operative or surgical procedures are undertaken for the mandibular primary or permanent teeth, the inferior alveolar nerve must be blocked. The supra periosteal injection technique may sometimes be useful in anesthetizing primary incisors, but it is not as reliable for complete anesthesia of the mandibular primary or permanent molars.

Olsen reported that the mandibular foramen is situated at a level lower than the occlusal plane of the primary teeth of the pediatric patient. Therefore the injection must be made slightly lower and more posteriorly than for an adult patient. An accepted technique is one in which the thumb is laid on the occlusal surface of the molars, with the tip of the thumb resting on the internal oblique ridge and the ball of the thumb resting in the retro molar fossa. Firm support during the injection procedure can be given when the ball of the middle finger is resting on the posterior border of the mandible. The barrel of the syringe should be directed on a plane between the two primary molars on the opposite side of the arch. It is advisable to inject a small amount of the solution as soon as the tissue is penetrated and to continue to inject minute quantities as the needle is directed toward the mandibular foramen.

The depth of insertion averages about 15 mm but varies with the size of the mandible and its changing proportions depending on the age of the patient. Approximately 1 mL of the solution should be deposited around the inferior alveolar nerve [Figs. 1,2](#)



**Figure-1** The mandible is supported by the thumb and middle finger, while the needle is directed toward the inferior alveolar nerve.



**Figure -2** Anesthetic solution is deposited around the inferior alveolar nerve.

## LINGUAL NERVE BLOCK

One can block the lingual nerve by bringing the syringe to the opposite side with the injection of a small quantity of the solution as the needle is withdrawn. If small amounts of anesthetic are injected during insertion and withdrawal of the needle for the inferior alveolar nerve block, the lingual nerve will invariably be anesthetized as well.

## LONG BUCCAL NERVE BLOCK

For the removal of mandibular permanent molars or sometimes for the placement of a rubber dam clamp on these teeth, it is necessary to anesthetize the long buccal nerve. A small quantity of the solution may be deposited in the muco-buccal fold at a point distal and buccal to the indicated tooth ([Fig. 3](#)).



**Figure 3** In anesthetizing the long buccal nerve, a small quantity of the solution may be deposited in the mucobuccal fold adjacent to the first permanent molar.

All facial mandibular gingival tissue on the side that has been injected will be anesthetized for operative procedures, with the possible exception of the tissue facial to the central and lateral incisors, which may receive innervation from overlapping nerve fibers from the opposite side.

## **INFILTRATION ANESTHESIA FOR MANDIBULAR PRIMARY MOLARS**

The two anesthesia techniques ( block and infiltration) were equally effective for restorative procedures, but the mandibular infiltration technique was less effective than mandibular block for extraction and pulpotomy. The behavior in young children can be adversely affected by the painful mandibular block. The mandibular infiltration anesthesia may produce adequate anesthesia in mandibular deciduous molars for most restorative procedures.

## **INFILTRATION FOR MANDIBULAR INCISORS**

The terminal ends of the inferior alveolar nerves cross over the mandibular midline slightly and provide conjoined innervation of the mandibular incisors. A single inferior alveolar nerve block may not be adequate for operative or surgical procedures on the incisors, even on the side of the block anesthesia. The labial cortical bone overlying the mandibular incisors is usually thin enough for supra periosteal anesthesia techniques to be effective.

If only superficial caries excavation of mandibular incisors is needed or if the removal of a partially exfoliated primary incisor is planned, infiltration anesthesia alone may be adequate. Incisor infiltration is most useful as an adjunct to an inferior alveolar nerve block when total anesthesia of the quadrant is desired. In this case the infiltration injection is made close to the midline on the side of the block

anesthesia, but the solution is deposited labial to the incisors on the opposite side of the midline. For example, if block anesthesia is used for the mandibular right quadrant, anesthetic solution is infiltrated over the left mandibular incisors by insertion of the needle just to the right of the midline diagonally toward the left incisors.

### Maxillary Primary and Permanent Molar Anesthesia

The innervation of maxillary primary and permanent molars arises from the posterior superior alveolar nerve (permanent molars) and middle superior alveolar nerve (mesiobuccal root of the first permanent molar, primary molars, and premolars).

In anesthetizing the maxillary primary molars or permanent premolars, the needle should penetrate the muco buccal fold and be inserted to a depth that approximates that of the apices of the buccal roots of the teeth (Figure 4). The solution should be deposited adjacent to the bone. The maxillary permanent molars may be anesthetized with a posterior superior alveolar nerve block or by local infiltration.



**FIGURE 4** Buccal infiltration for anesthetizing maxillary primary molars. Technique: 1. Reflect tissue to expose injection site. 2. Orient bevel of needle to be parallel to the bone. 3. Insert needle in muco buccal fold. 4. Proceed to depth that approximates the apices of the buccal roots of the molar(s). 5. The bevel of the needle should be adjacent to the periosteum of the bone. Aspirate. 6. Deposit the bolus of anesthetic slowly. 7. Remove needle and apply pressure with 2 × 2 inch gauze for 1 minute to obtain hemostasis.

### Maxillary Primary and Permanent Incisor and Canine Anesthesia

The innervation of maxillary primary and permanent incisors and canines is by the antero superior alveolar branch of the maxillary nerve. Labial infiltration commonly is used to anesthetize the primary anterior teeth. The needle is inserted in the muco buccal fold to a depth that approximates that of the apices of the buccal roots of the teeth (Figure 5). Rapid deposition of the solution in this area is contraindicated because it produces discomfort during rapid expansion of the tissue. The innervation of the anterior teeth may arise from the opposite side of the midline.

Thus it may be necessary to deposit some solution adjacent to the apex of the contralateral central incisor.



■ **FIGURE 5** Labial infiltration of maxillary incisor area. Technique for maxillary primary and permanent incisors and canines: 1. Reflect tissue to expose injection site. 2. Orient bevel of needle to be parallel to the bone. 3. Insert needle in muco buccal fold. 4. Proceed to depth approximating that of root apices. This depth is less in the primary dentition than in the permanent dentition. 5. The bevel of the needle should be adjacent to the periosteum of the bone. Aspirate. 6. Inject the bolus of anesthetic very slowly. 7. Remove needle and apply pressure to area with 2 × 2 inch gauze for hemostasis

Infraorbital block injection is an excellent technique that may be used in place of local infiltration of the anterior teeth. All ipsilateral anterior maxillary teeth are anesthetized by this block. The needle is inserted anywhere in the mucobuccal fold from the lateral incisor to the first primary molar and is advanced next to bone to a depth that approximates the infraorbital foramen. The foramen is readily palpated as a notch on the infraorbital rim of the bony orbit. The solution is deposited slowly only after an aspiration procedure.

### Palatal Tissue Anesthesia

The tissues of the hard palate are innervated by the anterior palatine and nasal palatine nerves. Surgical procedures involving palatal tissues usually require a nasal palatine nerve block (Figure 6) or anterior palatine anesthesia (Figure 7). These nerve blocks are painful, and care should be taken to prepare the child adequately. These injections are not usually required for normal restorative procedures unless the procedure involves palatal tissue. However, if it is anticipated that the rubber dam clamp will impinge on the palatal tissue, a drop of anesthetic solution should be deposited into the marginal tissue adjacent to the lingual aspect of the tooth. Blanching of the tissue will be observed.





**FIGURE 6** Nasal palatine block. The needle is inserted to the left or right side of the papilla. Note the blanching of tissue at the injection site.



**FIGURE 7** Palatal infiltration of primary molars anesthetizing the anterior palatine nerve. The cotton-tipped applicator is held firmly against the palatal tissue. The needle is inserted in the area between the applicator and tooth. The applicator may provide a masking or distracting effect. Technique: 1. Apply pressure with cotton-tipped applicator to site that is to receive the needle. 2. Insert needle with bevel oriented parallel to the bone immediately adjacent to the applicator. 3. Proceed to depth at which the bevel of the needle is adjacent to the periosteum and aspirate. 4. Inject the bolus of anesthetic very slowly. 5. Remove needle and apply pressure to area with 2 × 2 inch gauze for hemostasis.

## Supplemental Injection Techniques

### Periodontal Ligament Injection (Intraligamentary Injection)

The periodontal ligament injection has been used for a number of years as either a method of obtaining primary anesthesia for one or two teeth or as a supplement to infiltration or block techniques. The technique's primary advantage is that it provides pulpal anesthesia for 30 to 45 minutes without an extended period of soft tissue anesthesia, thus being extremely useful when bilateral treatment is planned. It is useful in pediatric or disabled patients when there is concern of postoperative

tissue trauma to the lip or tongue. However, its use should be avoided in primary teeth with a developing permanent tooth bud as there have been reports of enamel hypoplasia in permanent teeth following PDL injection. Because it is injected in a site with limited blood circulation it can be used in patients with bleeding disorders.

The PDL technique is simple, requires only a small amount of anesthesia and produces instant anesthesia. A ultra-short needle is placed in the gingival sulcus on the mesial surface and advanced along the root surface until resistance is met. In multi-rooted teeth injections are made mesially and distally. If lingual anesthesia is needed the procedure is repeated in the lingual sulcus. Approximately 0.2ml of anesthetic is injected.

Considerable effort is needed to express the anesthetic solution placing a great deal of pressure on the anesthetic cartridge with the possibility of breakage. There are syringes specifically designed to enclose the cartridge and provide protection from breakage. Since so little anesthetic solution is necessary.

### Selection of syringes and needles

The American Dental Association (ADA) has long standing standards for aspirating syringes for use in the administration of local anesthesia. Needle selection should allow for profound local anesthesia and adequate aspiration. Needle gauges range from size 23 to 30, with the lower numbers having the larger inner diameter. Needles with lower numbers provide for less deflection as the needle passes through soft tissues and for more reliable aspiration. The depth of insertion varies not only by injection technique but also by the age and size of the patient. Dental needles are available in three lengths: long (32 mm), short (20 mm), and ultra-short (10 mm). Most needle fractures occur during the administration of inferior alveolar nerve block with 30-gauge needles. Breakage can occur when a needle is inserted to the hub, when the needle is weakened due to bending it before insertion into the soft tissues, or by patient movement after the needle is inserted.

### Complications of Local Anesthesia

#### Anesthetic toxicity (overdose)

While rare in adults, young children are more likely to experience toxic reactions because of their lower weight. Most adverse drug reactions occur within 5-10 minutes of injection. Overdose of local anesthetics are caused by high blood levels of anesthetic as a result of an inadvertent intravascular injection or repeated injections. Local anesthetic overdose results in excitation followed by depression of the central nervous system and to a lesser extent of the cardiovascular system.

Early subjective symptoms of the central nervous system include dizziness, anxiety and confusion and may be followed by diplopia, tinnitus, drowsiness and

circumoral numbness or tingling. Objective signs include muscle twitching, tremors, talkativeness, slowed speech and shivering followed by overt seizure activity. Unconsciousness and respiratory arrest may occur.

The initial cardiovascular system response to local anesthetic toxicity is an increase in heart rate and blood pressure. As blood plasma levels of the anesthetic increase, vasodilatation occurs followed by depression of the myocardium with subsequent fall in blood pressure. Bradycardia and cardiac arrest may follow.

Local anesthetic toxicity is preventable by following proper injection technique, i.e., aspiration during slow injection. Clinicians should be knowledgeable of maximum dosages based on weight. If lidocaine topical anesthetic is used it should factored into the total administered dose as it can infiltrate into the vascular system. After injection the patient should be observed for any possible toxic response as early recognition and intervention are the keys to a successful outcome.

### **Allergic reactions**

Although allergic reactions to injectable amide local anesthetics are rare, patients may exhibit a reaction to the bisulfite preservative added to anesthetics containing epinephrine. Patients with a sulfa allergy should not receive articaine. Patients may also exhibit allergic reactions to benzocaine topical anesthetics. Allergies can manifest in a variety of ways including urticaria, dermatitis, angioedema, fever, photosensitivity and anaphylaxis.

### **Paresthesia**

Paresthesia is the persistence of anesthetic symptoms beyond the expected duration. It can be caused by trauma to the nerve by the needle during injection. It can also be caused by hemorrhage in and around the nerve. Reports of paresthesia are more common with articaine and prilocaine and thus nerve block should be avoided in children with these local anesthetics. The tongue and lips are the most common areas affected. Most cases resolve in 8 weeks without treatment.

### **Postoperative soft tissue injury**

Accidental biting or chewing of the lip, tongue or cheek is a problem seen in very young pediatric mentally or physically disabled patients. Soft tissue anesthesia lasts longer than pulpal anesthesia and may be present for up 4 hours after local anesthesia administration. The most common area of trauma is the lower lip and to a lesser extent the tongue, followed by the upper lip.

**Several preventive measures can be followed:**

- Select a local anesthetic with a duration of action that is appropriate for the length of the planned procedure.
- Advise the patient and accompanying adult about the possibility of injury if the patient bites, sucks or chews on the lips, tongue and cheek. They should delay eating and avoid hot drinks until the effects of the anesthesia are totally dissipated.
- Reinforce the warning with patient stickers and by placing a cotton roll or rolled up gauze (“Bite on the ghost”) in the mucobuccal fold if anesthesia symptoms persist.
- The management of soft tissue trauma involves reassuring the patient and parent (it’s okay if the tissue turns white), allowing up to a week for the injury to heal, and lubricating the area with petroleum jelly or antibiotic ointment to prevent drying, cracking and pain.

**THE END**

# Dental caries

Is an infectious and communicable disease requires multiple factors to influence the initiation and progression of it. The disease is recognized to require a host (tooth in the oral environment), a dietary substrate, and acid uric bacteria.' The saliva (also considered a host component), the substrate, and the bacteria form a biofilm (plaque) that adheres to the tooth surface. Over time the presence of the substrate serves as a nutrient for the bacteria, and the bacteria produce acids that can demineralize the tooth.

Dental caries as a preventable disease, the disease typically begins in enamel and progresses slowly in the early stages of the process. Cavitation of the tooth structure occurs at late stage of the disease. Prior to cavitation, the progress of the disease may be arrested and/or reversed if a favorable oral environment can be achieved. Even after cavitation occurs, if the pulp is not yet involved and if the cavitated area is open enough to be self-cleansing ("plaque-free"), the caries process can halt and become an "arrested lesion.

## **Arrested lesions**

1. Typically exhibit much coronal destruction.
2. Remaining exposed dentin is hard and usually very dark.
3. No evidence of pulpal damage.
4. The patient has no pain

Treating the oral infection by reducing the number of cariogenic microorganisms and establishing a favorable oral environment to promote remineralization of tooth structure over time will stop the caries process and cure the disease. Curing the disease requires modifications by the patient and/or caretaker and relies on their compliance in making the necessary modifications.

A number of microorganisms can produce enough acid to decalcify tooth structure, particularly acid uric streptococci, lactobacilli, diphtheroids, yeasts, staphylococci, and certain strains of sarcinae. *Streptococcus mutans* has been implicated as one of the major and most virulent of the caries-producing organisms.

The acids that initially decalcify the enamel have a pH of 5.5 to 5.2 or less and are formed in the plaque material, which has been described as an organic nitrogenous mass of microorganisms firmly attached to the tooth structure. This film, which exists primarily in the susceptible areas of the teeth.

The acids involved in the initiation of the caries process are normal metabolic by-products of the microorganisms and are generated by the metabolism of carbohydrates. Because the outer surface of enamel is far more resistant to demineralization by acid than is the deeper portion of enamel, the greatest amount of demineralization occurs 10 to 15  $\mu\text{m}$  beneath the enamel surface. The continuation of this process results in the formation of an incipient subsurface enamel lesion that is first observed clinically as a so-called white spot. Unless the demineralization is arrested or reversed (remineralization) the subsurface lesion will continue to enlarge, with the eventual collapse of the thin surface layer and the formation of a cavitated lesion. Remineralization of incipient subsurface lesions may occur as long as the surface layer of the enamel remains intact. Saliva, which is supersaturated with calcium and phosphate and has acid-buffering capability, diffuses into plaque, where it neutralizes the microbial acids and repairs the damaged enamel. The time required for remineralization to replace the hydroxyapatite lost during demineralization is determined by the age of the plaque, the nature of the carbohydrate consumed and the presence or absence of fluoride

## **RAMPANT DENTAL CARIES**

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.

Etiological factors

1. Emotional disturbances, repressed emotions and fear.
2. Traumatic school experience, continuous general tension and anxiety have been observed in children and adults who have rampant dental 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.
3. A noticeable salivary deficiency.
4. Various medications (such as tranquilizers and sedatives) commonly taken to help persons cope with stress, are associated with decreased salivary flow and decreased caries resistance
5. Radiation therapy to the head and neck results in diminished salivary function and may place patients at high risk for severe caries development.

## **EARLY CHILDHOOD CARIES, SEVERE EARLY CHILDHOOD CARIES, NURSING CARIES, BABY BOTTLE TOOTH DECAY**

The American Academy of Pediatric Dentistry (AAPD) defines early childhood caries (ECC) as the presence of one or more decayed (non cavitated or cavitated), missing (due to caries), or filled tooth surfaces in any primary tooth in a child younger than 3 years of age, any sign of smooth-surface caries is indicative of severe early childhood caries (S-ECC). After eruption of the primary teeth begins, excessively frequent bottle feedings and/or prolonged bottle or breast feedings is often associated with early and rampant caries. The clinical appearance of the teeth in S-ECC in a child 2, 3, or 4 years of age is typical and follows a definite pattern. There is early carious involvement of the maxillary anterior teeth, the maxillary and mandibular first primary molars, and sometimes the mandibular canines. The mandibular incisors are usually unaffected.

A discussion with the parents often reveals an inappropriate feeding pattern: the child has been put to bed at afternoon naptime and/or at night with a nursing bottle holding milk or a sugar-containing beverage. The child falls asleep and the liquid becomes pooled around the teeth (the lower anterior teeth tend to be protected by the tongue). carbohydrate-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.

## **ADDITIONAL FACTORS KNOWN TO INFLUENCE DENTAL CARIES**

### **\*\*SALIVA**

The flow, dilution, buffering, and remineralizing capacity of saliva are also recognized to be critical factors that affect and regulate the progression and regression of the disease. If the oral environment is balanced and favorable, saliva can contribute to strengthening of the tooth by supplying the components known to help build strong apatite structure. If the oral environment is unfavorable (too much acid is produced ), an adequate flow of saliva can help dilute and buffer the acid, and thus slow the rate of damage to the tooth or even repair it.



1. The salivary pH, the acid-neutralizing power, and the calcium, fluoride, and phosphorus content.
2. The rate of flow and the viscosity of saliva may influence the development of caries. The normal salivary flow aids in the solution of food debris on which microorganisms thrive.
3. Salivary antibacterial and other anti-infectious properties. A reduction in the salivary flow may be temporary or permanent. When the quantity is only moderately reduced, the oral structures may appear normal. A pronounced reduction or complete absence of saliva, however, will result in a septic mouth with rampant caries. In addition to the rapid destruction of the teeth, there may be dryness and cracking of the lips, with fissuring at the corners of the mouth, burning and soreness of the mucous membranes, crusting of the tongue and palate, and sometimes paresthesia of the tongue or mucous membrane.

#### **\*\*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 be untreated.

#### **\*\*ANATOMIC CHARACTERISTICS OF THE TEETH**

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 to saliva, the teeth are especially susceptible to caries formation during the first 2 years after eruption. Permanent molars often have incompletely coalesced pits and fissures that allow the dental plaque material to be retained at the base of the defect, sometimes in contact with exposed dentin. These defects or anatomic characteristics can readily be seen if the tooth is dried and the debris and plaque removed. 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 can proceed rapidly.

#### **\*\*ARRANGEMENT OF THE TEETH IN THE ARCH**

Crowded and irregular teeth are not readily cleansed during the natural masticatory process. It is difficult for the patient to clean the mouth properly with a toothbrush and floss if the teeth are crowded or overlapped. This condition may contribute to the problem of dental caries.

#### **\*\*PRESENCE OF DENTAL APPLIANCES AND RESTORATIONS**

Partial dentures, space maintainers and orthodontic appliances often encourage the retention of food debris and plaque material and result in an increase in the bacterial population.

#### **EARLY DETECTION OF DISEASE ACTIVITY**

##### **\*\* INFRARED LASER FLUORESCENCE (DIAGNOdent)**

An instrument designed to facilitate the detection of dental caries, DIAGNOdent, has recently become available in several countries. This instrument was developed for the detection and quantification of dental caries of occlusal and smooth surfaces. It uses a diode laser light source and a fiber-optic cable that transmits the light to a hand-held probe with a fiber-optic eye in the tip. The light is absorbed and induces infrared fluorescence by organic and inorganic materials. The emitted fluorescence is collected at the probe tip, transmitted through ascending fibers, and processed and presented on a display window as an integer between 0 and 99

##### **\*\*DIGITAL IMAGING FIBER-OPTIC TRANS-ILLUMINATION (DIFOTI)**

Intense light beam that is transmitted through a fiber optic cable to a specially designed probe to permit the use of trans illumination on the proximal surfaces of posterior teeth.

##### **\*\*QUANTITATIVE LIGHT FLUORESCENCE**

A small portable system was developed in which the laser source was replaced by a regular light source and filter system. The light illuminating the

tooth is transported through a liquid filled light guide. The fluorescent filtered images are captured using a color CCD camera and a frame grabber. Data are collected, stored, and analyzed by custom software. QLF instrument detected 5 to 10 times more early lesions than conventional detection methods, was particularly useful for examination of occlusal pits and fissures, and gave reproducible results. QLF for the early detection of dental caries on occlusal and smooth tooth surfaces as well as for the quantification of lesion changes related to treatment procedures and environmental factors such as oral hygiene. The only significant limitation to this instrument is its inability to detect or monitor interproximal lesions.

### **Pulpotomy**

Pulpotomy defined as the complete removal of the coronal portion of dental pulp, followed by placement of a suitable dressing or medicament that will promote healing and preserve the vitality of the tooth.

Pulpal state: healthy pulp or partial chronic pulpitis/symptomless carious exposure with pulp inflammation limited to the coronal pulp. The tooth has been anesthetized and isolated with a rubber dam. The treatment is performed with due consideration to disinfection and behavior management .

### **Indications**

- Carious pulp exposures of teeth when their retention is more advantageous than extraction.
- When inflammation is confined to coronal poster of pulp.
- Vital tooth with health periodontal support.
- Restorable teeth.
- Tooth that possess at least 2/3rd of its root length.
- Hemorrhage from the amputation site is pale red and easy to control.

### **Contraindications**

- Evidence of internal/external resorption.
- Evidence of inter radicular bone loss.
- Presence of abscess, fistula in relation to teeth.

- Radiographic evidence of pulpal calcification.
- Life expectancy of tooth is very short
- Non -restorable teeth.
- Marked tenderness to percussion.
- Any sign of spontaneous pain especially at nights.

### **Classification of Vital Pulp Therapy**

Devitalizing: Mummification; cauterization.

Devitalize means to deprive of vitality or vital properties, make lifeless, to weaken. These products are designed to mummify the remaining pulp tissue and are represented by formocresol, laser, and electro- surgery. As the most universally accepted method, formocresol was used.

#### **Formocresol Pulpotomy — Single Sitting:**

- Obtain profound anesthesia.
  - Selection of appropriate rubber dam clamp application.
  - Access opening with high speed hand piece with appropriate fissure bur.
- Prior to entering pulp chamber remove all carious lesion with slow speed bur.
- De -roof the chamber with a fissure bur in a high speed hand piece.
  - Amputate the coronal pulp using sterile round bur or sterile sharp spoon excavator.
  - Obtain hemostasis by exerting pressure with sterile cotton pellets.
  - Treat radicular pulp stumps by applying a barely moistened cotton pellet of formocresol for 5 minutes in pulp chamber. The excess are expressed to ensure very little moisture on the cotton pellet.
  - After removing the cotton pallet, place a dressing of zinc oxide eugenol with or without a drop of formocresol over radicular stumps.
  - The tooth is then restored with stainless steel crown or amalgam restoration.

#### **Formocresol Pulpotomy — Two Stages/Sitting**

First visit:

- Preparation of cavity until excavation of deep carious dentine under LA and isolation.
- Pulp exposure site enlarged with sterile round bur.

- Incorporate Paraformaldehyde paste into cotton pellet and place over exposure site and seal the tooth with immediate restorative material for 1 -2 weeks.

Second visit:

- Re -enter the tooth and amputate coronal pulp tissue with sterile spoon excavator/round bur.
- No LA is needed.
- Tooth is then restored with an antiseptic dressing and stainless steel crown.

Preserving: Minimal devitalization; non-inductive

By definition, preserving means to keep from injury, peril, harm; to protect.

Therefore, the objective of the materials included in this category is to minimally insult the tissue in order to preserve the vitality of the radicular pulp. As representatives of this category, glutaraldehyde, ferric sulfate (15.5%), and sodium hypochlorite (3% to 5% for 30 seconds).

### Preservation Pulpotomy

Similar to single stage formocresol pulpotomy only difference is instead of formocresol either glutaraldehyde or ferric sulfate is used and restored with stainless steel crown or amalgam restoration. The recommendation currently is to have the cotton pellet soaked in glutaraldehyde and applied very wet.

Regenerating: Inductive; reparative

By definition, to regenerate is to revive or produce anew; bring into existence again.

Thus, by definition, the pulpotomy medicament in this category should be one that leaves the remaining radicular pulp vital and completely enclosed away from the potentially noxious effects of restorative materials and bases. Materials that belong to this category of pulpotomy medicaments can induce reparative dentin, and their application has been based on sound biologic principles. Representatives of this category are calcium hydroxide (CaOH<sub>2</sub>) and mineral trioxide aggregate (MTA).

### MTA Pulpotomy

1. Once the pulp chamber is accessed, the coronal pulp is removed and hemostasis is achieved with a cotton pellet.
2. A 3:1 MTA to sterile saline is mixed into a paste and applied to the pulpal floor
3. ZOE or IRM is placed over the MTA and the tooth is restored .

### Pulpectomy

Under certain conditions a vital pulpotomy will not be successful. If hemostasis is not accomplished, if the pulp is necrotic, or if the tooth has irreversible pulp disease, a pulpectomy must be performed , or else the tooth should be extracted .

### Partial Pulpectomy

This procedure is actually a variation of the pulpotomy procedure. If hemostasis cannot be achieved, a slow -speed, round bur is advanced 2 to 3 mm down the canal to reach unaffected vital tissue. The procedure then proceeds to step #4 as described previously.

### Complete Pulpectomy

When a vital pulpotomy or a partial pulpectomy will not be successful, the canals must then be thoroughly debrided and filled with a resorbable paste. This technique relies heavily on the bactericidal properties of the paste and the recuperative powers of the body. Due to primary molar canal anatomy, all pulp tissue cannot be removed.

### Indications for a Complete Pulpectomy

A complete pulpectomy may be indicated in the following situations:

- ☒ a restorable primary tooth with hyper emic or necrotic pulp
- ☒ a history of spontaneous pain
- ☒ clinical or radiographic signs of an infection

## Contraindications for a Complete Pulpectomy

A complete pulpectomy may be contraindicated in the following situations:

- ☐ Grossly destroyed tooth that is non-restorable clinically
- ☐ Peri-radicular involvement extending to the permanent tooth bud, where the risk of damage to the permanent tooth is high
- ☐ medically compromised patients .
- ☐ pathologic root resorption
- ☐ excessive bone loss or mobility
- ☐ teeth with perforations

## Objectives

Following treatment, the infections process should resolve in 6 months as evidenced by bone deposition in the pretreatments radiolucent areas, and pretreatment clinical signs and symptoms should resolve within 2 weeks. There should be radiographic evidence of successful felling without gross overextension or under-filling. The treatment should permit resorption of primary tooth root structures and filling materials at the appropriate time to permit normal eruption of the succedaneus tooth.

There should be no pathologic root resorption or furcal/apical radiolucency

The success of endodontic treatment depends on elimination of the infecting Bacteria accomplished through adequate root canal debridement (instrumentation), antibacterial irrigations, and antibacterial filling materials.

Root canal treatment is considered successful if the followings are noted after a follow-up period

(1) The tooth is not mobile

(2) Remains in function without pain, discomfort, or infection until the permanent successor is ready to erupt

(3) Undergoes physiologic resorption.

Radio graphically the tooth should present absence or reduction in size of preexisting pathologic radiolucent defects and no new lesions.

## **Root Canal Filling Materials**

The ideal root canal filling material should resorb at the same pace as the physiologic resorption of the roots, be nontoxic or irritant to the peri-apical tissues and to the permanent tooth germ, resorbs readily if forced beyond the apex and be antiseptic, easy to insert, non-shrinkable, and easily removed if necessary.

### 1. Zinc oxide -eugenol paste

A thick mix of (ZOE) without setting accelerators may be pushed into the root canals using a suitable root canal plugger. ZOE tends to resorb at a slower rate than the roots of the primary teeth, so placing it in the root canals can create a problem to the clinician: When extruded beyond the apices, the material sets into a hard cement that resists resorption, it might remain in the alveolar bone for months or years. Remnants of ZOE may cause a mild foreign body reaction.

### 2. Calcium hydroxide pastes with iodoform

The aqueous, viscous, or oily vehicle used in the formulation of the root canal filling paste impacts the speed of ionic dissociation. As aqueous vehicles favor a high degree of solubility, they will cause a depletion of the paste from the root canals before the time of physiological root resorption. Viscous vehicles promote a lower solubility of the paste, and oily vehicles have the lowest solubility and diffusion of calcium hydroxide pastes showing better results. Iodoform-containing pastes are introduced into the root canal using disposable tips or a spiral lentulo mounted on a slow-speed

Hand piece, and the teeth are sealed with reinforced zinc oxide -eugenol. When extruded into furcal or apical areas, it can either diffuse or be resorbed in 1 or 2 weeks. Bone regeneration has been clinically and histologically documented.

### 3. Iodoform -based pastes



### Steps of pulpectomy in deciduous dentition:

- 1 Isolate the tooth and perform occlusal reduction.
- 2 Expose the pulp chamber by removing the roof of the pulp chamber with a high –speed hand piece.
- 3 Use the preoperative X -ray to determine a length 1 to 2 mm short of the radiographic apex.
- 4 Debride the canals using standard endodontic files (up to at least the size 30 file). An apical stop is required.
- 5 Irrigate during instrumentation and dry the canals when debridement is complete.
- 6 If hemostasis cannot be achieved, temporize and reappoint for fill.
- 7 Fill the canals with ZOE resorb able paste using pressure syringe, , jiffy tubes, lentulo spiral drills.
- 8 Expose a postoperative X -ray to evaluate the fill.
- 9 Place the ZOE dressing in the chamber and restore appropriately.

### Pulpectomy success evaluation:

- No purulent discharge from the gingival margin
- No abnormal mobility
- No postoperative pain
- No further resorption of root (except physiological)
- Resolution of sinus tract, by 6 months .

### Apexogenesis

The treatment of a vital pulp in the permanent teeth by capping or pulpotomy in order to permit continued growth of the growth of the root and closure of the open apex



## **ORAL SURGERY FOR CHILDREN**

All surgical procedures require anesthesia; if a patient properly premedicated and comfortable and if the tissues are handled gently, extensive operations can be performed with local anesthesia. When the fears of the patient are uncontrolled, when an understanding of the situation is impossible, or when the procedure is complicated, general anesthesia is indicated. It should be emphasized that no surgical procedure should be done without the permission of the parent or guardian who should have a basic understanding of what is to be done, why it is being done, and what complications can occur.

### **Indications for Extraction of Primary Teeth**

Indications for extraction for children are the same as for adult patients:

- 1- un-restorable caries.
- 2- apical disease
- 3- fractures of crown or roots.
- 4- prolonged retention of primary teeth because of improper root resorption or ankylosis
- 5- supernumerary teeth.

Radiographic surveys of teeth to be extracted are of prime importance because

1. to observe the size and contour of primary roots
- 2- the amount and type of resorption
- 3- the relation of roots to succedaneous teeth
- 4- the extent of the disease

## **Indication of extraction of the Permanent first Molar**

before 10 years of age, when permanent second molar is not erupted, the direction of eruption is mesially angulated. So when second permanent molar start to erupt, it will erupt mesially but the presence of first molar prevent such drifting. So if the first molar extracted before 10 years, the 2nd molar will erupt in its place and it will be in a nice occlusion with opposing tooth, although there is little space between 5 and 7 in comparison to 5 and 6.

If the first permanent molar is very badly carious, X-ray should be taken to see if the bud of 2<sup>nd</sup> permanent molar is present still unerupted in the jaw, we extract first permanent molar and have the second permanent molar to take its place.

when there is crowding in anterior teeth the sixes are extracted and all the teeth may retract posteriorly, so it will decrease the crowding.

If the first permanent molar a badly carious and the 2nd permanent molar erupted and the occlusion is in good alignment. If we extract the first permanent molar there will be space because the 2nd difficult to drift and fill the space. In such a case, the opinion of the orthodontist should be taken.

## **Contraindications of Extractions:**

There are no contraindications but there is postponed the extraction as in the followings:

1- when there is cellulites because:

- a. It cause spread of infection.
- b. local anesthetic will not work.

2-in a case of uncontrolled systemic disease such as:

- a. heart disease they need antibiotic cover.
- b. diabetic patient, they should measure blood sugar before extraction.
- c. hemophilic patient should be hospitalized for factor VIII and IX.

3- when the child has viral infection in his mouth such as viral stomatitis so it is painful.

4- when the child allergic to anesthesia since it is very rare cases but the type of anesthesia should be changed.

### **Extraction Technique for primary Teeth.**

The initial steps for extracting any tooth are the same. First having administered the local anesthetic, adequate time should be allowed for it to take effect. The adequacy of anesthesia is tested by reflection of gingival cuff from the tooth. The routine use of straight dental elevators as the next step has been over emphasized. In most cases proceeding with extraction forceps is preferable, smaller increments of pressure may be applied initially with the elevator. The first force exerted, prior to any attempt to luxate the tooth, is an apical direction. The low height of contour and small undercuts need this apical force to ensure good forceps seating to prevent slippage of the beaks, even during initial luxation there should be apical force. The maxillary primary incisors and canines have straight conical roots and can be removed easily with mesio-distal rotation.

1- In the primary maxillary molar region, the initial luxation force is palatal rather than buccal as is initially used with permanent maxillary posteriors. the palatal root of primary molar is straight, relatively bulky, and less prone to fracture than the spindly, curved buccal roots. Thus the fulcrum point should be on this stronger root.

2- The maxillary primary molars lie toward the palatal side of the alveolar ridge. The buccal plate is full in order to accommodate the erupting permanent teeth and as a result of normal lateral growth on the maxilla; therefore it is less easy to expand with buccally directed forceps. Once some movement has been gained the primary maxillary molar is now redelivered with gradual buccal palatal motion .

3-Mandibular primary anterior teeth have roots that are elliptical in cross-section. These teeth usually lie labial to the crowns of erupting permanent anterior. So the initial luxation force is toward the labial, Delivery of the tooth is made with gradual labial-lingual luxation. The primary mandibular molars are luxated initially to the buccal for similar reasons and delivered with bucco-lingual movement. A molar forceps are particularly suited to grasping the furcation area of these teeth.

Simple extraction of individual primary teeth do not usually require suturing for hemostasis, and a gauze placed under pressure for 15-20 minutes will cause a stable clot to form. When placing the gauze toward the buccal aspect of the teeth rather than

the lingual, which might cause the patient to gag. When the bleeding is a problem, or when more than one tooth or multiple teeth in the same area are extracted, suture is best placed from the buccal to lingual interdental papilla. Again, it is best to use a resorbable suture to avoid a second procedure in very young anxious or physically, or mentally handi-capped patients. In most other situations, black silk suture is perfect because it is soft, inexpensive, easy to see in the mouth, and easy to tie.

### **Post-Extraction Complications:**

#### Surgical Extraction

Tooth root or tooth tip fragments should be removed whenever possible. Any tooth root that is involved with peri apical or periodontal infection must be removed, it serve as the nidus for recurring infection. Without exception, a tooth fragment that might interfere with normal succedaneous tooth eruption must also be removed. Often the apical position of a primary molar root will fracture off, and if the radiograph indicate it is curved down below the height of contour of the premolar crown, we always attempt to remove it through the existing socket using a fine root elevator. If this is not successful, we may leave the root tip alone rather than attempt the more involved surgical approach of intervention by reflecting a buccal flap and removing buccal bone to reach the root tip. This may affect the bone support of the permanent tooth.

Another case for surgical extraction is the fully erupted tooth that is unsuited to forceps extraction. If the crown fractures or crumbles or if excessive force must be used, it will be kinder and time saving if initial plan is to raise a flap, divide the roots, and remove it in sections.

The forceps of primary teeth are small in size, small blades and small handle. There is forceps for upper anterior teeth, lower primary teeth, upper molar, lower molar.

### **Manifestation of Infection and its Management.**

A child is susceptible to the same organism as an adult, inflammatory responses are the same and the same general principles of infection control and treatment apply.

#### **Acute Dental Infections**

An acute apical infection resulting from a non-vital or degenerative pulp may be confined to the alveolar process, may break through the cortical barrier and involve the periosteum, or may invade the surrounding soft tissue and result in cellulites. one

of three results will become evident resolution, localization, or overwhelming infection. An immediate decision must be made whether to extract the tooth or treated endodontically. Fever, malaise, and oral pain result in low fluid intake and generalized acute illness, thus close observation is indicated antibiotic therapy is indicated, penicillin is the drug of choice, but erythromycin may be given and sedative.

One must not wait until the acute exacerbation has completely subside. A traumatic extraction that one performed at the time when the infection is most virulent may have local and systemic consequence .

If the pus seems to be localizing, heat should be applied intra-orally, extra-orally or in both ways to hasten localization. So that the incision and drainage may be performed, after that the antibiotic continue until the signs and symptoms of infection disappear.

### **Chronic Dental Infection.**

Chronic infections are usually manifested by apical pathosis, (as shown by radiographs examination) or by sinus tract that is draining through the alveolar process into the mouth. Antibiotic therapy is not usually necessary in the treatment of this phase, since healing is rapid

after the removal of the source of infection. Gentle curettage should be done after extraction, but in the case of primary tooth, injury to the underlying tooth bud must be avoided. the path of drainage of chronic infection will find its way through the cutaneous surface of the face, especially the anterior portion of the mandible when such draining area results from an infected tooth. antibiotic therapy and extra-oral surgical closures will fail completely until the source of infection has been removed.

### **Frenectomy:**

This is a procedure which involves the removal of the tissue fold that connects the lips or tongue to the jawbone. There are two primary locations in the mouth where the frenum is found — under the tongue and underneath the center of the upper lip. Sometimes the frenum is attached too high on the gums, causing space between the two upper front teeth. Or the frenum is attached too close to the tip of the tongue. In either case, a frenectomy is performed surgically to prevent interference in mouth development.

## **Frenectomy-Indications:**

A Frenectomy may be indicated in the following situations:

- Gum inflammation that persists even after root planning and good oral hygiene measures
  - An area of gum recession that is progressive
  - Midline diastma (gap)that is present even after the permanent canines have erupted
  - Ankyloglossia (tongue tied )

## **Labial Frenectomy**

### **Technique:**

The abnormal maxillary frenum can be treated by frenectomy procedure which includes the following steps:

- 1- Field block anaesthesia is given.
- 2- The frenum is engaged with a haemostat.
- 3- The frenum is incised along the upper and lower surface of the haemostat and the triangular portion of tissue is removed .
- 4- Bleeding is controlled with gauze sponge and the area is covered with a periodontal pack.
- 5- The pack is removed after two weeks and healing occurs.



## **Lingual Frenectomy**

### **Technique:**

- A transverse incision is made between the under surface of the tongue and floor of the mouth, and the tissue is removed.
- The wound is closed with sutures.

### **Post-operative care**

- Your surgeon will advise you on analgesic medicines to relieve pain.
- You should gargle with warm saline or mouthwash to maintain good oral hygiene.

## **Treatment of infections**

Acute dental abscess:

All acute infections require immediate treatment, observation and follow up for the condition to resolve.

- The abscess is incised and drained to relieve pressure.
- The tooth from which the infection is caused is treated endodontically in the subsequent visits.
- Plenty of fluids and analgesics are advised.

Chronic dental abscess:

In case of neglected pulp disease in primary teeth, chronic dental abscess may result. There are two options to treat this:

- The teeth may be saved by draining the pus through the root canal.
- Extraction of the diseased tooth and prescribing antibiotics.

# ***PEDIATRIC DENTISTRY***



# **Development and Morphology of the Primary Teeth**

# Primary Teeth

## Upper Teeth

Central incisor

Lateral incisor

Canine (cuspid)

First molar

Second molar

## Lower Teeth

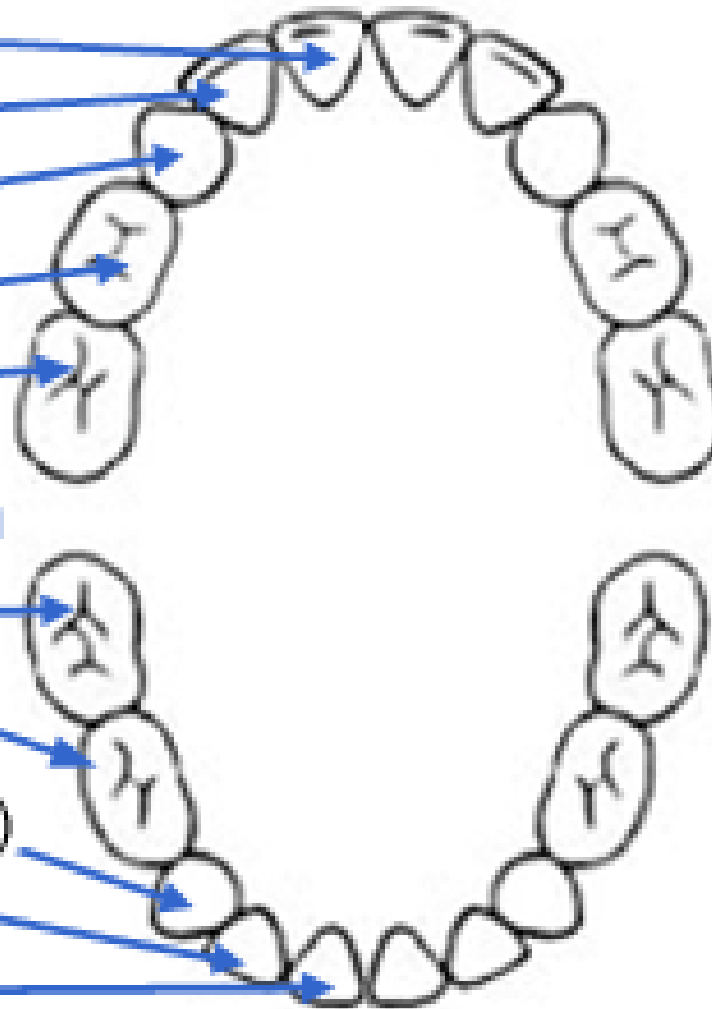
Second molar

First molar

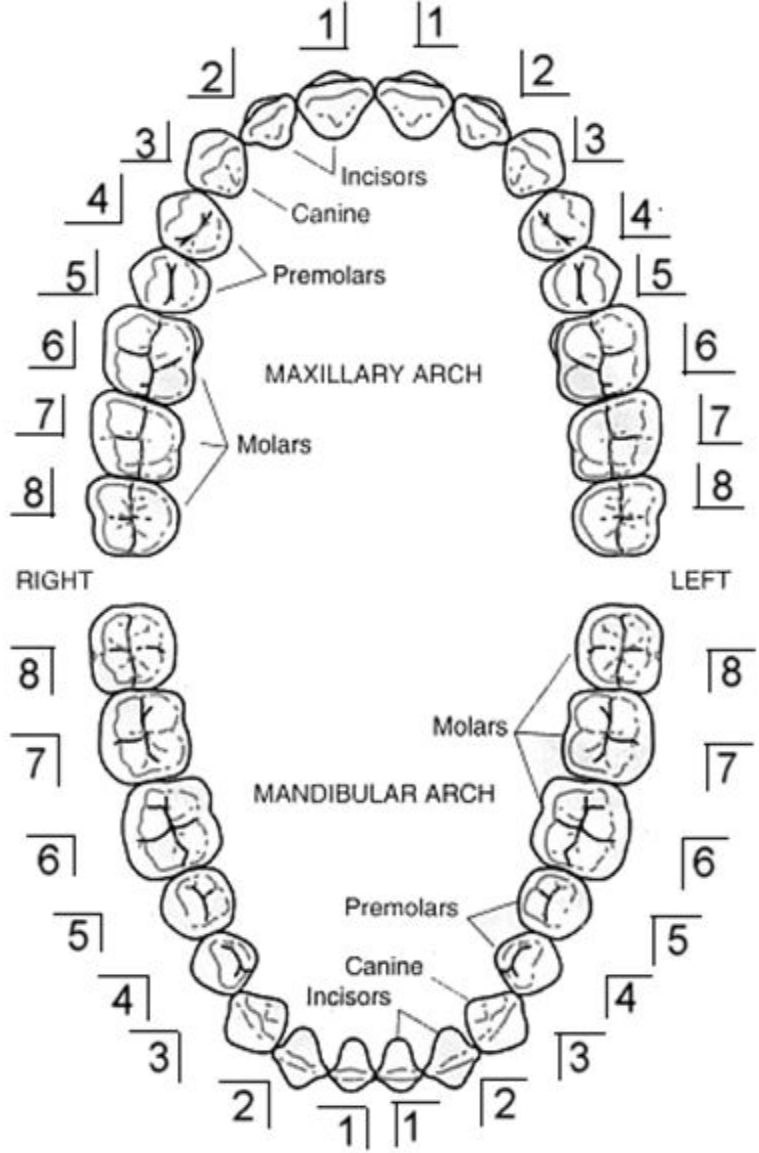
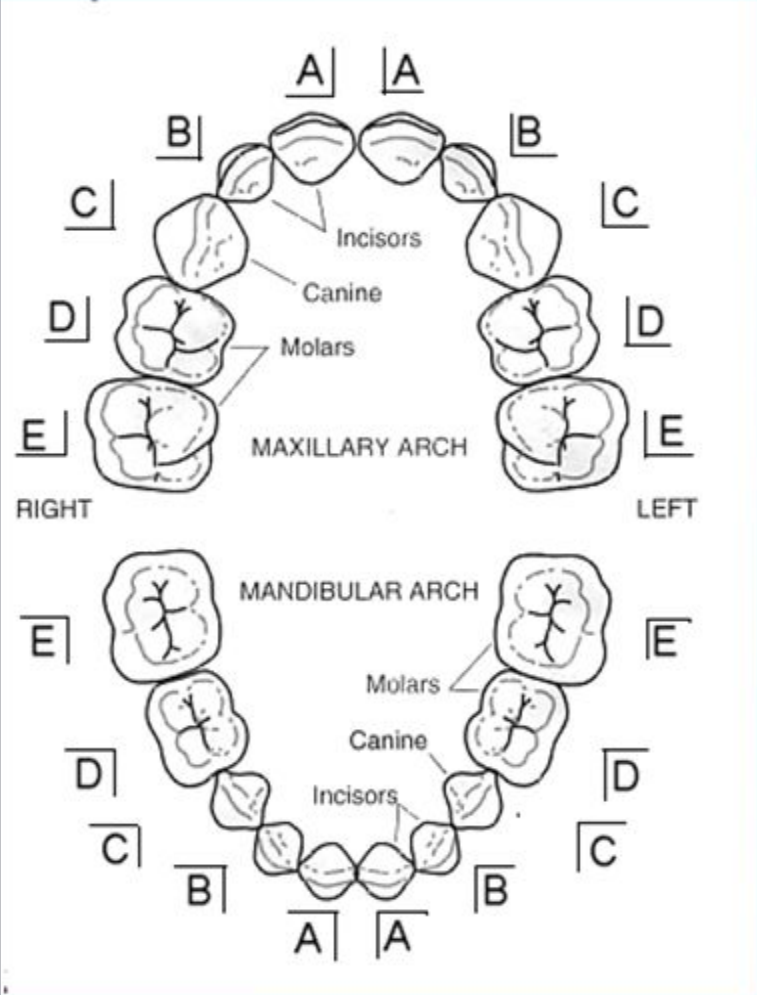
Canine (cuspid)

Lateral incisor

Central incisor



# Palmer Notation System



# Federation Dentaire Internationale (FDI).

- Two-digit system.
- Proposed by FDI has been Adopted by the WHO and by other organizations such as the International Association for Dental Research.
- The first digit indicates the quadrant: 5 to 8 for the primary dentition.
- The second digit indicates the tooth within a quadrant 1 to 5 for the primary teeth.

Upper Right					Upper Left				
55	54	53	52	51	61	62	63	64	65
85	84	83	82	81	71	72	73	74	75
Lower Right					Lower Left				

## Permanent Teeth

Upper Right								Upper Left							
18	17	16	15	14	13	12	11	21	22	23	24	25	26	27	28
48	47	46	45	44	43	42	41	31	32	33	34	35	36	37	38
Lower Right								Lower Left							

## Primary teeth

Upper Right					Upper Left				
55	54	53	52	51	61	62	63	64	65
85	84	83	82	81	71	72	73	74	75
Lower Right					Lower Left				

# Universal notation system

1) For the primary teeth ;

Right	A	B	C	D	E		F	G	H	I	J	Left
	T	S	R	Q	P		O	N	M	L	K	

- The **universal system of notation for the primary dentition** uses 'uppercase letters' for each of the primary teeth.
- For the maxillary teeth, beginning with the right second molar, letters A through J, and for the mandibular teeth, letters K through T, beginning with the left mandibular second molar.
- The ADA in 1968 officially recommended the "universal" numbering system.

2) For the permanent teeth ;

Right	1	2	3	4	5	6	7	8		9	10	11	12	13	14	15	16	Left
	32	31	30	29	28	27	26	25		24	23	22	21	20	19	18	17	



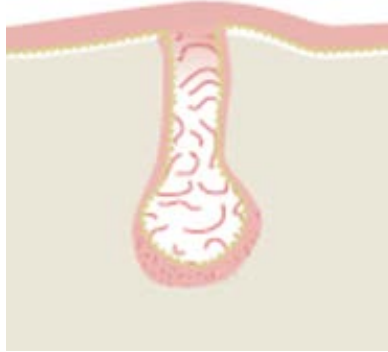
# Life cycle of the tooth

- A- INITIATION (BUD STAGE)

- At the **sixth week** of embryonic life, cells in the basal layer of the oral epithelium proliferate at a more rapid rate than do the adjacent cells. → **Dental lamina** → **tooth buds**
- The **congenital absence** of a tooth is the result of a lack of initiation or an arrest in the proliferation of cells.
- The presence of **supernumerary** teeth is the result of a continued budding of the enamel organ.



- B- PROLIFERATION (CAP STAGE)



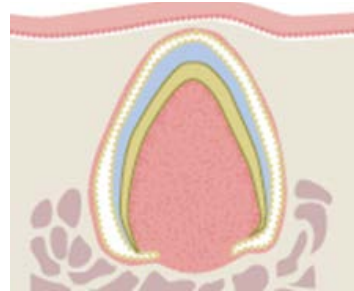
- Proliferation of the cells continues during the cap stage. As a result of unequal growth in the different parts of the bud, a cap is formed.
- deficiency in proliferation → failure of the tooth germ to develop.
- Excessive proliferation of cells → **epithelial rests**. These rests may remain inactive or become activated as a result of an irritation or stimulus.
- The **degree of differentiation** of the cells of these rests determines whether a **cyst**, an **odontoma**, or a **supernumerary** tooth develops

# • HISTODIFFERENTIATION AND MORPHODIFFERENTIATION (BELL STAGE)

- The formative cells are arranged to outline the **form and size** of the tooth.
- During this stage that there is a differentiation of the cells of the dental papilla into odontoblasts and of the cells of the inner enamel epithelium into ameloblasts.
- Disturbances and aberrations in **morphodifferentiation** lead to **abnormal forms and sizes** of teeth.
- Disturbances in the differentiation of the **formative cells** of the tooth germ result in **abnormal structure** of the dentin or enamel e.g. amelogenesis imperfecta



- D- APPOSITION & CALCIFICATION



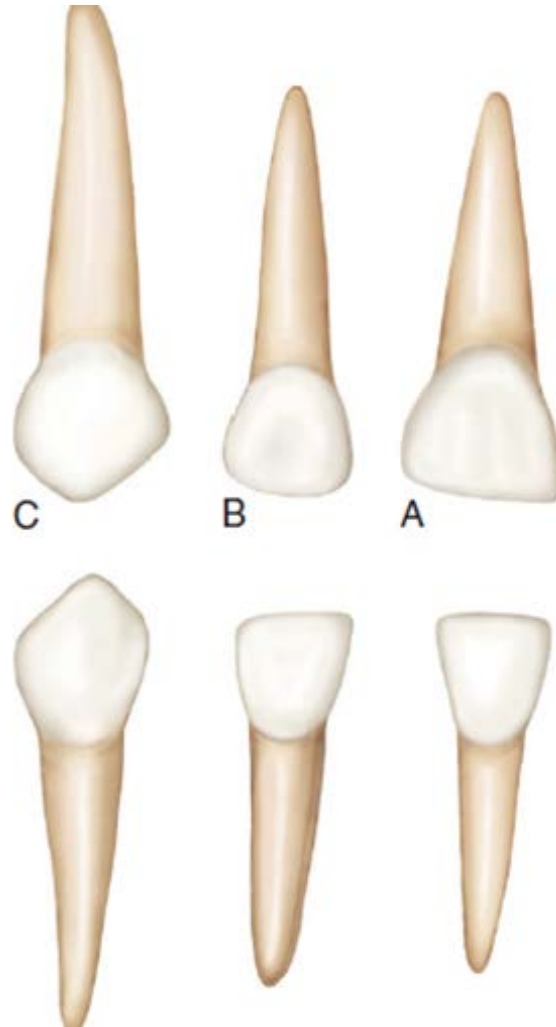
- **Extracellular matrix** is deposited by the formative cells, **ameloblasts**, and **odontoblasts**.
- Any systemic disturbance or local trauma that injures the ameloblasts → **enamel hypoplasia**.
- **Calcification** (mineralization) takes place following matrix deposition
- If the calcification process is disturbed, these deficiencies are not readily identified in the enamel, but in the dentin they are evident microscopically and are referred to as **interglobular dentin**.

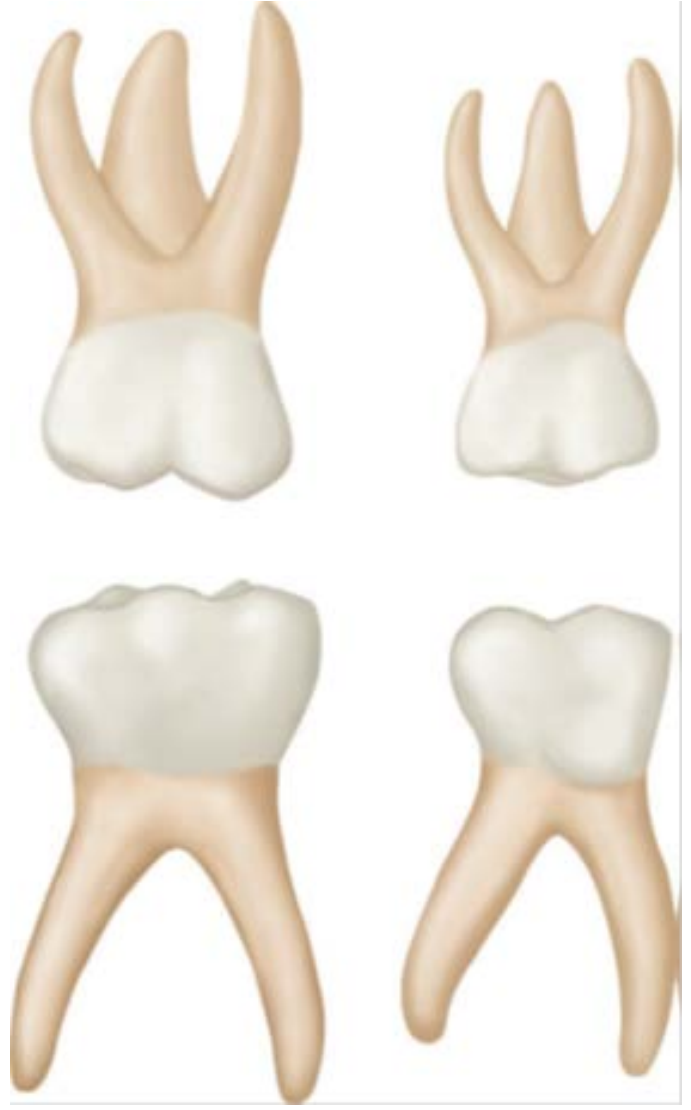
## Chronology of the Human Dentition

Tooth	Hard Tissue Formation Begins	Amount Of Enamel Formed At Birth	Enamel Completed	Eruption	Root Completed
<b><i>Deciduous Dentition</i></b>					
<b><i>Maxillary</i></b>					
Central incisor	4 mo in utero	Five sixths	1½ mo	7½ mo	1½ yr
Lateral incisor	4½ mo in utero	Two thirds	2½ mo	9 mo	2 yr
Cuspid	5 mo in utero	One third	9 mo	18 mo	3¼ yr
First molar	5 mo in utero	Cusps united	6 mo	14 mo	2½ yr
Second molar	6 mo in utero	Cusp tips still isolated	11 mo	24 mo	3 yr
<b><i>Mandibular</i></b>					
Central incisor	4½ mo in utero	Three fifths	2½ mo	6 mo	1½ yr
Lateral incisor	4½ mo in utero	Three fifths	3 mo	7 mo	1½ yr
Cuspid	5 mo in utero	One third	9 mo	16 mo	3¼ yr
First molar	5 mo in utero	Cusps united	5½ mo	12 mo	2¼ yr
Second molar	6 mo in utero	Cusp tips still isolated	10 mo	20 mo	3 yr

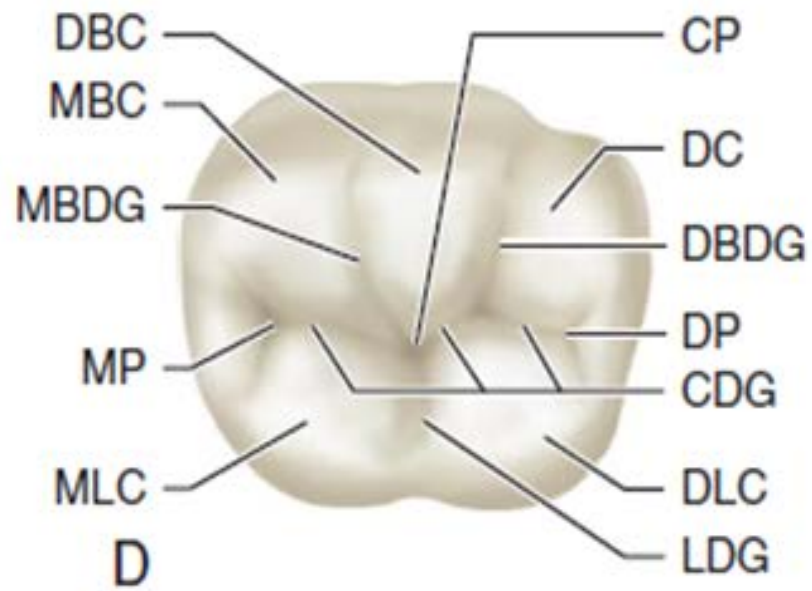
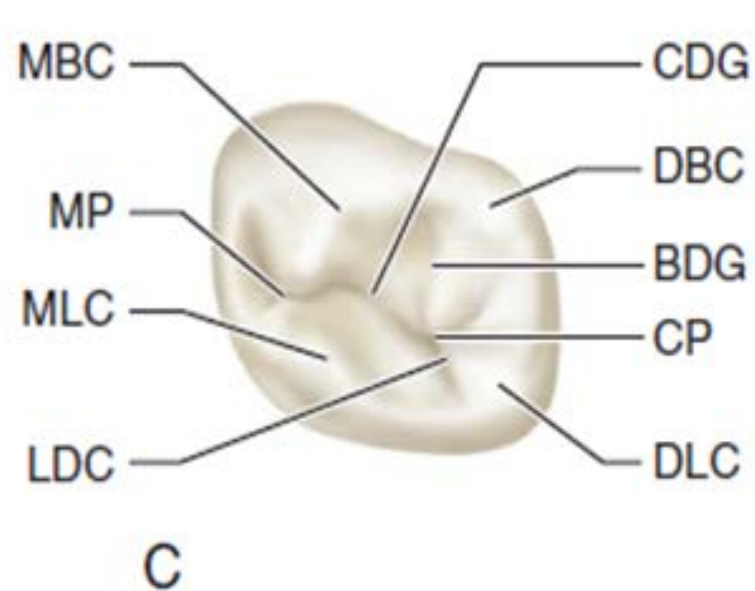
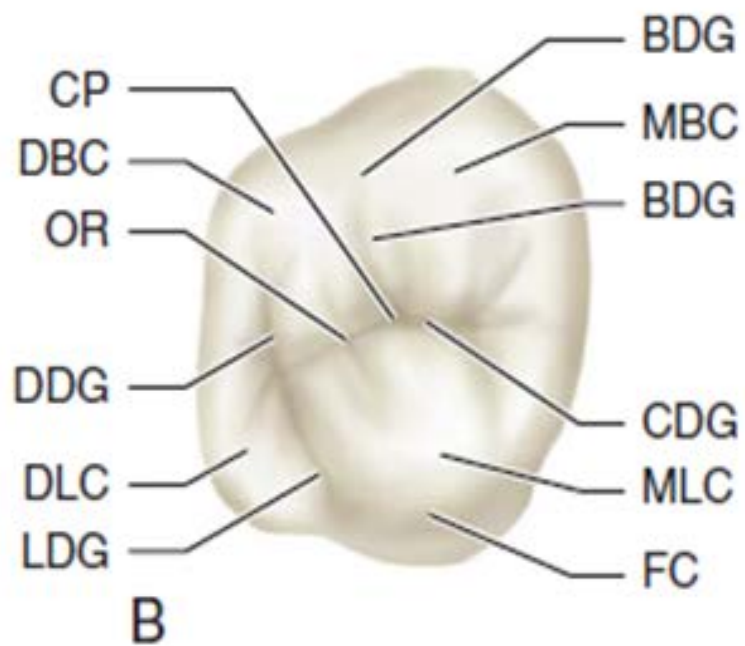
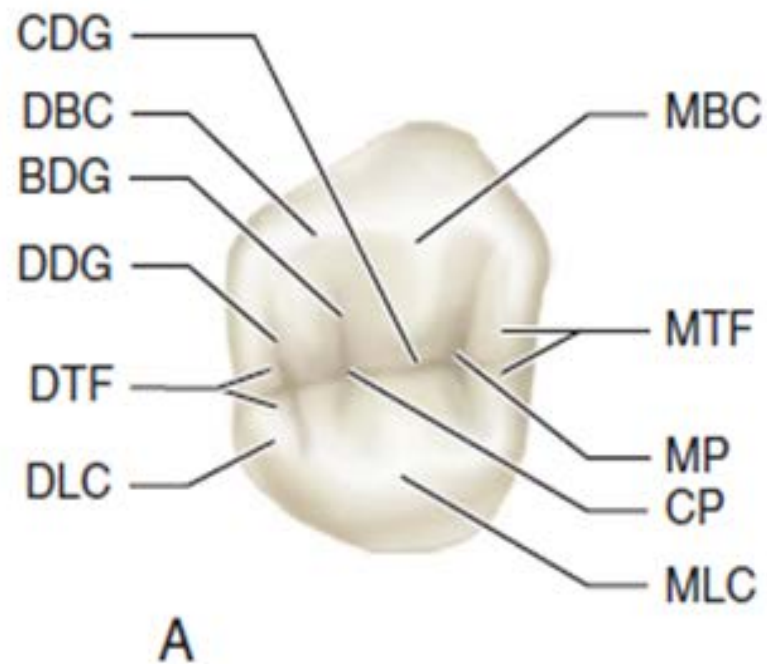
	Hard Tissue Formation Begins	Amount Of Enamel Formed At Birth	Enamel Completed	Eruption	Root Completed
<b>Permanent Dentition</b>					
<b>Maxillary</b>					
Central incisor	3-4 mo		4-5 yr	7-8 yr	10 yr
Lateral incisor	10-12 mo		4-5 yr	8-9 yr	11 yr
Cuspid	4-5 mo		6-7 yr	11-12 yr	13-15 yr
First bicuspid	1½-1¾ yr		5-6 yr	10-11 yr	12-13 yr
Second bicuspid	2-2¼ yr		6-7 yr	10-12 yr	12-14 yr
First molar	At birth	Sometimes a trace	2½-3 yr	6-7 yr	9-10 yr
Second molar	2½-3 yr		7-8 yr	12-13 yr	14-16 yr
Third molar	7-9 yr		12-16 yr	17-21 yr	18-25 yr
<b>Mandibular</b>					
Central incisor	3-4 mo		4-5 yr	6-7 yr	9 yr
Lateral incisor	3-4 mo		4-5 yr	7-8 yr	10 yr
Cuspid	4-5 mo		6-7 yr	9-10 yr	12-14 yr
First bicuspid	1¾-2 yr		5-6 yr	10-12 yr	12-13 yr
Second bicuspid	2¼-2½ yr		6-7 yr	11-12 yr	13-14 yr
First molar	At birth	Sometimes a trace	2½-3 yr	6-7 yr	9-10 yr
Second molar	2½-3 yr		7-8 yr	11-13 yr	14-15 yr
Third molar	8-10 yr		12-16 yr	17-21 yr	18-25 yr

# MORPHOLOGY OF INDIVIDUAL PRIMARY TEETH







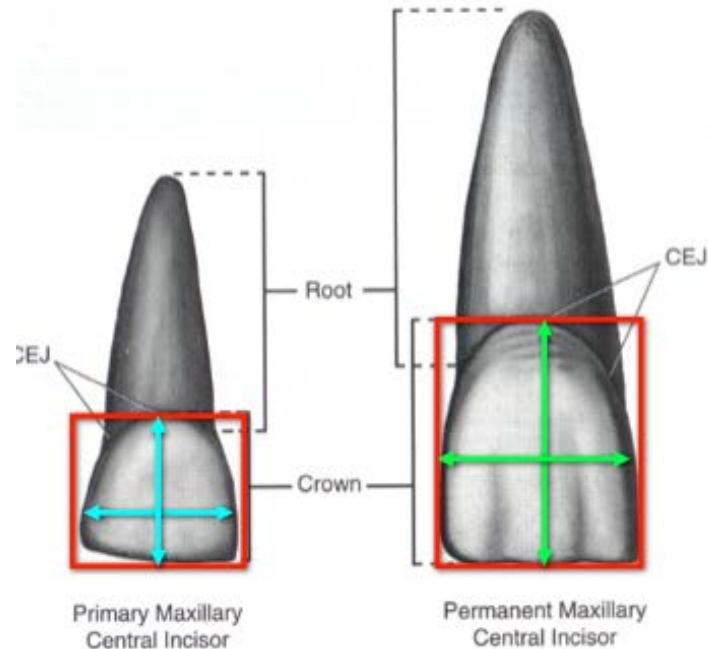


# DIFFERENCES BETWEEN PRIMARY AND PERMANENT TEETH



- The overall size of primary teeth is smaller than permanent teeth.
- Primary teeth are whiter in color.

- The crowns of the primary teeth are wider mesiodistally in comparison with crown length than are those of the permanent teeth
- The roots of primary anterior teeth are narrow and long compared with crown width and length.
- Primary anterior teeth have smooth labial surface and straight incisal edge with no developmental grooves or mamelons.



- Both anterior and posterior primary teeth show prominent cervical bulge (ridge) on the enamel at the cervical third which is more accentuated buccally on first molars.



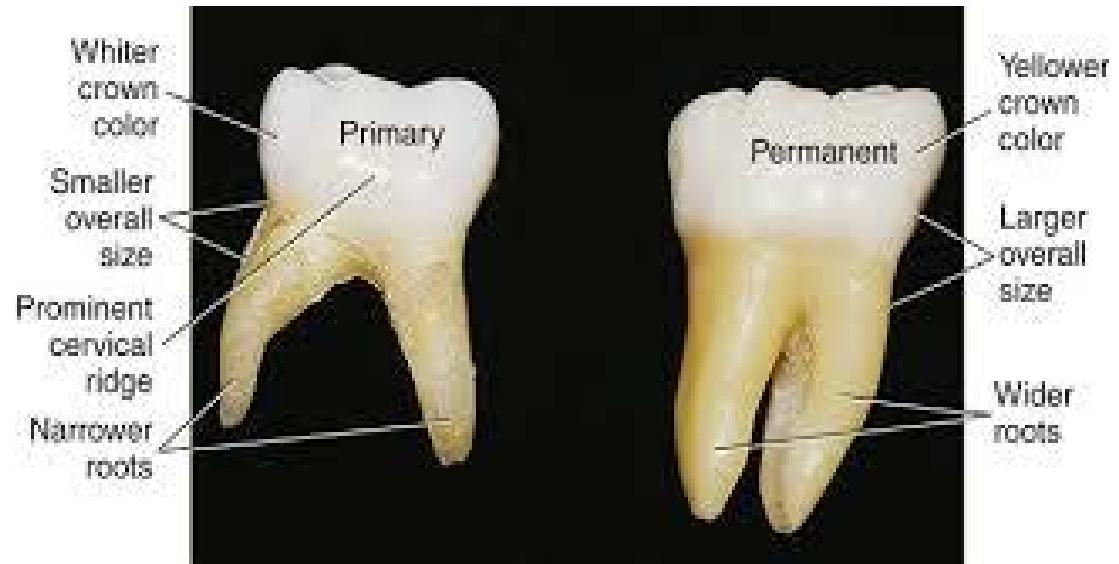
- Both anterior and posterior primary teeth show cervical constriction at the cementsoenamel junction
- The buccal and lingual surfaces of the primary molars are flatter above the cervical curvatures and converge more than those of the permanent molars, which makes the occlusal surface narrower compared with that of the permanent teeth.



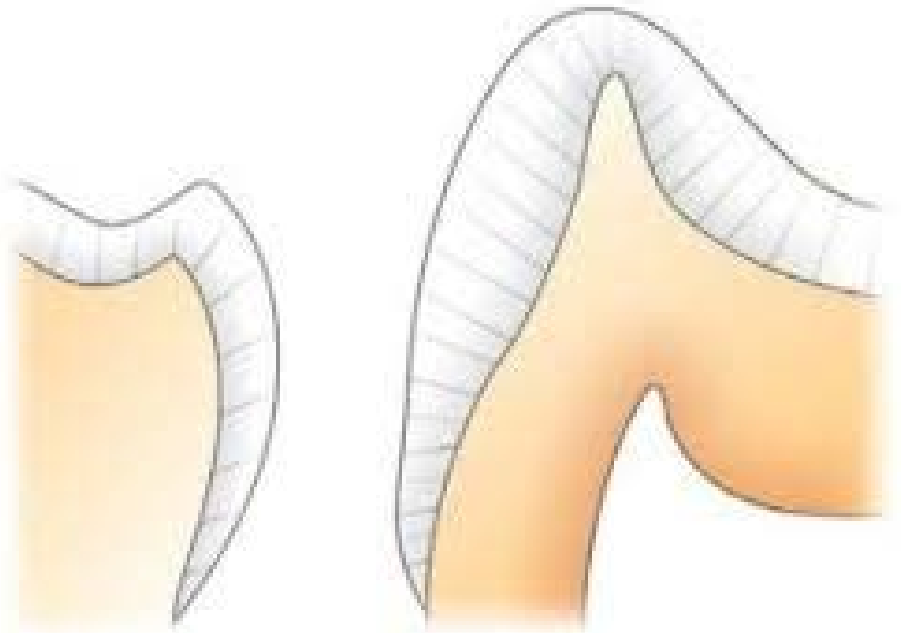
- The contact areas are broader buccolingually than permanent teeth (contact points) especially in molars.



- There is also a greater extension of the primary roots mesiodistally.  
“flaring”
- The trunk is shorter in primary molars and the furcation is higher and much closer to the cemento-enamel junction than in permanent molars.



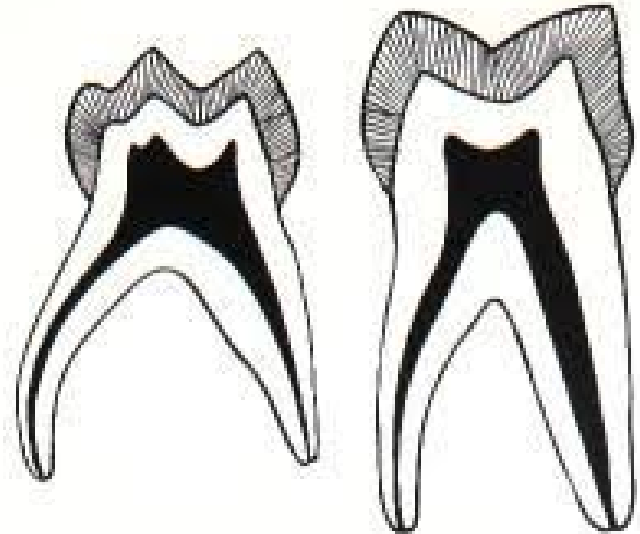
- The enamel is thinner and consistent. Enamel rods at the cervical third slopes occlusally or horizontally to the outer surface instead of apically in permanent teeth.



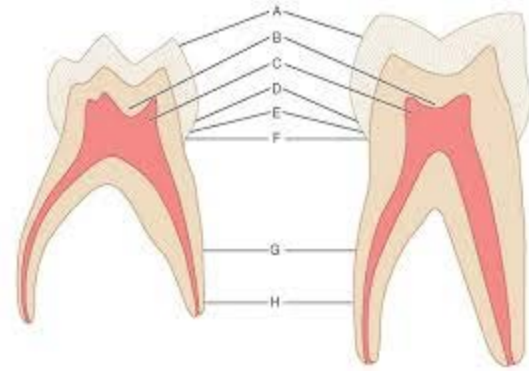
Deciduous tooth

Permanent tooth

- Thickness of dentin is much lesser in primary teeth



- Pulp cavity occupies a greater bulk of the tooth and the pulp horns are highly extended.
- Radicular pulp space exhibits unpredictable various configurations that may range from simple round canal to oval and ribbon-shaped anatomy with multiple isthmus, fins, anastomoses and lateral branches.
- Lateral and accessory canals are more common along the root particularly on the furcation area of molars (porous pulpal floor).



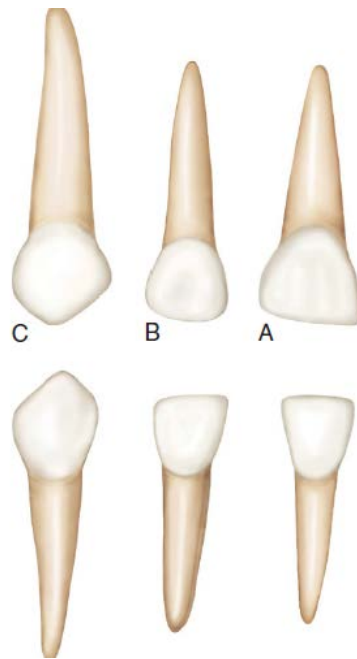


- Secondary dentin deposition and ongoing physiologic resorption can alter the shape and number of the root canals.
- Apical foramen is relatively oval in shape and wider and not usually coincident with the anatomic apex especially after root resorption begins



- The primary tooth pulp shows higher cellularity and vascularity on the histological level.
- Primary teeth, with their abundant blood supply, demonstrate a more typical inflammatory response than that seen in mature permanent teeth.
- Primary and permanent teeth also differ in their cellular responses to irritation, trauma, and medication
- The density of the innervation of the primary tooth is not as great as that of the permanent tooth.

## **MORPHOLOGY OF INDIVIDUAL PRIMARY TEETH**



### **MAXILLARY CENTRAL INCISOR**

*The mesiodistal width of the crown of the maxillary central incisor is greater than the cervicoincisal length. Developmental lines are usually not evident in the crown; thus the labial surface is smooth. The incisal edge is nearly straight even before abrasion becomes evident. There are well-developed marginal ridges on the lingual surface and a distinctly developed cingulum. The root of the incisor is cone shaped with tapered sides.*

### **MAXILLARY LATERAL INCISOR**

*The outline of the maxillary lateral incisor is similar to that of the central incisor, but the crown is smaller in all dimensions. The length of the crown from the cervical to the incisal edge is greater than the mesiodistal width. The root outline is similar to that of the central incisor but is longer in proportion to the crown.*

### **MAXILLARY CANINE**

*The crown of the maxillary canine is more constricted at the cervical region than are the incisors, and the incisal and distal surfaces are more convex. There is a well-developed sharp cusp rather than a relatively straight incisal edge. The canine has a long, slender, tapering root that is more than twice the length of the crown. The root is usually inclined distally, apical to the middle third.*

## **MANDIBULAR CENTRAL INCISOR**

*The mandibular central incisor is smaller than the maxillary central, but its labiolingual measurement is usually only 1 mm less. The labial aspect presents a flat surface without developmental grooves. The lingual surface presents marginal ridges and a cingulum. The middle third and the incisal third on the lingual surface may have a flattened surface level with the marginal ridges, or there may be a slight concavity. The incisal edge is straight and bisects the crown labiolingually. The root is approximately twice the length of the crown.*

## **MANDIBULAR LATERAL INCISOR**

*The outline of the mandibular lateral incisor is similar to that of the central incisor but is somewhat larger in all dimensions except labiolingually. The lingual surface may have greater concavity between the marginal ridges. The incisal edge slopes toward the distal aspect of the tooth.*

## **MANDIBULAR CANINE**

*The form of the mandibular canine is similar to that of the maxillary canine, with a few exceptions. The crown is slightly shorter, and the root may be as much as 2 mm shorter than that of the maxillary canine. The mandibular canine is not as large labiolingually as its maxillary opponent.*

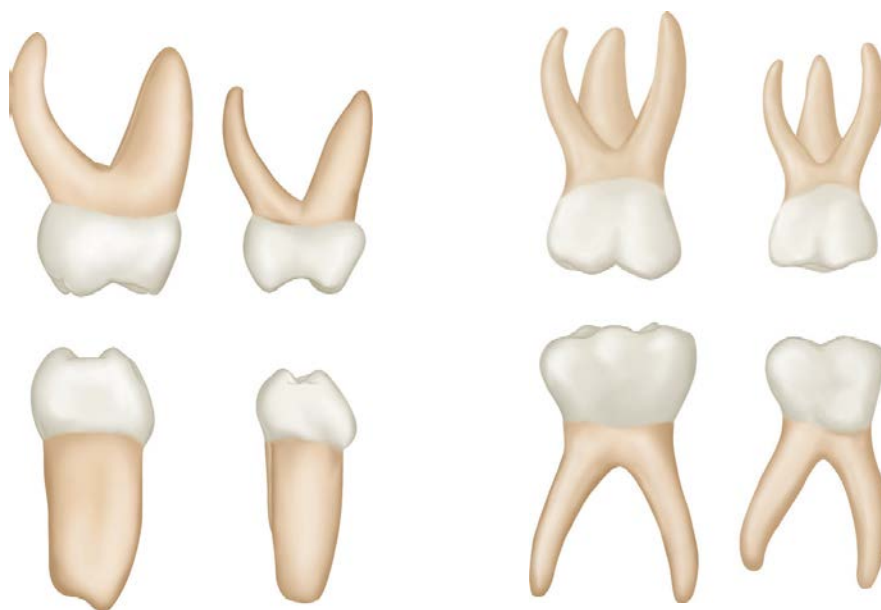
## **MAXILLARY FIRST MOLAR**

*The greatest dimension of the crown of the maxillary first molar is at the mesiodistal contact areas, and from these areas the crown converges toward the cervical region. The mesiolingual cusp is the largest and sharpest. The distolingual cusp is poorly defined, small, and rounded. The buccal surface is smooth, with little evidence of developmental grooves. The three roots are long, slender, and widely spread.*

## **MAXILLARY SECOND MOLAR**

*There is considerable resemblance between the maxillary primary second molar and the maxillary first permanent molar. There are two well-defined buccal cusps, with a developmental groove between them. The crown of the second molar is considerably larger than that of the first molar. The bifurcation between the buccal roots is close to the cervical region. The roots are longer and heavier than those of the first primary molar, and the lingual root is large and thick compared with the other roots. The lingual surface has three cusps: a mesiolingual cusp that is large and well developed, a distolingual cusp, and a third and smaller supplemental cusp (cusp of Carabelli). A well-defined groove separates the mesiolingual cusp from the distolingual cusp. On the*

*occlusal surface a prominent oblique ridge connects the mesiolingual cusp with the distobuccal cusp*

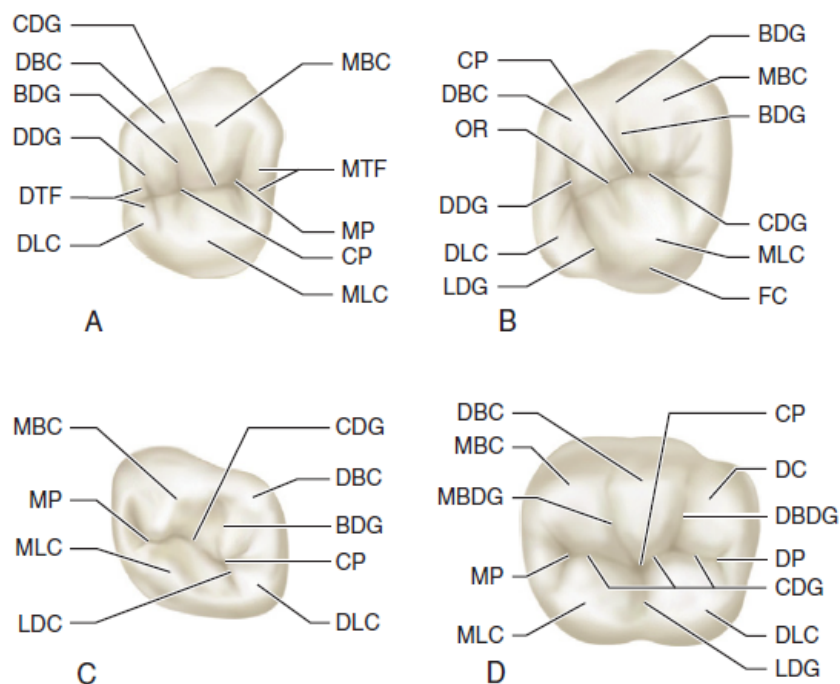


### **MANDIBULAR FIRST MOLAR**

*Unlike the other primary teeth, the first primary molar does not resemble any of the permanent teeth. The mesial outline of the tooth, when viewed from the buccal aspect, is almost straight from the contact area to the cervical region. The distal area of the tooth is shorter than the mesial area. The two distinct buccal cusps have no evidence of a distinct developmental groove between them; the mesial cusp is the larger of the two. There is a pronounced lingual convergence of the crown on the mesial aspect, with a rhomboid outline present on the distal aspect. The mesiolingual cusp is long and sharp at the tip; a developmental groove separates this cusp from the distolingual cusp, which is rounded and well developed. The mesial marginal ridge is well developed, to the extent that it appears as another small cusp lingually. When the tooth is viewed from the mesial aspect, there is an extreme curvature buccally at the cervical third. The crown length is greater in the mesiobuccal area than in the mesiolingual area; thus the cervical line slants upward from the buccal to the lingual surface. The longer slender roots spread considerably at the apical third, extending beyond the outline of the crown. The mesial root, when viewed from the mesial aspect, does not resemble any other primary root. The buccal and lingual outlines of the root drop straight down from the crown, being essentially parallel for more than half their length. The end of the root is flat and almost square.*

## MANDIBULAR SECOND MOLAR

The mandibular second molar resembles the mandibular first permanent molar, except that the primary tooth is smaller in all its dimensions. The buccal surface is divided into three cusps that are separated by a mesiobuccal and distobuccal developmental groove. The cusps are almost equal in size. Two cusps of almost equal size are evident on the lingual surface and are divided by a short lingual groove. The primary second molar, when viewed from the occlusal surface, appears rectangular with a slight distal convergence of the crown. The mesial marginal ridge is developed to a greater extent than the distal marginal ridge. One difference between the crown of the primary molar and that of the first permanent molar is in the distobuccal cusp; the distal cusp of the permanent molar is smaller than the other two buccal cusps. The roots of the primary second molar are long and slender; with a characteristic flare mesiodistally in the middle and apical thirds.



**Figure 4-7** Primary right molars, occlusal aspect. **A**, Maxillary first molar. **B**, Maxillary second molar. **C**, Mandibular first molar. **D**, Mandibular second molar. BDG, Buccal developmental groove; CDG, central developmental groove; CP, central pit; DBC, distobuccal cusp; DBDG, distobuccal developmental groove; DC, distal cusp; DDG, distal developmental groove; DLC, distolingual cusp; DP, distal pit; DTF, distal triangular fossa; FC, fifth cusp; LDG, lingual developmental groove; MBC, mesiobuccal cusp; MBDG, mesiobuccal developmental groove; MLC, mesiolingual cusp; MP, mesial pit; MTF, mesial triangular fossa; OR, oblique ridge. (From Nelson SJ: *Wheeler's dental anatomy, physiology, and occlusion*, ed 9, Philadelphia, 2010, WB Saunders.)

## **DIFFERENCES BETWEEN PRIMARY AND PERMANENT TEETH**

- *The overall size of primary teeth is smaller than permanent teeth.*
- *Primary teeth are whiter in color.*
- *The crowns of the primary teeth are wider mesiodistally in comparison with crown length than are those of the permanent teeth.*
- *Primary anterior teeth have smooth labial surface and straight incisal edge with no developmental grooves or mamelons.*
- *Both anterior and posterior primary teeth show prominent cervical bulge (ridge) on the enamel at the cervical third which is more accentuated buccally on first molars.*
- *Both anterior and posterior primary teeth show cervical constriction at the cementoenamel junction.*
- *The buccal and lingual surfaces of the primary molars are flatter above the cervical curvatures than those of the permanent molars, which makes the occlusal surface narrower compared with that of the permanent teeth.*
- *The contact areas are broader buccolingually than permanent teeth (contact points) especially in molars.*
- *The roots of primary anterior teeth are narrow and long compared with crown width and length.*
- *There is also a greater extension of the primary molars roots mesiodistally. This “flaring” allows more room between the roots for the development of the premolar tooth crowns.*
- *The trunk is shorter in primary molars and the furcation is higher and much closer to the cementoenamel junction than in permanent molars.*
- *The enamel is thinner in primary teeth and shows uniform and even thickness all over the crown.*
- *The enamel rods at the cervical third slopes occlusally or horizontally to the outer surface instead of apically as in permanent teeth.*
- *Thickness of dentin is much lesser in primary teeth; moreover the dentinal tubules are wider thus increasing dentin permeability. This ultimately leads to rapid progression of caries and early pulpal involvement.*
- *Pulp cavity occupies a greater bulk of the tooth and the pulp horns are highly extended. This makes pulpal exposure, either carious or traumatic, more likely to occur.*
- *Radicular pulp space exhibits unpredictable various configurations that may range from simple round canal to oval and ribbon-shaped anatomy with multiple isthms, fins, anastomoses and lateral branches.*
- *Lateral and accessory canals are more common along the root particularly on the furcation area of molars (porous pulpal floor).*

- *Secondary dentin deposition and ongoing physiologic resorption can alter the shape and number of the root canals.*
- *Apical foramen is relatively oval in shape and wider and not usually coincident with the anatomic apex especially after root resorption begins*
- *Root resorption leaves some areas on the root surface denuded of cementum with open dentinal tubules increasing the permeability of root surface and the communication between the radicular space and the periradicular tissues.*
- *The primary tooth pulp shows higher cellularity and vascularity on the histological level.*
- *Primary teeth, with their abundant blood supply, demonstrate a more typical inflammatory response than that seen in mature permanent teeth. The exaggerated inflammatory response in primary teeth may account for increased internal and external root resorption from calcium hydroxide pulpotomies.*
- *The density of the innervation of the primary tooth is not as great as that of the permanent tooth and may be the reason why primary teeth are less sensitive to operative procedures*
- *Primary and permanent teeth also differ in their cellular responses to irritation, trauma, and medication*
- *localization of infection and inflammation is poorer in the primary pulp than in the pulp of permanent teeth*



# Management of root fracture

1-uncommon in primary teeth?

2-the pulp in permanent teeth has a great chance of recovery?

3-the prognosis is poor in  
?immature teeth

?4-repair better in apical half

# Clinical Features

- 1-usually affect maxillary central incisor region
- 2-coronal fragments are displaced lingually or slightly extruded
- 3-temporary loss of sensitivity



# Classification

- ▶ Horizontal / transverse root fracture
- ▶ Vertical root fracture

# Management of horizontal root fracture

- ▶ Management of root fractures can be divided into treatment of
  1. apical-third
  2. middle-third and
  3. cervical-third fractures

## Apical third fracture

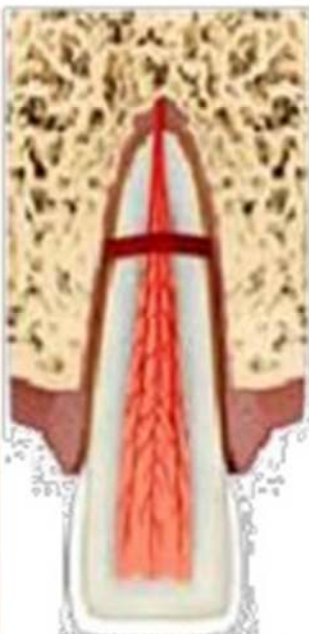
- ▶ In the case of apical-third fractures of the root, there is usually **no mobility** and the tooth may be **asymptomatic**.
- ▶ it has been observed that the apical segment of a transversely fractured tooth **remains vital** in most of the cases.
- ▶ Thus no treatment is required and a **watch and observe** policy is advocated.
- ▶ If the pulp undergoes **necrosis** in the apical fragment, **surgical removal** of the apical fragment is indicated.

- ▶ When a root fractures horizontally, the coronal segment is displaced to a varying degree, but, generally, the apical segment is not displaced. Because the **apical pulpal circulation is not disrupted**, pulp necrosis in the apical segment is extremely rare.
- ▶ Pulp necrosis develops in the coronal segment owing to its displacement but occurs in only **about 25% of cases**.

## Middle third fracture

- ▶ middle third root fractures has been **repositioning of the coronal fragment and immobilization through fixation** to the neighbouring teeth by means of a semi-rigid or rigid splint (e.g. orthodontic wire/composite resin splint, acid-etch/ resin splint)
- ▶ Maintaining the splint for **2-3 months**.
- ▶ **Titanium trauma splints** have also been advocated which are **0.2 mm thick rhomboid mesh** that can be easily adapted and stabilized on the teeth.





Done By: Wiam Alshoud .. Ola Qatu

## The treatment options may be categorized as follows:

### 1) *Repositioning the fractured segment and splinting*

- ▶ Horizontal root fracture with a **diastasis of 0.1 mm.** with clinical aspects showing pulp with
- ▶ **cold-induced sensibility, absence of dental mobility or periapical changes and non-discolored crown**
- ▶ a **rigid splinting** was performed with an **orthodontic wire bonded** to the labial surfaces of the maxillary anterior teeth using composite resin.
- ▶ After **45 days** of observation, the clinical findings remained unaltered and the rigid fixation was removed.

- ▶ The Clinical-radiographic control to **assess loss of vitality** must continue for **1 month to 1 year**
- ▶ because in this period, there is greater possibility for the occurrence of pulp necrosis

## 2) *Disinfection and obturation of the coronal segment only*

- ▶ If pulp necrosis develops, the apical fragment remains vital in approximately 99% of cases, while the **pulp tissue on the cervical fragment can develop necrosis** with consequent formation of granulation tissue between the fragments,
- ▶ **endodontic treatment** is performed only in the coronal segment. An **apexification** procedure of this segment should be performed before obturation of the root canal.
- ▶ This technique involves the **repeated placement of calcium hydroxide** over a period of **6-24 months** until a calcific barrier is formed at the fracture line. Disinfection of coronal segment with calcium hydroxide followed by **obturation with gutta-percha**

- ▶ 3) The third category of cases may be - of complete pulp necrosis, when **endodontic treatment should be performed in both** the apical and the coronal fragments.
- ▶ 4) In addition to both the coronal and **apical fragments being non-vital and misaligned too**, fourth treatment option should be considered that is ***the-surgical removal of the apical portion***

## 5) intraradicular splinting

- ▶ The technique involves **connecting the tooth fragments** through the root canal using a metal pin together with a root canal sealer
- ▶ it corrects the mobility of the coronal segment and the periodontal tissue around the fracture site may heal
- ▶ Steel pins, titanium endodontic implants, prefabricated titanium dowels, posts, and ceramic, silver, or alloy cast dowels and posts have been used for intraradicular splinting

- ▶ local infiltrative anesthetics,
- ▶ the coronal fragment is repositioned.
- ▶ both the coronal and the apical root fragments were endodontically treated and obturated at single visit
- ▶ Just before completion of the root canal filling, a **size 40 Hedstrom file** is inserted into the root canal with clockwise winding motion to further reduce the fracture (achieve anchorage from the apical fragment for the coronal fragment).
- ▶ The file was **separated intentionally**, approximately at the cervical level.
- ▶ Four-year follow-up examination revealed satisfactory clinical and radiographic findings with hard tissue repair of the fracture line.

6) *Removal of the apical segment and stabilization of the coronal segment with endodontic implants.*

- ▶ The coronal segment is stabilized with the use of **chrome cobalt pin as the implant material.**
- ▶ This alloy is composed of 65% cobalt, 30% chromium, and 5% molybdenum.
- ▶ An endodontic stabilizer was used in conjunction with surgical intervention and bone grafting
- ▶ Indication
- ▶ both the fragments were displaced wide apart



## CERVICAL THIRD ROOT FRACTURES

- ▶ Cervical root fracture has poor prognosis; because of
  1. Exposure of pulp to oral environment
  2. Constant movement of tooth therefore difficult to immobilize

Treatment options are decided upon by

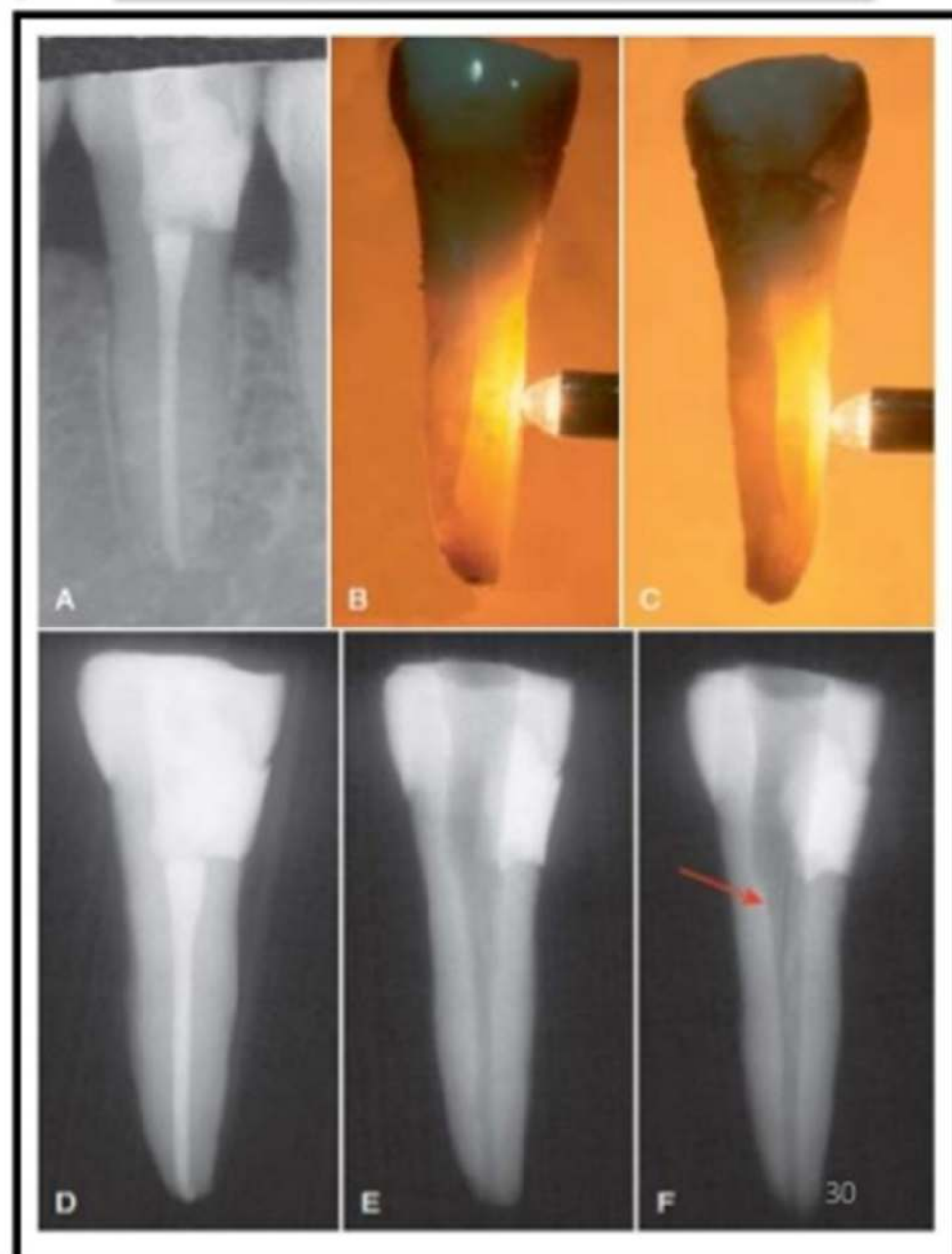
1. the position of the fracture line,
  2. length of the remaining root segment and
  3. the presence or absence of a coronal segment.
- ▶ Chances of healing with calcified tissue is poorest in cervical-third fractures

# VERTICAL ROOT FRACTURE & IT'S MANAGMENT



# Diagnosis

Radiograph of Empty Canal



# REACTION OF THE TOOTH TO TRAUMA

## 1. PULPAL HYPEREMIA



Radiograph demonstrates almost complete obliteration of the pulp chambers and canals.

2. Internal hemorrhage.
3. Calcific metamorphosis of dental pulp ( progressive canal calcification or dystrophic calcification )
4. Internal resorption
5. Peripheral (external) root resorption
6. Pulpal necrosis
7. Ankylosis



### Idiopathic Resorption

- **General Description**
- ✓ pink spot
- ✓ resorptive + inflammatory condition
- ✓ similar to resorbed tissue within the pulp



Fig. 1. Pink spot on the side of the central incisor of the lower lip. A similar central incisor with lateral resorption and pink spot on the side of the lower lip.





# Reaction of permanent tooth buds to injury

- ① 1-hypocalcification and hypoplasia
- ② 2-reparative dentin production
- ③ 3-dilaceration

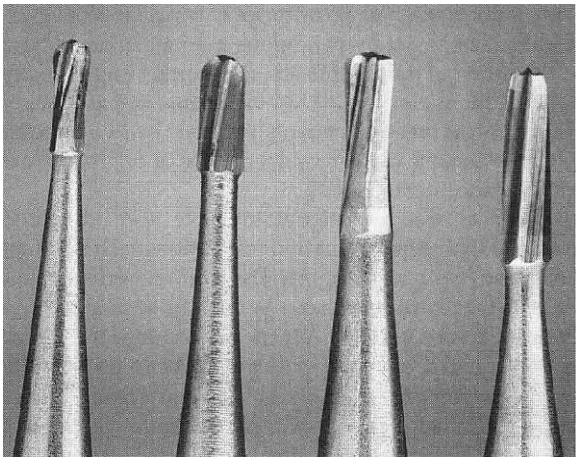




**Thank you for  
your patience**

## **CAVITY PREPARATION IN PRIMARY TEETH**

The steps in the preparation of a cavity in a primary tooth are not difficult but do require precise operator control. Many authorities advocate the use of small, rounded-end carbide burs in the high-speed handpiece to establish the cavity outline and perform the gross preparation.



Rounded-end, high-speed carbide burs No. 329, No. 330, No. 245, and No. 256, which may be used for cutting cavity preparations.

- ✓ a single bur may be used in completion of cavity preparation Therefore the dentist should select the bur that is best designed to accomplish all the high-speed cutting required for the procedure being planned.
- ✓ Alternatively, cavity preparations may be made with aluminum oxide air abrasion systems or with laser systems approved for hard-tissue procedures.

## **INCIPIENT CLASS I CAVITY IN A VERY YOUNG CHILD**

- children younger than 2 years of age, sometimes have a small but definite carious lesion in the central fossa of one or two first primary molars, with all other teeth being sound.
- Thus restorative needs are present but minimal.
- Because of the child's psychologic immaturity and because it is usually impossible to establish effective communication with the child, the parent should hold the child on his or her lap in the dental chair. This will help the child feel more secure and provide a better opportunity to restrain the child's movement during the operative procedure.
- The small cavity preparation may be made without the aid of a rubber dam or local anesthetic.
- A No. 329 or No. 330 bur is used to open the decayed area and extend the cavosurface margin only to the extent of the carious 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 will arrest the decay and at least temporarily prevent further tooth destruction without a lengthy or involved dental appointment for the child.
- If the child is cooperative, a preventive resin restoration, preceded by application of a dentinbonding agent, may be used.

## PIT OR FISSURE CLASS I CAVITY

### PREVENTIVE RESIN RESTORATION ( SEALED COMPOSITE RESIN RESTORATION)

- ✓ Caries is identified by careful visual examination of a dry occlusal tooth surface using a sharp explorer, a mirror, and a light.
- ✓ Articulating paper would indicate the points of occlusal contact.
- ✓ The tooth is anesthetized if deemed necessary, isolated, and reexamined to determine the extent of the caries process. A No. 329 bur, aluminum oxide air abrasion, or a laser system approved for hard tissue can be used to gain access to the depth of the lesion and to complete caries removal. The preparation, which should not extend to the occlusal contact marks, is washed, dried, and examined.
- ✓ The cavity and the enamel beside the susceptible grooves are etched. A gel or liquid form of 37% phosphoric acid is commonly used for 20 seconds.
- ✓ The tooth is thoroughly washed for approximately 30 to 40 seconds and completely dried.
- ✓ A thin layer of bonding agent is applied to the cavity. The cavities are filled with a light-curing composite or resin-modified glass ionomer, which may be cured at this time.
- ✓ A light-curing sealant is placed over the remaining susceptible areas and brushed into the pits and grooves. The materials are polymerized with visible light in accord with the manufacturer's instructions.
- ✓ The rubber dam is removed, and the occlusal contacts are checked.



## DEEP-SEATED CLASS I CAVITY

### *In amalgam restoration*

1. Outline form should include all fissures, areas of caries, pits and developmental grooves and should be dovetailed.
2. The extension of the occlusal portion of the cavity preparation depends on the primary molar involved:
  - a. The occlusal portion usually is extended about one half the way across on the primary maxillary and mandibular first molars.
  - b. For the primary mandibular second molar, extend the step completely across the occlusal surface.
  - c. The primary maxillary second molar preparation includes only the nearest occlusal pit. The oblique ridge is not included unless undermined with carious lesions .



3. The carious dentin should next be removed with large, round burs or spoon excavators.
4. The walls converge slightly with the greatest width at the pulpal floor.
5. Cavo-surface margins should be sharp
6. Angles of walls and floors should be slightly rounded
7. Isthmus width should be one-third the width of the occlusal table
8. Depth of the cavity—0.2-0.8 mm into the dentin.
9. 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 composite resin 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 will also provide 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 Lesions.*

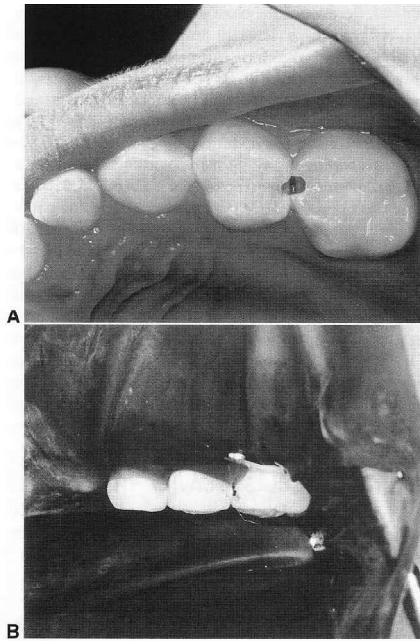
- Very small incipient proximal lesions may be chemically restored with topical fluoride therapy provided by the dentist, along with the judicious use of fluoride products

designed for topical application at home. If this treatment regimen is accompanied by improved diet and improved oral hygiene, some incipient proximal lesions may remineralize or remain in an arrested state indefinitely.

However, the parents should be informed of the incipient lesions and to bring the child back for periodic examinations.

- If the parents and the patient do not follow the instructions properly, subsequent bite-wing radiographs will reveal growth of the lesion, and restorative procedures should be initiated before the defects become extensive carious lesions.

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 carious lesions via small openings in the marginal ridges or in the facial surfaces of the teeth is becoming a popular technique.



### ***Lesions with Greater Dentin Involvement.***

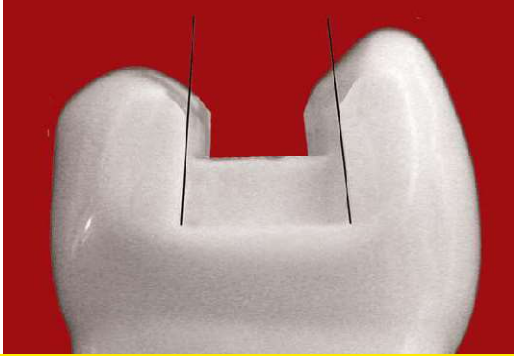
The first step in the traditional preparation of a class II cavity in a primary tooth for an amalgam or an esthetic restoration involves opening the marginal ridge area.

- ✓ Extreme care must be taken when breaking through the marginal ridge to prevent damage to the adjacent proximal surface.

### **Amalgam.**

1. The gingival seat and proximal walls should break contact with the adjacent tooth.
2. The angle formed by the axial wall and the buccal and lingual walls of the proximal box should approach a right angle.

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



4. The occlusal extension of the preparation should include any caries-susceptible pits and fissures.
5. 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.
6. If carious material remains after the preparation outline is established, it should next be removed.
7. The appropriate liner or intermediate base, if indicated, and a snugfitting matrix should be placed before the insertion of the amalgam.
8. The gingival floor should be beneath the point of contact, at or just beneath the gingival tissue. No bevel is placed
9. All internal line angles should be gently rounded
10. Buccal and lingual retentive grooves are contraindicated
11. The axial wall should follow the contour of the tooth
12. The isthmus is approximately one-half to one-third the width of the occlusal surface.

### **Esthetic Materials.**

- Because of the improvements in the properties of composite resins, many dentists use them routinely for posterior restorations.
- More recently the use of glass ionomer restoratives (or other materials on the glass ionomer—composite resin continuum) has also been advocated.
- The preparation and restoration may be similar to that described earlier 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.
- Then the proximal restoration may be combined with application of an occlusal sealant (with or without enameloplasty).
- Whenever composite restorative materials are employed, enamel beveling, etching, and application of bonding agents are recommended.

## **Art& Science of Behavior Management**

The means by which the dental health team effectively and efficiently performs treatment for a child. The aim is to instill a positive dental attitude. In another words behavior management mean methods used to make the child accept treatment in the dental chair beside educate the child and be sure that he will come a gain for the next appointment

The foundation of practicing dentistry for children is the ability to guide them through their dental experiences. Longer lasting beneficial effects also can result when the seeds for future dental health are planted early in life .

A professional goal is to promote positive dental attitudes and improve the dental health of society.

The purposes of studying child behavior management

1-To introduce basic information of children behavior .

2- To describe many of the methods used for child behavior management .

A major difference between the treatment of children and the treatment of adults is the relationship. Treating adults generally involves a one-to-one relationship, that is, a dentist-patient relationship. Treating a child, however, Usually relies on a one-to-two relationship among dentist, pediatric patient, and parents or guardians, is known as the pediatric dentist treatment triangle. Note that the child is at the apex of the triangle and is the focus of attention of both the family and the dental team .

### **Child development:**

It involves the study of all areas of human development from conception through young adulthood. All changes occur in size, shape function, structure or skills mean development .

There are several relatively important aspects of child development and no single aspect could be used to assess development because it a multidimensional process. So in order to make accurate information about



child's behavior a basic knowledge about child development can help the dentist .

#### Major areas of development:

- 1- **Physical development** :-Any changes that occur with age in children's size, strength, motor coordination and athletic skill beside the growth and changing function of all body systems such as the circulatory, nervous and digestive systems .
- 2- **Social development** :-That mean as a child grow in his ability to care for himself he gain social independence .

For example the small child more dependable on his parents specially the mother but as he grows up he became socially independence.

**3-Intellectual development or Mental development** :-It is consider the key of essential communication with the child so need comprehensive study .

**4- Personality development** :-Individual personality development involves a summation of all physical, social and mental development and can be define as a sum total of all the expectation the person holds for himself.

#### Assessment of child development :

There is no specific measure can be used accurately to know child's developmental status. But certain questionnaire completed in the clinic which screening the major area of child development can give the dentist information about :

- 1- Behavioral adjustment .
- 2- Child mental age level .
- 3- Social majority level .
- 4- Physical status .
- 5- History of medical problem .

#### The pattern of behavior at certain age with expected development :

At 2 years at this age the child called in the preoperative stage and they vary greatly in their ability to communicate (terrible twos)

At 3 years. The child can communicate more easily than 2 years old. But they need their parents to remain with them in clinic to feel more security .

At 4 years old. The child usually listens and has a response with interest to dentist explanation and verbal direction .

At 5 years old. The child will have no fear of new experience if he properly prepare by the parents .

At 6 years of age. The child need proper introduction about dental treatment so he will respond in a satisfactory manner because the tensional manifestation rise to peak at this age .

### **The influence of the family on the child behavior**

Family attitude and dental experience consider being the most important factors in determining a person reaction to dentistry because home environmental attitude .

Children are either accepting dental treatment gracefully or refuse it completely. This depend on how they have been prepared at home because emotions are contagious and child brought up in a home where the fear of dentistry is exaggerated show more concern and fear than child live in a family where dentistry discussed favorably . Therefore for dentistry should never be employed by the parents as a threat or punishment, also explanation to the child need to be frankly .Also parents should not be deceptive. If pain is involved, the child should be told to expect it. Beside that child first visit to dentist should be at an early age for a routine checkup so he might get to know his dentist before an emergency develops .Also a certain instruction should give to the parents

- 1-Tell the parent not to voice their own personal fears in front of their child

- 2- Tell the parent never to use the dentistry as a threat of punishment .

- 3- Tell the parent to take their child to the dentist at early age to familiarize the child with dentistry .

- 4-Discuss with the parents about home environment and the important of moderate parental attitude in building a good dental patient .

- 5-Stress to the parents the value of regular dental care .

6- Tell the parent not to bribing their children to go to the dentist .

7- The parent should not promise the child what the dentist is or is not going to do.

**Child behavior in dental clinic can be affected by types of parents which are very important :**

**1- Over protective parents**

For example, parents who insist to remain with the child regardless of the situation or the age of the child that mean those parents often prevent the natural development of the child toward independence .

**2- Manipulative parents**

This behavior can be known by excessively demanding attitude like change in appointment time then extends to directing the course of diagnosis or treatment .

**3- Hostile parents**

This behavior include parents who question the necessity for treatment and this resulted from

**\*\*Poor personal experience in the dental office .**

**\*\*General negativism toward health professionals .**

**\*\*Feeling of insecurity in a foreign environment .**

**4-Neglectful parents**

These behaviors characterized by the failure to maintain appointments, missing recall visits or not cooperate with respect with dental team .

**Classifying children s cooperative behavior**

Numerous systems have been developed for classifying the behavior of children in the dental environment .

**Benefit of different types of classification**

-1It can assist in directing the management method .

-2 It can provide a means for systematically recording behaviors .

3 -It can assist in evaluating the validity of current research .

### **A) the clinical classification (Wright)**

This classification put the children behavior in three categories

#### 1- Cooperative child

Cooperative children are relaxed with little apprehension, and can be treated by straight forward behavior shaping approach mostly dental office experience affect child behavior in dental clinic .

2-Lacking in cooperative ability .This category includes 2 types of children

\*\*Very young children who are uncooperative because of their age .

\*\*Children with specific handicapping conditions, these need special behavior management technique but changing in their behavior cannot be expected .

#### 3- Potentially cooperative

This group also called behavior problem because clinically that child s behavior can be modified and become cooperative .

This behavior include the following :

- 1- Uncontrolled behavior .This behavior seen in young age between 3-6years. The reaction can start in the reception room or even before entering the clinic also patient characterized by tears, loud crying and flying of the hands and legs .
- 2- Defiant behavior .This behavior can be seen in different age group but it more in school age group. It can consider controlled but it known by shouting of the child I do not want or I want. Child behave in this way similarly at home and can called spoiled child , dentist can control child behavior by straight forward firm approach which change child behavior completely .

## **B) Frankl behavioral rating scale :**

This scale divides the observed behavior into four categories, ranging from definitely negative to definitely positive. As follow .

\*Rating 1: Definitely negative refusal of treatment, crying forcefully, very fearful .

\*Rating 2: Negative reluctant to accept treatment, uncooperative with some evidence of negative attitude .

\*Rating 3: positive + acceptance of treatment with cautions .

\*Rating4: definitely positive++ good rapport with the dentist, interested in the dental procedure.

## **Variables affecting child behavior in the dental clinic**

### **A. Major variables**

1- past medical history .The pain experience during past medical visit with its emotional quality is the most important in determining the behavior of children in the dental clinic. There is general agreement; those children who view medical experiences positively are more likely to be cooperative with dentist. The emotional quality of past visits rather than the number of visits is significant . previous surgical experiences adversely influence behavior at the first dental visit, but this was not the case in subsequent visits .

2-Maternal anxiety (Parental anxiety) .Most investigations indicate a significant correlation between maternal anxiety and a child s cooperative behavior at the first dental visit. High anxiety on the part of parents tends to affect their children s behavior negatively. Although the scientific data reveal that children of all ages can be affected by their mothers anxieties, the effect is greatest with those under 4 years of age

3- Awareness of dental problem .The tendency toward negative behavior at the first dental visit increases significantly when the child believes that he has dental problem. This occurs due to anxiety transmitted from mother to the child because mother recognized the problem first .

## **B. Minor variables**

1- **Socioeconomic status** .Children from high social class consider to behave in a higher degree of cooperation in comparison with children from middle and lower class .

2-**Rank of the child** .The older child may become more anxious than children born later while middle child is usually more outgoing and suggestible because he use his older sibling and parent as a behavior pattern to follow .

3- **Child s gender** .The clear effect of the child s gender on behavior can be seen in the dental environment for example **boys are expected to be braver stronger than girls** (Boys act as man and do not cry .

4- **Child s age** .There are differences in type of fear in different ages, like in 2 -4 years fear of imaginary creatures and small animals then 4 -6 years .start of social . and school fear. Then from 6years to adolescent fear related to injury, death and so on .

5- **Attending to nursery school**

Child attend nursery school cooperate more with dental procedure

6- **Modeling: or imitation** .Modeling can be the most effective means to introduce children into dentistry also modeling effective for patient s who have no previous dental experience.

## **Techniques of Behavior managements**

There are 2 types of behavior management s techniques

1-**Non pharmaco therapeutic approaches**, mean without using drugs

2- **Pharmaco therapeutic approaches** .This by using drug in management of child but should be conscious when ,taking drugs and complete treatment .

## **BEHAVIOR SHAPING**

Behavior shaping is a common non pharmacologic technique. It is a form of behavior modification. It is that procedure which very slowly develops with the child patient in order to provide a treatment. It is a simple method of teaching the child step by step what is expected of him in dental clinic. This technique reinforces the desired behavior of the child gradually .

This method can be used with children who show a good cooperation to start communication with them while children with negative behavior, firstly need to change their behavior to cooperative then using this technique .

The procedure used called TSD method which means Tell show Do method The dentist explain to the child what he is going to do in a language that the child can understand in a slow and repeated word until the child aware of what will happen in dental seat .

This method indicated for young child and for first time also can use for fearful child because of bad dental experience in another clinic .

## RETRAINING.

Children who require retraining approach -the dental office displaying considerable apprehension or negative behavior. The demonstrated behavior may be the result of a previous dental visit or the effect of improper parental or peer orientation. Determining the source of the problem is obviously helpful, for then the problem can be avoided through another technique, or a distraction can be used. These ploys begin the retraining program, which eventually leads to behavior shaping .

## AVERSIVE CONDITIONING

The behavior modification method of aversive conditioning is also known as Hand-Over-Mouth,. Its purpose is to gain the attention of a highly oppositional child so that communication can be established and cooperation obtained for a safe course of treatment. It is not used routinely but as a method of last resort, usually with children 3 to 6 years of age having appropriate communicative abilities, for the very young, the immature, those with physical disabilities, or those who have mental or emotional disabilities, this behavioral approach is unacceptable.

## Restraint

The using of restraint device in combination with medication give the child patient feels of security and comfortable

For example

1-Papoose board .Used as a restraint device for immobilize the child during dental treatment it consist of head part, chest and arms part and legs part beside that we can use mouth prop (when child sleep ), Parent should be informed and give consent before the use physical restraints.

Beside papoose board device other types can be used like

2- Triangular sheet can use as a restraint .

3-White coat could be used also .

Beside that chair can positioned in supine position because it comfortable to dentist and also for the child prevent patient movement also help in swallowing saliva and no need to use sucker



4- Mouth prop : It is a mechanical aid that helps in maintaining the opening of the patient's mouth. There are several types present like :

1- Molt mouth prop which is similar to a scissor in different sizes .

2- McKesson bite block present in different sizes for children and older patients. It helps in epileptic patients; the bite block should have dental floss attached to it for easy removal if it becomes dislodged in the mouth .

3- Tongue blades: - They are easy to use, disposable, and not expensive. They are specially used for handicapped children at home by the parent to provide home dental care .

# *ATRAUMATIC RESTORATIVE TREATMENT (ART)*



## PRINCIPLES OF ART

- ❖ It is based on modern knowledge about minimal intervention, minimal invasion and minimal cavity preparation for carious lesions.
- ❖ It is a procedure based on removing carious tooth tissues using hand instruments alone and restoring the cavity with adhesive restorative material.



## INDICATIONS OF ART

- ✓ Only in small cavities
- ✓ In those cavities that are accessible to hand instruments
- ✓ Public health programs



## CONTRAINDICATIONS OF ART

- ✘ Swelling, abscess or fistula near the carious tooth.
- ✘ exposed pulp.
- ✘ painful for a long time.
- ✘ opening is inaccessible to hand instruments.
- ✘ cavity cant be entered from proximal or occlusal direction.



## ADVANTAGES OF ART

- ❖ A biological approach.
- ❖ Conservation of sound tooth tissues.
- ❖ Less trauma to teeth.
- ❖ Painless
- ❖ Infection control simplified
- ❖ Cost effective
- ❖ A friendly procedure, so great potentials for use in children & in fearful adults.
- ❖ for special groups such as the physically or mentally handicapped , people living in nursing homes & the home bound elderly.



# PROCEDURE

Arrange a  
good working  
environment



Hygiene and  
control of  
cross infection



Restore the  
cavity

## WORKING ENVIRONMENT

### A. OUTSIDE THE MOUTH



WORKING ALONE

The distance from the operator's eye to the patient's tooth is usually between 30-35cm.



ASSISTANCE

The assistant's head should be 10-15cm higher than the operator.





## WORKING ENVIRONMENT

### ○ B. INSIDE THE MOUTH



- The success of ART lies in control of saliva around the tooth being treated.
- Cotton wool rolls provide short term protection from moisture/saliva.



## HYGIENE & CONTROL OF CROSS INFECTION



AUTOCLAVE



PRESSURE COOKER

- Wash the instruments with brush in soapy water
- Put the clean instruments in an autoclave.
- Alternatively we can use a pressure cooker
- Take instruments out with forceps and dry them with a clean towel.
- Store in a covered metal box.



## RESTORING THE CAVITY



- Using **press finger technique** completes the filling: the dentist slightly overfills the cavity and applies light pressure onto it by using his gloved, Vaseline coated index finger.



## ESSENTIAL INSTRUMENTS FOR ART



- Reflects light
- Indirect vision
- Retraction of cheek & tongue

***Mouth Mirror***





➤ To identify soft carious dentin

**Explorer**





➤ For carrying cotton wool rolls, cotton wool pellets, wedges n articulation paper

## Pair of Tweezers

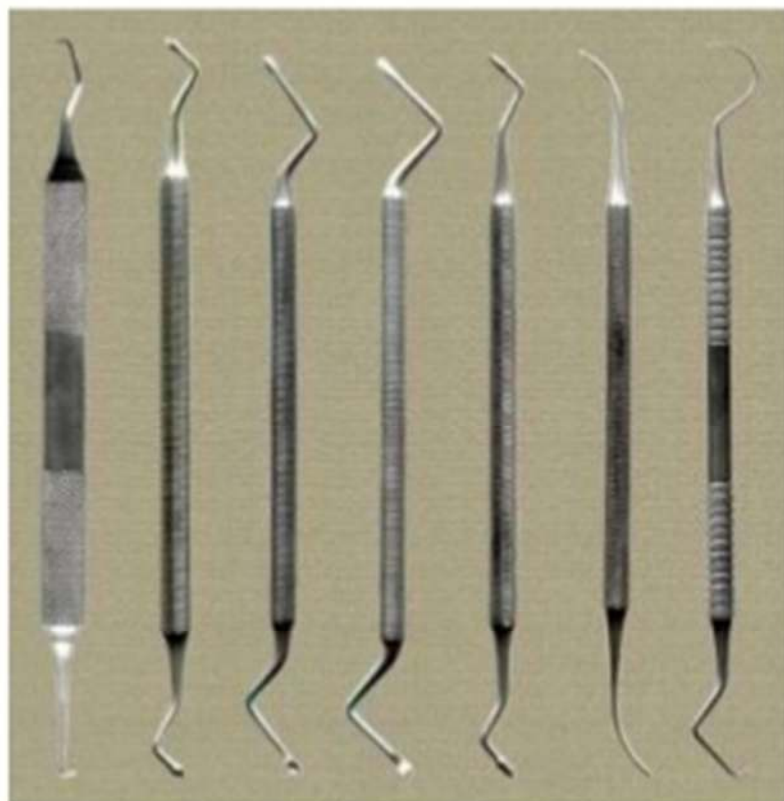




- For removing soft carious dentin
- For removal of excess of GIC

**Spoon Excavator**





- For widening the entrance to the cavity
- Slicing away thin unsupported and carious enamel

**Hatchets**







- For inserting mixed GIC into cleaned cavity
- To remove excess restorative material
- To shape GIC

**Applier/Carver**





➤ For mixing GIC

**Mixing pad & spatula**



## ESSENTIAL MATERIALS FOR ART



➤ To absorb saliva

**Cotton wool rolls**



➤ For cleaning cavities



**Cotton wool pellets**





- To keep moisture away from GIC
- To prevent gloves from sticking to GIC

**Petroleum jelly**





➤ To hold plastic strip close to the shape of the proximal surface of the tooth

## Wedges





- POWDER: Si oxide, Al oxide, Ca fluoride
- LIQUID: Polyacrylic acid or Demineralized water

- Type n GIC is used for restoring the cavities.
- P/L ratio -3:1

## Glass Ionomer Cement



## ADVANTAGES OF USING GIC



- **The result is a sealed restoration with the filled cavity and sealed pits and fissures adjacent to it, which provides additional protection against recurrent caries attacks.**
- **International research shows that ART restorations are as durable and successful as conventional restorations and are considered as permanent fillings. Not only does the procedure help to reduce bacteria causing caries, but chemically bonds the filling material to cavity walls, thus preventing any further nutrient supply to remaining bacteria. In effect bacteria 'starve' and become inactive. Continued fluoride release by the filling material also acts toxic against bacteria and assist in the remineralisation and rebuild of weakened tooth tissues.**





## PRECAUTIONS FOR GIC MATERIAL

- Dispense P/L only when cavity is properly dried.
- Recap the bottles immediately after use. This prevents uptake of moisture from the air or evaporation of water component from the liquid.
- If more than 30 seconds are used for mixing and the mixture looks dry, discard it because there will be poor adhesion to the tooth structure.



# Management of space problems

## Definition

- \* It is an artificial replacement for a prematurely lost primary tooth or teeth;
- \* Its main function is to preserve the space until the eruption of permanent teeth.



## Factors affecting decision of space maintaining

- Time elapsed since loss of primary tooth



## Factors affecting decision of space maintaining

- chronological age *Vs.* dental age



## Factors affecting decision of space maintaining

- Amount of bone covering the unerupted tooth



## Factors affecting decision of space maintaining

- Delayed eruption of the permanent tooth



## Factors affecting decision of space maintaining

- Congenital absence of permanent tooth





# Loss of primary incisors

- ❖ Due to ectopic eruption of permanent incisors
- ❖ May indicate extraction of primary incisors
- ❖ Premature loss of incisors not affect inter canine space if it occurs after canine eruption
- ❖ Consequences of loss are( delayed eruption of successor, unattractive appearance, habit development, improper pronunciation of sounds

## Acrylic partial denture



# Premature loss of first primary molar

*Band and loop*



## Crown and loop band



# Premature loss of primary second molar



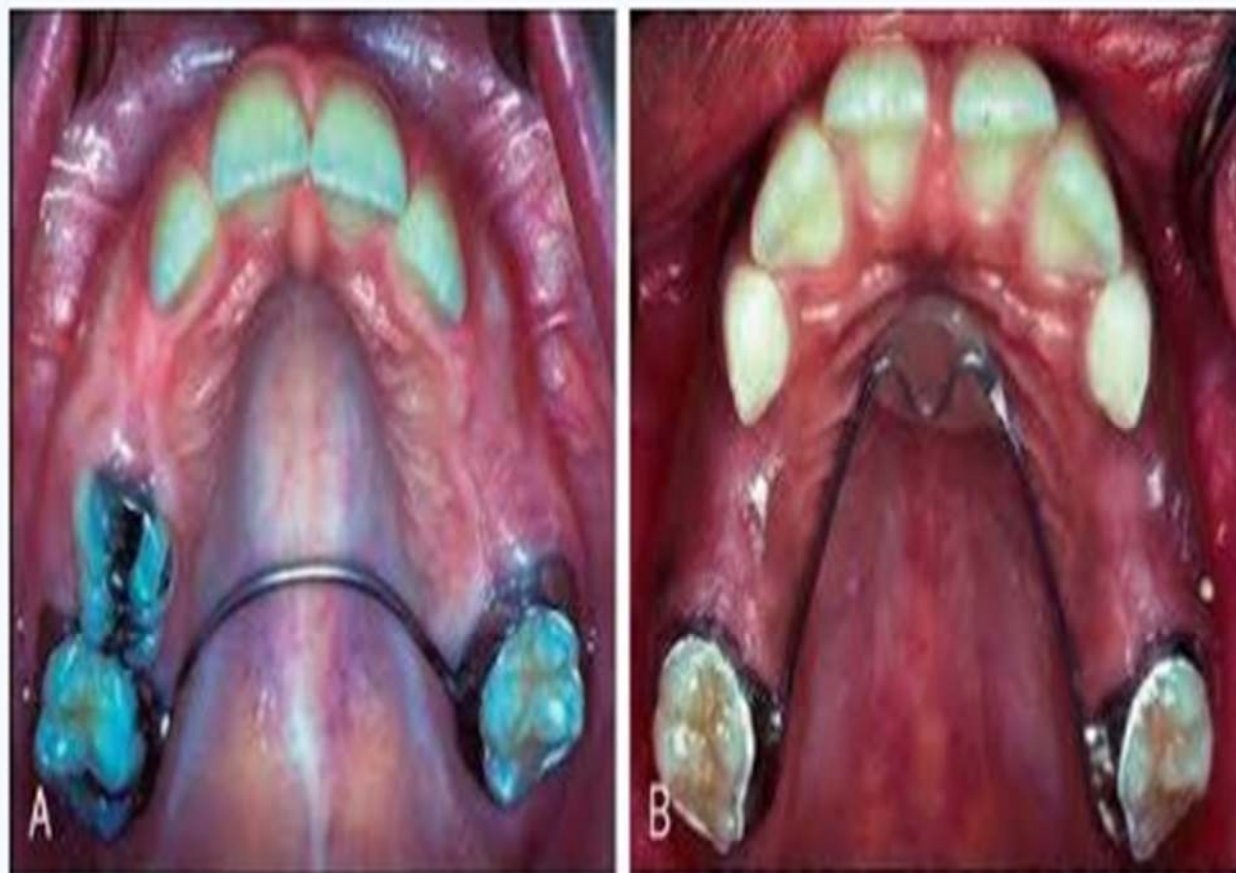
## Passive lingual arch



## *Nance holding appliances*



## Trans palatal arch





# Loss of primary 2<sup>nd</sup> molar before eruption of permanent 1<sup>st</sup> molar

*Crown with distal shoe extension*



# Loss of permanent 1<sup>st</sup> molar

- ❖ The loss will lead to changes in dental arch
- ❖ 2<sup>nd</sup> molar start to drift mesially
- ❖ If the age 8-12years, it can lead to bodily movement
- ❖ In older ages, it can lead to mesial tipping
- ❖ All teeth anterior to space, may show evidence of movement
- ❖ Rotation of premolars

# Treatment

- ❖ If it removed several years before eruption of 2<sup>nd</sup> molar, there is a great chance of eruption in excellent position
- ❖ If it removed after eruption, orthodontic evaluation is indicated.
- ❖ Auto transplantation of 3<sup>rd</sup> molar

*Thank you...*

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# **NORMAL PERIODONTIUM AND GINGIVAL DISEASES IN CHILDREN**

# GINGIVA

*It is divided into: Marginal , interdental, and attached.*



HOW IS A CHILD'S GINGIVA  
DIFFERENT FROM THAT OF AN  
ADULT



## **Summary of gingival tissue characteristics in children**

- Less stippled, thicker and rounded margins
- Flaccid and less keratinized
- Increased vascularity
- Interdental col formation and saddle areas
- translucent



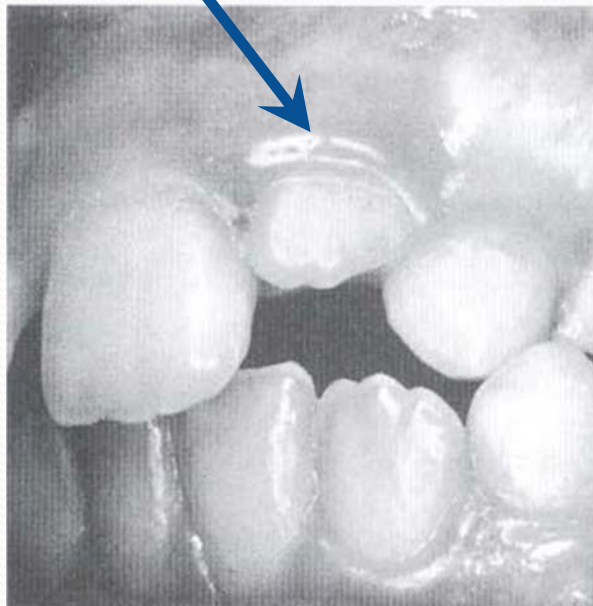
PHYSIOLOGIC CHANGES  
IN GINGIVA ASSOCIATED  
WITH TOOTH ERUPTION

## Pre-eruption bulge

- It is present over the crown of the tooth which is about to erupt.
- May be slightly blanched.

## ➤ Formation of gingival margin

- As the crown penetrates oral mucosa, marginal gingiva and sulcus develop.
- Usually edematous, rounded and slightly reddened.



## ➤ Normal prominence of gingival margin

Prominence of gingival margin especially over maxillary anteriors is normal till the teeth are fully erupted.



# CHRONIC GINGIVAL DISEASES IN CHILDHOOD

## ➤ CHRONIC MARGINAL GINGIVITIS



- ❑ Numerous studies indicate that marginal gingivitis is the most common form of periodontal disease and starts in early childhood.
- ❑ Severe gingivitis is relatively uncommon in children

# ▶ CHRONIC MARGINAL GINGIVITIS

- ❑ Gingiva exhibits all characters of chronic inflammation.
- ❑ **Color change and swelling** are more common in children than bleeding or increase in pocket depth.
- ❑ ETIOLOGY: uncalcified and calcified bacterial plaque.

*Bacterial plaque is composed of soft bacterial deposits that adhere firmly to the teeth. It is considered to be a complex, metabolically interconnected, highly organized bacterial system consisting of dense masses of microorganisms embedded in an intermicrobial matrix. In sufficient concentration it can disturb the host-parasite relationship and cause dental caries and periodontal disease.*

# CHRONIC MARGINAL GINGIVITIS

- ❑ The response to bacterial plaque is less severe in preschool children than in adults.
- ❑ Plaque forms more rapidly in children between 8 to 12 years than adults.





## ➤ CHRONIC GINGIVITIS ASSOCIATED WITH ERUPTION

- A temporary type of gingivitis.
- Often observed in young children when primary teeth are erupting.
- Subsides after the teeth emerge into the oral cavity.
- Related to accumulated dental plaque associated with erupting tooth.

## ➤ CHRONIC GINGIVITIS ASSOCIATED WITH ERUPTION

- ❑ The greatest increase in the incidence of eruption gingivitis in children is often seen in the 6- to 7-year age group when the permanent teeth begin to erupt because the gingival margin receives no protection from the coronal contour of the tooth during the early stage of active eruption, and the continual impingement of food on the gingiva causes the inflammatory process.

# **ALLERGY AND GINGIVAL INFLAMMATION**

- ❑ Seasonal variation of gingival inflammation is seen in children with allergies to birch pollen.**
- ❑ Patients with complex allergies who have symptoms for longer periods may be at higher risk for more significant adverse periodontal changes.**

# GINGIVAL INFLAMMATION ASSOCIATED WITH MALPOSED TEETH

- ❑ Malposed teeth have increased tendency of accumulating plaque.

## OTHER CAUSES

- ❑ Mouth breathing habit and nasal obstruction.
- ❑ Excessive overjet and overbite
- ❑ Malposed teeth have increased tendency of accumulating plaque.

# ACUTE GINGIVAL DISEASES IN CHILDHOOD

# HERPES SIMPLEX VIRUS INFECTION

- ❑ The primary infection usually occurs in a child under 6 years of age who has had no contact with the type 1 herpes simplex virus (HSV-1).
- ❑ 99% of all primary infections are of the subclinical type.
- ❑ In some preschool children the primary infection may be characterized by only one or two mild sores which may go unnoticed.

# HERPES SIMPLEX VIRUS INFECTION

- ❑ In other children, the primary infection may be manifested by acute symptoms (*acute herpetic gingivostomatitis*).
- ❑ Acute disease can occur in children with clean mouths and healthy oral tissues.
- ❑ symptoms of the disease develop suddenly and include:
  - Fiery red gingival tissues,
  - Malaise,
  - Irritability,
  - Headache,
  - and
  - Pain associated with intake of food and liquids of acid content.



**DIFFUSE  
ERYTHEMA**

# HERPES SIMPLEX VIRUS INFECTION

- ❑ characteristic oral finding in the acute primary disease is presence of yellow or white liquid filled vesicles that rupture in few days and form painful ulcers, 1 to 3 mm in diameter, which are covered with a whitish gray membrane and have a circumscribed area of inflammation
- ❑ ulcers may be observed on any area of the mucous membrane



**MULTIPLE LESIONS ON LABIAL MUCOSA**



**CLUSTERS OF VESICLES**



# ➤ *HERPES SIMPLEX VIRUS INFECTION*

- Diagnostic investigations:
  - four fold rise of serum antibodies to HSV-1
  - lesion culture will also show positive results for HSV-1.

# HERPES SIMPLEX VIRUS INFECTION

## □ TREATMENT:

- relief of the acute symptoms so that fluid and nutritional intake can be maintained
- The application of a mild topical anesthetic, such as dyclonine hydrochloride (0.5%) *before mealtime*.
- an alternative to the anesthetic is mixture of equal parts of diphenhydramine elixir and Kaopectate. The diphenhydramine has mild analgesic and antiinflammatory properties, whereas the kaolin-pectin compound coats the lesions.

# HERPES SIMPLEX VIRUS INFECTION

- The antiviral medications currently prescribed are acyclovir, famciclovir, and valacyclovir.
- Acyclovir should be administered in 5 daily doses to equal 1000 mg per day for 10 days.
- Bed rest and isolation from other children in the family are also recommended.

# HERPES SIMPLEX VIRUS INFECTION

- ❑ After initial primary attack during early childhood, the herpes simplex virus becomes inactive and resides in sensory nerve ganglia.
- ❑ The virus will often reappear later as the familiar cold sore or fever blister, usually on outside of the lips . It is commonly referred to as *recurrent herpes labialis (RHL)*.
- ❑ The recurrence of the disease has been related to:
  - conditions of emotional stress and lowered tissue resistance
  - Excessive exposure to sunlight



## ➤ *HERPES SIMPLEX VIRUS INFECTION*

- ❑ The most effective treatment for these recurrences is the use of the specific systemic antiviral medications. The daily dosages are the same as those for the primary infection, but the course of treatment is usually 5 days.
- ❑ topical antiviral agent, penciclovir cream may be applied to perioral lesions (approved for use in children 12 years of age and older)

# HERPES SIMPLEX VIRUS INFECTION

- ❑ Other remedies for herpes simplex infection also include the amino acid lysine. The oral therapy is based on lysine's antagonistic effect on another amino acid, arginine. L-Lysine monohydrochloride is available commercially in capsule form or tablet.
- ❑ L-Lysine monohydrochloride is available commercially in capsule form or tablets containing 100 or 300 mg of L-Lysine
- ❑ Ingestion of cereals, seeds, nuts, and chocolate should be avoided.
- ❑ Foods with adequate lysine, such as dairy products and yeast to be encouraged.

# ▶ RECURRENT APHTHOUS ULCER/STOMATITIS (CANKER SORE)

- ❑ Occurs in school-aged children.
- ❑ Painful ulceration on the unattached mucous membrane.
- ❑ Lesions persist for **4 to 12 days** and heal uneventfully, leaving scars only rarely.
- ❑ May appear as attacks of minor or single, major or multiple ulcers.
- ❑ The major form (RAS) is less common and has been referred to as **peradenitis mucosa necrotica recurrens** and **Sutton disease**.

# ▶ *RECURRENT APHTHOUS ULCER/STOMATITIS (CANKER SORE)*

□ RAS has been associated with other systemic diseases:

- Pharyngitis,
- Behcet disease,
- Crohn disease,
- Ulcerative colitis,
- Neutropenia,
- Immunodeficiency syndromes,
- Systemic lupus erythematosus



# RECURRENT APHTHOUS ULCER/STOMATITIS (CANKER SORE)

- ❑ Cause of RAU is unknown.
- ❑ Suggested etiology is:
  - 1. Local factors like-
    - ❖ Trauma,
    - ❖ Allergy to toothpaste constituents (sodium lauryl sulfate),
    - ❖ and Salivary gland dysfunction.
  - 2. Deficiencies of iron, vitamin B12, and folic acid
  - 3. It is also possible that the lesions are caused by an autoimmune reaction of the oral epithelium
  - 4. Infectious microbial factors

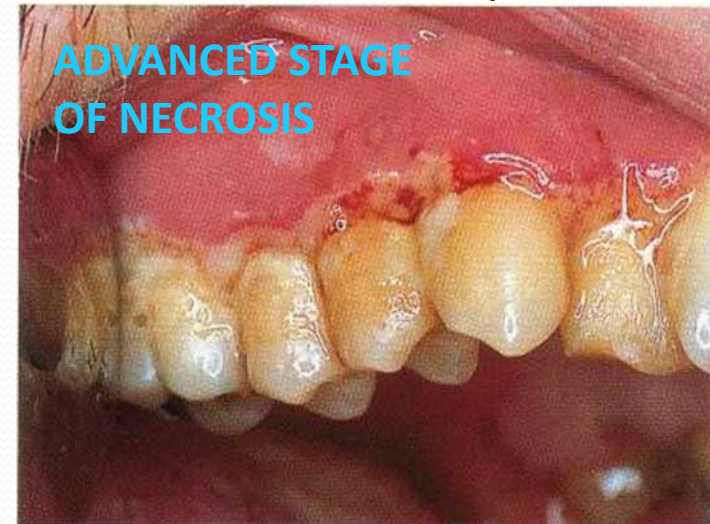
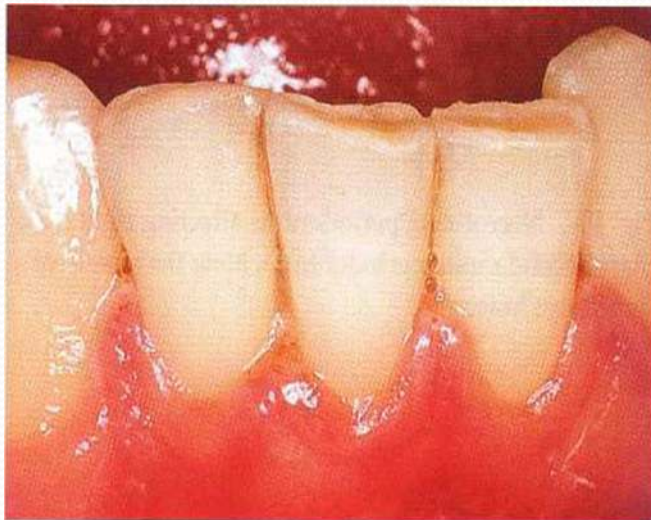
# RECURRENT APHTHOUS ULCER/STOMATITIS (CANKER SORE)

- TREATMENT: variety of treatments have been recommended for RAU/RAS, but a completely successful therapy has not been found.
- Topical anti inflammatory and analgesics
- Immunosuppression agents like triamcinolone acetonide, amlexanox (an anti allergic immunomodulator)
- Aloe vera freeze-dried gel extract adheres and forms an occlusive protective patch.
- The topical application of tetracyclines to the ulcers is often helpful in reducing the pain and in shortening the course of the disease.
- Topical rinses have also been helpful- dexamethasone elixir, Chlorhexidine mouthwash.
- Treatment with acyclovir may respond favorably

# ACUTE NECROTIZING ULCERATIVE GINGIVITIS (VINCENT INFECTION)

- Rare among preschool children, occurs occasionally in children from 6 to 12 years old
- ANUG can be easily diagnosed because of the involvement of the interproximal papillae and the presence of a gray pseudomembranous necrotic covering of the marginal tissue.
- Two microorganisms, *Borrelia vincentii* and fusiform bacilli, referred to as spirochetal organisms, are generally believed to be responsible for the disease.

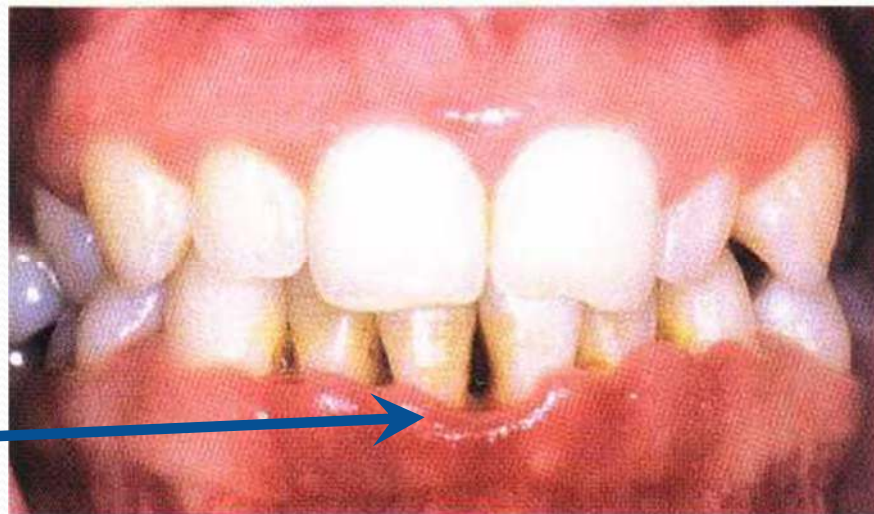
**INITIAL  
PUNCHED  
OUT LESIONS**



## ACUTE NECROTIZING ULCERATIVE GINGIVITIS (VINCENT INFECTION)

- Characteristics lesion are punched out crater like lesions at the crests of the inter dental papillae extending to marginal gingiva, and rarely to attached gingiva.
- The clinical manifestations of the disease include inflamed, painful, bleeding gingival tissue, poor appetite, fever as high as 40° C (104° F), general malaise, and a fetid odor.

CRATERING



# ➤ ACUTE NECROTIZING ULCERATIVE GINGIVITIS (VINCENT INFECTION)

## □ TREATMENT :

- Subgingival curettage, debridement, and the use of mild oxidizing solutions
- If the gingival tissues are acutely and extensively inflamed when the patient is first seen, antibiotic therapy is indicated
- Improved oral hygiene, the use of mild oxidizing mouthrinses after each meal, and twice-daily rinsing with chlorhexidine will aid in overcoming the infection.

# ACUTE NECROTIZING ULCERATIVE GINGIVITIS (VINCENT INFECTION)

- ❑ Distinguishing ANUG from acute herpetic gingivostomatitis
  - Therapeutic prophylaxis and debridement will bring about a favorable response in cases of ANUG but not in acute herpetic gingivostomatitis.
  - A therapeutic trial of antibiotics will reduce the acute symptoms in ANUG but not in the viral infection.
  - Acute herpetic gingivostomatitis is most frequently seen in preschool children, and its onset is rapid. ANUG rarely occurs in the preschool-aged group and develops over a longer period, usually in a mouth in which irritants and poor oral hygiene are present.
  - Clinical picture
  - Biopsy of specimen.

## ACUTE CANDIDIASIS (THRUSH, CANDIDOSIS, MONILIASIS)

- ❑ *Candida (Monilia) albicans* is a common inhabitant of the oral cavity that multiply rapidly and cause a pathogenic state when tissue resistance is lowered.
- ❑ Young children sometimes develop thrush after local antibiotic therapy, which allows the fungus to proliferate.
- ❑ lesions of the oral disease appear as raised, furry, white patches, which can be removed easily to produce a bleeding underlying surface
- ❑ Antifungal antibiotics are available to control thrush.

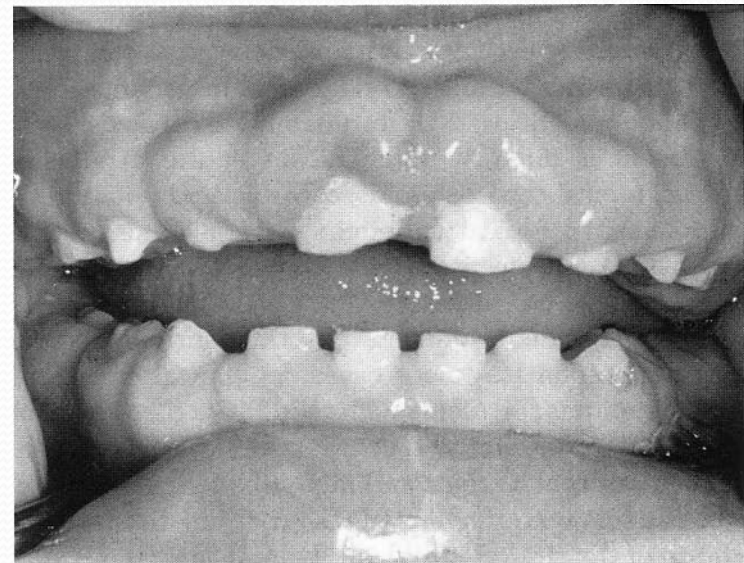
# PHENYTOIN-INDUCED GINGIVAL OVERGROWTH(PIGO)

- ❑ Phenytoin is a major anticonvulsant agent used in the treatment of epilepsy.
- ❑ Varying degrees of gingival hyperplasia is one of the most common side effects of phenytoin therapy.
- ❑ Incidence has been reported as ranging between 0% and 95%.
- ❑ true hyperplasia not to exist.
- ❑ Most investigators agree on the existence of a close relationship between oral hygiene and PIGO rather than dose of phenytoin.
- ❑ The relationship between plaque, local irritants, and PIGO is also supported by the observation that patients without teeth almost never develop PIGO.



# PHENYTOIN-INDUCED GINGIVAL OVERGROWTH

- ❑ appear as early as 2 to 3 weeks after initiation of phenytoin therapy
- ❑ The initial clinical appearance is painless enlargement of the interproximal gingiva.
- ❑ become more generalized later.
- ❑ These lesions may remain purely fibrotic in nature or may be combined with a noticeable inflammatory component.
- ❑ In some cases, the entire occlusal surface of the teeth becomes covered.



# ➤ PHENYTOIN-INDUCED GINGIVAL OVERGROWTH


- ❑ Problems include: esthetics, difficulty in mastication, delayed tooth eruption, and secondary inflammation leading to periodontal disease

## TREATMENT:

- ❑ Unfortunately, no cure exists and treatment is often symptomatic in nature
- ❑ Patients with mild PIGO (i.e., less than one third of the clinical crown is covered) require daily meticulous oral hygiene
- ❑ For patients with moderate PIGO (i.e., one third to two thirds of the clinical crown is covered) meticulous oral home care and the judicious use of an irrigating device may be needed

# PHENYTOIN-INDUCED GINGIVAL OVERGROWTH

- ❑ Phenytoin levels should be checked after four prophylaxis visits (4 weeks).
- ❑ If there has been no change, consultation with the patient's physician concerning the possibility of using a different anticonvulsant drug may be helpful
- ❑ Severe PIGO (i.e., more than two thirds of the tooth is covered) : surgical removal and good oral hygiene after surgery are generally considered to be the most effective treatment.
- ❑ Recurrence may occur.

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- ❑ Other drugs that have been reported to induce gingival overgrowth in some patients include cyclosporin, calcium channel blockers, valproic acid, and phenobarbital.

# ASCORBIC ACID DEFICIENCY

## GINGIVITIS

- ❑ differs from the type of gingivitis related to poor oral hygiene
- ❑ The involvement is usually limited to the marginal tissues and papillae
- ❑ severe pain, and spontaneous hemorrhage will be evident.
- ❑ Complete dental care, improved oral hygiene, and supplementation with vitamin C and other water soluble vitamins will greatly improve the gingival condition.

# PERIODONTAL DISEASES IN CHILDHOOD

# PERIODONTAL DISEASES IN CHILDHOOD

- ❑ Periodontitis is an inflammatory disease of the gingiva and deeper tissues of the periodontium
- ❑ It is characterized by pocket formation and destruction of the supporting alveolar bone.
- ❑ Bone loss in children can be detected in bite-wing radiographs by comparing the height of the alveolar bone to the cemento-enamel junction.
- ❑ Distances between 2 and 3 mm can be defined as questionable bone loss and distances greater than 3 mm indicate definite bone loss.



## **Children vs Adults**

- Greater metabolic activity in children offers periodontium greater resistance to breakdown and enhances repairs.
- Oral flora is different (spirochetes and *B melaninogenicus* are established late)
- Composition and metabolism of plaque different (lower irritation potential)
- Preschoolers with 4x plaque have 1/4 gingival index



# EARLY-ONSET PERIODONTITIS


- ❑ EOP is used to describe a heterogeneous group of periodontal diseases occurring in young individuals who are otherwise healthy
- ❑ EOP consists of three categories of periodontitis that may have overlapping etiologies and clinical presentations:
  - ❑ (1) a localized form (**localized juvenile periodontitis [LJP]**),
  - ❑ (2) a generalized form (**generalized juvenile periodontitis [GJP]**)
  - ❑ (3) a prepubertal category that may have both localized and generalized forms (**localized and generalized prepubertal periodontitis**)

# ➤ EARLY-ONSET PERIODONTITIS

- ❑ American Academy of Periodontology has recategorized the early-onset form under **Aggressive Periodontitis** and has recommended that its sub-classifications be discarded.
- ❑ The old categorization has been retained because the new classification is not as widely used.

# 1. LOCALIZED EARLY-ONSET PERIODONTITIS (LOCALIZED JUVENILE PERIODONTITIS)

- ❑ LJP occurs in otherwise healthy children and adolescents without clinical evidence of systemic disease.
- ❑ It is characterized by the rapid and severe loss of alveolar bone around more than one permanent tooth, usually the first molars and incisors
- ❑ bone loss around the primary teeth can be an early finding in this disease.


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- ❑ patients have little or no tissue inflammation and very little supragingival dental plaque or calculus
  - ❑ Micro-organisms predominating in the gingival pockets include *Actinobacillus actinomycetemcomitans* (Aa) or Aa in combination with Bacteroides-like species
  - ❑ variety of neutrophil defects have been reported in patients with LJP.
  - ❑ Some suspect a hereditary basis for LJP

## 2. GENERALIZED EARLY-ONSET PERIODONTITIS (GENERALIZED JUVENILE PERIODONTITIS)

- ❑ The generalized form of EOP occurs at or around puberty in older juveniles and young adults.
- ❑ It often affects the entire periodontium of the dentition
- ❑ known by the terms *generalized juvenile periodontitis (GJP)*, *severe periodontitis*, and *rapidly progressive periodontitis*.
- ❑ Affected teeth harbor more nonmotile, facultative, anaerobic, gram-negative rods (especially *Porphyromonas gingivalis*)
- ❑ Individuals with GJP exhibit marked periodontal inflammation and have heavy accumulations of plaque and calculus.

# TREATMENT OF LOCALISED AND GENERALIZED EARLY-ONSET PERIODONTITIS

- Treatment of EOP, both the localized and generalized types (LIP and GJP), includes surgery and the use of tetracyclines (sometimes in combination with metronidazole)
- FOR LJP:
  - Surgical removal of infected crevicular epithelium and debridement of root surfaces during surgery while the patient is on a 14-day course of doxycycline hyclate (1 g per day) is considered the best effective treatment modality.

- 
- a DNA test kit for periodontal pathogens. The test involves collecting a plaque specimen by inserting a paper point provided in the kit into a periodontal pocket for 10 seconds. The paper point is placed into a test vial and returned for the microbial test.
  - Retesting in 4 to 6 weeks after the completion of antibiotic therapy will determine the patient's response to the treatment.



□ Treatment of GJP:

- is often less predictable.
- Alternative antibiotics directed at the specific pathogenic flora may be required



### 3. PREPUBERTAL PERIODONTITIS

#### *LOCALIZED FORM:*

- ❑ *Localized prepubertal periodontitis (LPP)* is localized attachment loss and alveolar bone loss only in the primary dentition in an otherwise healthy child.
- ❑ appears to arise around or before 4 years of age
- ❑ the bone loss is usually seen on radiographs around the primary molars and/or incisors



❑ Affected sites may present with:

✓ Abnormal probing depths with minor gingival inflammation,

✓ rapid bone loss, and,

✓ minimal to varying amounts of plaque.

❑ Abnormalities in host defenses (e.g., leukocyte chemotaxis), extensive proximal caries facilitating plaque retention and bone loss, and a family history of periodontitis have been associated with LPP in children

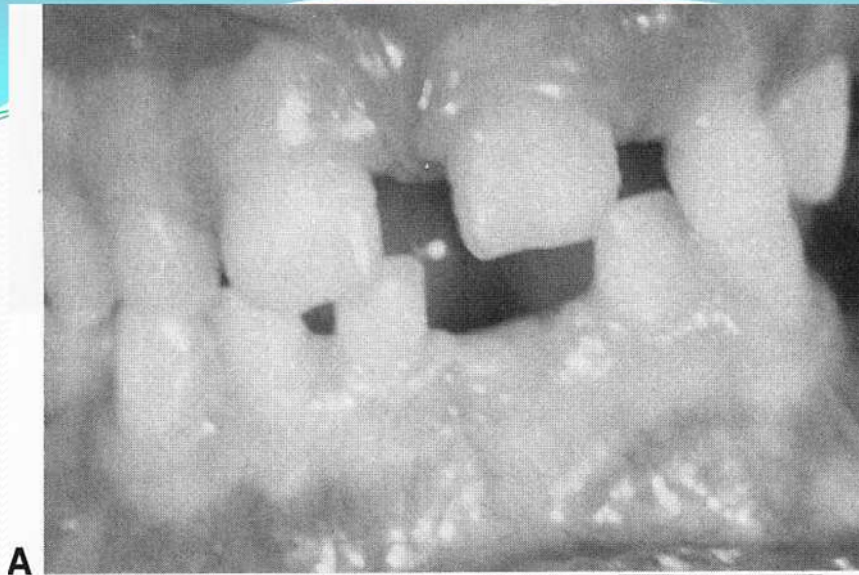
❑ Micro-organisms predominating in the gingival pockets include *Actinobacillus actinomycetemcomitans* (Aa), *Porphyromonas (Bacteroides) gingivalis*.

## **GENERALIZED FORM:**

- ❑ onset of *generalized prepubertal periodontitis (GPP)* is during or soon after the eruption of the primary teeth.
- ❑ results in severe gingival inflammation and generalized attachment loss, tooth mobility, and rapid alveolar bone loss with premature exfoliation of the teeth
- ❑ The gingival tissue may initially demonstrate only minor inflammation with a minimum of plaque material
- ❑ the primary teeth may be lost by 3 years of age.
- ❑ Abnormalities in host defenses may be associated.
- ❑ Micro-organisms predominating in the gingival pockets include *Actinobacillus actinomycetemcomitans (Aa)*, *Porphyromonas (Bacteroides) gingivalis*.

## *TREATMENT OF BOTH FORMS:*

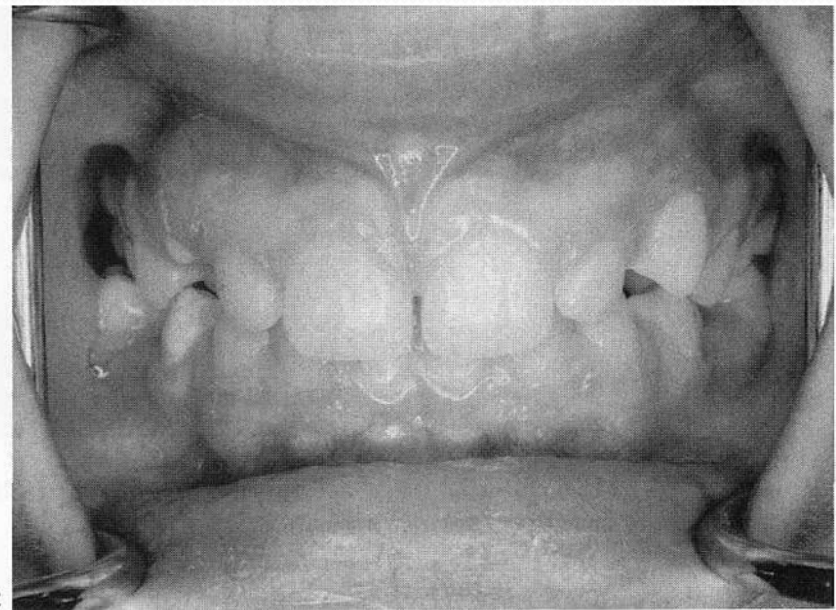
- ❑ Consultation with a pediatrician is needed to rule out systemic diseases.
- ❑ Use of antimicrobial rinses (chlorhexidine) and therapy with broad-spectrum antibiotics are effective in eliminating the periodontal pathogens.(Amoxicillin, tetracycline)
- ❑ The child's parents should be made aware of the potential for pigmentation change in the developing permanent teeth and an increased susceptibility to oral candidiasis as a result of tetracycline therapy.
- ❑ Treatment of GPP is less successful overall and sometimes requires extraction of all primary teeth.



**A, Prepubertal periodontitis in a 4 $\frac{1}{2}$ -year-old girl.** Loosening, migration, and spontaneous loss of the primary teeth occurred.

**B, A generalized loss of alveolar bone can be seen in the radiographs.**

**C, Eight years after the initial observation of an involvement of the supporting tissues, there is evidence of normal gingival tissues. It is believed that dietary counseling and excellent oral hygiene contributed to the success of the treatment.**



## Down Syndrome:

- ❑ Caused by trisomy of ch no. 21
- ❑ Characterized by mental deficiency and mental retardation.
- ❑ Prevalence of periodontal diseases in these patients is very high.(100%in patients less than 30 yrs of age)
- ❑ Cause of periodontal disease:
  - T-cell defect and defective chemotaxis.
  - poor circulation in gingival tissue.
- ❑ Presents with deep periodontal pockets,substantial plaque formation, and moderate gingivitis.

## Hypophosphatasia:

- Caused by low levels in blood of alkaline phosphatase
- Teeth are lost with no signs of gingival inflammation
- Cemenum formation is defective
- Primary teeth may be lost prematurely
- Involves skeletal system as well

## Leucocyte adhesion deficiency:


- Rare
- Extremely acute inflammation of gingiva and rapid destruction of bone surrounding the teeth
- Permanent dentition may not be affected.




# GINGIVAL RECESSION

Several factors predispose patients to gingival recession:

- presence of a narrow band of attached or keratinized gingiva
- Toothbrush trauma,
- tooth prominence,
- impinging frenum attachment,
- soft tissue impingement by opposing occlusion,
- orthodontic tooth movement,
- use of impression techniques including subgingival tissue retraction,
- Oral habits,
- periodontitis, and
- pseudorecession (extrusion of teeth)

- 
- ❑ Recession is dealt by elimination of the stimulus if possible, while excellent oral hygiene is maintained in the affected areas.
  - ❑ If the recession has progressed after a 4- to 8-week period of observation, other periodontal procedures may be required based on the identified predisposing factor.



THE END

THANK YOU