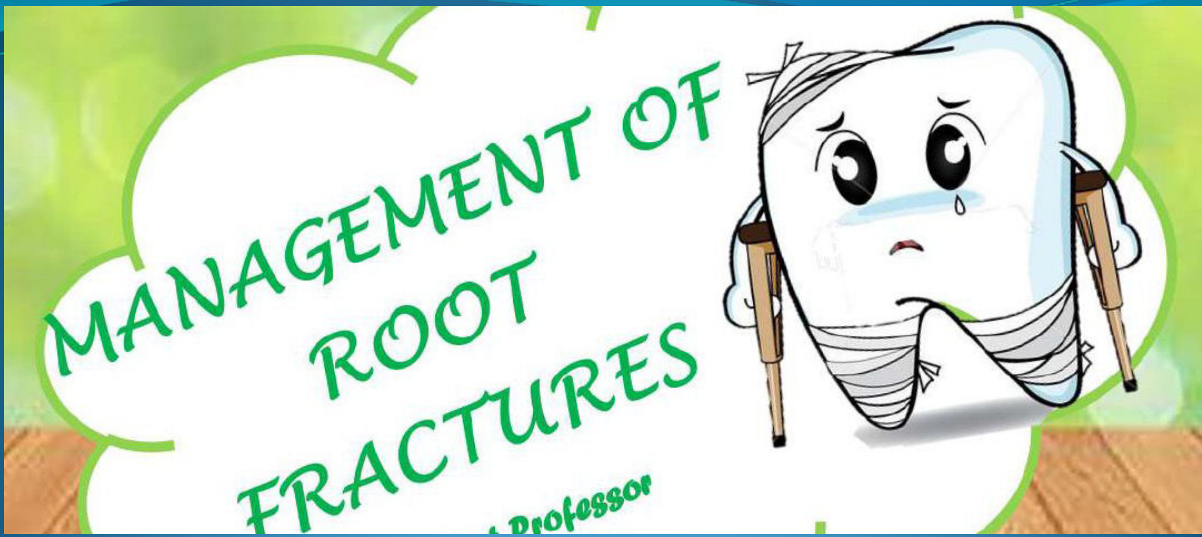


- It is defined as fractures involving dentin, cementum and pulp, they are relatively uncommon.
- The mechanism of root fractures is usually a frontal impact, which creates compression zones labially and lingually.

- The resulting shearing stress zone then dictates the plane of fracture.

1- Root fracture of primary teeth is relatively uncommon because it is more pliable alveolar bone allows for displacement of the tooth.
When root fracture does occur, it should be treated in the same manner as recommended for permanent teeth; however, the prognosis is less favorable.
2-The pulp in a permanent tooth with a fractured root has a Better chance to recover, since the fracture allows immediate decompression and circrulation is more likely to be maintained.

3- The prognosis is poor for any tooth with a fracture that extends below the gingival margin and involves the pulp in an immature tooth.

4- Root fractures occur in the apical half of the tooth are more likely to undergo repair. Fractures in the apical third are often repaired without treatment. In fact, many apparently are undetected until evidence of a calcified repair i seen radiographically sometime after the injury.

Clinical features

1) Root fractures involving the permanent dentition predominantly affect the maxillary central incisor region.
2) Coronal fragment are displaced lingually or slightly extruded.
3) Temporary loss of sensitivity

Radiographic features

- Radiographic demonstration of root fractures is facilitated by the fact that the fracture line is most often oblique .
- In this context it should be remembered that a root fracture would normally be visible only if the central beam is directed within a maximum range of 15 to 20° of fracture plane.

Classification of root fracture

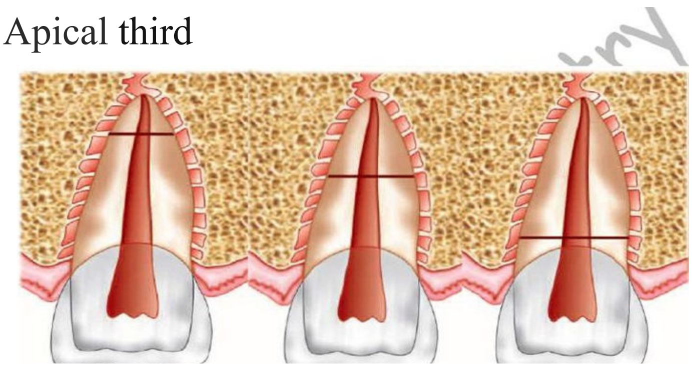
A- based on angulation of fracture line on long axis of the tooth

- 1-Horizontal (transverse root fracture, intralveolar root :fractures): Fracture perpendicular to long axis of tooth.
- 2-Oblique: Fracture is at an angle to long axis.

3-Vertical: Fracture parallel to long axis.

B- Based on location

Cervical third.
Middle third.
Apical third



- The position of the fracture line is an important factor in determining the treatment outcome.
- Fractures, which occur in the apical third of the root, have an excellent prognosis if the coronal and apical segments **can be maintained in proximity.**
- A tooth with a middle third fracture has fair prognosis for Repair. and requires endodontic therapy.
- If the root fracture is in the coronal third, approximation and stabilization of fractured segments is almost impossible ,tooth usually should be extracted

Tissue reaction after root fracture

- 1- Healing with calcified tissue a uniting callus of hard tissue may cosist of dentin ,osteodentin or cementum.
- 2- Healing with interposition of connective tissue, in which the fractured root surfaces are covered by cementum with connective tissue fibers joining the two fragments

(3) Healing with interposition of bone and connective tissue, in which a bony bridge and connective tissue are positioned between the fragments.

- Interposition of granulation tissue. It is the least favorable form of attempted repair, and the fracture will not heal spontaneously

- The teeth usually present unfavorable symptoms that may be accompanied by fistulas resulting from necrosis of the coronal portion and also sometimes the apical portion of the pulp.
- These teeth require follow-up endodontic treatment or extraction

- It had been found that hard-tissue healing also took place in teeth that were not even splinted
- A comparison between nonsplinted and splinted teeth showed no difference in frequency of healing.
- So that optimal positioning of dislocated fragments significantly increases the frequency of healing, particularly in mature teeth

- The principle of treatment of permanent teeth is reduction of displaced coronal fragments and firm immobilization.
- Immobilization of teeth with root fractures is achieved with rigid fixation with an acid etch splint.
- Following treatment modalities are recommended based on the fracture line:

Coronal 3rd fracture

1- If the remaining root is long enough, coronal portion can be removed, endodontic treatment completed on the apical fragment and restored with post and core.
Then cement it and take an impression overall to make acrylic crown.

2- If the remaining root is short, do extraction.

Notes

- If the fracture line located subgingivally, removal of the coronal fragment supplemented by gingivectomy and/or osteotomy, in order to convert the subgingival fractures surface to supragingival in situations where esthetics permit, thereafter, restoration (e.g., with a post retained crown)

Fracture of middle third

1) If there is slight mobility: This fracture is treated by performing RCT in which obturation with silver cone (that also acts as a splint) is done and later on, callus formation will occur.

Sometime mostly the apical part, the tooth stay vital also inject Ca $(OH)_2$ to interrupt the fracture line. New calcific body will be formed by Ca (OH)2 in fracture line.

- 2) If there is high mobility: The tooth should be extracted

Fracture of apical third

- High apical fractures usually:require no treatment. The prognosis will depend on height of fracture - the more apical the better the prognosis.
- Calcific repair will be formed without treatment. Just observe the child in future and do devitalization of the pulp. Sometimes the fracture part become reattached with the root.
- X -Ray is important.

Vertical root fracture

- It is also called as cracked tooth syndrome_
- It runs lengthwise from crown towards the apex.
- It is mostly found in posterior teeth and its etiology is mostly iatrogenic like insertion of screws, after pulp therapy or due to traumatic occlusion.
- **Clinical Features:**
- Persistent dull pain of long-standing origin.
- Pain is elicited by applying pressure.

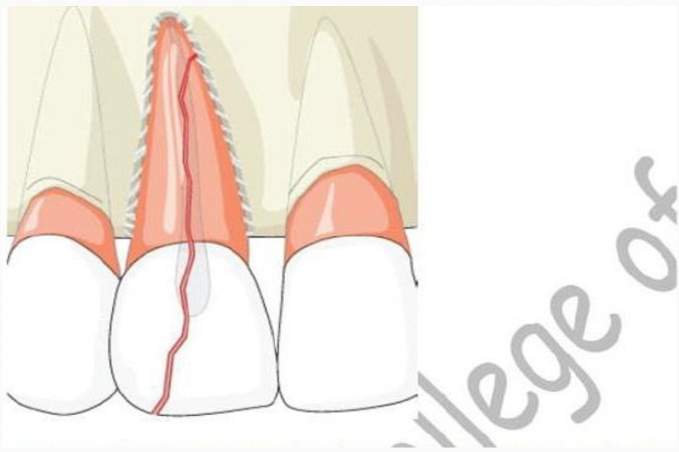
Radiographic features

If the central beam lies in the line of fracture, it is visible as radiolucent line.

- Thickening of PDL is also seen.
- Occlusal pressure test: When asked to bite/chew on a cotton applicator or a rubber polishing wheel patient gets sharp pain.

Treatment:

- Single rooted teeth-extraction
- Multi rooted teeth-hemisection and the remaining tooth is endodonticall ti:eated and resorted with crown.



Other displacement injuries of teeth need stabilization

- The severity of the injury will help determine the length of time the splint should remain in place.

Splinting times may vary from:

- 1 to 2 weeks, for teeth that have been discernibly loosened (subluxation),
- 4 to 6 weeks, for teeth that have been laterally displaced, fracturing the alveolar process.

As with all tooth injuries, frequent periodic evaluation is required for at least the first 6 months

Displaced teeth with closed apices and many with open apices will require follow up endodontic therapy.

As with many of the other injuries, calcium hydroxide paste is the currently recommended material for initial canal filling.

Notes

- Categories for the treatment of avulsed teeth can be summarized as below (for both closed and open apex teeth)

First condition Treatment

- Closed Apex:
  Tooth replanted prior to the patient's arrival at the dental office or clinic

Treatment

- Leave the tooth in place.
- Clean the area with water spray, saline, or chlorhexidine.
- Suture gingival lacerations if present.
- Verify normal position of the replanted tooth both clinically and radiographically.
- Apply a flexible splint for up to 2 weeks.

- Administer systemic antibiotics. Tetracycline is the first choice (Doxycycline 2x per day for 7 days at appropriate dose for patient age and weight).
- The risk of discoloration of permanent teeth must be considered before systemic administration of tetracycline in young patients (In many countries tetracycline is not recommended for patients under 12 years of age).
- In young patients Phenoxymethyl Penicillin (Pen V) or amoxycillin, at an appropriate dose for age and weight, is an alternative to tetracycline.

- If the avulsed tooth has been in contact with soil, and if tetanus coverage is uncertain, refer to physician for a tetanus booster.
- Initiate root canal treatment 7-10 days after replantation and before splint removal.

Patient instructions

- Avoid participation in contact sports.
- Soft food for up to 2 weeks.
- Brush teeth with a soft toothbrush after each meal.
- Use a chlorhexidine (0.1 %) mouth rinse twice a day for 1 week.

Follow-up

- Root canal treatment 7-10 days after replantation.
- Place calcium hydroxide as an intra-canal medicament for up to 1 month followed by root canal filling with an acceptable material.
- Alternatively an antibiotic-corticosteroid paste may be placed immidiately or shortly following replantation and left for at least 2 weeks.
- Splint removal and clinical and radiographic control after 2 weeks.
- Clinical and radiographic control after 4 weeks, 3 months, 6 months, 1 year and then yearly thereafter.

Second condition treatment

- Closed apex:
  Extraoral dry time less than 60 min. The tooth has been kept in physiologic storage media or osmolality balanced media (Milk, saline, saliva or Hank's Balanced Salt Solution) and/or stored dry less than 60 minutes.

- The essential functions of a balanced salt solution is to

1. maintain pH
2. osmotic balance
3. provide cells with water and essential inorganic ions

Treatment procedures

- Clean the root surface and apical foramen with a stream of saline and soak the tooth in saline thereby removing contamination and dead cells from the root surface.
- Administer local anesthesia
- Irrigate the socket with saline.
- Examine the alveolar socket. If there is a fracture of the socket wall, reposition it with a suitable instrument.

- Replant the tooth slowly with slight digital pressure. Do not use force.
- Suture gingival lacerations if present.
- Verify normal position of the replanted tooth both, clinically and radiographically.
- Apply a flexible splint for up to 2 weeks, keep away from the gingiva.
- Administer systemic antibiotics. Tetracycline is the first choice (Doxycycline 2x per day for 7 days at appropriate dose for patient age and weight).
- The risk of discoloration of permanent teeth must be considered before systemic administration of tetracycline in young patients (In many countries tetracycline is not recommended for patients under 12 years of age).

- In young patients Phenoxymethyl Penicillin (Pen V) or amoxycillin, at appropriate dose for age and weight, is an alternative to tetracycline.

- If the avulsed tooth has been in contact with soil, and if tetanus coverage is uncertain, refer to physician for a tetanus booster.
- Initiate root canal treatment 7-10 days after replantation and before splint removal.

Patient instructions

- Soft food for up to 2 weeks.
- Brush teeth with a soft toothbrush after each meal.
- Use a chlorhexidine (0.1 %) mouth rinse twice a day for 1 week.

Follow-up

- Root canal treatment 7-10 days after replantation. Place calcium hydroxide as an intra-canal medicament for up to 1 month followed by root canal filling with an acceptable material.
- Alternatively an antibiotic-corticosteroid paste may be placed immidiately or shortly following replantation and left for at least 2 weeks.
- Splint removal and clinical and radiographic control after 2 weeks.
- Clinical and radiographic control after 4 weeks, 3 months, 6 months, 1 year and then yearly thereafter.

3rd condition treatment

- Closed apex:
  Extraoral dry time exceeding 60 min or other reasons suggesting non-viable cells

Treatment

- Delayed replantation has a poor long-term prognosis.
- The periodontal ligament will be necrotic and can not be expected to heal.
- The goal in delayed replantation is, in addition to restoring the tooth for esthetic, functional and psychological reasons, to maintain alveolar bone contour.
- However, the expected eventual outcome is ankylosis and resorption of the root and the tooth will be lost eventually.

- Remove attached non-viable soft tissue carefully, with gauze.
- Root canal treatment can be performed prior to replantation, or it can be done 7-10 days later.
- Administer local anesthesia
- Irrigate the socket with saline.
- Examine the alveolar socket. If there is a fracture of the socket wall, reposition it with a suitable instrument.

- Remove attached non-viable soft tissue carefully, with gauze.
- Root canal treatment can be performed prior to replantation, or it can be done 7-10 days later.
- Administer local anesthesia
- Irrigate the socket with saline.
- Examine the alveolar socket. If there is a fracture of the socket wall, reposition it with a suitable instrument.

- Replant the tooth slowly with slight digital pressure. Do not use force.
- Suture gingival lacerations if present.
- Verify normal position of the replanted tooth clinically and radiographically.
- Stabilize the tooth for 4 weeks using a flexible splint.

- Administer systemic antibiotics. Tetracycline is the first choice (Doxycycline 2x per day for 7 days at appropriate dose for patient age and weight).
- The risk of discoloration of permanent teeth must be considered before systemic administration of tetracycline in young patients (In many countries tetracycline is not recommended for patients under 12 years of age).
- In young patients Phenoxymethyl Penicillin (Pen V) or amoxycillin, at an appropriate dose for age and weight, is an alternative to tetracycline.

- If the avulsed tooth has been in contact with soil, and if tetanus coverage is uncertain, refer to physician for a tetanus booster.
- To slow down osseous replacement of the tooth, treatment of the root surface with fluoride prior to replantation has been suggested (2 % sodium fluoride solution for 20 min.

Patient instructions

- Avoide participation in contact sports.
- Soft food for up to 2 weeks.
- Brush teeth with a soft toothbrush after each meal.
- Use a chlorhexidine (0.1%) mouth rinse twice a day for 1 week.

Follow-up

- Root canal treatment 7-10 days after replantation. Place calcium hydroxide as an intra-canal medicament for up to 1 month followed by root canal filling with an acceptable material.
- Alternatively an antibiotic-corticosteroid paste may be placed immidiately or shortly following replantation and left for at least 2 weeks.
- Splint removal and clinical and radiographic control after 4 weeks.
- Clinical and radiographic control after 4 weeks, 3 months, 6 months, 1 year and then yearly thereafter.

- Ankylosis is unavoidable after delayed replantation and must be taken into consideration.
- In children and adolescents ankylosis is frequently associated with infraposition.
- Careful follow-up is required and good communication is necessary to ensure the patient and guardian.
- Decoronation may be necessary when infraposition (> 1 mm) is seen.

Forth condition treatment

- Open apex:
  Tooth replanted prior to the patients arrival at the dental office or clinic

- Treatment
- Leave the tooth in place.
- Clean the area with water spray, saline, or chlorhexidine.
- Suture gingival laceration if present.
- Verify normal position of the replanted tooth both clinically and radiographically.
- Apply a flexible splint for up to 1-2 weeks.

- Administer systemic antibiotics. Tetracycline is the first choice (Doxycycline 2x per day for 7 days at appropriate dose for patient age and weight).
- The risk of discoloration of permanent teeth must be considered before systemic administration of tetracycline in young patients (In many countries tetracycline is not recommended for patients under 12 years of age).
- In young patients Phenoxymethyl Penicillin (Pen V) or amoxycillin, at an appropriate dose for age and weight, is an alternative to tetracycline.

- If the avulsed tooth has been in contact with soil and if tetanus coverage is uncertain, refer to physician for a tetanus booster.
- The goal for replanting still-developing (immature) teeth in children is to allow for possible revascularization of the tooth pulp. If that does not occur, root canal treatment is recommended.

Patient instructions

- Avoid participation in contact sports.
- Soft food for up to 2 weeks.
- Brush teeth with a soft toothbrush after each meal.
- Use a chlorhexidine (0.1%) mouth rinse twice a day for 1 week.

Follow-up

- For immature teeth, root canal treatment should be avoided unless there is clinical or radiographic evidence of pulp necrosis.
- Splint removal and clinical and radiographic control after 2 weeks.
- Clinical and radiographic control after 4 weeks, 3 months, 6 months, 1 year and then yearly thereafter.

Fifth condition treatment

- Open apex:
  Extraoral dry time less than 60 min.
- The tooth has been kept in physiologic storage media or osmolarity balanced media (Milk, saline, saliva or Hank's Balanced Salt Solution) and/or stored dry less than 60 minutes.

Treatment

- Clean the root surface and apical foramen with a stream of saline.
- Topical application of antibiotics has been shown to enhance chances for revascularization of the pulp and can be considered if available (minocycline or doxycycline 1 mg per 20 ml saline for 5 minutes soak).
- Administer local anesthesia.
- Examine the alveolar socket. If there is a fracture of the socket wall, reposition it with a suitable instrument.

- Irrigate the socket with saline.
- Replant the tooth slowly with slight digital pressure.
- Suture gingival lacerations, especially in the cervical area.
- Verify normal position of the replanted tooth clinically and radiographically.
- Apply a flexible splint for up to 2 weeks.

- Administer systemic antibiotics. Tetracycline is the first choice (Doxycycline 2x per day for 7 days at appropriate dose for patient age and weight).
- The risk of discoloration of permanent teeth must be considered before systemic administration of tetracycline in young patients (In many countries tetracycline is not recommended for patients under 12 years of age).
- In young patients Phenoxymethyl Penicillin (Pen V) or amoxycillin, at an appropriate dose for age and weight, is an alternative to tetracycline.
- If the avulsed tooth has been in contact with soil and if tetanus coverage is uncertain, refer to physician for a tetanus booster

- The goal for replanting still-developing (immature) teeth in children is to allow for possible revascularization of the pulp space.
- The risk of infection-related root resorption should be weighed up agains the chances of revascularization.
- Such resorption is very rapid in children.
- If revascularization does not occur, root canal treatment may be recommended.

Patient instructions

- Avoide participation in contact sports.
- Soft food for up to 2 weeks.
- Brush teeth with a soft toothbrush after each meal.
- Use a chlorhexidine (0.1%) mouth rinse twice a day for 1 week.

Follow-up

- For immature teeth, root canal treatment should be avoided unless there is clinical or radiographic evidence of pulp necrosis.
- Splint removal and clinical and radiographic control after 2 weeks.
- Clinical and radiographic control after 4 weeks, 3 months, 6 months, 1 year and then yearly thereafter.

Sixth condition treatment

- Open apex:
  Dry time longer than 60 min or other reasons suggesting non-viable cells.

Treatment

- Delayed replantation has a poor long-term prognosis.
- The periodontal ligament will be necrotic and not expected to heal.
- The goal in delayed replantation is to restore the tooth to the dentition for esthetic, functional , and psychological reasons and to maintain alveolar contour.
- The eventual outcome will be ankylosis and resorption of the root.

Procedures

- Remove attached non-viable soft tissue with gauze.
- Root canal treatment can be carried out prior to replantation or later.
- Administer local anesthesia.
- Irrigate the socket with saline.
- Examine the alveolar socket. if there is a fracture of the socket wall, reposition it with a suitable instrument.
- Replant the tooth slowly with slight digital pressure.
- Suture gingival lacerations if present.

- Verify normal position of the replanted tooth clinically and radiographically.
- Stabilize the tooth for 4 weeks using a flexible splint.
- Administer systemic antibiotics. Tetracycline is the first choice (Doxycycline 2x per day for 7 days at appropriate dose for patient age and weight).
- The risk of discoloration of permanent teeth must be considered before systemic administration of tetracycline in young patients (In many countries tetracycline is not recommended for patients under 12 years of age).
- In young patients Phenoxymethyl Penicillin (Pen V) or amoxycillin, at an appropriate dose for age and weight, is an alternative to tetracycline.

- If the avulsed tooth has been in contact with soil or if tetanus coverage is uncertain, refer to physician for evaluation of the need for a tetanus booster.

- To slow down osseous replacement of the tooth, treatment of the root surface with fluoride prior to replantation has been suggested (2 % sodium fluoride solution for 20 min.

Patient instructions

- Avoide participation in contact sports.
- Soft food for up to 2 weeks.
- Brush teeth with a soft toothbrush after each meal.
- Use a chlorhexidine (0.1%) mouth rinse twice a day for 1 week.

Follow-up

- Splint removal and clinical and radiographic control after 4 weeks.
- Clinical and radiographic control after 4 weeks, 3 months, 6 months, 1 year and then yearly thereafter.

- Ankylosis is unavoidable after delayed replantation and must be taken into consideration. In children and adolescents ankylosis is frequently associated with infraposition.
- Careful follow-up is required and good communication is necessary to ensure the patient and guardian of this likely outcome. Decoronation may be necessary when infraposition (> 1 mm) is seen

Oral burns

- Because of secondary wound healing and scar contracture, bums involving the perioral and intraoral tissues cause various degrees of microstomia.
- A common cause of oral burns is electrical trauma. The most frequently encountered electrical injury to children is the electrical burns of the mouth.
- These burns occur most often in children between 6 months and 3 years of age and are equally common among boys and girls.

Treatment

- Assessing the general physical status of a patient who has sustained an electrical burn to the mouth is the first priority.
- Subsequently, the extent of the burn is carefully evaluated and local measures are initiated, such as control of minor hemorrhage or conservative debridement of nonviable tissue.
- The immunization status of the patient must be ascertained, and tetanus toxoid or depot triple antigen (diphtheria-pertussis-tetanus vaccine) administered when appropriate.
- Many physicians prescribe a broad-spectrum antibiotic as prophylaxis. However, it may not be necessary or prudent to prescribe antibiotics in the absence of infection.

Development of occlusion

- ❑A sequences of developmental events occurs through transition from primary dentition to mixed then to permanent in orderly result in
- ❑Functional , esthetic and stable occlusion.
- ❑Any disruption ------ occlusion problems ------appropriate corrective **measures** are needed to restore the normal occlusion.
- ❑Passive space maintainer active tooth guidance or combination.
- ❑Series of forces affect position of tooth in dental arch , when altered lead to changes .

Early loss of primary teeth

- ✓It may affect alignment of perm.teeth
- ✓Opposing teeth supra erupt.
- ✓Distal teeth drift mesially
- ✓Mesial teeth drift distally

Altered tooth position may include:

1. Loss of arch length
2. Blocked or deflected eruption of perm teeth
3. Esthetic
4. Food impaction
5. caries and PD diseases

Arch length analysis

Size of both tooth and dental arch determine the status of permanent dental arch.----spacing or crowding.

Crowding is most common malocclusion.

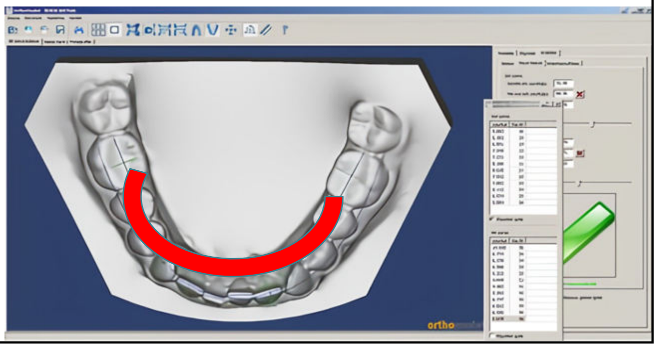
Arch length analysis is to

1. Estimate space adequacy
2. Predict how much space required for eruption and alignment in dental arch .

Nance Analysis

Compare space required and space available to arrive at arch length discrepancy. During mixed dentition Nance concluded:

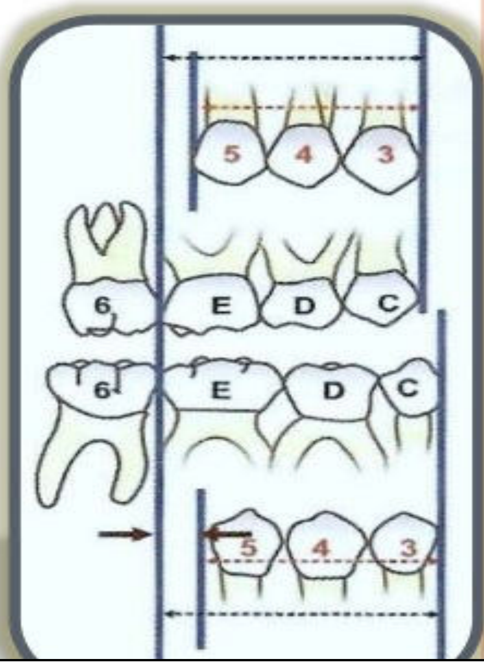
1- The length of D A from M surface of lower 6 to the M surface of the other lower 6 in opposite side is always shortened during transition from mixed to permanent dentition.



LEEWAY SPACE OF NANCE

Described by Nance in 1947

Maxilla: 0.9 mm/segment = 1.8 mm.
Mandible: 1.7 mm/segment = 3.4mm.



Method

1- measure the M-d width of the erupted perm teeth

2- measure the MD width of each unerupted tooth, cuspids and bicuspids from intraoral PA radiograph.

3. The total MD width of all teeth in each quadrant will indicate space required to accommodate perm teeth.

4- Using brass wire to measure the arch perimeter.

5- compare the space required and space available to determine the arch length discrepancy

Limitations

N.Analysis is seldom used , partly bcs procedure require complete set of P A radiographs (risk of radiation exposure).

The clinical reliability of other analysis do not based on x-ray is sufficient for major arch length inadequacies.

2- Moyer's mixed dentition analysis

There is high co-relation between sizes of different teeth in the same individual , thus making it possible to predict the size of unerupted tooth by looking at the teeth present in oral cavity.

It is also used during mixed dentition period.

Advantages

a. Minimal error and range of error is precisely known.
b. It can be done with equal reliability –beginner or expert.
c. Less time consuming.
d. No special equipment

It can be used for both arches

It based on correlation of tooth size through measuring a tooth or gp of teeth and predict accurately the size of other teeth in the same mouth.

Lower incisors erupt early accurately measured will be chosen to predict the size of the upper as well as lower posterior teeth .

If the predicted value is greater than available arch length ,crowding may be expected.

Method

1- measure the MD width lower incisors

2- measure the space for mand.cuspids and bicuspids from the D of aligned lateral incisor to mesial aspect of 1st perm molar

3- measure the space for the maxillary cuspids and bicuspids from D surface of aligned lateral incisor to M aspect of 1st perm molar.

4. using Moyer 's probability chart find out the sum total MD width of upper and lower bicuspids for the given sum width of the lower central and lateral incisors at 75 % probability

5- compare the space available and space required in all 4 quadrants to determine the arch length discrepancy.

Tanaka and Johnston Analysis.

The Tanaka and Johnston method of arch - length analysis is a variation of Moyer's analysis except that a prediction table is not needed .

It is also used during the mixed dentition period .

The method includes :

1. The sum of the widths of the mandibular permanent incisors is measured and divided by 2 .

2. For the lower arch , 10.5 mm is added to the result

3. For the upper arch , 11 mm is added to the result to obtain the total estimated widths of the canines and premolars .

For example , if the width of the lower incisors is 23 mm , divide by 2 and add 10.5 mm for the lower arch . The result is 22 mm compared with 22.2 mm obtained from Moyer's table .

4. One can them take these tooth mass preddictions and compare them with the total measured arch length and obtain any inadequacies in the arch length

5. If the result is positive , there is more space available in the arch than is needed for the unerupted teeth

6. If the result is negative , the unerupted teeth require more space than is available to erupt into ideal alignment

Advantages

a . The technique involves simple , easily repeated procedures and minimal material needs .

b . It does not use prediction charts .

c . This method does not require additional radiographs , but it tends to over predict slightly the widths of the unerupted premolar .

Also called as Bolton's tooth size ratio analysis .

Bolton analysis

This analysis is used during the permanent dentition period .

According to Bolton, a ratio exists between the mesio - distal widths of maxillary and mandibular teeth .

This analysis addresses tooth mass discrepancies between the maxillary and mandibular arches .

1. It can be used to compare the sum of the mesio - distal widths of the 12 maxillary teeth with that of the 12 mandibular teeth , first molar to first molar , and to compare the 6 maxillary teeth with the 6 mandibular teeth , canine to canine .

2. The Bolton analysis ratio measurement is as follows : a) If overall ratio is < 91.5 % , it indicates maxillary tooth material excess which can be determined by :

Sum of mandibular = sum of maxillary / 100 x 91.3 4 +

b) If overall ratio is > 91.5 % , it indicates maxillary tooth material lack which is determined by :

Sum of maxillary = sum of mandibular / 100 x 91.3

c) If the anterior ratio is < 77.2 % , it indicates maxillary anterior excess which is determined by :

Sum of mandibular = sum of maxillary / 100 x 77.2

d) If the anterior ratio is > 77.2 % , it indicates mandibular anterior excess which is determined by :

Sum of maxillary = sum of mandibular / 100 x 77.2

3. When a significant discrepancy with these ratios is noted , the clinician must assess where the tooth mass problem is located and decide on the best method to resolve it .

Thanks for attendance and listening

General anesthesia

(Hospital Based Dentistry)

General anesthesia (Hospital Based Dentistry):

- The use of general anesthesia for dental care in children is sometimes necessary for **safe, efficient, and effective care**.

- All available management techniques, including acceptable **restraints and sedation,** should be considered before the decision is made to use a general anesthetic.

Patients for whom general anesthesia has been the management technique of choice include the following:

1.Patients **unable to cooperate due to a lack of psychological or emotional** maturity and/or those who have a **physical, mental, or medically** compromising disability that precludes conscious sedation.

2.Patients with dental restorative or surgical needs for whom **local anesthesia is ineffective because of acute infection**, anatomic variations, or allergy.

3.The **extremely uncooperative**, fearful, anxious, physically resistant, or uncommunicative child or adolescent with substantial dental needs for whom there is **no expectation** that the behavior will soon improve.

4.Patients who have **sustained extensive orofacial or dental trauma** and/or require significant surgical procedures.

5.Patients **requiring immediate, extensive** comprehensive oral or dental needs.

6.Patients requiring dental care for whom the use of general anesthesia may protect the **developing psyche** and/or reduce **medical risks**.

If the benefits of the procedure outweigh the risk of anesthesia, there are few if any contraindications to general anesthesia.

However, when a concern about the medical condition exists, consultation with an anesthesiologist would be desirable.

Patients for whom general anesthesia is usually contraindicated include those with a medical contraindication to general anesthesia and healthy and cooperative patients with minimal dental needs.

Advantages of Hospital Dentistry:

1 No need for multiple visits.

2 All the treatments can be accomplished in 1 to 1.5 h.

3 Full mouth rehabilitation can be achieved under ideal circumstances.

Disadvantages:

1-Does not help in behavior management.

2-Does not teach the child about dentistry.

3-Risks of G.A.

4-Need to bring own staff and supplies.

5-Need to close office.

6-Expensive.

Four stages of anesthesia

1- Analgesia: Pt. is conscious, reflexes are intact.

2 Delirium

3. Surgical anesthesia

4. Respiratory paralysis

**Pt. unconscious in stage 2, 3 and 4

Ways to minimize the negative effects of G.A. on child and parents:

(1) Involving the child in the operating room tour,

(2) Allowing the child to bring along a favorite doll or toy,

(3) Giving pre-induction sedation,

(4) Providing a nonthreatening environment, thorough explanation of the procedure to the parents, mothers receiving G.A. were more stressed.

(5) Giving post-procedure sedation as needed,

(6) Allowing parents to rejoin their children as early as possible in the recovery area.

Requirements of hospital set up for dental treatment:

1 Well-equipped dental unit.

2 Experience, understanding hospital staff.

3 Availability of adequate operating room time and patients beds.

4- Readily available pediatrician.

5- Close proximity to the dentist's private office.

Steps in hospital procedure

Step one: Initial examination and parent discussion

At the time of initial dental appointment, a complete examination is performed and a detailed treatment plan is made which should be discussed with the parents concerning the need to perform the treatment under G.A. and the associated risks and expenses.

Step two: Consultations

Medical clearance for performing dental treatment under G.A. should be obtained after discussion with the child physician.

Step three: Patient admittance

Routinely treatment is performed in the morning and the patient can be admitted to the hospital the previous day evening, a consent form for anesthesia and dental procedure should be signed by the parents.

Step four: Preoperative procedure

Personal and medical record entry in the case sheet should be verified.

Review the nursing notes in the chart, to ensure that the patient's medical history and physical examination has been performed by the child's physician and recorded in the case sheet.

Step five: Preoperative preparation

All the **equipment** available in the hospital **should be checked** and any instruments or materials not provided or available for performing dental procedure must be **brought by the dental team.**

All the instruments must be sterilized.

For the assistance, experienced **dental surgery assistance** should be present.

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On the day of the dental operation the **dentist and his team** should **arrived** at the hospital at least **1 h. before** the scheduled dental operation.

All the personnel should change their clothing and wear operators' **gown, gloves, shoe covers or special shoes** provided inside the premises, head cover and surgical mask.

The instruments and materials should be prearranged on a trolley

Step six: Anesthesia induction

The patient will be pre-medicated and may or may not be able to converse.

After the anesthesiologist is ready with the monitoring devices and intravenous route, induction begins.

In younger children, induction may begin with a low percentage of anesthetic gases, however, in older children a barbiturate may be used.

The dentist **should request nasal intubation instead of oral intubation** for maintenance of the anesthetic state.

When the anesthesiologist has completed the placement of the nasal tube, the tube should be taped in place on the child's face and nose.

Some anesthesiologist will place an **ophthalmic ointment in the eyes and then tape them shut to prevent conjunctivitis and entry of foreign bodies in the eyes.**

Step seven: Dental treatment procedure

Dental surgery equipment is brought into place; **throat pack must be carefully placed**.

The patient's lips are lubricated by petroleum jelly to avoid drying, bite blocks should be used for mouth opening.

The following points should be remembered while selecting the type of treatment to
be rendered to the patient:

- Any two or three surfaces of caries should be restored with stainless steel crown.
- Any incipient interproximal or developmental precarious lesions should be restored.
- There should be no heroic pulp therapy done where **prognosis** is a **doubt**.
- **Indirect or direct pulp capping should be avoided.**
- When there is doubt as to pulpal status and the treatment choice perform the more radical one (e.g. when there is doubt regarding the health of the radicular pulp **perform pulpectomy instead of pulpatomy.**

The anesthesiologist must be informed as to the anticipated **finishing time** because the amount of gaseous anesthesia can be reduced and the patient will receive a high percentage of oxygen.

Rinse and thoroughly aspirate the mouth, gently **remove** the **throat pack** and **inspect** the area for **any debris**, the **anesthesiologist** will use an **aspirating tube to clear the nasal area, pharynx and throat** from any debris and accumulated fluids.

Step eight: post-operative procedure

Don't leave the operating room **until** the patient has **recover** and reacting, reassurance to the patient during this period is often very helpful for recovery.

The operative summary and **post -operative instructions are entered** in the patient's **case chart**.

Step nine: Discharge and follow up care

The patient's progress is reviewed and the patient is discharged.

Discharge orders should be written after checking the nurse's notes and the patient has been evaluated by the attending anesthesiologist and **physician**.

The discharge summary should include:

1- Date of admission

2- Diagnosis

3Procedure performed

4Complications 5- Discharge status

6Date of discharge

7Disposition

8Follow up

Pediatric Endodontics

Introduction

- The treatment of the dental pulp exposed by the caries process, by accident during cavity preparation, or even as a result of injury and fracture of the tooth has long presented a challenge in treatment.

- As early as 1756, Pfaff reported placing a small piece of gold over a vital exposure in an attempt to promote healing.

Endodontic therapy in pediatric dentistry

Pediatric endodontics is more challenging and difficult than adult endodontics due to the following reasons:

1. Behaviour management problems in children.
2. Limited opening of the mouth.
3. Complexities of the root canal system such as presence of fine and tortuous canals, accessory canals, lateral canals, anastomoses in primary molars.
4. Danger of injuring the permanent tooth bud.

Pulp Therapy in Pediatric Dentistry

- Reasons to preserve the integrity of the primary dentition are to
  1. Reduce the likelihood of mesial drift and the resultant malocclusion.
  2. Aid in mastication.
  3. Preserve a pulpally involved primary tooth in the absence of a succedaneous tooth.
  4. Prevent possible speech problems.
  5. Maintain esthetics.
  6. Prevent aberrant tongue habits
  7. Prevent the psychological effects associated with early tooth loss.
  8. Maintain normal eruption time of the succedaneous teeth.

Pulp Therapy in Pediatric Dentistry

- Before attempting pulp therapy in the primary dentition, the clinician should be familiar with the basic differences between primary and permanent root canal anatomy.

- As a review, the pulp performs five major functions:
  - Induction
    - Pulp participates in the induction and development of odontoblasts and dentin, which, when formed, induce enamel formation.
  - Formation
    - Odontoblasts form dentin. Dentin is formed continuously throughout the life of the tooth. Odontoblasts can also form a unique type of dentin in response to injury, such as occurs with caries, trauma, and restorative procedures.

Pulp Therapy in Pediatric Dentistry

- Pulp functions (continued)
  - Nutrition
    - Via dentinal tubules, pulp supplies nutrients that are essential for dentin formation and hydration.
  - Defense
    - Odontoblasts form dentin in response to injury, particularly when the original dentin thickness has been compromised by caries, wear, trauma, or restorative procedures.
    - Pulp also has the **ability** to elicit an inflammatory and immunologic response in an attempt to neutralize or eliminate invasion of dentin by caries-causing microorganisms and their byproducts.

Pulp Therapy in Pediatric Dentistry

- Pulp functions (continued)
  - Sensation
    - Through the nervous system, pulp transmits sensations mediated through enamel or dentin to the higher nerve centers.
- The pulp of the primary tooth is histologically similar to that of a permanent tooth.

- Normal pulp has the following histological components:
  - Lymph vessels
  - Blood vessels
  - Nerve tissue
  - Undifferentiated mesenchymal cells
  - Fibroblasts
  - Defense cells (neutrophils, lymphocytes, an macrophages)
  - Odontoblasts
  - Osteoclasts/Odontoclasts

Pulp Therapy in Pediatric Dentistry

-

- Characteristics of Pulp Tissue
  - Most similar to connective tissue
  - Apical vascularity is important to healing potential
  - Coronal tissue is more cellular
  - Apical tissue is more fibrous
  - Pulp becomes more fibrotic with age

Pulp Therapy in Pediatric Dentistry

- The healing potential of healthy pulp tissue is a function of:
  - The vascularity of the pulp.
  - The absence of cariogenic and inflammatory bacteria.
  - The cellular/structural integrity of the pulp/dentin/enamel complex.
  - The absence of a chemical and/or thermal insult.

DIAGNOSTIC AIDS IN THE SELECTION OF TEETH FOR VITAL PULP THERAPY

HISTORY OF PAIN:

- Presence or absence of pain.
- The history of a toothache should be the first consideration in the selection of teeth for vital pulp therapy.
- The pain may be caused by an accumulation of food within a carious lesion or severe toothache at night or spontaneous toothache of more than momentary duration.

Pulp Therapy in Pediatric Dentistry --Clinical Assessment of Pulp Status--

- History of Pain
  - Three important factors to consider
    - Duration (how long does it hurt?)
    - Frequency (how often does it hurt?)
    - Location (where does it hurt?)
- Types of Pain and Pulp Status
  - Irreversible → **Nonvital Therapy**
    - Spontaneous/Non-stimulated
    - Nocturnal
    - Constant

Pulp Therapy in Pediatric Dentistry
--Clinical Assessment of Pulp Status--

- Types of Pain and Pulp Status (continued)
  - Reversible → **Vital Therapy**
    - Thermal
    - Chemical
    - Intermittent
    - Stimulated
- Extent of Lesion
  - Location
  - Color
- Mobility
  - Differentiate between physiologic root resorption and pathologic root/bone loss

CLINICAL SIGNS AND SYMPTOMS

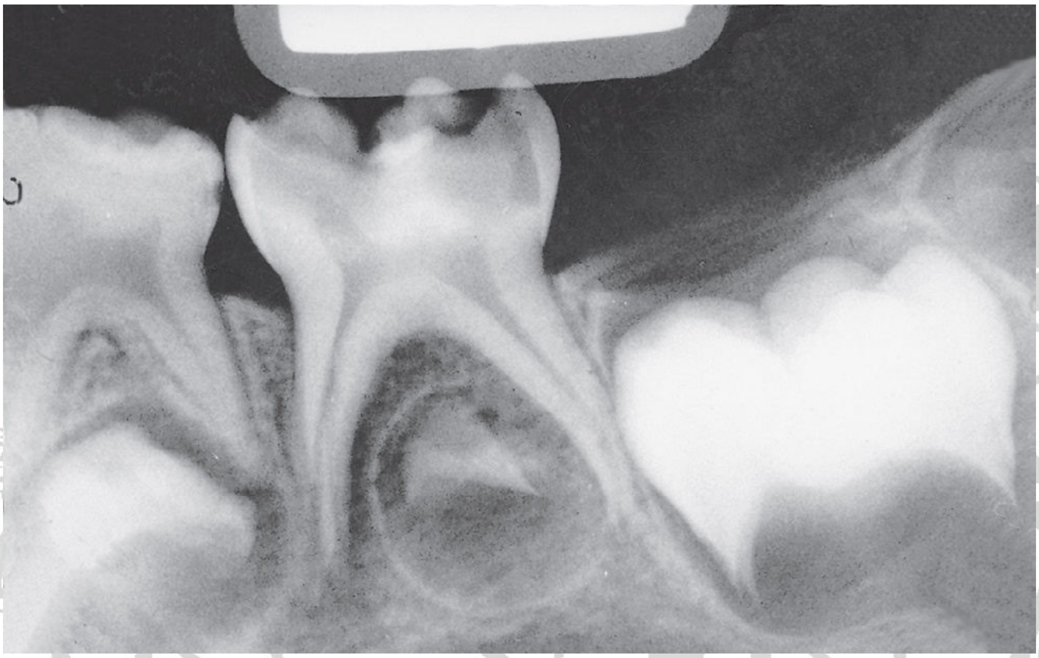
- A gingival abscess or a draining fistula associated with a tooth with a deep carious lesion.
- Abnormal tooth mobility.
- Sensitivity to percussion or pressure.
- Tooth mobility or sensitivity to percussion or pressure may be a clinical signal of other dental problems as well.

Pulp Therapy in Pediatric Dentistry

RADIOGRAPHIC INTERPRETATION

- Radiographic interpretation is more difficult in children than in adults.
- A recent x-ray film must be available to examine for evidence of periradicular or periapical changes.
- The proximity of carious lesions to the pulp cannot always be determined accurately in the x-ray film.
- What often appears to be an intact barrier of secondary dentin protecting the pulp may actually be a perforated mass of irregularly calcified and carious material, The pulp beneath this material may have extensive inflammation.

- Radiographic evidence of calcified masses within the pulp chamber is diagnostically important.
- If the irritation to the pulp is relatively mild and chronic….,
- If the irritation is intense and acute and if the carious lesion is developing rapidly,…..
- In this instance the pulp may attempt to form a barrier at some distance from the exposure site.
- These calcified masses are sometimes evident in the pulp horn or even in the region of the pulp canal entrance.



Calcified mass in the pulp chamber beneath the exposure site is associated with extensive inflammation of the pulp in the coronal area and in the pulp canals.

Pulp Therapy in Pediatric Dentistry --Clinical Assessment of Pulp Status--

- Pulp Testing
  - Percussion Testing is most reliable in primary teeth.
  - Thermal sensitivity Testing is also reliable in primary teeth.
  - Electrical Pulp Testing is ***NOT*** reliable in primary teeth (due to the patient's response).

PULP TESTING

- The value of the electric pulp test in determining the condition of the pulp of primary teeth is questionable, although it will give an indication of whether the pulp is vital.
- A complicating factor is the occasional positive response to the test in a tooth with a necrotic pulp if the content of the canals is liquid.
- Thermal tests have reliability problems in the primary dentition, too. The lack of reliability is possibly related to the young child's inability to understand the tests.

Thermal sensitivity

Necrotic pulp will not respond to cold or hot:

1. Cold test
   - Ice, dry ice, or ethyl chloride used to determine the response of a tooth to cold.
2. Heat test
   - Piece of gutta-percha or instrument handle heated and applied to the facial surface of the tooth.

Evaluation of thermal test results

Four distinct responses:

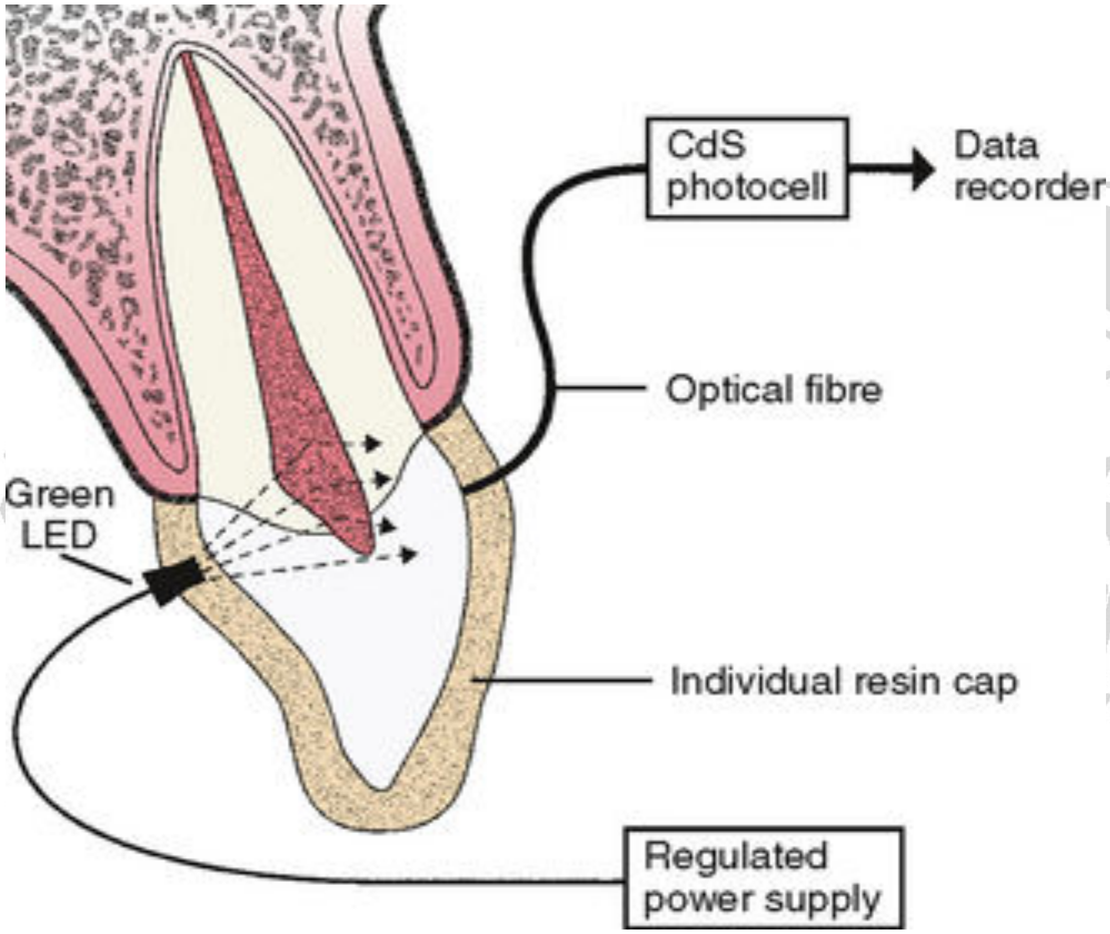
1. No response → **Non-vital pulp or false negative**
2. Mild response → **Normal**
3. Strong but brief → **Reversible**
4. Strong but lingering → **Irreversible**

Causes of false positives/negative

1. Calcified canals
2. Immature apex – usually seen in young patients
3. Trauma
4. Premedication of the patient – pulp sedated

- Two of these methods include the use of a laser Doppler flowmeter and transmitted-light photoplethysmography.
- These methods essentially work by transmitting a laser or light beam through the crown of the tooth; the signal is picked up on the other side of the tooth by an optical fiber and photocell.

- A study by Miwa et al suggests that the transmitted-light technique can detect pulpal blood flow in young permanent teeth and is thus applicable to the assessment of pulp vitality.'



Electric pulp testing

Delivers a small electrical stimulus to the pulp

Factors that may influence readings:

- Teeth with extensive restorations.
- Teeth with more than one canal.
- Dying pulp can produce a variety of responses.
- Moisture on the tooth during testing.
- Batteries in the tester may be weak.

Placement of a pulp tester.

PHYSICAL CONDITION OF THE PATIENT

- In seriously ill children,……..
- Occasionally, pulp therapy for a tooth of a chronically ill child may be justified, but only after careful consideration is given to the prognosis of the child's general condition.
- Children with conditions that render them susceptible to subacute bacterial endocarditis or those with nephritis, leukemia, …….

Pulp Therapy in Pediatric Dentistry
--A Review--

EVALUATION OF TREATMENT PROGNOSIS BEFORE PULP THERAPY

The diagnostic process of selecting teeth are two dimensions:

- First, the dentist must decide that the tooth has a good chance of responding favorably to the pulp therapy procedure indicated.
- Second, the advisability of performing the pulp therapy and restoring the tooth must be weighed against extraction and space management.

Pulp Therapy in Pediatric Dentistry
--Vital Pulp Therapy--

- The treatment objectives for *vital pulp therapy* include:
  - Eradication of infection.
  - Maintenance of tooth/teeth in a state of health.
  - Preservation of space for underlying permanent tooth/teeth.

VITAL PULP EXPOSURE

- The appropriate procedure should be selected only after a careful evaluation of the patient's symptoms, results of diagnostic tests, and conditions at the exposure site.
- The health of the exposed dental pulp is sometimes difficult to determine, especially in children, and there is often lack of conformity between clinical symptoms and histopathologic condition.

SIZE OF THE EXPOSURE AND PULPAL HEMORRHAGE

- The size of the exposure, the appearance of the pulp, and the amount of bleeding are valuable observations in diagnosing the condition of the primary pulp.
- The most favorable condition for vital pulp therapy is the small pinpoint exposure surrounded by sound dentin.
- However, a true carious exposure, even of pinpoint size,…………… inflammation of the pulp………………… directly related to the size of the exposure.

- A large exposure……… when a mass of leathery dentin is removed……………………is often associated with……………… a watery exudate or pus at the exposure site…………. Advanced degeneration and often of internal resorption in the pulp canal.
- Excessive hemorrhage at the point of carious exposure or during pulp amputation……………. … hyperemia and generalized inflammation of the pulp………. endodontic therapy or extraction of the tooth

Pulp Therapy in Pediatric Dentistry
--Vital Pulp Therapy--

- Techniques of Vital Pulp Therapy

1. Indirect pulp cap/treatment (IPT) – Gross Caries Removal
2. Direct pulp cap/treatment (DPT)
3. Pulpotomy (formocresol)
4. Pulpotomy (other categories of medicaments)
5. Pulpotomy (non-pharmacotherapeutic)
6. Partial pulpectomy

Pulp Therapy in Pediatric Dentistry
--Vital Pulp Therapy--

- Indirect Pulp Cap/Treatment (IPT)
  - Definition: The procedure in which only the gross caries is removed from the lesion and the cavity is sealed for a time with a biocompatible material with no clinical exposure of the pulp with the objective of generating reparative dentin formation beneath the carious lesion is referred to as indirect pulp treatment..
  - Indicated when the chance of pulp exposure with complete caries removal is ≥ 75 %.

- Place calcium hydroxide (Dycal) or other medicament (MTA) over remaining caries.

- The temporary restoration and marginal seal are key to success.

- Can be done in primary and permanent teeth.
- The procedure reduces the risk of direct pulp exposure and preserves pulp vitality.
- Most clinicians are successfully practicing indirect pulp treatment without reentry after the initial caries excavation.

VITAL PULP THERAPY TECHNIQUES

- The pulp-capping procedure has been widely practiced for years and is still the favorite method of many dentists for treating vital pulp exposures.

- It is generally pulp-capping procedures ……….small exposures ………….. by trauma or during cavity preparation ………… true pinpoint carious exposures that are surrounded by sound dentin

Pulp Therapy in Pediatric Dentistry
--Vital Pulp Therapy--

- Primary Tooth Direct Pulp Cap/Treatment
  - Contraindicated for carious pulp exposures
  - Valid for small mechanical or traumatic exposures
  - Optimal chance for favorable prognosis depends on case selection
  - At UKCD, direct pulp caps on primary teeth are not considered ideal or acceptable treatment

- Permanent Tooth Direct Pulp Cap/Treatment
  - Valid for carious lesions in close proximity to pulp but not carious exposures
  - Valid for mechanical or traumatic exposures
  - Case selection is critical

Pulp Therapy in Pediatric Dentistry
--Vital Pulp Therapy--

- Pulpotomy (Pharmacotherapeutic)
  - Objectives
    1. Preserve vitality of radicular pulp
    2. Amputate infected coronal pulp
    3. Treat remaining pulp with medicament
    4. Neutralize residual infectious process
    5. Avoid dystrophic pulpal change
    6. Avoid breakdown of periradicular area
  - Indications
    1. Mechanical or carious exposure
    2. Inflammation limited to coronal pulp
    3. Absence of spontaneous pain
    4. Absence of swelling or alveolar abscess formation

Pulp Therapy in Pediatric Dentistry
--Vital Pulp Therapy--

- Pulpotomy (continued)
  - Contraindications
    - History of unprovoked toothache
    - Presence of fistula or swelling
    - Evidence of necrotic/irreversibly damaged pulp
    - Uncontrolled pulpal hemorrhage
    - Periapical or bifurcation radiolucency
    - Pathologic resorption of pulp
    - Dystrophic calcification
    - Primary root length less than 2/3

Pulp Therapy in Pediatric Dentistry
--Vital Pulp Therapy--

- Formocresol Pulpotomy
  - Success Rate
    - 62 to 97% (depending on the study and follow up protocol)
    - Clinical Success > Radiographic Success > Histological Success
    - Formocresol is the standard against which pulpotomy alternatives are rated.

Pulp Therapy in Pediatric Dentistry
--Vital Pulp Therapy--

- Actions of Formocresol in Pulpotomy Technique
  - Fixation with progressive fibrosis
    - Acidophilic zone: fixation
    - Pale staining zone: atrophy
    - Broad zone of inflammatory cells
  - Bactericidal
  - No dentinal bridging

Pulp Therapy in Pediatric Dentistry
--Vital Pulp Therapy--

- Time of Formocresol Application
  - Direct relation between application time and inflammation
  - One minute produces less inflammation than 5 minutes
  - Neither time shows inflammation in apical third
- Prevalence of Formocresol Use
  - The majority of pediatric dentists worldwide (76.8%) utilize full-strength formocresol or the one-fifth dilution as the preferred pulpotomy medicament for vital primary teeth (Fuks, 1991).

Pulp Therapy in Pediatric Dentistry
--Vital Pulp Therapy--

- Formocresol Pulpotomy Technique (Primary Tooth)

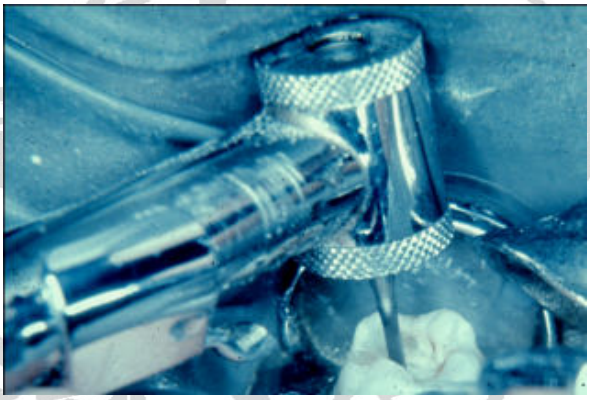
1. Identification/Diagnosis of offending tooth based upon diagnostic criteria (history, symptoms, radiographic and clinical evaluation)

2. Achieve adequate anesthesia.

Pulp Therapy in Pediatric Dentistry
--Vital Pulp Therapy--

- Formocresol Pulpotomy Technique (continued)

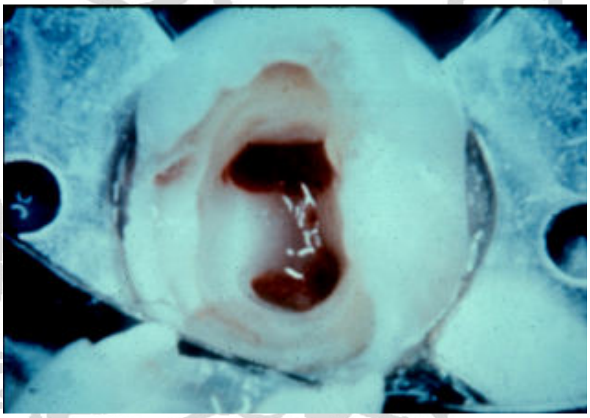
3. With a slow speed hand piece, remove caries



Pulp Therapy in Pediatric Dentistry
--Vital Pulp Therapy--

- Formocresol Pulpotomy Technique (continued)

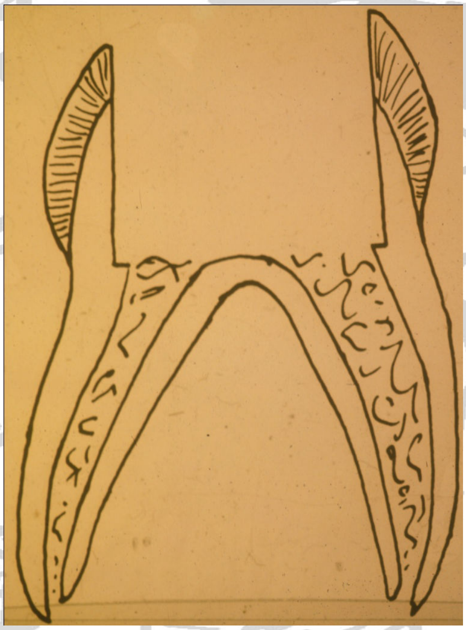
    4. With a high speed hand piece , remove only **roof of pulp chamber** exposing all canals



Pulp Therapy in Pediatric Dentistry
--Vital Pulp Therapy--

- Formocresol Pulpotomy Technique (continued)

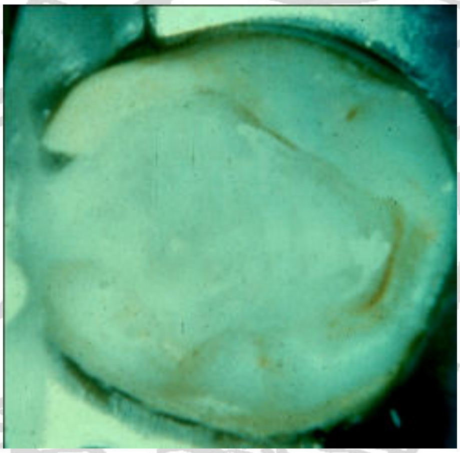
    5. Remove all coronal pulp with a slow speed hand piece and round bur. Remove all vital tissue “ledges” near canal orifices.



Pulp Therapy in Pediatric Dentistry
--Vital Pulp Therapy--

- Formocresol Pulpotomy Technique (continued)

6. After all coronal pulp tissue has been removed, wet 2-3 cotton pellets with formocresol and squeeze between 2 x 2 gauze to remove the excess.
7. Place cotton pellets in the pulp chamber (making sure that they contact the pulp tissue in the coronal portion of the canals) for 5 minutes.



Pulp Therapy in Pediatric Dentistry
--Vital Pulp Therapy--

- Formocresol Pulpotomy Technique at UKCD (continued)

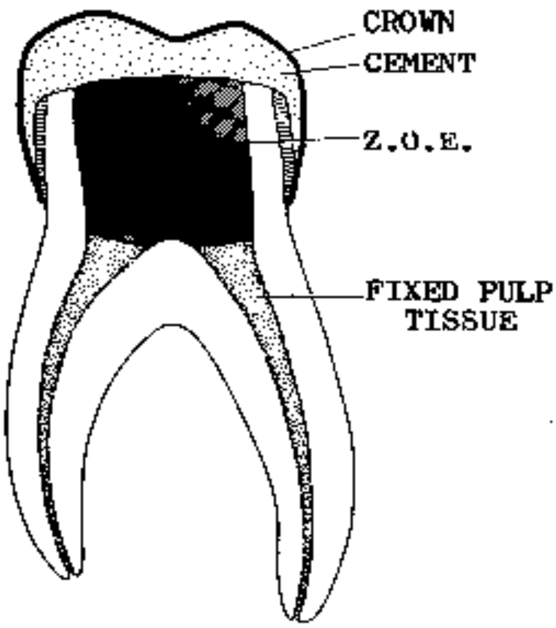
8. If hemorrhage has ceased, place a thick mix of zinc oxide and eugenol paste into the chamber (use an amalgam carrier and a cotton pellet to ensure proper condensation/placement).

Pulp Therapy in Pediatric Dentistry
--Vital Pulp Therapy--

- Formocresol Pulpotomy Technique (continued)

9. Complete the planned restoration.

A tooth having had vital pulp therapy will require full coverage protection (i.e. Stainless Steel Crown) for long-term success.



Pulp Therapy in Pediatric Dentistry
--Vital Pulp Therapy--

- Permanent Tooth Pulpotomy
  - **Objectives**
    - Maintain vitality of radicular pulp
    - Achieve root-end closure (Apexogenesis)
    - Eliminate need for apicoectomy
    - Facilitate GP obturation with apical stop

Pulp Therapy in Pediatric Dentistry
--Non-Vital Pulp Therapy--

- Objectives of Non-Vital Pulp Treatment (Primary Teeth)
  - Maintain tooth free of infection
  - Achieve biomechanical cleansing and canal obturation
  - Promote physiologic resorption
  - Maintain space and function

Pulp Therapy in Pediatric Dentistry
--Non-Vital Pulp Therapy--

- Pulpectomy Indications/Considerations
  - Strategic importance of tooth (2nd primary molar with unerupted 6-yr molar)
  - Sufficient remaining tooth structure
  - Poor chance of vital pulp treatment success
  - Adequate remaining root
  - Cooperative patient

Pulp Therapy in Pediatric Dentistry
--Non-Vital Pulp Therapy--

- Pulpectomy Contraindications
  - A non-restorable tooth
  - A tooth with a mechanical or carious perforation of the floor of the pulp chamber
  - Pathologic root resorption involving more than one-third of the root
  - Pathologic loss of bone support resulting in loss of the normal periodontal attachment
  - The presence of a dentigerous or follicular cyst
  - Radiographically visible internal root resorption

Pulp Therapy in Pediatric Dentistry --Non-Vital Pulp Therapy--

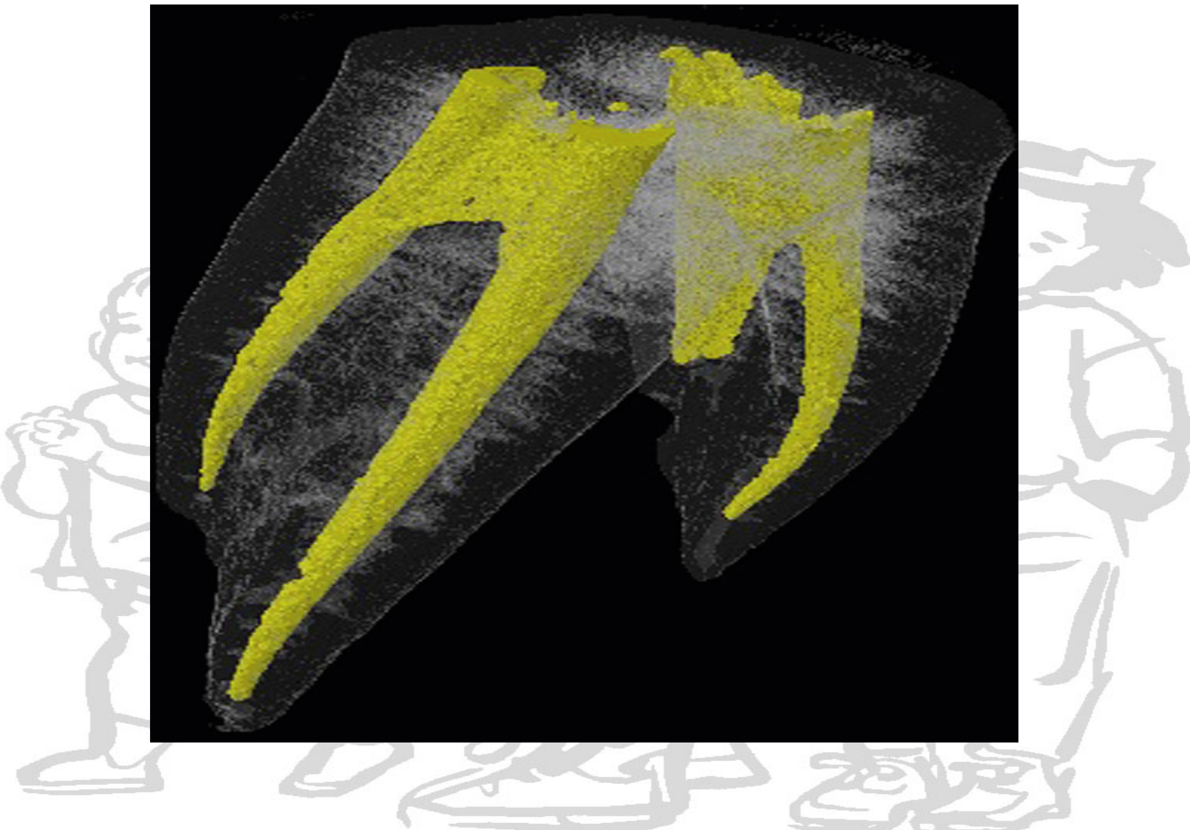
- Pulpectomy Technique

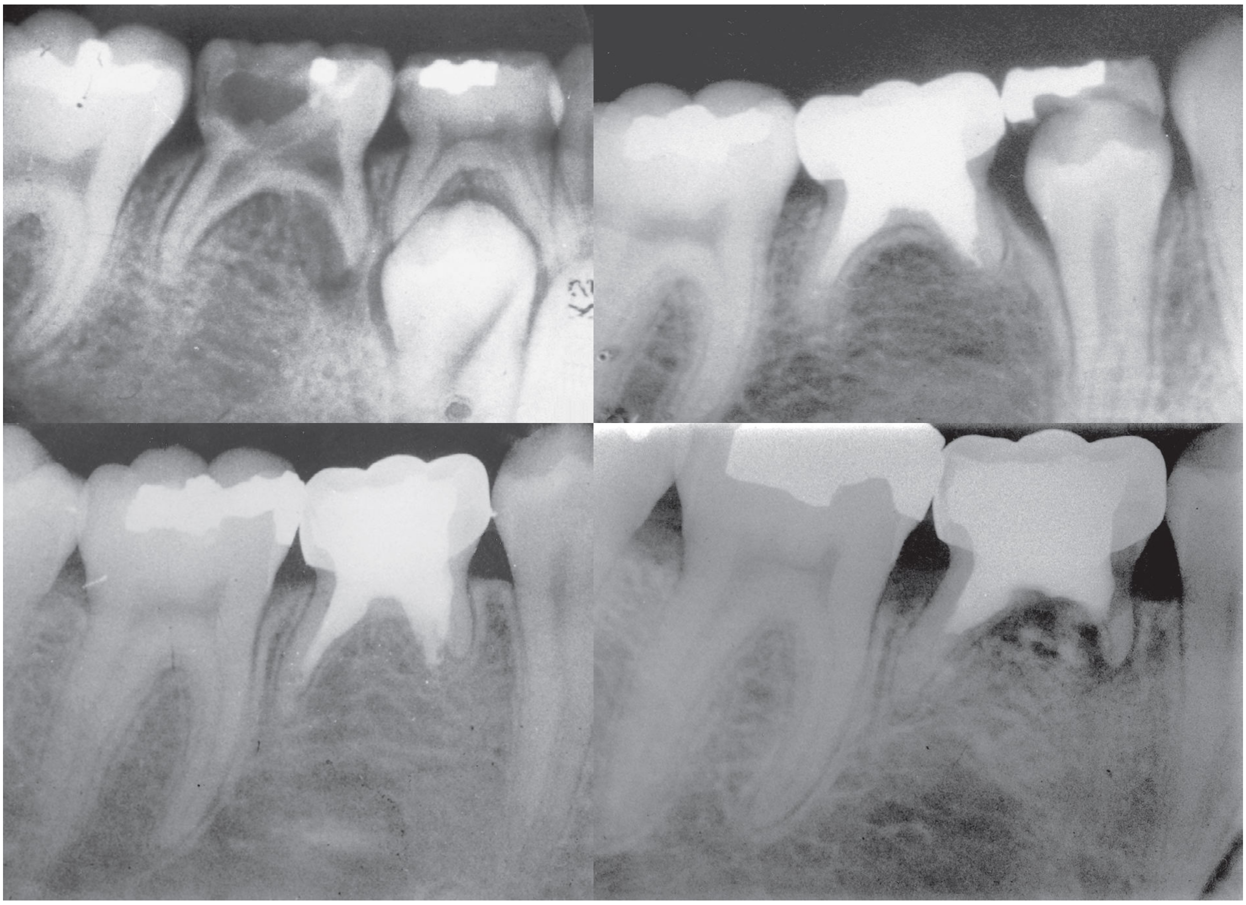
1. Achieve adequate anesthesia and rubber dam isolation.
2. Remove all caries.
3. Remove the roof of the pulp chamber with a high-speed handpiece.
4. Amputate the coronal aspect of the pulp tissue with a large round bur in a slow-speed handpiece.
5. The remaining pulp tissue occupying the root canals is removed using endodontic files at a predetermined working length, approximately 1 to 2 mm short of the root apices.
6. The canals should be enlarged several sizes beyond the size of the first file that fits snugly into the canal to a minimum final size of 30 to 35.
7. Throughout root canal instrumentation, the canals should be irrigated with sodium hypochlorite to aid in debridement.

Pulp Therapy in Pediatric Dentistry --Non-Vital Pulp Therapy--

- Pulpectomy Technique (continued)

8. Dry the canals with sterile paper points.
9. The canals are filled with a treatment paste (Zinc Oxide/Eugenol using a pressure syringe.
10. The tooth is restored with a stainless steel crown.





Pulp Therapy in Pediatric Dentistry
--Non-Vital Pulp Therapy--
Apexogenesis and Apexification

- It is accepted that vital pulp therapy is the treatment of choice for immature teeth (incompletely developed apices).
- The treatment of pulpal injury during the period of root maturation provides a significant challenge for the clinician.
- Depending on the vitality of the affected pulp, apexogenesis or apexification may be considered

Apexogenesis

- is "a vital pulp therapy procedure performed to
- encourage continued physiological development and formation of the root end in vital, young, permanent teeth can be accomplished by implementing the appropriate vital pulp therapy(i.e. indirect pulp treatment, direct pulp capping, partial pulpotomy) for teeth having mechanical or traumatic pulp exposure

Pulp Therapy in Pediatric Dentistry
--Non-Vital Pulp Therapy--

Apexification

- is "a method to induce a calcified barrier in a root with an open apex or the continued apical development of an incomplete root in a tooth with a necrotic pulp.

Pulp Therapy in Pediatric Dentistry
--Non-Vital Pulp Therapy--

- Apexification (Young Permanent Teeth)
  - Apical closure of an incompletely formed root
  - Implemented when apexogenesis has failed
  - Necrotic tissue removal short of the apexification site
  - Agent is placed in canals to achieve closure/apical stop

Procedure:

1. Administration of local anesthesia.
2. Application of rubber dam.
3. Extirpation of pulp can be done using barbed broaches.
4. Remove the debris from the coronal portion of the crown of the canal using reamers and large files. Clean the canal and irregate it with irrigating solution like normal saline.

5. Dry the canal with absorbent points.
6. Insert calcium hydroxide non setting type (most frequently used) incrementally in the canal, keeping it 2-3 mm short of the apex followed by plugging it with endodontic pluggers.

7. Restoration of the tooth temporarily with glass ionomer or composite to prevent fracture.

- Apexification Recall Schedule
- Recall every six monthes.
  - Calcium Hydroxide Rotation
    - 3-6 month intervals

Pulp Therapy in Pediatric Dentistry
--Non-Vital Pulp Therapy--

- Action of Calcium Hydroxide in Apexification
  - Bactericidal
  - Low grade irritation inducing hard tissue barrier formation
  - Dissolves necrotic debris
- Forms of Calcium Hydroxide
  - Caliscept
  - Self-mixed (CaOH + sterile water or local anesthetic)

Pulp Therapy in Pediatric Dentistry
--Non-Vital Pulp Therapy--

- Evaluation of Success
  - Asymptomatic
  - Radiographic absence of pathology
  - Continued root development
  - Hard tissue barrier at apex
  - Responsive pulp

Thanks

BEHAVIOR MANAGEMENT
AAPD 2003
Behavior Guidance

- Behavior Guidance AAPD 2003

- In its clinical guidelines to emphasize that the goals are not to "deal with " a child's behavior but rather to **enhance communication** and partner with the child and parent **<u>to promote a positive attitude and good oral health</u>**.

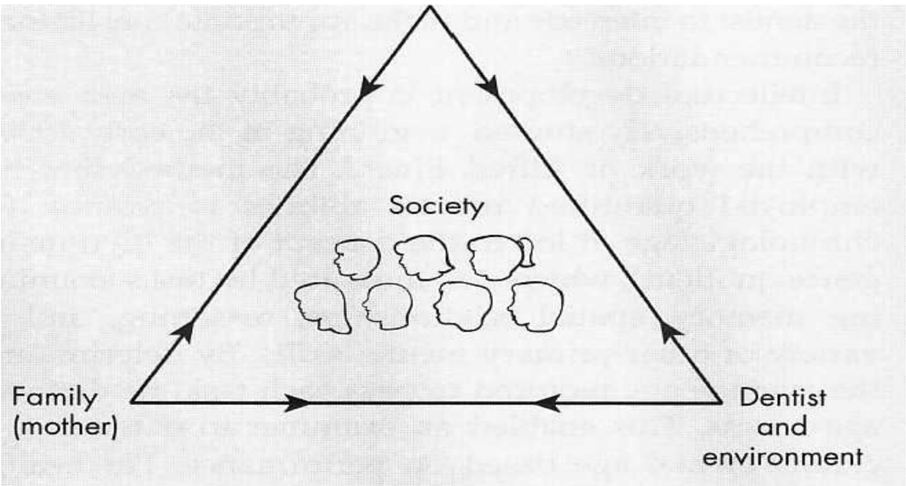
- Logically, children are keys to the future.

- 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
- *Recently, society has* been centered in the triangle. Management methods acceptable to society and the litigiousness of society have been factors influencing treatment modalities

Pediatric dentistry treatment triangle.

Child patient



PEDIATRIC DENTAL PATIENTS

- Child development involves the study of all areas of human development from beginning through young adulthood.
- It involves more than physical growth, which often implies only an increase in size.
- Development implies a sequential unfolding that may involve changes in size, shape, function, structure, or skill.

Physical Developmental Milestones

DEVELOPMENTAL TASK	AVERAGE AGE	NORMAL RANGE
Focuses on light	2 wk	1-4 wk
Lies on stomach, lifts chin	3 wk	1-10 wk
Birth weight doubles	6 mo	5-7 mo
Rolls from back to stomach	7 mo	5½ -11 mo
Sits alone	7 mo	6-11 mo
Stands with support	10 mo	7½ -14 mo
Stands alone	13½ mo	9-18 mo
Walks alone	14 mo	10-20 mo
Bowel control attained	18 mo	1-2½ yr
First menstruates	12 yr, 9 mo	10-17 yr

- From these milestones, ranging from infancy through early childhood, two pieces of information are derived:
- (1) the average age at which a child acquire particular skills and
- (2) the normal range of ages at which a skill is acquired

Age-Related Psychosocial Traits and Skills for 2- to 5-Year-Old Children*

TWO YEARS

Geared to gross motor skills, such as running and jumping

Likes to see and touch

Very attached to parent

Plays alone; rarely shares

Has limited vocabulary; shows early sentence formation

Becoming interested in self-help skills

THREE YEARS

Less egocentric; likes to please
Has very active imagination; likes stories
Remains closely attached to parent

FOUR YEARS

Tries to impose powers
Participates in small social groups
Reaches out—expansive period
Shows many independent self-help skills
Knows "thank you" and "please"

FEAR

Fear is primary emotion for survival against danger, which is acquired soon after birth.

TYPES OF FEAR:-

1-objective fear
2-subjective fear

OBJECTIVE FEAR:-

They are the respons to stimuli that are felt, seen, heard, smelt or tasted and are not liked or accepted.

SUBJECTIVE FEAR:-

These are based on the feelings and attitudes that have been suggested to child by others about dentistry without the child having had the experience personally.

PEDIATRIC DENTAL CLINIC

FACTORS INFLUENCING CHILD'S BEHAVIOR

1-FACTOR INVOLVING THE CHILD:

A. Growth and development
B. I.Q of child
C. Past dental experience
D. Social and adaptive skill
E. Position of child in the family

2- FACTORS INVOLVING THE PARENTS:-

A. Family influence
B. Parent-child relationship
C. Maternal anxiety
D. Attitude of parents to dentistry

3- FACTORS INVOLVING THE DENTIST

A. Appearance of the dental office

B. Personality of the dentist

C. Time and length of appointment

D. Dentist's skill and speed

E. Use of fear promoting word

F. Use of subtle, flattery, praise and reward

Frankl Behavioral Rating Scale

- The scale divides observed behavior into four categories, ranging from definitely positive to definitely negative. Following is a description of the scale:
- ***Rating 1:*** *Definitely Negative. Refusal of treatment,* forceful crying, fearfulness, or any other overt evidence of extreme negativism.

- ***Rating 2:*** *Negative. Reluctance to accept treatment,* uncooperativeness, some evidence of negative attitude but not pronounced (sullen, withdrawn).
- ***Rating 3****: Positive. Acceptance of treatment; cautious* behavior at times; willingness to comply with the dentist, at times with reservation, but patient follows the dentist's directions cooperatively.
- ***Rating 4****: Definitely Positive. Good rapport with the* dentist, interest in the dental procedures, laughter and enjoyment.

CLASSIFICATION OF CHILDREN'S BEHAVIORS

1- CO-OPERATIVE BEHAVIOR:-

Reasonably relaxed, have minimal apprehension and can be treated by a straight forward behavior shaping approach.

2- LACKING CO-OPERATIVE BEHAVIOR:-

-This behavior is contrast to co-operative child.

-Includes very young child (<2.5) or with specific debilitating or handicapping conditions.

3- POTENTIALLY CO-OPERATIVE BEHAVIOR

- Differs from a child lacking cooperative ability in that this child is able to cooperate and is physically and medically fit.
- Potentially cooperative group are further categorized as follows:

A- Uncontrolled behavior:-

- Seen in 3-6 years.
- Tantrum may begin in the reception area or even before.
- Tears, loud crying, physical lashing out and flailing of hands and legs all suggestive of a state of acute anxiety or fear.

B- Defiant behavior:-

- Can be found in all ages, more typical in the elementary school group.
- Distinguished by "I don't want to" or "I don't have to" or "I wont".
- Once won over, these children frequently become highly cooperative.

C- Timid behavior:-

- If they are managed incorrectly, their behavior can deterioate to uncontrolled.
- May be from an overprotective home environment or may live in an isolated area having little contact with strangers.
- Needs to gain self confidence of the child.

D- Tense cooperative behavior:-

- Accept treatment, but are extremely tense.
- Tremor may be heard, when they speak.

E- Whining behavior:-

- Thay do not prevent treatment, but whine throughout the procedure.
- Great patience is required while treating such children.

CONTROLLED BEHAVIOR

UNCONTROLLED BEHAVIOR

TIMID BEHAVIOR

Behavior management can be achieved by basically two methods:-

1- Non pharamcological methods.

A- Preappointment behavior modification.

B- Communication.

C- Behavior shaping.

Tell-show do technique.

Modeling.

D- Behavioral management techniques.
- Audioanalgesia
- Aversive conditioning
- Implosion therapy
- Retraining

2- Pharmacological methods.
A- Sedative
B- Hypnotic
C- General anesthesia
D- Tranquilizer

Preappointment behavior modification

Various methods used for preappointment behavior modification includes letters, films and videotaps.

COMMUNICATION

The hallmark of successful dentist in managing children is his ability to communicate with them and win their confidence.

BEHAVIOR MANAGEMENT
Part II

TELL-SHOW DO TECHNIQUE

In this technique the child is told about the treatment, showed the instruments and then the treatment is performed.

MODELING

This prosedure involves, allowing patient to observe one or more model who demonstrate appropriate behavior in a particular situation.

- **Word Substitutes for Explaining Procedures to Children**

DENTAL TERMINOLOGY WORD SUBSTITUTES

- Rubber dam Rubber----- raincoat
- Sealant ---------------------Tooth paint
- Fluoride varnish -------Tooth vitamins
- Air syringe -------------Wind gun
- Water syringe------- Water gun
- Suction--------------- Vacuum cleaner
- Alginate -------------Pudding
- High speed ---------Whistle
- Low speed----------- Motorcycle

TELL-SHOW –DO TECHNIQUE

MODELING

Distraction

- Films,   e.g Tom and Jerry vedio, games talking tom on I pads and tabs
- Conversation
- Triple syringe

Communication

- **Establishment of Communication**

Generally, verbal communication with younger children is best initiated with complimentary comments, followed by questions that elicit an answer other than *yes or no.*

Establishment of Communicator

Message Clarity.

Voice Control

- Sudden and firm commands are used to get the child's attention or to stop the child from whatever is being done.
- Monotonous, soothing conversation is supposed to function like music

- **Multisensory Communication.**
- In verbal communications, the focus is on *what to say or how it is said.*
- However, **nonverbal messages** also can be sent to patients or received from them.
- ***Body contact*** can be a form of nonverbal communication.

- **Problem Ownership**
- **Active Listening.**
- **Appropriate Responses**

BEHAVIOR SHAPING

- Behavior shaping is a common non-pharmacologic technique.

- *Definition*
- procedure which very slowly develops behavior by reinforcing successive approximations of the desired behavior until the desired behavior comes to be

- The following is an outline for a behavior-shaping model:
- 1. State the general goal or task to the child at the outset.
- 2. Explain the necessity for the procedure. A child who understands the reason is more likely to cooperate.
- 3. Divide the explanation for the procedure.
- 4. Give all explanations at a child's level of understanding.
- 5. Use successive approximations

RETRAINING

If a child have an unpleasant experience in the previous dental office, the child still tends to generalized that an unpleasant event will occur in his new dental office also. This is non as stimulus generalization. To remove this the dentist has demonstrate a difference and create new stimulus which is pleasant and replaces the old.

AVERSIVE CONDITIONING

1- Hand over mouth technique.

Used for children with sufficient maturity to understand simple verbal commands.

Contraindicated in immature frightened, or the child with a serious physical, mental or emotional handicap.

- The technique fits the rules of learning theory: maladaptive acts (screaming, kicking) are linked to restraint (hand over mouth),
- and cooperative behavior is related to removal of the restriction and the use of positive reinforcement (praise).

HAND OVER MOUTH TECHNIQUE

PRACTICAL CONSIDERATIONS

- ***Scheduling.***
- Many children become restless and tired when faced with long delays in a reception area.
- Appointment time .
- Appointment length.

Short appointments ranged from 16 to 30 minutes.

- ***Parent-Child Separation***

- ***Parent-Child Separation***
- Excluding the parent from the operating room can contribute toward development of positive behavior on the part of the child

- The policy of requiring the parent to remain in the reception room could be justified for many of the following reasons

1. The parent often repeats orders, which creates an annoyance for both the dentist and the pediatric patient.
2. The parent injects orders, becoming a barrier to development of rapport between the dentist and the child.
3. The dentist is unable to use voice intonation in the presence of the parent because he or she may be offended.
4. The child divides attention between the parent and dentist.
5. The dentist divides attention between the parent and child.

Tangible Reinforcements

- **Giving gifts to children**.
- If the gift has a dental significance (such as a toothbrush kit), so much the better.
- Various trinkets in a toy chest should be use as tokens of affection for children, not as bribes.
- "A bribe is promised to induce the behavior.
- A reward is recognition of good behavior after completion of the operation, without previously implied promise."

- **Dental Dress**
- If a child had poor experiences previously (whether with a physician or a barber), it is possible that these fears could be generalized to the dental situation.
- Association of Pedodontic Diplomates suggested that enough children react unfavorably to white uniforms that many pediatric dentists have taken to wearing colored clothing.

LIMITATIONS

- Children today differ
- Parenting also has changed.
- Two decades ago, when "father" came to the office, it usually meant that the child had a behavior problem and "father" was the enforcer.
- If a child misbehaved, the father might have spanked the child.
- Today, this is unacceptable in many families.

- Dental students rarely have the opportunity to use the technique.
- Because dental practitioners are encouraged to perform behavior management consistent with their educational training and clinical experience,

- The corners of the pediatric treatment triangle have been changing rapidly, and this influences the practice of dentistry for children.
- Recognizing these changing times, the Clinical Affairs Committee of the American Academy of Pediatric Dentistry has produced guide-lines for behavior management.
- The techniques recommended in this chapter conform to these guide-lines

Physical restraints or Immobilizations techniques

- Dental staff and parent help
- Papoose board
- Pedi wrap
- Mouth probes different sizes and shapes

PAPOOSE BOARD

PEDI WRAP

MOUTH PROP

- **Pharmacological behavior management**

Pain management for children

- The proper treatment of pain in children is often inadequate and involves misconceptions that:
- • Children experience less pain than adults.
- • Neonates do not feel or remember pain.
- • Pain is character-building for children.
- • Children cannot localize or describe their pain.

Measurement of pain in children

- There are individual circumstances for each child that affect how they respond to pain and, subsequently, how that pain will be assessed. These include:

1. • Age and developmental level.
2. • Social and medical factors.
3. • Previous pain experience.

- Observation of non-verbal signals and behaviour is important. A quiet, withdrawn child may be in severe pain.

Methods for paediatric pain assessment include

1 • Observer-based techniques which are useful in pre-verbal children, i.e. scales that measure blood pressure, crying, movement, anxiety and verbal expression/body language.

2 • Self-reporting of pain is valid in children over 4–5 years of age.

3 • Children with severe developmental delay can be extremely difficult to assess

- regarding pain, even by their regular carers. Unusual changes in behaviour from normal may represent an expression of pain.

Analgesia prior to procedures (preventive analgesia)

• Poor analgesia for an initial procedure in children can diminish the efficacy of analgesia for subsequent similar procedures.

- Ensure adequate systemic and/or local analgesia prior to the commencement of a procedure.
- Appropriate time for absorption and effect should be allowed.
- • A stronger analgesic may be required for the procedure with regular simple analgesics for the postoperative period.

Routes of administration

1 • Oral analgesia is the preferred route of administration in children. Absorption for most analgesics is generally rapid – within 30 min.

2 • Attention to formulation suitable to the individual child can help greatly with compliance, i.e. liquid versus tablets in younger children, pleasant taste.

3 • The rectal route of administration can be valuable in a child not tolerating oral fluids.

4 • Intranasal or sublingual administration of opioids has been described as an alternative to injection, which avoids first pass metabolism by the liver.

Parenteral paracetamol is now available.

5 • Repeated intramuscular injection should be avoided in children

- In obese children, the dosage given should be based on ideal body weight
- **Examples**
- Paracetamol
- Non-steroidal anti-inflammatory drugs (NSAIDs)
- Aspirin
- Ibuprofen
- Codeine
- Oxycodone
- Morphine
- Tramadol

Discharge criteria

- Many drugs that are used for combination sedation and analgesia in children have a long half-life of several hours.
- Discharge criteria should be used to assess that the child is well enough prior to discharge from a free-standing facility.

- Criteria should include:

1. • Self-maintenance of airway.
2. • No ataxia, i.e. can walk properly
3. Tolerating oral fluids.
4. • Discharge in the care of a responsible adult with appropriate information about after-hours contact if a problem arises.

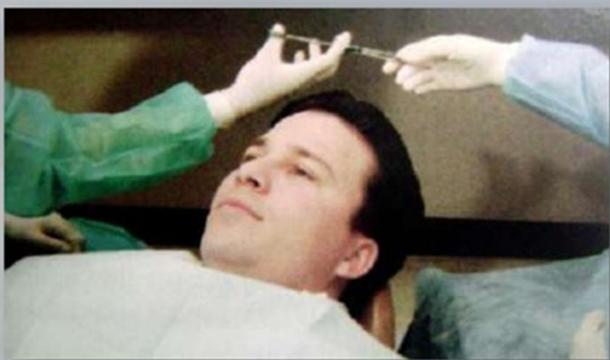
Local anaesthesia

- Every clinician must be proficient at administering painless local anaesthesia.
- While it is the mainstay of our pain control for operative treatment, it also represents one of the greatest fears in our patients.
- Use of many of the non-pharmacological techniques described in the previous chapter may enable the dentist to deliver an injection without the child being aware.
- There are few patients, old or young, who are not genuinely afraid of injections, and there are obvious disadvantages in the physical size of the dental cartridge syringe.

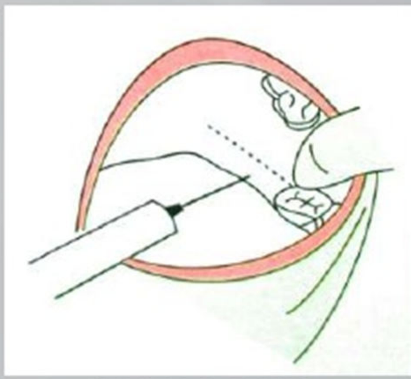
Successful local anaesthesia depends on:

- = Communication with the child and parent.
- = Routine use of topical anaesthesia, and leaving adequate time for it to act.
- = Slow injection of warm solution.
- = Avoiding direct palatal injections.
- = Adequate anaesthesia for procedure being performed.

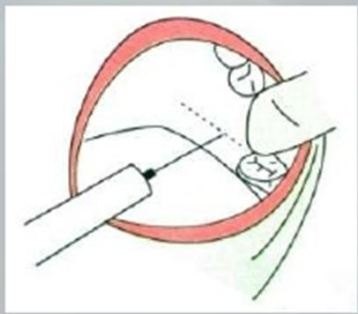
Keep the syringe away from the Line of sight of the patient



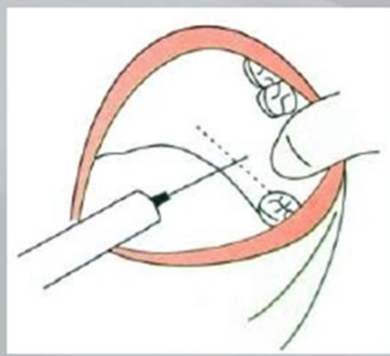
PEDIATRIC PATIENT



BELOW 6 YEARS



6 – 12 YEARS



ABOVE 12 YEARS

Complications with local anaesthesia

- The most significant complication encountered is overdosage.
- maximum doses need to be calculated according to weight and preferably written in the notes if more than just a short procedure is being performed.
- This clinical complication as a negative outcomes (death or neurological damage) in children due to local anaesthetic overdose

Other complications include:

- • Failure to adequately anaesthetize the area.
- • Intravascular injection (inferior alveolar nerve blocks or, infiltration in the posterior maxillae, directly into the pterygoid venous plexus).
- • **Biting of the lower lip or tongue postoperatively**.
- • Facial nerve paralysis by injecting too far posteriorly into the parotid gland.

- Consequently, adequate pre and postoperative instructions to both children and parents are necessary to minimize these complications.
- In addition, inadequate local anaesthetic technique (inexperienced operator, fast delivery of solution and inadequate behaviour management) may jeopardize a successful outcome in an otherwise cooperative child.
- Allergic reactions to local anaesthetic solutions and needle breakage are rare in children.

Sedation in paediatric dentistry

- The decision to sedate a child requires careful consideration by an experienced team.

The choice of a

- particular technique,
- sedative agent and
- route of delivery

should be made at a prior consultation appointment to determine the suitability of the child (and their parents) to a specific technique.

- The use of any form of sedation in children presents added challenges to the clinician.
- During sedation, a child's responses are more unpredictable than that of adults.
- Their proportionally smaller bodies are less tolerant to sedative agents and they may be easily over-sedated.

Anatomically Differences in the Paediatric airways include:

- • The vocal cords positioned higher and more anterior.
- • The smallest portion of paediatric airway is at the level of the subglottis (below cords) at the level of the cricoid ring.
- • Children have relatively larger tongue and epiglottis.
- •

- Possible presence of large tonsillar/adenoid mass .
- • Larger head to body size ratio in children.
- • The mandible is less developed and retrognathic in younger children and infants.
- • Children have smaller lung capacity and higher metabolic rate resulting in a smaller oxygen reserve

- **Patient assessment**
- The preoperative assessment is among the most important factors when choosing a particular form of sedation.
- **This assessment must include**:

1 • A thorough medical and dental history (including current medications, previous hospitalization and past operations).

2 • Patient medical status

History of recent respiratory illness or current infections.

3• Assessment of the airway to determine suitability for conscious sedation or general anaesthesia (GA).

4• Fasting requirements and the ability of the career to comply with instructions.

5• Proposed procedures being performed.

6• Patient’s weight and vital signs.

- Pharmacological agents may be administered in a number of ways but the more common routes of delivery include:

1. Inhalational sedation.N_2O
2. Oral sedation or rectal sedation.
3. Parenteral or intravenous sedation.
4. General anaesthesia.

SPACE MAINTAINERS

SPACE MAINTENANCE IN THE PRIMARY DENTITION

Space maintainers are appliances used to maintain space or regain minor amounts of space lost by primary tooth or group of teeth,

So as to guide the unerupted tooth into a proper position in the arch.

Objectives of space maintenance

- Preservation of primate space
- Preservation of integrity of dental arches
- Preservation of normal occlusion
- Esthetic and phonetic preservation in anterior teeth

IDEAL REQUIREMENTS of Sp.M

1. It should maintain the entire mesio-distal space created by a lost tooth.
2. It's preferred to restore the function as far as possible &
3. prevent over-eruption of opposing teeth.
4. It should be simple and strong.
5. It should be strong enough to withstand the functional forces.

6. It should not exert excessive stress on adjoining teeth.
7. It must permit maintenance of oral hygiene.
8. It must not restrict normal growth & development and natural adjustments which take place during the transition from deciduous to permanent dentition.
9. It should not come in the way of other functions.

PLANNING FOR SPACE MAINTENANCE

- The following factors are important to the dentist when space maintenance is considered after the untimely loss of primary teeth-

1) *Time elapsed since tooth loss.*

If space closure occurs,it usually takes place during the first 6 months after the extraction.When a primary tooth is removed & all factors indicate the need for space maintenance,it is best to insert an appliance as soon as possible after the extraction.

2) *Dental age of the patient-*

The chronologic age of the patient is not so important as the developmental age.

Gron studied the emergence of permanent teeth based on the amount of root development,as viewed on radiographs,at the time of emergence.

She found that teeth erupt when three-fourths of the root is developed,regardless of the child's chronologic age.

3) *Amount of bone covering the unerupted tooth-*

if there is bone covering the crowns,it can be readily predicted that eruption will not occur for many months,a space-maintaining appliance is indicated.

4) *Sequence of eruption of teeth-*

the dentist should observe the relationship of developing & erupting teeth adjacent to the space created by the untimely loss of a tooth.

5) Delayed eruption of the permanent tooth-

- in case of impacted permanent tooth, it is necessary to extract the primary tooth, construct a space maintainer & allow the permanent tooth to erupt at its normal position.
- If the permanent teeth in the same area of the opposing dentition have erupted, it is advisable to incorporate an occlusal stop in the appliance to prevent supraeruption in the opposing arch.

6) Congenital absence of the permanent tooth-

if permanent teeth are congenitally absent, the dentist must decide whether it is wise to hold the space for many years until a fixed replacement can be provided or it is better to allow the space to close.

If the decision is made to allow the space to close, there will rarely if ever be bodily movement of the teeth adjacent to the space. Therefore, orthodontic treatment will be needed to guide the teeth into a desirable position.

7) Presentation of problems to parents-

Take sufficient time to explain existing conditions & discuss the possibility of the development of a future malocclusion if steps are not taken to maintain the space or to guide the development of the occlusion.

Also explain that the space-maintaining appliance will not correct an existing malocclusion but will only prevent an undesirable condition from becoming worse or more complicated.

8. Amount of Space Loss

- a . Loss of maxillary second primary molars results in the greatest amount of closure , up to 8 mm of space loss in a quadrant .
- b . Loss of mandibular second primary molars shows the next greatest amount , up to 4 mm in a quadrant .
- c . Loss of upper or lower first primary molars shows almost equal amounts of space closure when compared with one another , the amount is most affected by timing of the first primary molar loss .

d . Space loss potential is particularly high if the primary molar loss occurs in approximation to first permanent molar eruption , irrespective of which primary molar is lost and in which arch the loss occurs

e . After first permanent molars have erupted into occlusion , loss of second primary molars may still result in significant space closure .

f Loss of a first primary molar with retention of the second primary molar shows minimal amounts of space closure because the second primary molar serves to buttress first permanent molar positions after occlusion is established .

9. Rate of Space Closure

a . The younger the patient , more is the space loss .

b . Maximum space is lost during first 6 months of extraction and most immediate loss is within 76 hours .

10. Direction of Space Closure

- Maxillary posterior spaces close predominantly by mesial bodily movement and mesiolingual rotation around the palatal root of the first permanent molars .
- Only minimal mesial crown tipping of the first molar is usually noted . In contrast , mandibular spaces close primarily by mesial tipping of the first permanent molars , along with distal movement and retroclination of teeth anterior to the space .
- Bodily movement of first molars is not typically notable in the lower arch as seen in the upper arch . Lower molars also tend to roll lingually in conjunction with their mesial crown - tipping during space loss movements . 5. Eruntion Status of the Adiacent Teeth

11. Eruption Status of the Adjacent Teeth

- It helps us ascertain mesial shift for molars and distal tipping for canines . For example , if the first primary molar is lost during the time of active eruption of the first permanent molar , a strong forward force will be exerted on the second primary molar , causing it to tip into the space required for the eruption of the first premolar . In addition , if the loss of the second primary molar occurs after the first permanent molars have fully erupted and normal cuspal interdigitation has been established , the degree of space loss should be less dramatic than earlier during molar transition

12. Eruption Status of the Succedaneous

- Tooth It is estimated by the amount of root completion (tooth erupts in oral cavity after 2 / 3rd root formation) .Teeth normally erupt when three fourths of the root is developed , regardless of the child's chronologic age . However , the eruption timing of a permanent successor may be delayed or accelerated after premature loss of a primary tooth , depending on the developmental status , bone density of the area , and nature of the primary tooth loss .Very early loss before significant root formation of the permanent successor usually results in delayed eruption timing .

13. Abnormal oral musculature (Abnormal Oral Habits)

- They will exert abnormal pressure on dental arches and so may influence the type and planning of space maintainer .
- Strong mentalis muscle patterns may have a pronounced negative effect after loss of mandibular primary molars or canines , with collapse of the arch and the distal drifting of the anterior segment that is often exhibited .
- Thumb or finger habits may similarly produce abnormal forces in initiating collapse of the dental arches after untimely loss of primary teeth .

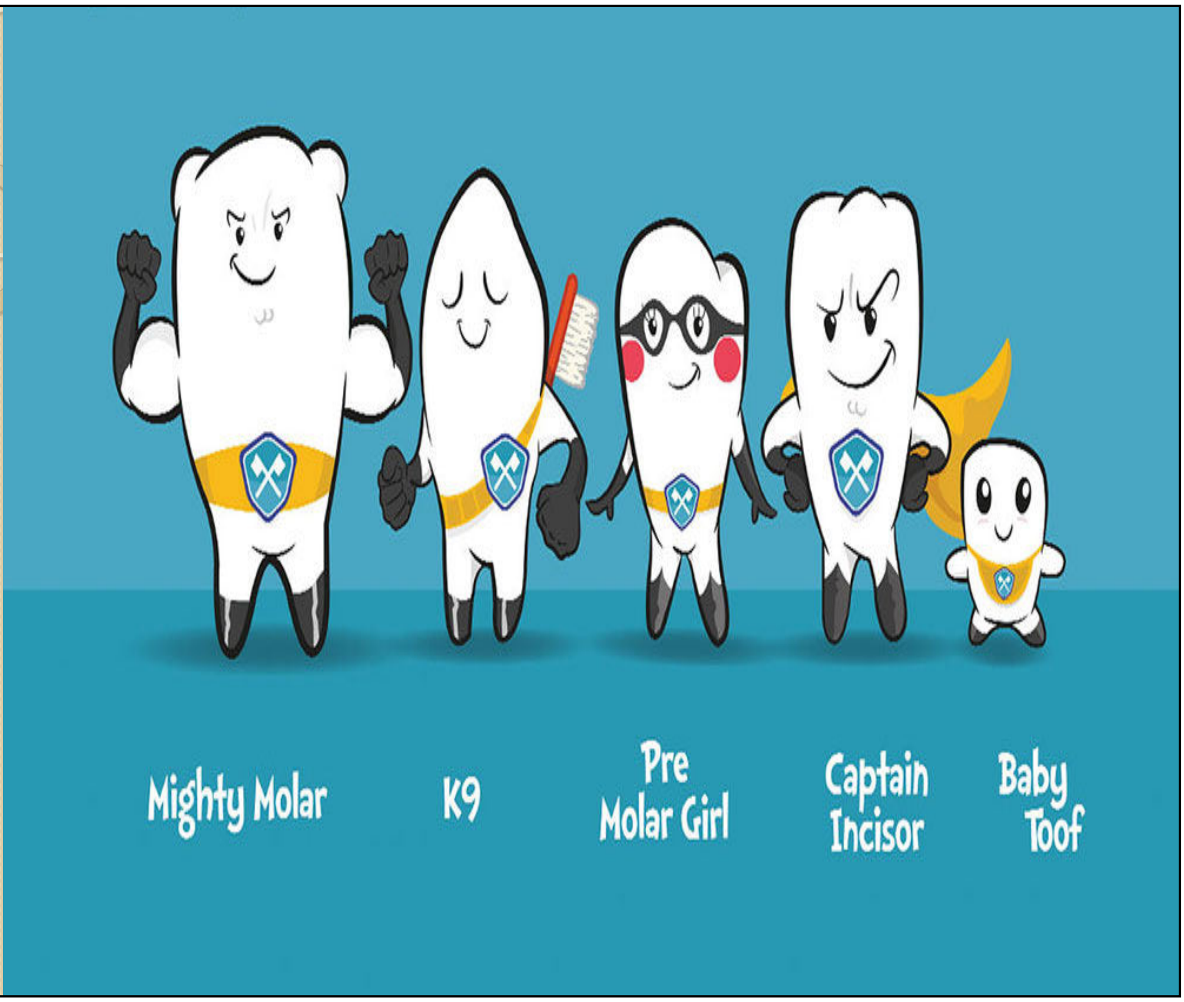
14. Arch Length Adequacy

- This will be estimated by position of incisors , Leeway space and incisor liability :
- a . If analysis indicates a positive arch length or deficiency of less than 1 to 2 mm per quadrant , a space maintainer may be beneficial in holding tooth position . If the pace is not held , the total arch length may be further decreased and lead to possible premolar extraction requirements . Holding the space may allow the permanent premolars and canines to erupt and utilize leeway space to alleviate anterior crowding .
- b . If the arch length deficiency is 2 to 3 mm or more per quadrant , a significant discrepancy exists where space regaining , serial extraction , and / or comprehensive orthodontic treatment may be indicated

- **C** . If there is no question that permanent teeth will have to be removed to obtain a favorable occlusion , space maintenance may not be desirable because the space would need to be closed during orthodontic treatment anyway . In less obvious extraction cases , holding the space to allow teeth to erupt and prevent impactions can be a valuable service .

15. Miscellaneous Factors

- These factors influence planning because they may be associated with either space gain or space loss . Some of these factors are growth of jaws , proximal caries , wear and attrition .



- **Types of space maintainers**

APPLIANCE THERAPY

Fixed space maintainers-

- Band & loop space maintainer.
- Crown & loop appliance.
- Lingual arch.
- Palatal arch appliance.
- Transpalatal arch.
- Distal shoe.
- Esthetic anterior space maintainer.
- Band & Bar type space maintainer.

Removable space maintainers-

- Acrylic partial dentures.
- Full or complete dentures.
- Removable distal shoe space maintainer.

Four appliances generally used to maintain space in the primary dentition are-

- The Band & Loop
- The Lingual Arch
- The Distal Shoe
- The Removable Appliance

Fixed Space Maintainers

Space maintainers which are fixed or fitted onto the teeth are called fixed space maintainers.

- ADVANTAGES:

1. Bands and crowns are used which require minimum or no tooth preparation.
2. They do not interfere with passive eruption of abutment teeth.
3. Jaw growth is not hampered.
4. The Succedaneous permanent teeth are free to erupt into the oral cavity.
5. They can be used in un-co-operative patients.
6. Masticatory functions is restored if pontics are placed.

- DISADVANTAGES:

1. Elaborate instrumentation with expert skill is needed.
2. They may result in decalcification of tooth material under the bands.
3. Supra eruption of opposing teeth can take place if pontics are not used.
4. If pontics are used it can interfere with vertical eruption of the abutment tooth & may prevent eruption of replacing permanent teeth if patient fails to report.

CONSTRUCTION-

The fixed space maintainer generally are constituted of the following components-

a) Band
b) Loop / arch wire
c) Solder joint
d) Auxiliaries

BAND-

The band forms an important part of the constructions of the various fixed appliances several bands are employed such as-

1) Loop bands
2) Tailored bands
3) Preformed seamless bands

made of precious metal or chrome alloy.

Every band should possess a few ideal criteria such that-

- It should fit the contours of the tooth as closely as possible,thereby enhancing the placement of the attachment in relationship to the tooth.
- Should not extend subgingivally any more than necessary.
- Band material should resist deformation under stresses in the mouth.
- Resist tarnish.
- Inherent springiness.
- Cause no occlusal interference.

- **STEPS IN BAND FORMATION-**

A) Separation of teeth

By (i) Brass wire

(ii) Elastic threads

B) Band formation

By (i) Direct formation

-Band pinching

-Festooning

-Trimming

-Folded flap

(ii) Preformed bands

(iii) Indirect band technique

C) Welding

D) Soldering

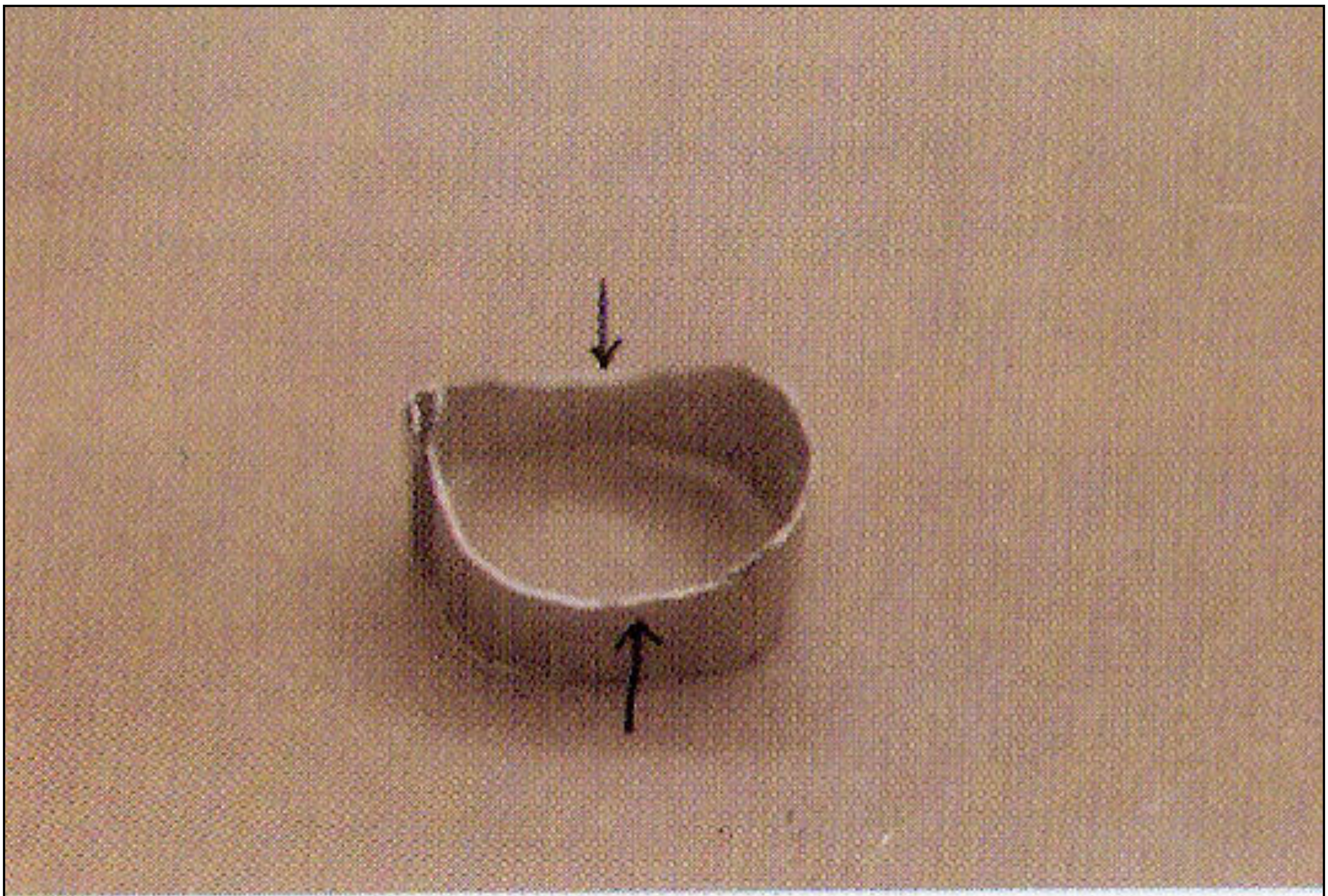


Fig. 9.15 Band showing the festooning

WELDING-

- It is the process during which a portion of the metal being joined is melted & flowed together.
- Bands are generally joined by welding.

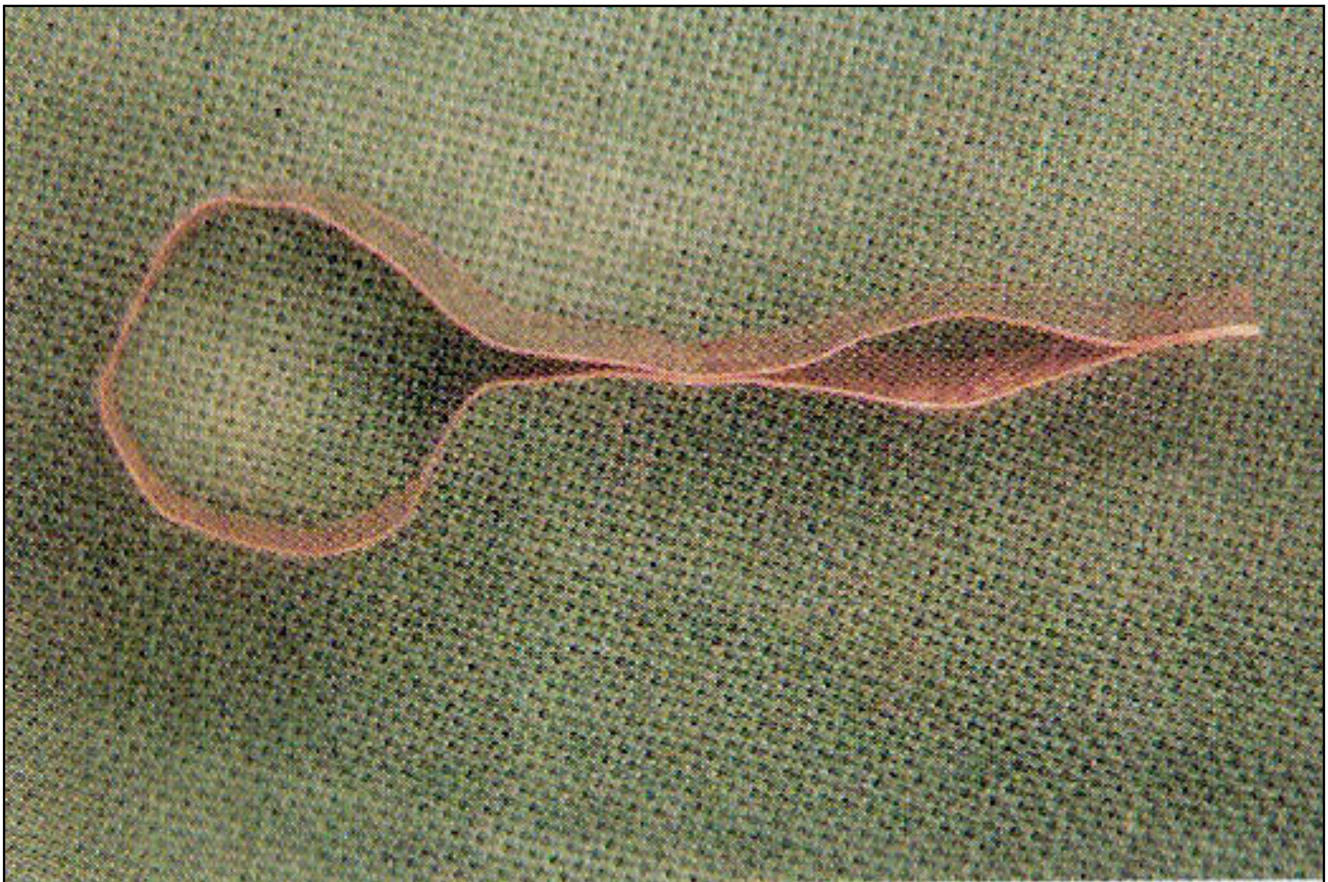


Fig. 9.12 Welded band material with eyelet

SOLDERING-

- It is the process by which the two metals are joined together by an intermediary metal of a lower fusion temperature.
- The most common solder used is the silver solder containing silver,zinc,copper & tin.

REMOVABLE APPLIANCE

- The appliance is typically used when more than one tooth has been lost in a quadrant.
- It is often the only alternative because there are no suitable abutment teeth and because the cantilever design of the distal shoe or the band and loop is too weak to withstand occlusal forces over a two-tooth span.
- Not only can the partial denture replace more than one tooth, it also can replace occlusal function.
- Two drawbacks of the appliance are retention and compliance.

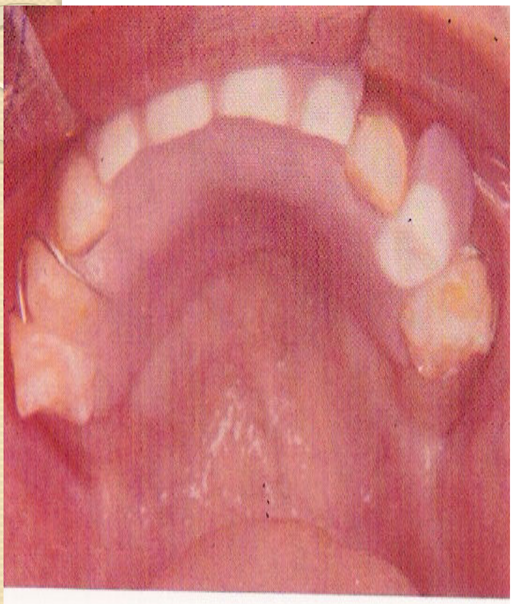


Fig. 9.21a Functional removable space maintainer - upper arch

Fig. 9.21b Functional removable space maintainer lower arch

Advantages:

1. Easy to clean and permit maintainance of proper oral hygiene.
2. Maintain or restore the vertical dimension.
3. Can be worn part time allowing circulation of the blood to the soft tissues.
4. Room can be made for permanent teeth to erupt without changing the appliance.
5. Stimulate eruption of permanent teeth.
6. Help in preventing development of tongue thrust habit into the extraction space.

DISADVANTAGES:

1. May be lost or broken by the patient.
2. Un-co-operative patients may not wear the appliance.
3. Lateral jaw growth may be restricted, if clasps are incorporated.
4. May cause irritation of the undrelying soft tissues.

Indication:

1. When aesthetics is of importance.
2. In case the abutment teeth cannot support a fixed appliance.
3. In cleft palate patients who require obturation of the palatal defect.
4. In case the radiograph reveals that the unerupted permanent tooth is not going to erupt in less than five months time.
5. If the permanent teeth have not fully erupted it may be difficult to adapt bands.
6. Multiple loss of deciduous teeth which may require functional replacement in the form of either partial or complete dentures.

CONTRAINDICATIONS-

1. Lack of patient co-operation.
2. patients who are allergic to acrylic material.
3. Epileptic patients.

BAND & LOOP APPLIANCE
(Fixed,Non functional,Passive space maintainer)

- It is used to maintain the space of a single tooth.
- Inexpensive & easy to fabricate.
- It does not restore the occlusal function of the missing tooth.

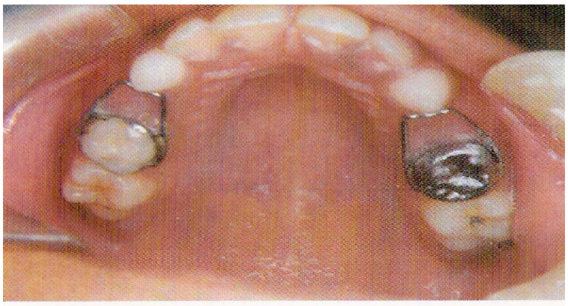
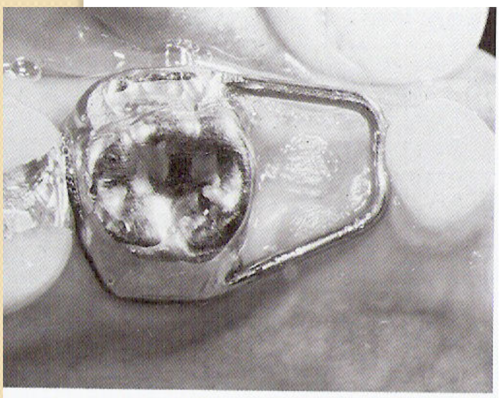


Fig. 9.16 Space maintained for missing primary first molars using the crown and loop on left side, band and loop on the right



-2 Crown and loop space maintainer.

24 Bilateral use of band and loops.

Indications

- Unilateral loss of the primary first molar before or after eruption of the permanent first molar.
- Bilateral loss of a primary molar before the eruption of the permanent incisors.

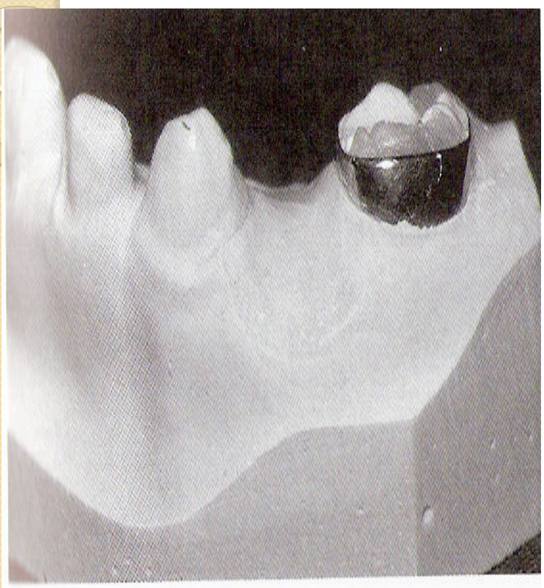


Fig 21-8 The tooth has been cut off the cast. Note the sticky wax around the band.

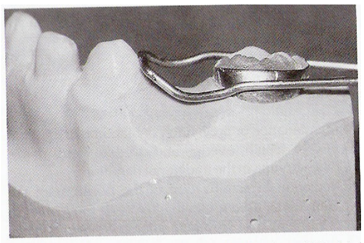


Fig 21-10 The finished loops should end in the middle third of the band.

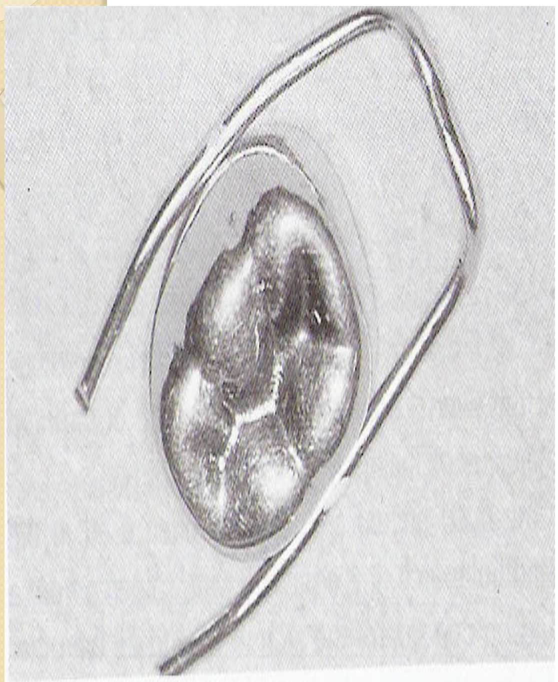


Fig 21-11 Completed wire, bent before soldering.

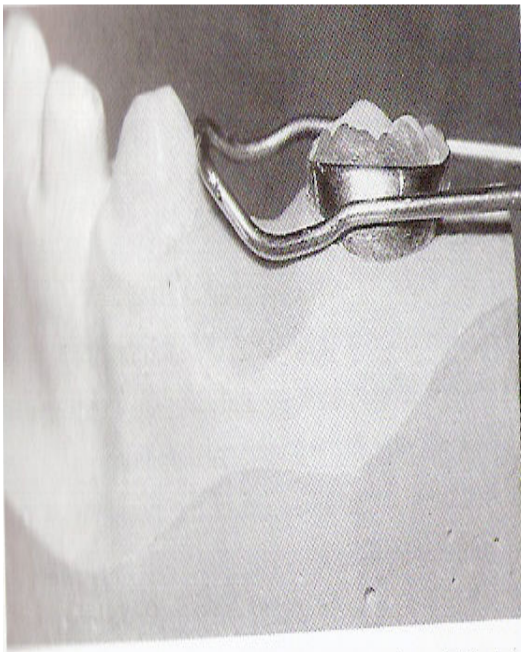


Fig 21-10 The finished loops should end in the middle thir of the band.

LINGUAL ARCH
(Fixed,Non functional,Passive Mandibular arch appliance)

- **Used to maintain the posterior space in the primary dentition.**
- **The lingual arch is often suggested when teeth are lost in both quadrants of the same arch.**
- **Belong to those group of space control appliances which not only control anteroposterior movements but also are capable of controlling & preventing an arch perimeter distortion,by controlling the lingual collapse of single tooth or segments of the arch.**

- It consist of a round stainless steel or precious alloy wire closely adapted to the lingual surfaces of the teeth & anchored to bands on the first permanent molars.
- The means used to anchor the archwire to the bands will define whether the lingual arch is of a removable or fixed type.
- Because the permanent incisor tooth buds develop & erupt somewhat lingual to their primary precursors,a conventional mandibular lingual arch is not recommended in the primary dentition (bilateral band & loop appliances are recommended in this situation.)

Fig. 9.17a Pre-formed lingual arches

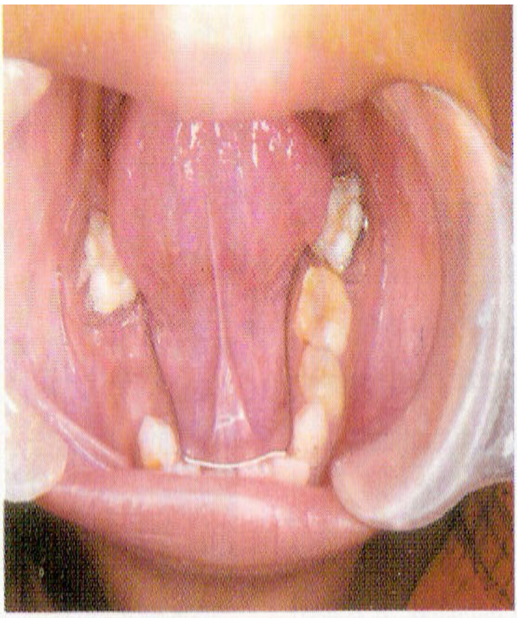


Fig. 9.17b Fixed lingual arch space maintainer with banded first first permanent molars

PASSIVATION-

The lingual archwire should be completely passive.This is done by heating the wire to a dull brownish appearance,while keeping the wire gently in place on the cingula with an old instrument.

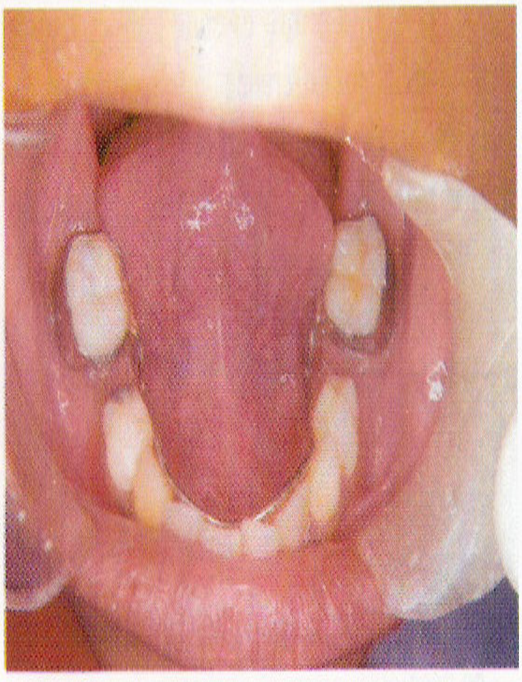


Fig. 9.17c Lingual arch with 'U'-loop

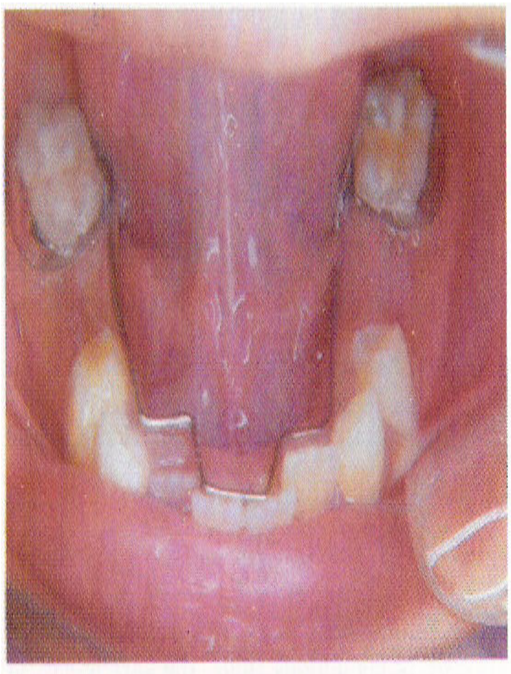
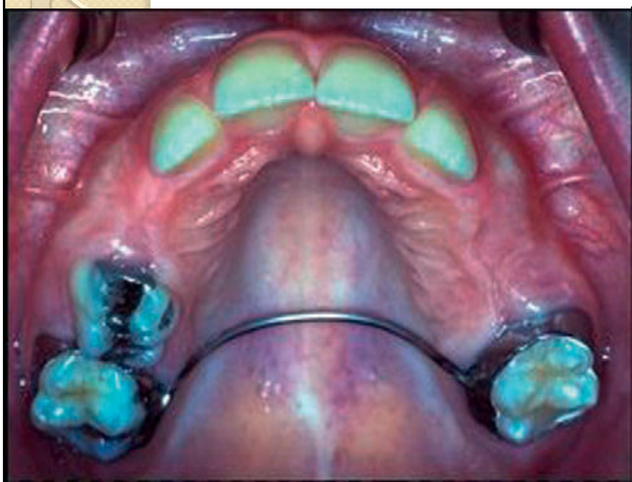


Fig. 9.17d Modified lingual arch

- The maxillary lingual arch is possible in the primary dentition because it can be constructed to rest away from the incisors.
- Two types of lingual arch designs are used to maintain maxillary space-

  the Nance arch.

  the Transpalatal arches.
- These appliances use a large wire to connect the banded primary teeth on both sides of the arch that are distal to the extraction site.
- The difference b/w the two appliances amounts to where the wire is placed in the palate.
- The Nance arch incorporates an acrylic button that rests directly on the palatal rugae.
- The Transpalatal arch(TPA) is made from a wire that traverses the palate directly without touching it.



- TPA   Nance arch

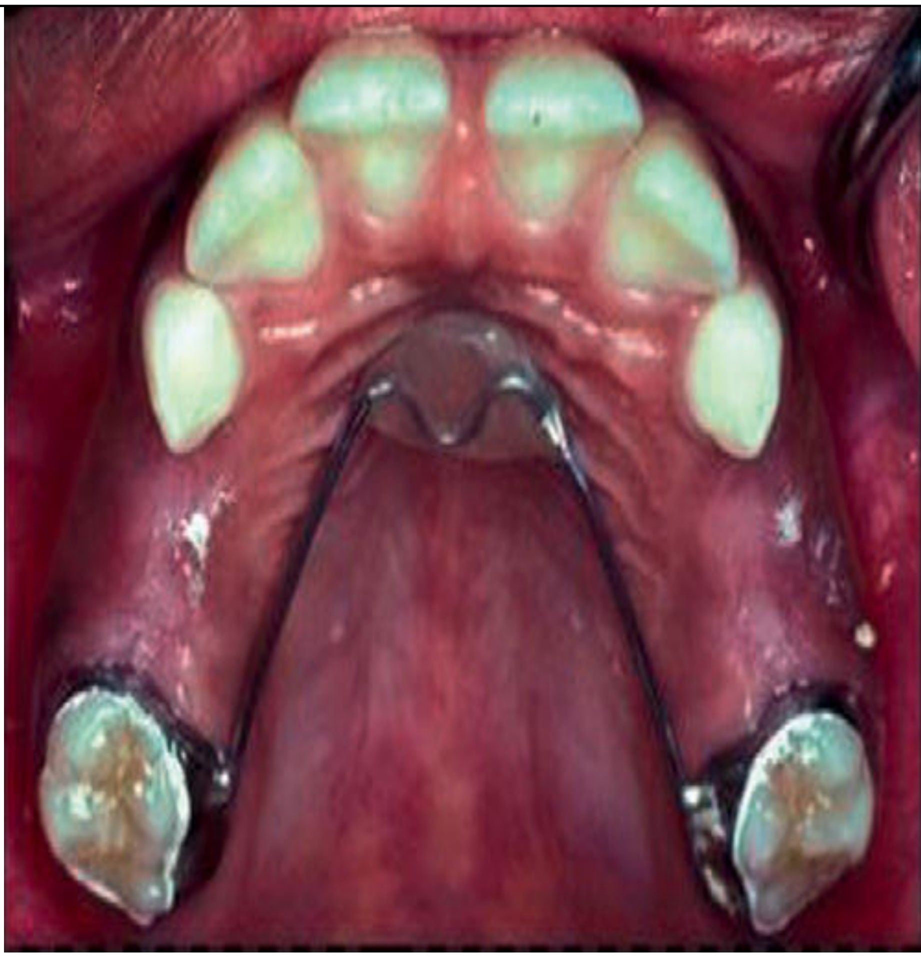
NANCE ARCH or NANCE SPACE HOLDING APPLIANCE

(Fixed,Non-functional,Passive,Maxillary arch appliance)

- Nance(1947) described the "preventive lingual wire".
- It consists of bands on the upper molars,with the arch wire extending forward into the vault.

CONSTRUCTION-

- The acrylic button is present on the slope of the palate & provides an excellent resistance against forward movement(U loop).The wire should extend from the lingual of bands to the deepest & most anterior point in the middle of hard palate.
- 'U' bend is given in the wire for the retention of the acrylic 1-2mm away from the soft tissue.



TRANSPALATAL ARCH
(Fixed,Non-functional,Passive appliance)

- The arch is soldered to both sides,straight without a button & without touching the palate.
- The basis of the appliance is that the migration & rotation is caused by rotation around the lingual root.By preventing this,space loss is prevented by the appliance.
- Cross arch anchorage can be used if only one of the primary molars is lost & both the permanent molars are erupted.

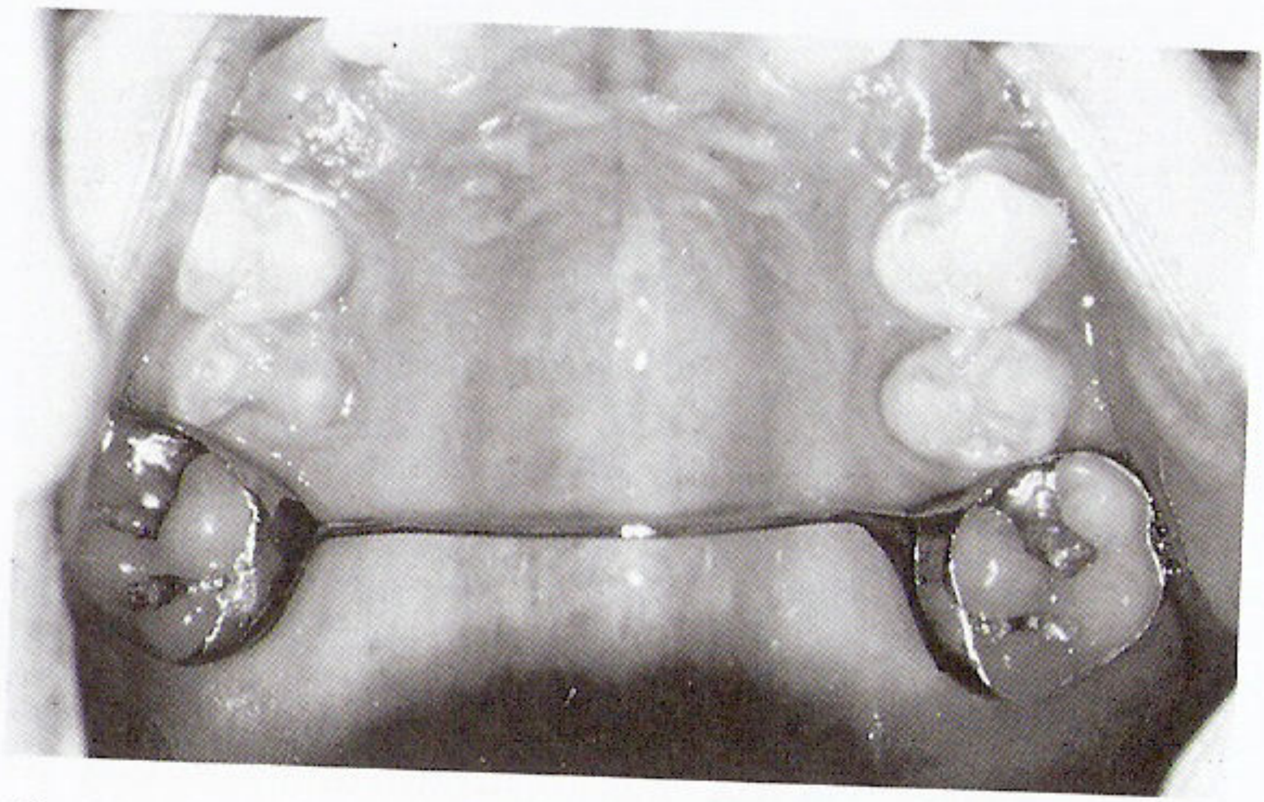
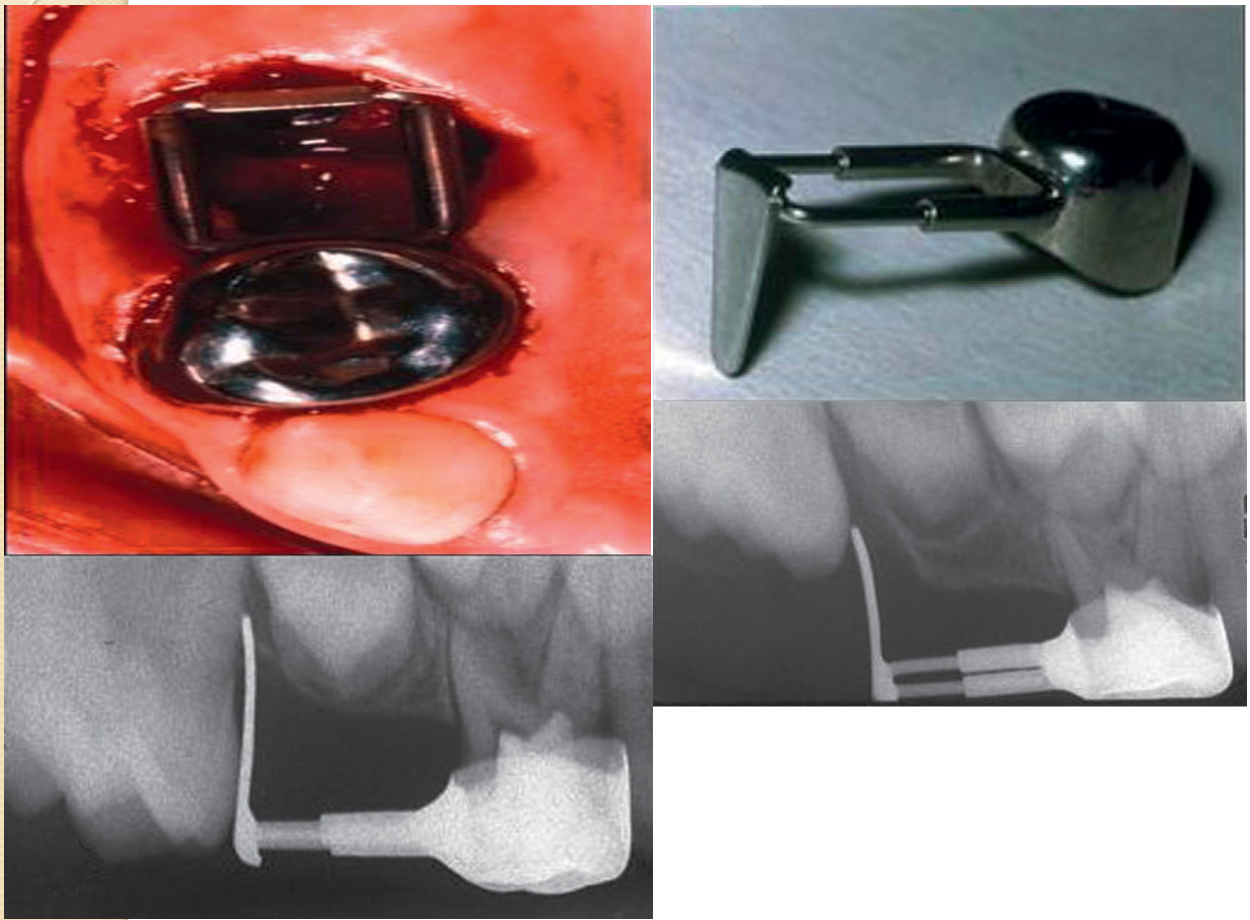


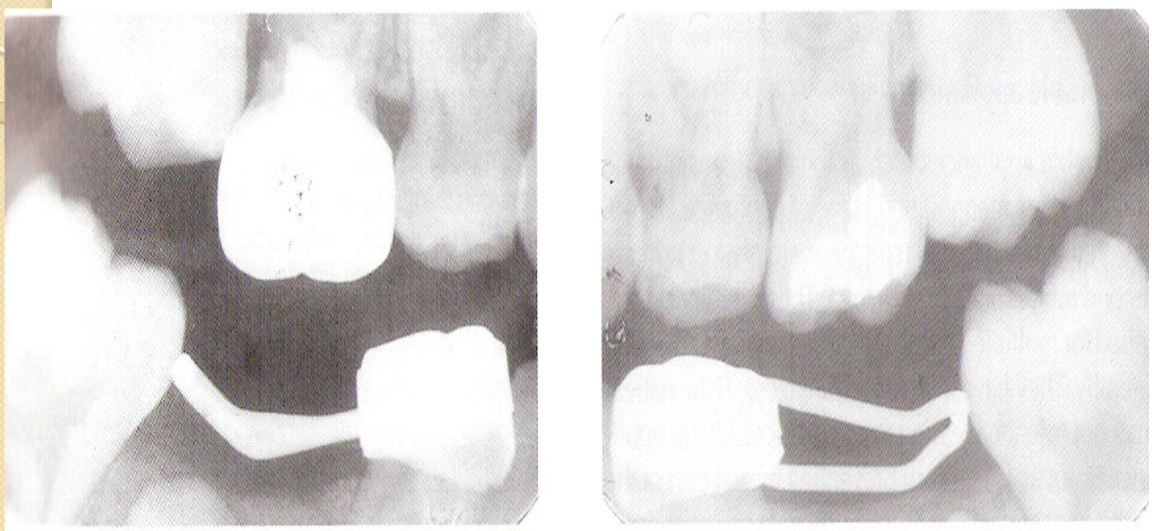
Fig 21-16 Transpalatal bar from one permanent first molar across the palate to the opposite permanent first molar.

DISTAL SHOE

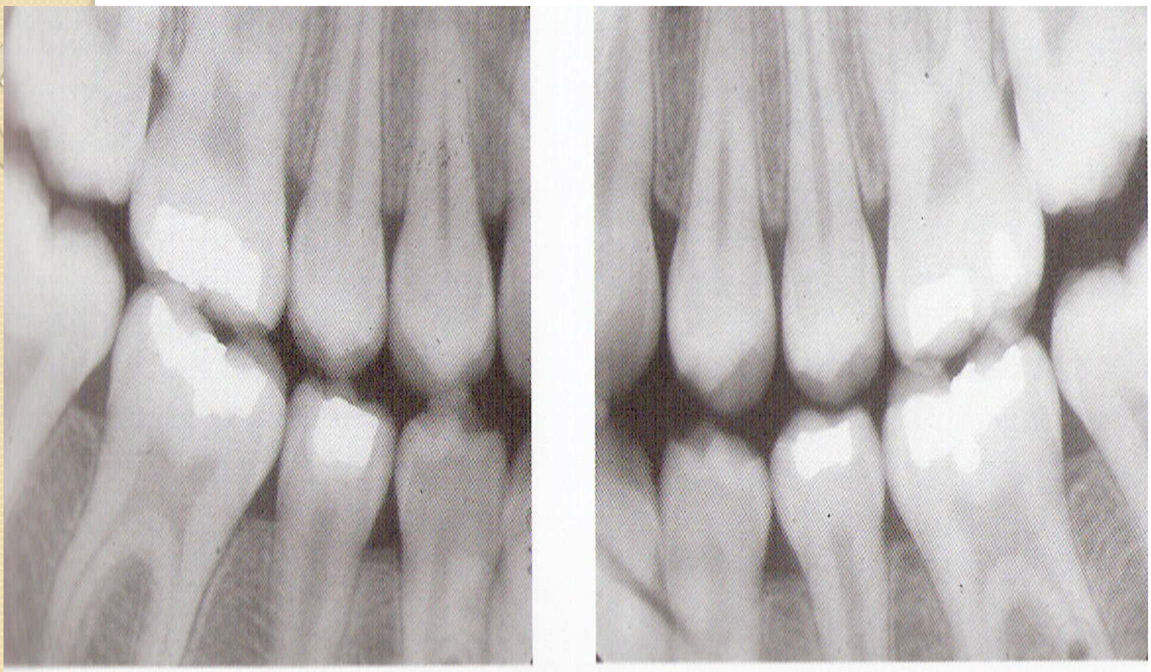
(Intra-alveolar, Eruption guidance appliance)

- Used to maintain the space of a primary second molar that has been lost before the eruption of the permanent first molar.
- An unerupted permanent first molar drifts mesially within the alveolar bone if the primary second molar is lost prematurely. The result of the mesial drifts is loss of arch length & possible impaction of the second premolar.





g 21-41b After 1 year, the distal shoes were replaced with crown and loops.



21-41c Final permanent dentition.

DISADVANTAGES-

- Because of its cantilever design & the fact it is anchored on the occlusally convergent crown of the primary first molar,the appliance can replace only a single tooth & is somewhat fragile.
- No occlusal function is restored because of this lack of strength.
- Histologic examination shows that complete epithelialization does not occur after placement of the appliance.

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Medically compromised children

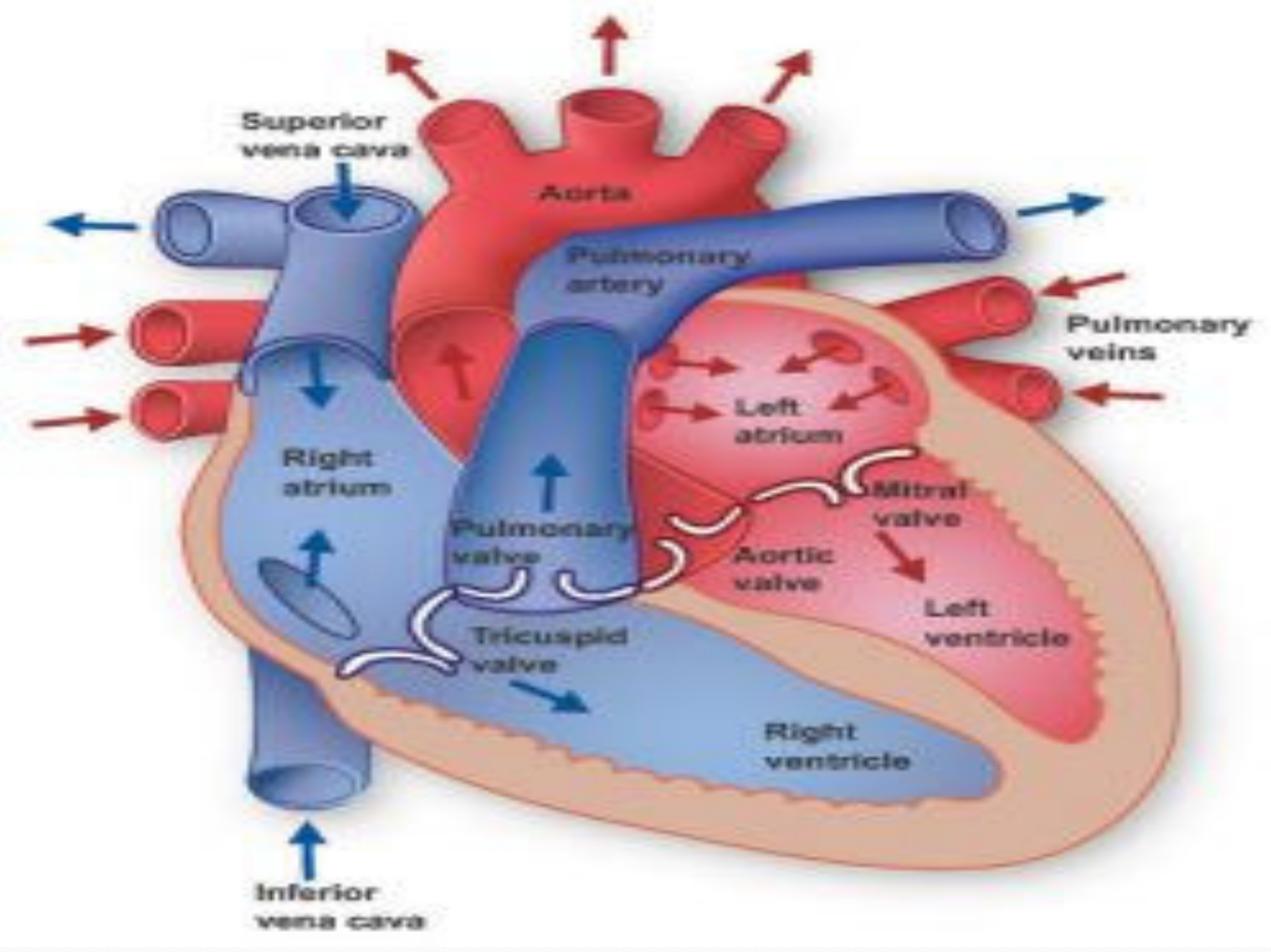
These children often have medical conditions that can affect dental treatment or that they can present with specific oral manifestations of a systemic disease.

Congenital heart diseases

- Congenital heart disease (CHD) has an incidence of approximately 8–10 cases per 1000 live births and represents the largest group of paediatric cardiovascular diseases.

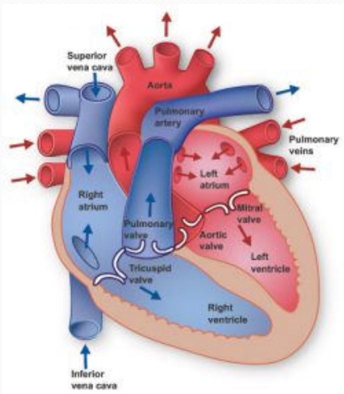
Can be classified into

- acyanotic (shunt or stenotic) and
- cyanotic lesions depending on clinical presentation



Acyanotic conditions

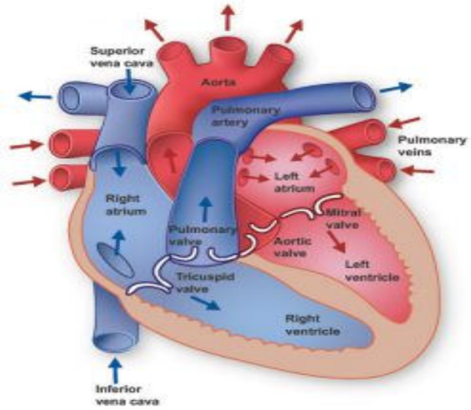
- The acyanotic group of conditions is characterized by a connection between the systemic and pulmonary circulations or a stenosis (narrowing) of either circulation.
- Infant often present with
- Feeding difficulties,
- Breathlessness and
- Failure to thrive.
- Shunts are from the left to right.



- **Atrial septal defect (ASD)**
- **Ventricular septal defect (VSD) .**
- **Patent ductus arteriosus (PDA) .**
- **Aortic stenosis or narrowing of the aortic central orifice**
- **Pulmonary stenosis**

Cyanotic conditions

- All cyanotic conditions exhibit right-to-left shunting of desaturated blood.
- Infants with mild cyanosis may be pink at rest but become very blue during crying or physical exertion.
- Children with cyanotic defects are at significant risk for desaturation during G.A and preoperative consultation with the paediatric cardiologist and anaesthetist is essential.



1. **Tetralogy of Fallot .**
2. **Transposition of great vessels .**
3. **Eisenmenger syndrome**
4. **Tricuspid atresia .**
5. **Pulmonary atresia**

Other cardiovascular diseases

Other common paediatric cardiovascular disorders include:

Cardiomyopathies such as

- myocardial disease.
- pericardial disease.
- cardiac arrhythmia.
- infective endocarditis.
- Rheumatic heart disease (RHD).

- Both CHD and RHD can predispose the internal lining of the heart to bacterial or fungal infection (infective endocarditis) and lead to the formation of friable vegetations of blood cells and organisms

- The initial step in the establishment of a vegetation is endocardial injury, followed by focal adherence of platelets and fibrin.

- Some organisms with high virulence are capable of infecting normal human heart valves, such as *Staphylococcus aureus*.

- Vegetations may embolize and cause renal, pulmonary or myocardial infarcts or cerebrovascular accidents.

- *Streptococcus viridans, also common commensal organism in the oral* cavity, is most frequently responsible for <u>chronic infective endocarditis</u>.

Dental management

- Several important principles need to be followed when managing children with cardiac disease.
- Transient bacteraemia can occur following invasive dental procedures and potentially cause infective endocarditis in a susceptible patient.
- Therefore, all children with CHD or previous RHD **<u>require antibiotic prophylaxis to reduce the risk of infective endocarditis</u>**

Dental management

- Those children who have been previously taking long term antibiotics should be prescribed an alternative medication as per the protocol to avoid development of resistant oral organisms.

- In addition, a preoperative oral antiseptic mouthwash, such as 0.2% chlorhexidine gluconate, is recommended to reduce the oral bacterial counts.

Dental management

- Children with CHD have a higher prevalence of enamel anomalies in the primary dentition and concomitant risk of early childhood caries.
- Some cardiac medications may contain up to 30% sucrose and dietary prescription with high-caloric supplements (Polyjoule) further potentiate caries risk.
- careful oral hygiene and preventive dental care, such as fissure sealants and topical fluoride therapy is recommended to reduce the risk of dental caries in susceptible children.

Dental management

- Dental disease in children with cardiac disorders can seriously complicate their medical management.
- Children with advanced cardiovascular disease should receive only palliative dental care until their medical condition has been stabilized.
- Aggressive treatment of pulpally involved primary teeth is recommended.

- Pulpotomy or pulpectomy is contraindicated in these children due to the possibility of subsequent chronic bacteraemia.
- Although routine treatment in the dental surgery environment is possible, it is often preferable to manage children with multiple carious teeth under general anaesthesia in the hospital environment

- This protocol allows completion of treatment with one invasive procedure and negates the risk of infective endocarditis with further operative procedures.
- If multiple visits are planned, there is a need to

1. prescribe alternative antibiotics or
2. wait for a month between appointments to reduce bacterial resistance.

- A thorough preoperative assessment of the child's regular medication (including anticoagulants, antiarrhythmics, an antihypertensives) is essential to avoid any potential drug interactions during treatment.
- There is no contraindication to the use of vasoconstrictors in local anaesthetic solutions.
- If conscious sedation is used, vital signs and oxygen saturation during the procedure should be carefully monitored.

Avoid the use of

- electrosurgery,
- electronic pulp testers and
- ultrasonic cleaning devices in children with cardiac pacemakers, in case of potential interference.
- Some common impediments are non-compliance with oral hygiene and dietary advice.

Antibiotic prophylaxis protocols for the prevention of infective endocarditis

- Approved antibiotic prophylaxis regimens are still recommended for potentially at-risk patients receiving dental treatment, as there is evidence,
- Recommendations differ from one institution to another and vary in different countries, and therefore it is the responsibility of clinicians to determine which guideline is the most suitable to their individual patient

- **Cardiac conditions associated with the highest risk of adverse outcome from endocarditis for which prophylaxis with dental procedures is recommended:**
- Previous history of infective endocarditis.
- Prosthetic cardiac valve replacement.
- Cardiac transplant recipients who develop valvulopathy.
- Specified congenital heart disease involving the presence or placement of shunts
- Unrepaired cyanotic shunts, including palliative shunts .
- Completely repaired congenital heart defects with prosthetic material or device for at least 6 months after the procedure.
- Repaired congenital heart disease with residual defects or adjacent to a site of prosthetic patch or material.

Non invasive dental procedure

- The following procedures and events *do not need prophylaxis:*
- Routine anaesthetic injections through non-infected tissue.
- Taking dental radiographs.
- Placement of removable prosthodontic or orthodontic appliances.
- Adjustment of orthodontic appliances.
- Placement of orthodontic brackets.
- Shedding of deciduous teeth.
- Bleeding from trauma to the lips or oral mucosa

- Pediatric dosing
- The dose for any child should be calculated up to, but not exceeding the maximum adult dose.
- Dosage should always be prescribed according to weight (dose/kg).

Table 2. DENTAL PROCEDURES FOR WHICH ENDOCARDITIS PROPHYLAXIS IS REASONABLE FOR PATIENTS IN TABLE 1

All dental procedures that involve manipulation of gingival tissue or the periapical region of teeth or perforation of the oral mucosa**

* The following procedures and events do not need prophylaxis: routine anesthetic injections through non-infected tissue, taking dental radiographs, placement of removable prosthodontic or orthodontic appliances, adjustment of orthodontic appliances, placement of orthodontic brackets, shedding of deciduous teeth, and bleeding from trauma to the lips or oral mucosa.

Table 3. REGIMENS FOR A DENTAL PROCEDURE

Regimen: Single Dose 30 to 60 min Before Procedure

Situation	Agent	Adults	Children
Oral	Amoxicillin	2 g	50 mg/kg
Unable to take oral medication	Ampicillin OR Cefazolin or ceftriaxone	2 g IM or IV 1 g IM or IV	50 mg/kg IM or IV 50 mg/kg IM or IV
Allergic to penicillins or ampicillin—oral	Cephalexin*† OR Clindamycin OR Azithromycin or clarithromycin	2 g 600 mg 500 mg	50 mg/kg 20 mg/kg 15 mg/kg
Allergic to penicillin or ampicillin and unable to take oral medication	Cefazolin or ceftriaxone† OR Clindamycin	1 g IM or IV 600 mg IM or IV	50 mg/kg IM or IV 20 mg/kg IM or IV

Table A.13 Current protocols for susceptible patients

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Haematological Disorder

Disorders of haemostasis

- **Primary haemostasis** is initiated after injury to a blood vessel with the formation of a primary platelet plug.
- **Secondary haemostasis** or coagulation is also triggered by the initial injury and reaches its greatest intensity after the primary platelet plug is formed.
- This process is mediated by interactions between the platelets and coagulation factors in the plasma and the vessel wall.

- The clinical manifestations of a haemostasis disorder vary depending on the phase affected.
- Defects in primary haemostasis generally result in bleeding from the skin or mucosal surfaces, with the development of petechiae and purpura (ecchymoses).

- These disorders include von Willebrand's disease as well as defects in platelet function.
- In contrast, defects in secondary haemostasis, such as haemophilia, lead to bleeding that tends to be more deep-seated in muscles and joints.
- In both disorders uncontrolled prolonged oral bleeding can occur from harmless insults such as a tongue laceration or cheek biting.

Children with haemostasis disorders can be identified from

- A thorough medical history,
- Examination
- Laboratory tests.

Questions should reveal

1. episodes of spontaneous bleeding or bruising;
2. the occurrence of prolonged bleeding in other family members
3. prescription of anticoagulant medication.

- A physical examination of

1. skin (unusual areas of bruising on the chest or back or bruising from lying on a toy),
2. joints and oral mucosa should be undertaken for evidence of petechiae, ecchymoses and haematoma.

- If a haemostasis disorder is suspected, referral to a haematologist is recommended for evaluation and laboratory blood tests.

Laboratory tests

1- **PFA** 100 (platelet function analysis) may be used as a screening test for von Willebrand's disease and platelet dysfunction.

2- Complete blood count (**CBC**) is required to determine platelet levels (normal range 150–400 × 109/L).

3- Coagulation tests include

- A. Prothrombin time (**PT**) that is a test of the extrinsic coagulation pathway (normal range 11–17 s) .
- B. Activated partial thromboplastin time (**APTT**),

Classification

Vascular disorders

- Vascular disorders are characterized by increased capillary fragility and include the
- purpuras,

- hereditary haemorrhagic telangiectasia,
- haemangiomas,

- vitamin C deficiency,

Platelet disorders

- Platelet disorders can be either a deficiency (thrombocytopenia) or dysfunction.

Thrombocytopenia

- Thrombocytopenia is defined as a platelet count <150 × 109/L.
- Clinical signs and symptoms associated with decreased platelet counts are as follows:

• <75 × 109/L – May exhibit post-surgical haemorrhage.
• <25 × 109/L – Spontaneous haemorrhage, easy bruising.
• <15 × 109/L – Petechiae appear on the skin.
• <5 × 109/L – Oral petechiae, submucosal and mucosal bleeding.

Thrombocytopenia may occur as an isolated entity of

1. unknown cause (idiopathic thrombocytopenic purpura, ITP),
2. marrow suppression by drugs
3. from other haematological diseases such as aplastic anaemia.

Thrombocytosis

- Thrombocytosis is an increased number of platelets (>500 × 109/L) and may be associated with prolonged bleeding due to abnormal platelet function

- Platelet function disorders
- These may be congenital or acquired.

- The most common cause of acquired platelet dysfunction is the use of non-steroidal anti-inflammatory drugs (e.g. aspirin).

Inherited coagulation disorders

- Decrease in the amount of particular plasma factors in the coagulation cascade.

The most common disorders are

- Haemophilia A (factor VIII Def.)
- Von Willebrand's disease.
- Haemophilia B or Christmas disease(factor IX)

Dental management

- Dental management of children with suspected haemostasis disorders should begin with screening laboratory tests.
- If tests are abnormal, haematological consultation is required for a definitive diagnosis.
- Invasive dental procedures should be performed only after the extent of the problem has been determined.

Dental procedures

1-- Use an atraumatic technique. In the event that oral surgery is necessary, a sound surgical technique to minimize trauma and local measures to control bleeding such as careful atraumatic suturing and socket dressings are mandatory.

- Maxillary infiltration anaesthesia can generally be administered slowly without pretreatment with platelet or factor replacement.
- However, if the infiltration injection is into loose connective tissue or a highly vascular area, then factor replacement to achieve 40% activity levels is recommended.

- **Avoid** mandibular block injections as these may be complicated by **dissecting haematoma and airway obstruction**.
- In the absence of suitable factor replacement, intra-periodontal injections may be used, but with great caution.
- The anaesthetic solution is placed under moderate pressure along the four axial surfaces of the tooth
- by inserting the needle into the gingival sulcus and the periodontal ligament space

- Nitrous oxide sedation can be effective for restorative procedures with the need for local anaesthesia.

- Care must be taken when placing matrix bands.
  - Use rubber dam to protect the soft tissues.
  - Endodontic treatment can be safely carried out without factor cover.
  - Periodontal treatment with deep scaling and subgingival curettage requires factor replacement.
  - Multiple extractions require hospital admission and haematological work-up in conjunction with the haematology team.

Questions commonly asked by parents are:

- = Will my child's teeth erupt normally? **Usually yes**, but there is often more bleeding from a traumatized **operculum** that may require active intervention.
- = Will my child's teeth fall out normally? **Usually yes**, unless continually traumatized, there is normally no abnormal bleeding associated with exfoliating primary teeth.

- However, if there is prolonged mobility and oozing occurs, then extraction may be necessary under appropriate factor cover to reduce the risk of persistent bleeding.

- = Can a **child with a bleeding disorder have orthodontic treatment?** Yes, provided extractions are performed after appropriate consultation with the haematologist and there is watchful maintenance of the appliances.

Anticoagulant therapy

- Management of children on anticoagulant therapy needs special consideration.
- Anticoagulants are usually prescribed for children with :
- valvular heart disease
- prosthetic valves to reduce the risk of remobilization.
- If extractions or surgery are required, it is necessary to decrease the clotting times to facilitate adequate coagulation but not to such an extent so as to cause emboli or clotting around the valves.

- The dental management of these children is also complicated by their congenital cardiac defect and antibiotics are required for prophylaxis against infective endocarditis.

Therapeutic drugs used

1-Oral warfarin sodium (Coumadin):

2-Vitamin K antagonist depleting factors II, VII, IX and X.

Usually 3–4 days are required for full anticoagulation onset and its efficacy is assessed by PT level (factor VII levels).

3- Heparin sodium (Heparin):

- • Shorter acting and has an immediate onset (inhibits factors IX, X and XII).
- • Can be administered either subcutaneously using a low-molecular-weight derivative
- or intravenously under the supervision of a paediatric haematologist.

4- Enoxaparin sodium (Clexane):

- Children on anticoagulant therapy should stop taking warfarin **3–5 days** prior to the surgery date.
- When there is a significant risk for thrombosis with subtherapeutic warfarin level, parenteral anticoagulation may be necessary.
- This is generally achieved with enoxaparin sodium (Clexane) 1.5 mg/kg subcutaneously once daily

- This drug is omitted on the morning of surgery.
- With the use of this regimen, the child may be admitted to hospital on the day of dental surgery
- Warfarin is recommenced in normal dose on the evening of surgery.
- If further enoxaparin sodium prophylaxis is required, it should be given the morning after surgery and continued until the **PT** and international normalized ratio (**INR**) are therapeutic.

Local haemostatic measures

- • Application of topical thrombin (Avitene).
- • Packing of the socket with microfibrillar collagen haemostat (MCH or CollaTape),
- Oxidized regenerated cellulose (Gelfoam or Surgicel).
- • Suturing of attached gingivae to maintain pressure.
- • Splints or stomo-adhesive bandages may also be of benefit.
- • There have been recent reports of the efficacy of 'fibrin glue' in the management of coagulopathies.

- Digital compression of the alveolus after tooth extraction.
- • Packing of the socket with a resorbable gel.
- • Adequate suturing of extraction sites to help reduce postoperative complications.
- • Pressure application to the surgical site with gauze packs.
- • Construction of a removable splint is recommended following more extensive surgery.

Red cell disorders

Anaemia

- Anaemia is considered to be present if the haemoglobin Hb level falls below 100 g/L.

The cause of anaemia in children may be due to

- Blood loss
- Iron, Folate and vitamin B12 deficiency
- Bone marrow failure
- Haemolysis of red blood cells
- Anaemia of chronic disorders

Haemoglobinopathies

1- Haemolytic anaemia

- ABO incompatibility and Rhesus (Rh) iso immunization.

2- Glucose 6-phosphate dehydrogenase (G6PD)

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α-Thalassaemia

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Normal Hemoglobin Count Ranges Widely Accepted by Physicians

- Children
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Dental management

1- Consultation with the child's haematologist prior to treatment is essential to arrange haematological preparation and transfusion.

2- It is important to schedule dental treatment shortly after blood transfusions and provide **antibiotic prophylaxis**, especially if the child has had splenectomy.

3- Avoid not obligatory treatment if hemoglobin level is <100 g/L.

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Endocrinopathies :

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Diabetes mellitus is a disease complex characterized by hyperglycemia, altered protein and lipid metabolism as a result of absolute or relative deficiency of insulin.

Oral manifestation:

- Xerostomia
- Increased caries risk
- Increased severity of periodontitis, bone loss and periodontal abscess
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- Screening blood sugar prior to procedure.
- Antibiotic prophylaxis
- Morning appointment is preferred
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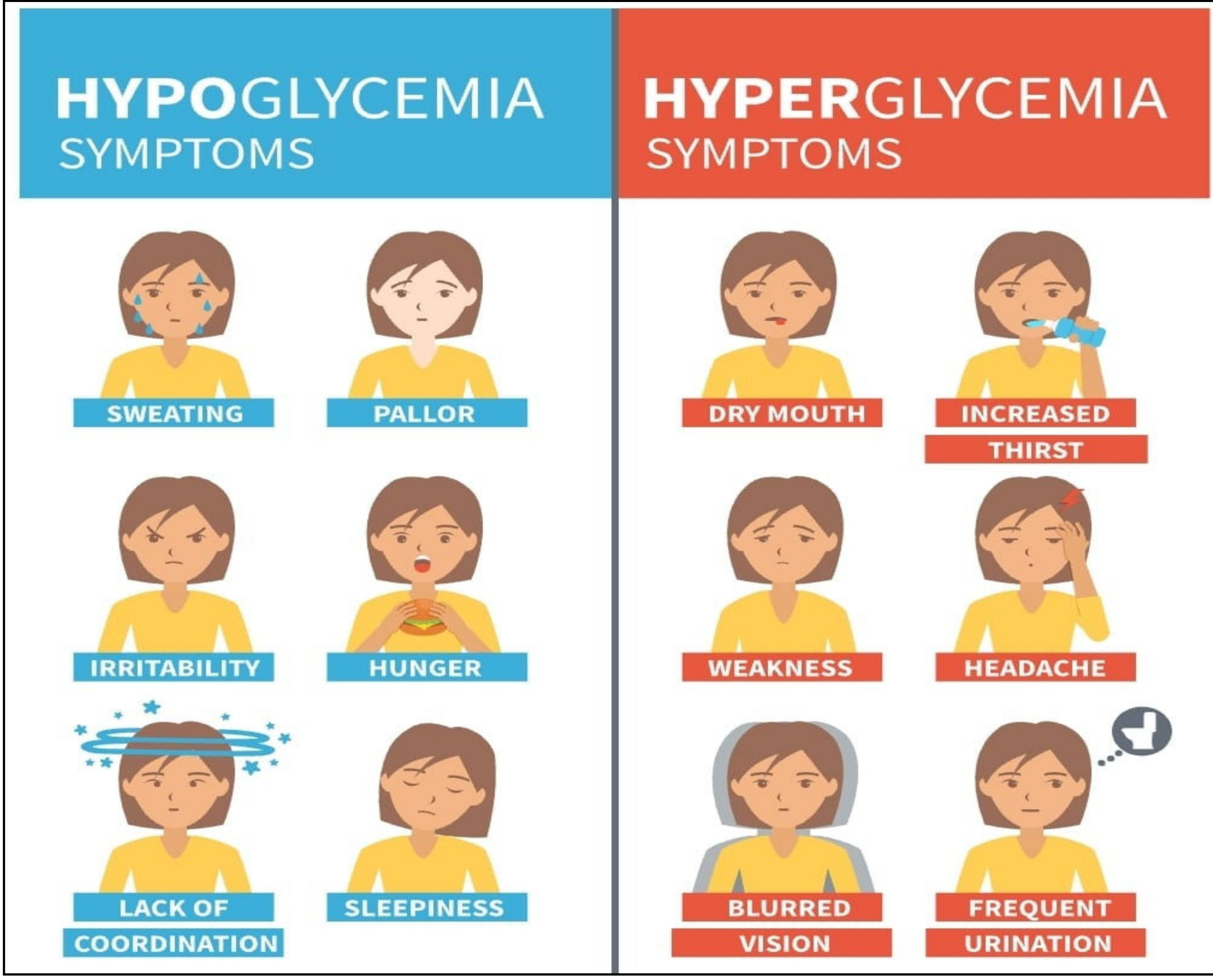

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It may be primary or secondary, The patient with adrenal insufficiency have:

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3-susceptibility to infection and hypertensive.

Oral manifestation like gingival and periodontal disease, oral candidiasis, and pigmentation of oral mucosa.

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- Medical consultation
- Antibiotic prophylaxis.
- Patient on steroid use
- Major dental procedure may require hospitalization with parenteral steroids.
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Thyrotoxicosis refer to increased amount of thyroid hormones (thyroxine and triiodothyronine) in blood.

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- Early jaw development.
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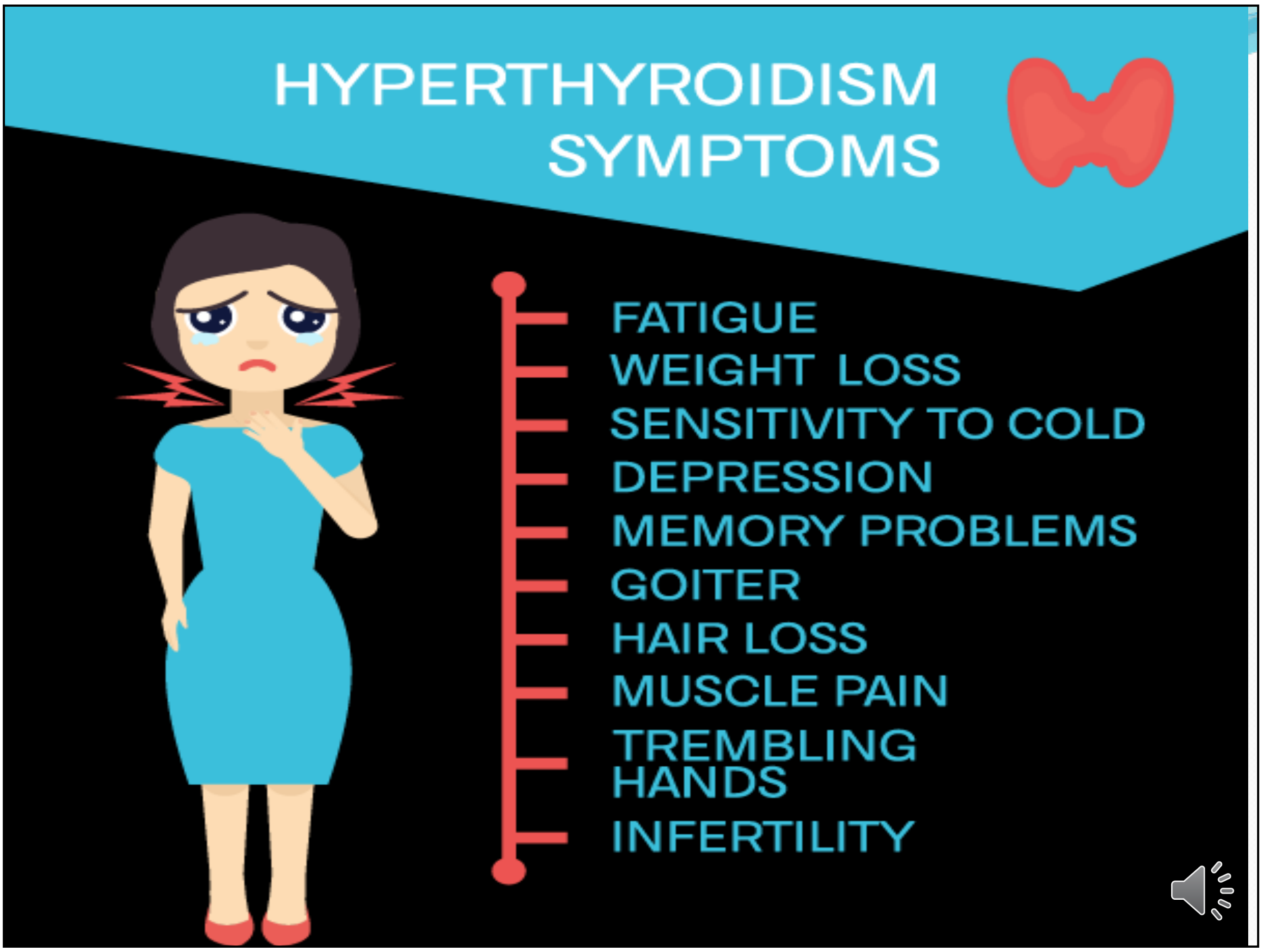

Dental management:

- Medical consultation
- Avoidance of dental treatment until thyrotoxicosis under a good medical control.
- Acute infection must be dealt with antibiotic therapy to prevent thyroid crisis.
- Avoidance of adrenaline and other vasoconstrictor.
- Thyroid storm may be precipitated due to trauma, surgery, stress or infection.
- **Thyroid storm** is a life-threatening health condition that is associated with untreated or undertreated hyperthyroidism

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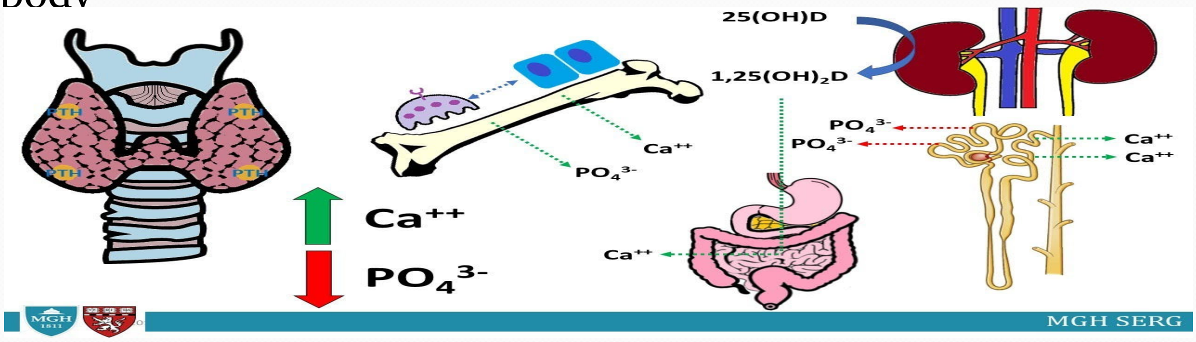
The parathyroid hormone has effects in human body



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Dental management :

- Medical consultation
- Treatment avoided in case of sever hypocalcemia with serious cardiac problems.

Thanks for listening

Medically compromised children

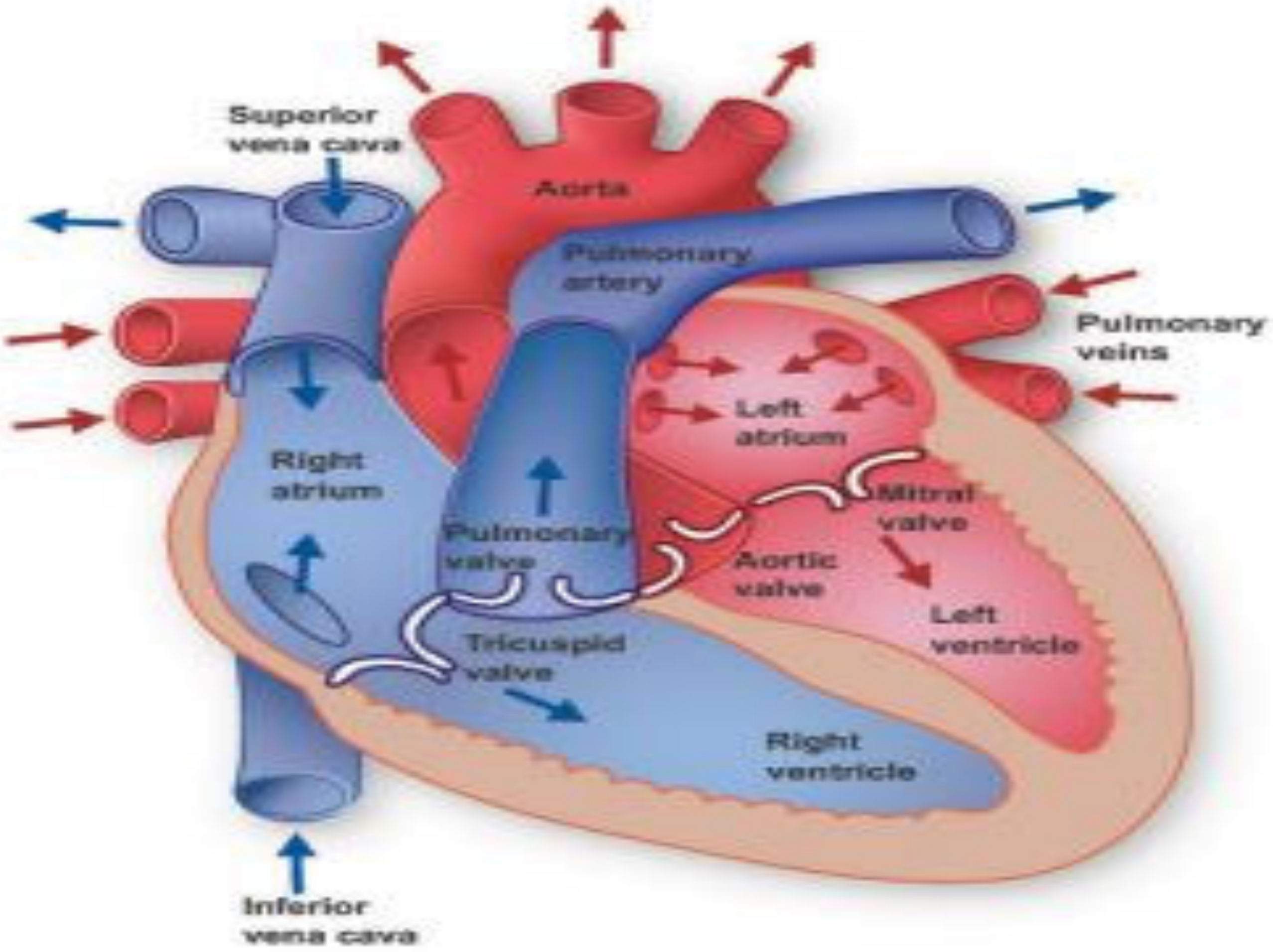
These children often have medical conditions that can affect dental treatment or that they can present with specific oral manifestations of a systemic disease.

Congenital heart diseases

- Congenital heart disease (CHD) has an incidence of approximately 8–10 cases per 1000 live births and represents the largest group of paediatric cardiovascular diseases.

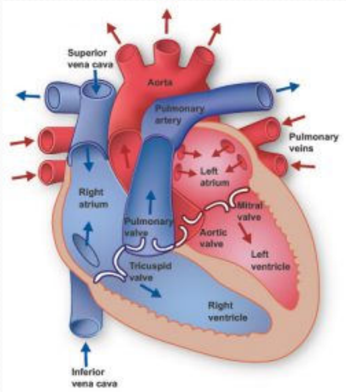
Can be classified into

- acyanotic (shunt or stenotic) and
- cyanotic lesions depending on clinical presentation



Acyanotic conditions

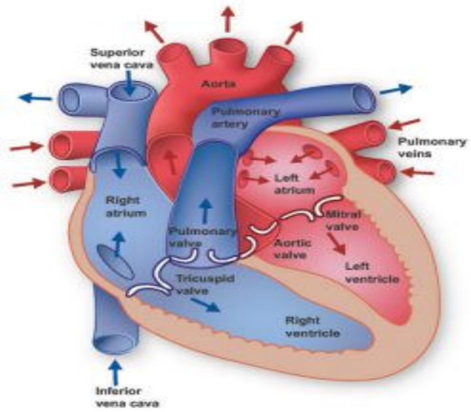
- The acyanotic group of conditions is characterized by a connection between the systemic and pulmonary circulations or a stenosis (narrowing) of either circulation.
- Infant often present with
- Feeding difficulties,
- Breathlessness and
- Failure to thrive.
- Shunts are from the left to right.



- **Atrial septal defect (ASD)**
- **Ventricular septal defect (VSD) .**
- **Patent ductus arteriosus (PDA) .**
- **Aortic stenosis or narrowing of the aortic central orifice**
- **Pulmonary stenosis**

Cyanotic conditions

- All cyanotic conditions exhibit right-to-left shunting of desaturated blood.
- Infants with mild cyanosis may be pink at rest but become very blue during crying or physical exertion.
- Children with cyanotic defects are at significant risk for desaturation during G.A and preoperative consultation with the paediatric cardiologist and anaesthetist is essential.



1. **Tetralogy of Fallot .**
2. **Transposition of great vessels .**
3. **Eisenmenger syndrome**
4. **Tricuspid atresia .**
5. **Pulmonary atresia**

Other cardiovascular diseases

Other common paediatric cardiovascular disorders include:

Cardiomyopathies such as

- myocardial disease.
- pericardial disease.
- cardiac arrhythmia.
- infective endocarditis.
- Rheumatic heart disease (RHD).

- Both CHD and RHD can predispose the internal lining of the heart to bacterial or fungal infection (infective endocarditis) and lead to the formation of friable vegetations of blood cells and organisms

- The initial step in the establishment of a vegetation is endocardial injury, followed by focal adherence of platelets and fibrin.

- Some organisms with high virulence are capable of infecting normal human heart valves, such as *Staphylococcus aureus*.

- Vegetations may embolize and cause renal, pulmonary or myocardial infarcts or cerebrovascular accidents.

- *Streptococcus viridans, also common commensal organism in the oral* cavity, is most frequently responsible for chronic infective endocarditis.

Dental management

- Several important principles need to be followed when managing children with cardiac disease.
- Transient bacteraemia can occur following invasive dental procedures and potentially cause infective endocarditis in a susceptible patient.
- Therefore, all children with CHD or previous RHD **require antibiotic prophylaxis to reduce the risk of infective endocarditis**

Dental management

- Those children who have been previously taking long term antibiotics should be prescribed an alternative medication as per the protocol to avoid development of resistant oral organisms.

- In addition, a preoperative oral antiseptic mouthwash, such as 0.2% chlorhexidine gluconate, is recommended to reduce the oral bacterial counts.

Dental management

- Children with CHD have a higher prevalence of enamel anomalies in the primary dentition and concomitant risk of early childhood caries.
- Some cardiac medications may contain up to 30% sucrose and dietary prescription with high-caloric supplements (Polyjoule) further potentiate caries risk.
- careful oral hygiene and preventive dental care, such as fissure sealants and topical fluoride therapy is recommended to reduce the risk of dental caries in susceptible children.

Dental management

- Dental disease in children with cardiac disorders can seriously complicate their medical management.
- Children with advanced cardiovascular disease should receive only palliative dental care until their medical condition has been stabilized.
- Aggressive treatment of pulpally involved primary teeth is recommended.

- Pulpotomy or pulpectomy is contraindicated in these children due to the possibility of subsequent chronic bacteraemia.
- Although routine treatment in the dental surgery environment is possible, it is often preferable to manage children with multiple carious teeth under general anaesthesia in the hospital environment

- This protocol allows completion of treatment with one invasive procedure and negates the risk of infective endocarditis with further operative procedures.
- If multiple visits are planned, there is a need to

1. prescribe alternative antibiotics or
2. wait for a month between appointments to reduce bacterial resistance.

- A thorough preoperative assessment of the child's regular medication (including anticoagulants, antiarrhythmics, an antihypertensives) is essential to avoid any potential drug interactions during treatment.
- There is no contraindication to the use of vasoconstrictors in local anaesthetic solutions.
- If conscious sedation is used, vital signs and oxygen saturation during the procedure should be carefully monitored.

Avoid the use of

- electrosurgery,
- electronic pulp testers and
- ultrasonic cleaning devices in children with cardiac pacemakers, in case of potential interference.
- Some common impediments are non-compliance with oral hygiene and dietary advice.

Antibiotic prophylaxis protocols for the prevention of infective endocarditis

- Approved antibiotic prophylaxis regimens are still recommended for potentially at-risk patients receiving dental treatment, as there is evidence,
- Recommendations differ from one institution to another and vary in different countries, and therefore it is the responsibility of clinicians to determine which guideline is the most suitable to their individual patient

- **Cardiac conditions associated with the highest risk of adverse outcome from endocarditis for which prophylaxis with dental procedures is recommended:**
- Previous history of infective endocarditis.
- Prosthetic cardiac valve replacement.
- Cardiac transplant recipients who develop valvulopathy.
- Specified congenital heart disease involving the presence or placement of shunts
- Unrepaired cyanotic shunts, including palliative shunts .
- Completely repaired congenital heart defects with prosthetic material or device for at least 6 months after the procedure.
- Repaired congenital heart disease with residual defects or adjacent to a site of prosthetic patch or material.

Non invasive dental procedure

- The following procedures and events *do not need prophylaxis:*
- Routine anaesthetic injections through non-infected tissue.
- Taking dental radiographs.
- Placement of removable prosthodontic or orthodontic appliances.
- Adjustment of orthodontic appliances.
- Placement of orthodontic brackets.
- Shedding of deciduous teeth.
- Bleeding from trauma to the lips or oral mucosa

- Pediatric dosing
- The dose for any child should be calculated up to, but not exceeding the maximum adult dose.
- Dosage should always be prescribed according to weight (dose/kg).

Table 2. DENTAL PROCEDURES FOR WHICH ENDOCARDITIS PROPHYLAXIS IS REASONABLE FOR PATIENTS IN TABLE 1

All dental procedures that involve manipulation of gingival tissue or the periapical region of teeth or perforation of the oral mucosa**

* The following procedures and events do not need prophylaxis: routine anesthetic injections through non-infected tissue, taking dental radiographs, placement of removable prosthodontic or orthodontic appliances, adjustment of orthodontic appliances, placement of orthodontic brackets, shedding of deciduous teeth, and bleeding from trauma to the lips or oral mucosa.

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Table 3. REGIMENS FOR A DENTAL PROCEDURE

Situation	Agent	Adults	Children
	Regimen: Single Dose 30 to 60 min Before Procedure		
Oral	Amoxicillin	2 g	50 mg/kg
Unable to take oral medication	Ampicillin OR Cefazolin or ceftriaxone	2 g IM or IV 1 g IM or IV	50 mg/kg IM or IV 50 mg/kg IM or IV
Allergic to penicillins or ampicillin—oral	Cephalexin*† OR Clindamycin OR Azithromycin or clarithromycin	2 g 600 mg 500 mg	50 mg/kg 20 mg/kg 15 mg/kg
Allergic to penicillin or ampicillin and unable to take oral medication	Cefazolin or ceftriaxone† OR Clindamycin	1 g IM or IV 600 mg IM or IV	50 mg/kg IM or IV 20 mg/kg IM or IV

Table A.13 Current protocols for susceptible patients

- Hand book of ped.dentistry page 493 Appedex E

Haematological Disorder

<u>Disorders of haemostasis</u>

- **Primary haemostasis** is initiated after injury to a blood vessel with the formation of a primary platelet plug.
- **Secondary haemostasis** or coagulation is also triggered by the initial injury and reaches its greatest intensity after the primary platelet plug is formed.

- This process is mediated by interactions between the platelets and coagulation factors in the plasma and the vessel wall.

- The clinical manifestations of a haemostasis disorder vary depending on the phase affected.

- Defects in primary haemostasis generally result in bleeding from the skin or mucosal surfaces, with the development of petechiae and purpura (ecchymoses).

- These disorders include von Willebrand's disease as well as defects in platelet function.
- In contrast, defects in secondary haemostasis, such as haemophilia, lead to bleeding that tends to be more deep-seated in muscles and joints.
- In both disorders uncontrolled prolonged oral bleeding can occur from harmless insults such as a tongue laceration or cheek biting.

Children with haemostasis disorders can be identified from

- A thorough medical history,
- Examination
- Laboratory tests.

Questions should reveal

1. episodes of spontaneous bleeding or bruising;
2. the occurrence of prolonged bleeding in other family members
3. prescription of anticoagulant medication.

- A physical examination of

1. skin (unusual areas of bruising on the chest or back or bruising from lying on a toy),
2. joints and oral mucosa should be undertaken for evidence of petechiae, ecchymoses and haematoma.

- If a haemostasis disorder is suspected, referral to a haematologist is recommended for evaluation and laboratory blood tests.

Laboratory tests

1- **PFA** 100 (platelet function analysis) may be used as a screening test for von Willebrand's disease and platelet dysfunction.

2- Complete blood count (**CBC**) is required to determine platelet levels (normal range 150–400 × 109/L).

3- Coagulation tests include

- A. Prothrombin time (**PT**) that is a test of the extrinsic coagulation pathway (normal range 11–17 s) .
- B. Activated partial thromboplastin time (**APTT**),

Classification

Vascular disorders

- Vascular disorders are characterized by increased capillary fragility and include the
- purpuras,

- hereditary haemorrhagic telangiectasia,
- haemangiomas,

- vitamin C deficiency,

Platelet disorders

- Platelet disorders can be either a deficiency (thrombocytopenia) or dysfunction.

Thrombocytopenia

- Thrombocytopenia is defined as a platelet count <150 × 109/L.
- Clinical signs and symptoms associated with decreased platelet counts are as follows:

• <75 × 109/L – May exhibit post-surgical haemorrhage.
• <25 × 109/L – Spontaneous haemorrhage, easy bruising.
• <15 × 109/L – Petechiae appear on the skin.
• <5 × 109/L – Oral petechiae, submucosal and mucosal bleeding.

Thrombocytopenia may occur as an isolated entity of

1. unknown cause (idiopathic thrombocytopenic purpura, ITP),
2. marrow suppression by drugs
3. from other haematological diseases such as aplastic anaemia.

Thrombocytosis

- Thrombocytosis is an increased number of platelets (>500 × 109/L) and may be associated with prolonged bleeding due to abnormal platelet function

- Platelet function disorders
- These may be congenital or acquired.

- The most common cause of acquired platelet dysfunction is the use of non-steroidal anti-inflammatory drugs (e.g. aspirin).

Inherited coagulation disorders

- Decrease in the amount of particular plasma factors in the coagulation cascade.

The most common disorders are

- Haemophilia A (factor VIII Def.)
- Von Willebrand's disease.
- Haemophilia B or Christmas disease(factor IX)

Dental management

- Dental management of children with suspected haemostasis disorders should begin with screening laboratory tests.
- If tests are abnormal, haematological consultation is required for a definitive diagnosis.
- Invasive dental procedures should be performed only after the extent of the problem has been determined.

Dental procedures

1-- Use an atraumatic technique. In the event that oral surgery is necessary, a sound surgical technique to minimize trauma and local measures to control bleeding such as careful atraumatic suturing and socket dressings are mandatory.

- Maxillary infiltration anaesthesia can generally be administered slowly without pretreatment with platelet or factor replacement.
- However, if the infiltration injection is into loose connective tissue or a highly vascular area, then factor replacement to achieve 40% activity levels is recommended.

- **Avoid** mandibular block injections as these may be complicated by **dissecting haematoma and airway obstruction**.
- In the absence of suitable factor replacement, intra-periodontal injections may be used, but with great caution.
- The anaesthetic solution is placed under moderate pressure along the four axial surfaces of the tooth
- by inserting the needle into the gingival sulcus and the periodontal ligament space

- Nitrous oxide sedation can be effective for restorative procedures with the need for local anaesthesia.

- Care must be taken when placing matrix bands.
- Use rubber dam to protect the soft tissues.
- Endodontic treatment can be safely carried out without factor cover.
- Periodontal treatment with deep scaling and subgingival curettage requires factor replacement.
- Multiple extractions require hospital admission and haematological work-up in conjunction with the haematology team.

Questions commonly asked by parents are:

- = Will my child's teeth erupt normally? **Usually yes**, but there is often more bleeding from a traumatized **operculum** that may require active intervention.
- = Will my child's teeth fall out normally? **Usually yes**, unless continually traumatized, there is normally no abnormal bleeding associated with exfoliating primary teeth.

- However, if there is prolonged mobility and oozing occurs, then extraction may be necessary under appropriate factor cover to reduce the risk of persistent bleeding.

- = Can a **child with a bleeding disorder have orthodontic treatment?** Yes, provided extractions are performed after appropriate consultation with the haematologist and there is watchful maintenance of the appliances.

Anticoagulant therapy

- Management of children on anticoagulant therapy needs special consideration.
- Anticoagulants are usually prescribed for children with :
- valvular heart disease
- prosthetic valves to reduce the risk of remobilization.
- If extractions or surgery are required, it is necessary to decrease the clotting times to facilitate adequate coagulation but not to such an extent so as to cause emboli or clotting around the valves.

- The dental management of these children is also complicated by their congenital cardiac defect and antibiotics are required for prophylaxis against infective endocarditis.

Therapeutic drugs used

1-Oral warfarin sodium (Coumadin):

2-Vitamin K antagonist depleting factors II, VII, IX and X.

Usually 3–4 days are required for full anticoagulation onset and its efficacy is assessed by PT level (factor VII levels).

3- Heparin sodium (Heparin):

- • Shorter acting and has an immediate onset (inhibits factors IX, X and XII).
- • Can be administered either subcutaneously using a low-molecular-weight derivative
- or intravenously under the supervision of a paediatric haematologist.

4- Enoxaparin sodium (Clexane):

- Children on anticoagulant therapy should stop taking warfarin **3–5 days** prior to the surgery date.
- When there is a significant risk for thrombosis with subtherapeutic warfarin level, parenteral anticoagulation may be necessary.
- This is generally achieved with enoxaparin sodium (Clexane) 1.5 mg/kg subcutaneously once daily

- This drug is omitted on the morning of surgery.
- With the use of this regimen, the child may be admitted to hospital on the day of dental surgery
- Warfarin is recommenced in normal dose on the evening of surgery.
- If further enoxaparin sodium prophylaxis is required, it should be given the morning after surgery and continued until the **PT** and international normalized ratio (**INR**) are therapeutic.

Local haemostatic measures

- • Application of topical thrombin (Avitene).
- • Packing of the socket with microfibrillar collagen haemostat (MCH or CollaTape),
- Oxidized regenerated cellulose (Gelfoam or Surgicel).
- • Suturing of attached gingivae to maintain pressure.
- • Splints or stomo-adhesive bandages may also be of benefit.
- • There have been recent reports of the efficacy of 'fibrin glue' in the management of coagulopathies.

- Digital compression of the alveolus after tooth extraction.
- • Packing of the socket with a resorbable gel.
- • Adequate suturing of extraction sites to help reduce postoperative complications.
- • Pressure application to the surgical site with gauze packs.
- • Construction of a removable splint is recommended following more extensive surgery.

Red cell disorders

Anaemia

- Anaemia is considered to be present if the haemoglobin Hb level falls below 100 g/L.

The cause of anaemia in children may be due to

- Blood loss
- Iron, Folate and vitamin B12 deficiency
- Bone marrow failure
- Haemolysis of red blood cells
- Anaemia of chronic disorders

Haemoglobinopathies

1- Haemolytic anaemia

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2- Glucose 6-phosphate dehydrogenase (G6PD)

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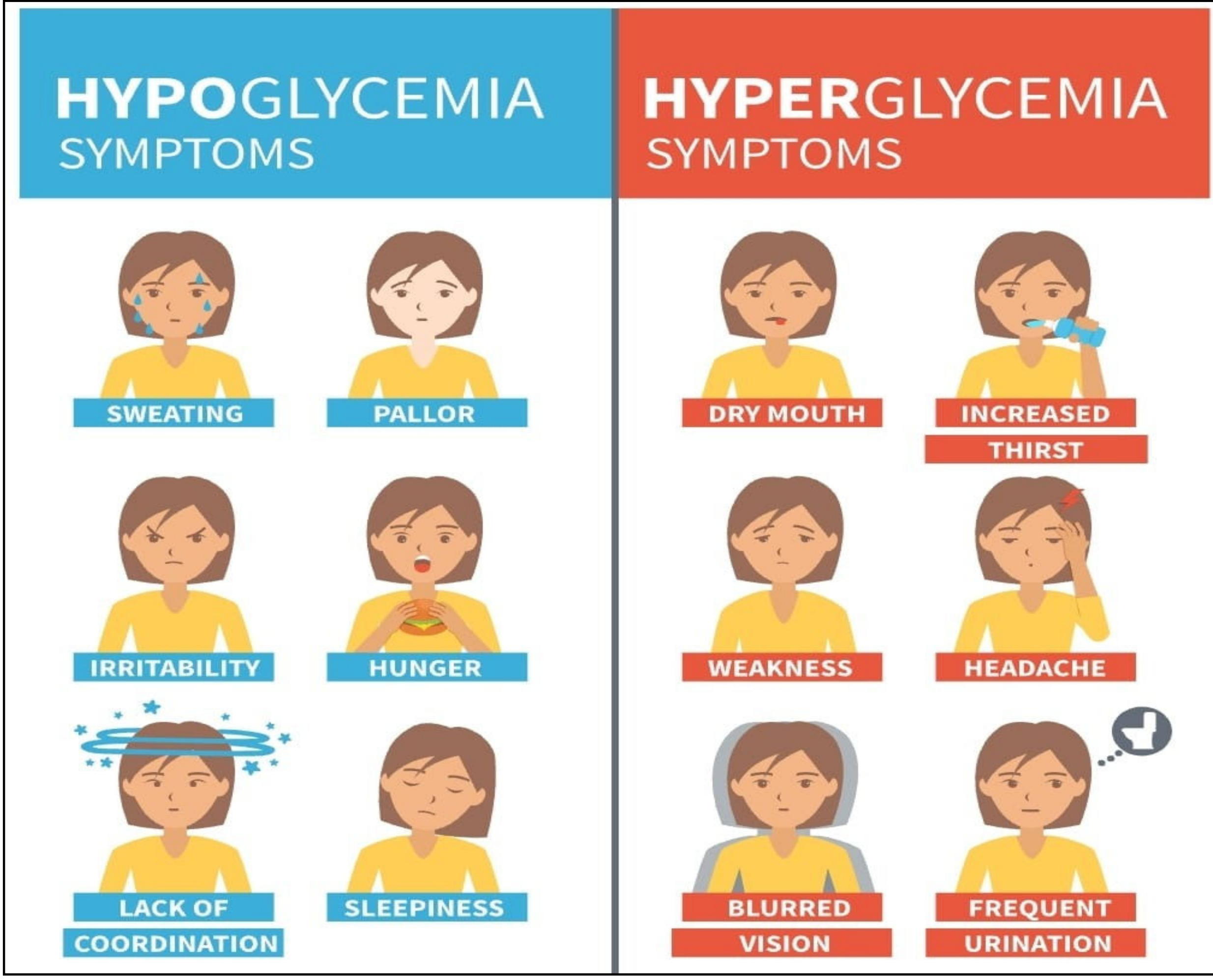

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- Early jaw development.
- Periodontal disease accelerated.

HYPERTHYROIDISM SYMPTOMS

- FATIGUE
- WEIGHT LOSS
- SENSITIVITY TO COLD
- DEPRESSION
- MEMORY PROBLEMS
- GOITER
- HAIR LOSS
- MUSCLE PAIN
- TREMBLING HANDS
- INFERTILITY

Dental management:

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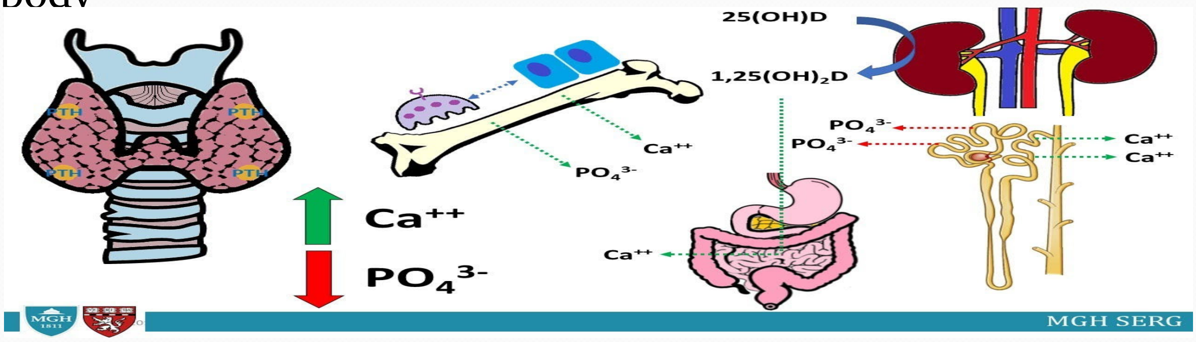

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Dental management :

- Medical consultation
- Treatment avoided in case of sever hypocalcemia with serious cardiac problems.

Thanks for listening

Management of Traumatic Injuries of Teeth and Supporting Structures

- Trauma is a tragic experience for the young patient and is a problem requires experience, judgment, and skill to manage it.
- The dentist should decide either to treat the patient with all possible means or to immediately refer the patient to a specialist.
- The oral and emotional health of the young patient is involved, and the child's appearance, must be restored to normal to relieve the consciousness of being different from other children.

Some scientists found

- the progress of children in school
- their behavior ,
- their psychologic well-being,

can **be adversely influenced** by an injury to the teeth that causes an unsightly fracture.

- The diagnosis of the extent of the injury after a blow to a tooth, regardless of loss of tooth structure, is difficult.

- Trauma to a tooth is invariably followed by pulpal hyperemia, the extent of which cannot always be determined by available diagnostic methods.

- Congestion and alteration in the blood flow in the pulp may be sufficient to initiate irreversible degenerative changes, which over time can cause pulpal necrosis.

- In addition, the apical vessels may have been damaged enough to interfere with the normal reparative process.

- Treatment of injuries causing pulp exposure or tooth displacement are ***particularly challenging***, because the prognosis of the involved tooth is often uncertain.

- Although the dentist may prefer to delay the restoration because of a questionable prognosis for the pulp,
- often a malocclusion can develop within a matter of days as a result of a break in the normal proximal contact with adjacent teeth.
- Success depends on the rapidity with which the tooth is treated after the injury.

- This loss of space will create a problem when the final restoration is contemplated.
- There must often be a compromise of an ideal esthetic appearance, at least in the initial restoration,because
- The prognosis is questionable
- The tooth is young and has a large pulp
- The tooth is still in the stage of active eruption.

HISTORY AND EXAMINATION

- The routine use of a clinical evaluation sheet for injured anterior teeth is helpful during the initial examination and subsequent examinations of an injured tooth .

- The form, which becomes a part of the patient's record, serves as a checklist of important questions that must be asked and observations that must be made by the dentist and the auxiliary personnel during the examination of the child.

- Some authers have attempted to classify pulpal and periodontal healing of traumatic dental injuries based on the effect of treatment delay.
- They developed three major categories of treatment timing:

1. Acute treatment (i.e.within a few hours),
2. Subacute treatment (i.e., within the first 24 hours)
3. Delayed treatment (i.e., after the first 24 hours).

Prevalence of dental trauma

- Taking a complete dental history can help the dentist learn of previous injuries to the teeth in the area.
- Primary more than permanent
- Age incidence in primary 2-4 yr,
- perm.teeth 9-11 yr.
- Male more than female
- In autumn and winter more than other season
- Repeated injuries to the teeth are common in

1. children with protruding anterior teeth and in
2. those who are active in athletics.

Another etiologic or risk factors

- Oral factors
- Environmental S.Eco
- Human behavior.
- Inappropriate use of teeth
- Falls in infancy
- Child abuse
- Sports injuries
- Horse riding
- Car accidents
- Mental retardation
- Drug related injuries
- Developmental defect in enamel and dentin

- Presence of illness (e.g. learning difficulties or physical limitations: Epilepsy, Cerebral palsy, Learning difficulties, Hearing and visual impairments).
- In primary teeth, injury usually results in displacement or avulsion of teeth rather than fracture.

- **Trauma to the face:**
  - It will cause either tooth fracture or displacement. Tooth fracture may be the cause of concussion or subluxation, displacement which is either partial or total.
- **1. Tooth Fracture**: The first thing occur:
  - a. **Concussion**: Sensitivity of the tooth due to trauma without abnormal loosening or mobility. The tooth may be sensitive to percussion usually caused by a mild blow.
  - b. **Subluxation**: Loosening of the tooth without displacement, due to a more severe blow resulting in injury to periodontal ligament.

2. Displacement /luxation:

- a. partial displacement
- b. total displacement **(avulsion)**
- Partial displacement: caused by direct or indirect trauma.

Injuries caused by direct trauma may cause:

- **1.** Palatal or lingual movement of the tooth with palatal fracture of the alveolar bone.
- **2.** Palatal or lingual movement of the tooth with buccal alveolar bone fracture.
- **3.** Displacement of the tooth from its socket without alveolar bone fracture and the tooth appear longer **(Extrusion)**

Injuries caused by indirect trauma may cause:

- **1.** Labial movement of the tooth with fracture of palatal or lingual alveolar bone.
- **2.** Labial movement of the tooth with fracture of labial alveolar bone.
- **3.** Displacement of a tooth in an apical direction **(Intrusion)**.

Tooth is pushed into the socket, the tooth appear shorter and it may cause fracture of the bone at the floor of the socket in most of the cases.

History of the injury

- The time of the injury should first be established. Unfortunately, many patients do not seek professional advice and treatment immediately after an injury.
- Dental treatment cannot be started immediately because other injuries have higher priority.

- That a force strong enough to fracture, intrude, or avulse a tooth is also strong enough to result in cervical spine or intracranial injury.

- The dentist must be particularly alert to such potential problems, be prepared ahead of time to make a neurologic assessment, and make appropriate medical referral when indicated without delay.'

- The patient should be assessed for nausea, vomiting, drowsiness, or possible cerebral spinal fluid leakage from the nose and ears, which would be indicative of a skull fracture.

- Patient should be evaluated for lacerations and facial bone fractures, temperature, pulse, blood pressure, and respiratory rate prior to addressing the dental needs.

- **A quick cranial nerve evaluation involving the following four areas:**

- Extraocular muscles are intact and functioning appropriately; that is, the patient can track a finger moving vertically and horizontally through the visual field with the eyes remaining in cycle.

- Pupils are equal, round, and reactive to light with accommodation.

- Sensory function is normal as measured through light contact to various areas of the face.

- Symmetry of motor function is present, as assessed by having the patient frown, smile, move the tongue, and perform several voluntary muscular movements.

- 1- The prognosis of an injured tooth depends logically, often to a great extent, on the time that has elapsed between the occurrence of the accident and the initiation of emergency treatment.

- This is particularly true in cases of pulp exposure, for which pulp capping or pulpotomy would be the procedure of choice

- 2- The prognosis of the injured teeth maintaining pulpal vitality diminished when treatment was delayed.

- The loss of vitality of some injured teeth occurred as early as 3 months and as late as 24 months after the injury, which justifies a long follow up period after injury.

- **3-** The patient's complaints and experiences after the injury are often valuable in determining the extent of the injury and in estimating the ability of the injured pulp and supporting tissues

- A-Pain caused by thermal change is indicative of significant pulpal inflammation.

- B. Pain occurring when the teeth are brought into normal occlusion may indicate that the tooth has been displaced.

- Such pain could indicate an injury to the periodontal and supporting tissues.

- **C.** Spontaneous pain can indicate damage to the tooth supporting structures, e.g., hyperemia or extravasation of blood into the periodontal ligament. Damage to the pulp due to crown or crown-root fractures can also give rise to spontaneous pain.
- **D.** Mobility of the tooth at the time of the first examination increase the likelihood of eventual pulpal necrosis. The greater the mobility, the greater the chance of pulpal death.

- **4-** Trauma to the supporting tissues may cause sufficient inflammation to initiate external root resorption.
- In severe injury, teeth can be lost as a result of pathologic root resorption and pulpal degeneration.

CLINICAL EXAMINATION

- For any fracture case, an accurate medical and dental history should be taken with record information about the condition involves that could be related to the:

1. Cause of the fracture

2. Place of fracture which could be dirty, contaminated, or clean place, the place of accident may indicate a need for tetanus prophylaxis.

3. The Time of fracture for the treatment plane (for ex. To see the vitality of the tooth). If the fracture before one year, there is high probability that the tooth is non-vital.

- 4. Pain is very important in determining the extent of the injury.

- Diangelis and colleagues have advocated the following classification of crown fractures in describing the extent of damage to the crown of the tooth:
- Crown fracture–uncomplicated: an enamel fracture or an enamel-dentin fracture that does not involve the pulp.
- Crown fracture–complicated: an enamel-dentin fracture with pulp exposure.

- A complete history provides information important for diagnosis and treatment. Following points should be recorded:
- **1)** Patient's name, age, sex, address, and telephone number.
- **2)** When did the injury occur?
- **3)** Where did the injury occur?
- **4)** How did injury occur
- **5)** Treatment elsewhere.
- **6)** History of previous dental injuries.
- **7)** General health.

- Did the trauma cause drowsiness, vomiting, or headache?
- **9)** Is there spontaneous pain from the teeth?
- **10)** Are the teeth tender to touch or during eating.
- **11)** Is there any disturbance in the bite?
- **12)** Recording of extra oral wounds and palpation of the facial skeleton
- **13)** Recording of injuries to oral mucosa or gingival injuries.
- **14)** Examination of crowns of teeth.
- **15)** Recording of displacement of teeth.
- **16)** Disturbances in occlusion.
- **17)** Tenderness of teeth to percussion and change in percussion tone
- **18)** Reaction of teeth to pulpal testing.

		TOOTH NUMBER				
DENTAL INJURIES	AVULSION	Extraoral time				
		Storage medium				
	INFRACTION					
	CROWN FRACTURE					
	PULP EXPOSURE	Size				
		Appearance				
	COLOR					
	MOBILITY (mm)					
	PERCUSSION					
	LUXATION	Direction				
		Extent				
	PULP TESTING	Electric				
		Thermal				
	CARIES/PREVIOUS RESTORATIONS					
RADIOGRAPHS	PULP SIZE					
	ROOT DEVELOPMENT					
	ROOT FRACTURE					
	PERIODONTAL LIGAMENT SPACE					
	PERIAPICAL PATHOLOGY					
	ALVEOLAR FRACTURE					
	FOREIGN BODY					
	DEVELOPMENTAL ANOMALY					
	OTHER					

METHODS OF CLINICAL EXAMINATION

1. Visual Examination :

a . Any leakage of straw colored fluid from the nose , bruising , hemorrhage or laceration of the soft tissues or swelling .

b . Type of fracture .

c . Discoloration of the tooth .

d . Oral hygiene .

e . Occlusion .

f . Deviation in the path of mandible during mouth opening .

- The clinical examination should be conducted after the teeth in the area of injury have been carefully cleaned of debris .
- A piece of cotton moistened with saline or hydrogen peroxide can be used to clean the teeth and surrounded area .

When the injury has resulted in a fracture of the crown , the dentist should observe :

- The amount of tooth structure that has been lost and
- Should look for evidence of pulp exposure .

With the aid of a good light ,

- The dentist should carefully examine the clinical crown for cracks and craze lines , the presence of which could influence the type of permanent restoration used for the tooth .

With light transmitted through the teeth in the area ,

- The color of the injured tooth should be carefully compared with that of adjacent uninjured teeth .

2. Digital examination

- a . Tenderness of the tooth to gentile percussion .
  b . Mobility of the tooth .
- c . Vitality test of the injured tooth by thermal or electrical pulp tester .
- Immediately after trauma , it does not give response to vitality test (why ?) reexamine the tooth after 6 weeks and if the child does not give response , this is an indicator that the tooth is non vital .

- The injured tooth should be performed , and the teeth in the immediate area , as well as those in the opposing arch , should be tested .
- When the electric pulp tester is used , the dentist should first determine the normal reading by testing an uninjured tooth on the opposite side of the mouth and recording the lowest number at which the tooth responds .

- If the injured tooth requires more current than does a normal tooth , the pulp may be undergoing degenerative change , whereas if it required less current , pulpal inflammation is usually indicated .
- Pulp testing following traumatic injuries is a controversial issue .
- These procedures require cooperation and a relaxed patient .

- However , this is often not possible during initial treatment of injured patients , especially children .
- Furthermore , the electric pulp test is frequently unreliable , even on normal teeth when apices are incompletely formed .
- The thermal test is also somewhat helpful in determining the degree of pulpal damage after trauma

- Although there are difficulties with the thermal test , it is probably more reliable than the electric pulp test in testing primary incisors in young children .
- Failure of a tooth to respond to heat indicates pulpal necrosis .
- The response of a tooth to a lower degree of heat than is necessary to elicit a response in adjacent teeth is an indication of inflammation .
- Pain occurring when ice is applied to a normal tooth will subside when the ice is removed

- A more painful and often lingering reaction to cold indicates a pathologic change within the pulp , the nature of which can be determined when the reaction is correlated with other clinical observations .
- Failure of a recently traumatized tooth to respond to the pulp test is not uncommon and may indicate a previous injury with a resulting necrotic pulp .

- However , the traumatized tooth may be in a state of shock and as a result may fail to respond to the accepted methods of determining pulp vitality .
- The failure of a pulp to respond immediately after an accident is not an indication for endodontic therapy . Instead , emergency treatment should be completed , and the tooth should be retested at the next follow - up visit .

- Note : In children the electric pulp tester is controversy because it needs cooperation and a relaxed child . When the child come from the 1st time because of anxiety the child will give false response .

3. Radiographical Examination

- The examination of traumatized teeth cannot be considered complete without a radiograph of the injured tooth , the adjacent teeth , and sometimes the teeth in the opposing arch .
- In search of a fractured tooth fragment , it may be necessary to obtain a radiograph of the soft tissue surrounding the injury site .
-

- Radiographs are taken for :
- 1) Baseline evaluation .
- 2) Medicolegal records .
- 3) Follow up evaluation (comparison with the records in future) .

- Periodic radiographs reveal evidence of continued pulp vitality or adverse changes that take place within the pulp or the supporting tissues .
- In young teeth in which the pulp recovers from the initial trauma , the pulp chamber and canal decrease in size coincident with the normal formation of secondary dentin .
- After a period of time an inconsistency in the true size or contour of the pulp chamber or canal compared with that of adjacent teeth may indicate a developing pathologic condition

- 4) To assess the size of pulp chamber and proximity to the fracture line . The relative sizes of the pulp chamber and canal should be carefully examined .
- Irregularities or an inconsistency in the size of the chamber or canal compared with that of adjacent teeth may be evidence of a previous injury .
- This observation is important in determining the immediate course of treatment.

- 5) Determine the stage of root development (the stage of apical development often indicates the type of treatment) . Selopm
- 6) Presence of root fracture or alveolar bone fracture .
- A root fracture as a result of the injury or one previously sustained can be detected by a careful examination of the radiograph .

A root fracture may not influence the course of treatment , particularly if the fracture line is in the region of the apical third .

- Teeth with root fractures in apical 3rd rarely need stabilization , and a fibrous or calcified union usually results .

- 7) To ascertain the position of traumatized tooth and its relationship in erupted teeth in the area.

- If teeth have been dislocated , with or without root fracture , two or three radiographs of the area at different angles may be needed to clearly define the defect .

- 8) Periodontal ligament condition .
- 9) Pre - existing pathological condition .
- 10) Extraoral radiographs help in diagnosis of jaw fractures , complex injuries (to identify the extent and location of all injuries e.g. panoramic , oblique lateral jaw radiograph are useful in addition to the diagnostic process .
- 11) Soft tissue radiographs are helpful in determining displacement of tooth / teeth fragments into adjacent soft tissue .

Emergency Treatment of Soft Tissue Injury

- Injury to the teeth of children is often accompanied by :
- 1) Open wounds of the oral tissues ,
- 2) Abrasion of the facial tissues ,
- 3) Puncture wounds .
- The dentist must recognize the possibility of the development of tetanus after the injury and must carry out adequate first - aid measures .

- Primary immunization is usually a part of medical care during the first 2 years of life .
- However , primary immunization cannot be assumed - it must be confirmed by examination of the child's medical record .
- When the child who has had primary immunization receives an injury from an object that is likely to have been contaminated , the antibody - forming mechanism may be activated with a booster injection of toxoid

- An unimmunized child can be protected through passive immunization or serotherapy with tetanus antitoxin (tetanus immune globulin , or TIG) .
- The dentist examining the child after an injury should determine the child's immunization status , carry out adequate debridement of the wound , and , when indicated , refer the child to the family physician .

- Tetanus is often fatal , and preventive measures must be taken if there is a possibility that an injured child is not adequately immunized .
- Debridement , suturing , and / or hemorrhage control of open soft - tissue wounds should be carried out as indicated .
- Working with an oral and maxillofacial surgeon or a plastic surgeon may also be indicated
- In extensive injury the child should be hospitalized

- Note :
- The aim of treatment of any injured tooth is to : ellege of
- 1) Maintain vitality
- 2) Allow normal development and growth of the jaws and alveolar bone.

Emergency Treatment and Temporary Restoration of Fractured Teeth without Pulp Exposure

- Crown Craze or Crack :
- These are minute cracks extending throughout the labiolingual surface , usually resulting from direct trauma to a tooth .
- These crazed areas may involve enamel alone or both enamel and dentin .
- A trauma to a tooth that causes a loss of only a small portion of enamel should be treated as carefully as one in which greater tooth structure is lost.

- The emergency treatment of minor injuries in which only the enamel is fractured may consist of no more than smoothing the rough , jagged tooth structure .
- However , without exception , a thorough examination should be conducted .
- The patient should be reexamined at 2 weeks and again at 1 month after the injury .
- If the tooth appears to have recovered at that time , continued observation at the patient's regular recall appointments should be the rule .

- Sudden injuries with a resultant extensive loss of tooth structure and exposed dentin require an immediate temporary restoration or protective covering (to avoid further damaging of the pulp from thermal or bacteria which can transmitted to the pulp through dentinal tubule) .
- In this type of injury , initial pulpal hyperemia and the possibility of further trauma to the pulp by pressure or by thermal or chemical irritants must be reduced

- Furthermore , if normal contact with the adjacent or opposing teeth had been lost , temporary restoration or protective covering can be designed to maintain the arch integrity .

- Several restorations that will satisfy these requirements can easily be fabricated

- There are factors that can affect the treatment :
- 1) The time dentin had been exposed .
- 2) The thickness of the dentin covering the pulp .
- 3) The stage of the development of the root .

- If thick layer of dentin cover that pulp, an indirect pulp capping is indicated to cover the dentinal tubule by Ca (OH)2 and hold the medication by means of retainer.

- Use an orthodontic band (or one of the followings: acrylic crown (which is good for esthetic), celluloid crown, stainless steel crown, cupper ring).

- Then fill the gap with cement and ask the patient to come after some time to check the vitality, the mobility, and the band should stay 6-8 weeks if everything is all right then restoring the teeth.

- If the patient have class II # near the pulp

- If the patient come immediately do pulp capping.

- If the patient come later on then we consider it as an exposure and we do root canal filling because the thin layer of dentin left is not enough to protect the pulp from infection

Fragment restoration(reattaching)

- Dentist ma have the chance to reattach the fragment of fractured tooth using resin and bonding technique.
- Sealing the injured tooth and aesthetically restoring its natural contour and color are accomplished simply and constitute an excellent service. to the patient
- For cases in which considerable dentin is exposed or a direct pulp cap is indicated, some controversy exists about the best treatment to enhance the likelihood of maintaining pulp vitality

- After the fragment was trial-seated to confirm a precise fit, the exposed dentin of the fractured tooth was covered with a thin layer of hard-setting calcium hydroxide that was allowed to remain as a sedative dressing between the tooth and restored fragment.
- A portion of the dentin in the fragment was removed to provide space for the calcium hydroxide.

TEMPORARY RESIN BONDED RESTORATION

The excellent marginal seal and retention derived from the application of aesthetic restorative materials to etched enamel surfaces of fractured anterior teeth.

These bonding techniques are highly successful and versatile in many situations involving anterior trauma.

- It may not be advisable to restore an extensive crown fracture with a finished aesthetic resin restoration.

TREATMENT OF VITAL/ PULP EXPOSURE

- Injury resulting in an exposure of the pulp in young patients often presents a challenge in diagnosis and treatment even greater than that of a pulp exposed by caries
- The immediate objective in treatment should be the selection of a procedure designed to maintain the vitality of the pulp whenever possible.
- In the management of vital pulp exposure, at least three choices of treatment are
- available:

1) Direct pulp capping,
2) Pulpotomy,
3) Pulpectomy with endodontic therapy

DIRECT PULP CAPPING

The treatment of choice is direct pulp capping if:

A. The patient is seen within an hour or two after the trauma.
B. The vital exposure is small.
C. Sufficient crown remains to retain a capping material and prevent the ingress of oral bacteria.

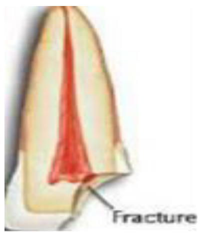
- Ca (OH)? is material of choice for direct pulp capping.
- Even though the pulp at the exposure site has been exposed to oral fluids for a period of time, the tooth should be isolated with a rubber dam, and the treatment procedure should be completed in a surgically clean environment.

- The crown and the area of the actual exposure should be washed free of debris, and the pulp should be kept moist before the placement of the pulp-capping material.

- Numerous pulp-capping materials have been studied.

1. Pulp capping with conventional bonding materials is now accepted by many, Reports of the use.
2. Mineral trioxide aggregate
3. (MTA),
4. Biodentin
5. Bone morphogenetic proteins

are significant not only for pulp capping but also for general use in endodontic therapy for vital and nonvital teeth.



- If the injured tooth presents a good indication for direct pulp capping, there is a definite advantage in providing this treatment.
- The pulp will remain functional and reparative, and dentin will develop and allow the tooth to be restored without loss of normal pulp vitality.
- If final restoration need the use of pulp chamber or the pulp canal for retention, a pulpotomy or pulpectomy is the treatment of choice.

2) PULPOTOMY

- If the pulp exposure in a traumatized (open apex) tooth is large
- If even a small pulp exposure exist, and the patient did not seek treatment until several hours or days after the injury
- If there is insufficient crown remaining to hold a temporary restoration, the immediate treatment of choice is a shallow pulpotomy or a conventional pulpotomy.
- A shallow or partial pulpotomy is preferable if coronal pulp inflammation is not widespread and if a deeper access opening is not needed to help retain the coronal restoration.

- Pulpotomy is also indicated for immature permanent teeth if necrotic pulp tissue is evident at the exposure site with inflammation of the underlying coronal tissue, but a conventional or cervical pulpotomy would be required.

- However, another indication is trauma to a more mature permanent (closed apex) tooth that has caused both a pulp exposure and a root fracture.
- In addition, a shallow pulpotomy may be the treatment of choice for a complicated fracture of a tooth with a closed apex when definitive treatment can be provided soon after the injury.

- The exposure site should be conservatively enlarged, and 1 to 2 mm of coronal pulp tissue should be removed for the shallow pulpotomy or all pulp tissue in the pulp chamber should be removed for the conventional pulpotomy.
- When pulp amputation has been completed to the desired level, the pulp chamber should be thoroughly cleaned with copious irrigation. No visible dentin chips or pulp tissue tags should remain.

- If the remaining pulp is healthy, hemorrhage will be easy to control with a pledget (a small wad of absorbent cotton) of moist cotton lightly compressed against the tissue.
- The pulp should also have a bright reddish-pink color and a concave contour (meniscus).

- A deeper amputation may be necessary if the health of the pulp is questionable.
- A dressing of calcium hydroxide is gently applied to the vital pulp tissue so that it is in passive contact with the pulp.
- The remaining access opening is filled with a hard-setting, biocompatible material with excellent marginal sealing capability.
- The crown may then be restored with a separate bonding procedure.

- Some experts on pulp therapy recommend conventional pulpectomy and root canal fillings for all teeth treated with calcium hydroxide pulpotomies soon after the root apices close.

- They view the calcium hydroxide pulpotomy as an interim procedure performed solely to achieve normal root development and apical closure.

- They justify the pulpectomy and RCT after apical closure as necessary to prevent an exaggerated calcific response that may result in total obliteration of the root canal (calcific metamorphosis or calcific degeneration).
- This calcific degenerative response had been observed and the researchers agree that it should be intercepted with root canal therapy if possible after apical closure.
- However, long-term successes can be achieved after calcium hydroxide pulpotomy in which no calcific metamorphosis has been observed.

- There is a high probability that long-term success can be achieved without follow-up root canal therapy if:

1) Healthy pulp tissue remains in the root canal.
2) The coronal pulp tissue is cleanly excised without excessive tissue laceration and tearing.
3) If the calcium hydroxide is placed gently on the pulp tissue at the amputation site without undue pressure.
4) If the tooth is adequately sealed.

Pulpectomy with Endodontic Treatment

- One of the most challenging endodontic procedures is the treatment and subsequent filling of the root canal of a tooth with an open apex.
- The lumen of the root canal of such an immature tooth is largest at the apex and smallest in the cervical area and is often referred to as a blunderbuss canal.
- Hermetic sealing of the apex with conventional endodontic techniques is usually impossible without apical surgery.
- This surgical procedure is traumatic for the young child and should be avoided if possible.

- Occasionally a patient has an acute periapical abscess associated with a traumatized tooth.
- The trauma may have caused a very small pulp exposure that was overlooked, or the pulp may have been devitalized because of injury or actual severing of the apical vessels.
- A loss of pulp vitality may have caused interrupted growth of the root canal, and the dentist is faced with the task of treating a canal with an open apex. If an abscess is present, it must be treated first.

- If there is acute pain and evidence of swelling of the soft tissues, drainage through the pulp canal wall give the child almost immediate relief.
- A conventional endodontic access opening should be made into the pulp chamber.

APEXIFICATION

- The conventional treatment of pulp less anterior teeth usually requires apical surgery.
- There is a less traumatic endodontic therapy called apexification, which has been found to be effective in the management of immature, necrotic permanent teeth.

- The apexification procedure should precede root canal therapy in the management of teeth with irreversibly diseased pulps and open apices.
- The procedure has been demonstrated to be successful in repeated clinical trials stimulating the process of root end development, which was interrupted by pulpal necrosis, so that it continues to the point of apical closure.

- Often a calcific bridge develops just coronal to the apex.
- When the closure occurs, or when the calcific “plug” is observed in the apical portion, routine endodontic procedures may be completed; the possibility of recurrent periapical pathosis is thus prevented.

- The following steps are included in this technique; immature Tooth

1) The affected tooth is carefully isolated with a rubber dam, and an access opening is made into the pulp chamber.
2) A file is placed in the root canal, and a radiograph is made to establish the root length accurately. It is important to avoid placing the instrument through the apex, which might injure the epithelial diaphragm.

After the remnants of the pulp have been removed using barbed broaches and files, the canal is flooded with hydrogen peroxide to aid in the removal of debris.
The canal is then irrigated with sodium hypochlorite and saline.

The canal is dried with large paper points and loose cotton.

A thick paste of calcium hydroxide is transferred to the canal. An endodontic plugger may be used to push the material to the apical end, but excess material should not be forced beyond the apex.

A cotton pledget is placed over the calcium hydroxide, and the seal is completed with a layer of reinforced zinc oxide-eugenol cement.

- The apexification procedure recommended to be completed in two appointments.
- After instrumentation, irrigation, and drying of the canal during the first appointment, sealing a sterile, dry, cotton pellet in the pulp chamber for 1 to 2 weeks.
- Placing a calcium hydroxide dressing in the canal is optional at the first appointment.

- During the second appointment, the debridement procedures are repeated before the canal is filled with a thick paste of calcium hydroxide and camphoric p-monochlorophenoln (CMCP) or calcium hydroxide in a methylcellulose paste.
- Whether the tooth is filled in one or two appointments (or more) should be determined to a large extent by the clinical signs and symptoms present and to a lesser extent by operator convenience

- All signs and symptoms of active infection should be eliminated before the canal is filled with the treatment paste.

- Absence of tenderness to percussion is an especially good sign before the canal is filled.

- Because of the wide-open access to periapical tissues, it is not always possible to maintain complete dryness in the root canal.
- the treatment paste is allowed to remain for 6 months

- Four successful results of apexification treatment:

(1) Continued closure of the canal and apex to a normal appearance.

(2) A dome-shaped apical closure with the canal retaining a blunderbuss appearance.

(3) No apparent radiographic change but a positive stop in the apical area.

(4) A positive stop and radiographic evidence of a barrier coronal to the anatomic apex of the tooth.

- If apical closure has not occurred in 6 months, the root canal is retreated with the calcium hydroxide paste.
- If leaking in the canal was not controlled before the canal was filled, retreatment is recommended 2 or 3 months after the first treatment.
- Ideally, the postoperative radiographs should demonstrate continued apical growth and closure as in a normal tooth.

- However, any of the other three previously described results is considered successful.
- When closure has been achieved, the canal is filled in the conventional manner with gutta-percha.

- The incorporation of antibacterial agents, such as CMCP, into the calcium hydroxide treatment paste.
- CMCP does not enhance the repair

- MTA or Biodentme can be used to form an apical plug for apexification.
- The root canals that had suffered premature interruption of root development as a consequence of trauma were rinsed with 5% sodium hypochloride.
- Calcium hydroxide was then placed in the canals for 1 week. Following this, the apical portion of the canal (4 mm) was filled with MTA, or Biodentm and the remaining portions of the root canals were closed with thermoplastic gutta-percha.
- At the 6-month and 1-year follow-ups, the clinical and radiographic appearance of the teeth should showed resolution of the periapical lesions. MTA or Biodentine are a valid option for apexification.

- Teeth treated by the apexification method are susceptible to fracture because of the brittleness that results from nonvitality and from the relatively thin dentinal walls of the roots.
- In addition, another important problem with the calcium hydroxide apexification technique is the duration of therapy, which often lasts many months.

Regenerative Endodontic Procedures (REPs

It can be defined as biologically based procedures designed to replace damaged structures, which include dentin, root structures, and cells of the pulp—dentin complex.

These procedures provide a biological alternative to induce continuous root development and reduce the risk of fracture associated with traditional treatments of immature teeth with necrotic pulps, such as calcium hydroxide or MTA or biodentm apexification, where the root remains thin and weak.

- In the last two decades improvements in clinical outcome by this technique include healing of periapical pathology, continued development of the root apex, and increased thickness of the root canal wall.

There are three key ingredients for tissue engineering:

- 1- Stem cells are undifferentiated cells that continuously divide

- 2- Scaffolds, which provides a matrix for cell organization, proliferation, differentiation, and revascularization. REPs have used dentin and blood clots to provide scaffolds in the root canal
- 3- Growth factors. Biological signaling protien release important signaling molecules that may play an important role in regenerative procedures.

Thanks for listening

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Pediatric Dentistry

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Pediatric Dentistry

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

Examination of the Mouth and Other Relevant Structures

- **INITIAL PARENTAL CONTACT WITH THE DENTAL OFFICE**
- **THE DIAGNOSTIC METHODs**
- **PRELIMINARY MEDICAL AND DENTAL HISTORY**
- **CLINICAL EXAMINATION**
- **TEMPOROMANDIBULAR EVALUATION**
- **RADIOGRAPHIC EXAMINATION**
- **EARLY EXAMINATION**
- **INFANT DENTAL CARE**

Dentist is qualified to

1. Perform a complete oral examination of the patient
2. Develop a treatment plan from the examination findings.
3. Do a case presentation to the patient or parents, outlining the recommended course of treatment.

- The plan should include

1. Recommendations designed to correct existing oral problems (or arrest their progression)

2. Prevent anticipated future problems.

AAPD Guidelines on

- **Periodicity of Examination (recall visits)**
- **Preventive measures,**
- **Oral Treatment for Children.**

- ***Anticipatory guidance*** *is the term often used to describe* the discussion and implementation of such a plan with the patient and/or parents.

From Birth-12 Months

1. Complete the clinical oral assessment and appropriate diagnostic tests to assess oral growth and development and/or pathology.
2. Provide oral hygiene counseling for parents, guardians, and caregivers, including the implications of the oral health of the caregiver.

3. Remove supra- and subgingival stains or deposits as indicated.
4. Assess the child's systemic and topical fluoride status (including type of infant formula used, if any, and exposure to fluoridated toothpaste), and provide counseling regarding fluoride
5. Assess appropriateness of feeding practices, including bottle feeding and breast-feeding, and provide counseling as indicated.

6. Provide dietary counseling related to oral health.
7. Provide age-appropriate injury prevention counseling for orofacial trauma.
8. Provide counseling for non-nutritive oral habits (e.g., digit, pacifiers).
9. Provide diagnosis and required treatment and/or appropriate referral for any oral diseases or injuries.

10. Provide anticipatory guidance for parent/guardian.

1 1. Consult with the *child's physician* as indicated.

12. Based on evaluation and history, *assess the patient's risk for oral disease.*

13. Determine interval for periodic reevaluation.

- Pediatric patient - opportunity -complete dental care.
- The dentist **should not attempt to decide** what the child, parents, or caregiver will accept or can pay for.

- If parents reject a portion or all of the recommendations, the dentist has **at least fulfilled the obligation of educating the child and the parents** about the importance of the recommended procedures.
- The dentist should explains that the child's future **oral health** and even **general health** are related to the correction of **oral defects.**

INITIAL PARENTAL CONTACT **WITH THE DENTAL OFFICE**

- The receptionist must have a warm, friendly voice and the ability to communicate clearly.
- The receptionist's responses should assure the parent that the well-being of the child is the chief concern.
- The information recorded by the receptionist
- Filling out a patient information form is a convenient method of collecting the necessary initial information

THE DIAGNOSTIC METHODs

- Before making a diagnosis and developing a treatment plan.
- Collect and evaluate the facts associated with the patient's or parents' chief concern and any other identified problems that may be unknown to the patient or parents.
- Some pathognomonic signs may lead to an almost immediate diagnosis.

- A comprehensive diagnosis of all the patient's problems or potential problems may sometimes need to be postponed until more urgent conditions are resolved.
- **For example**

A newly fractured crown needs immediate treatment, but the treatment will likely be only palliative, and further diagnostic and treatment procedures will be required later.

- A thorough examination of the pediatric dental patient includes assessment of:

1. General growth and health(Medical and dental history)
2. Chief complaint, such as pain
3. Extraoral soft tissue and temporomandibular joint evaluation (Inspection & Palpation)
4. Intraoral soft tissue (Exploration)
5. Oral hygiene and periodontal health
6. Intraoral hard tissue *(tooth Percussion)
7. Developing occlusion
8. Caries risk
9. Behavior

- <u>The following list of Additional diagnostic aids are often also required in Examination of the Patient</u>

1. • Radiography
2. • Transillumination
3. • Vitality tests
4. • Study casts
5. • Laboratory tests
6. • Photography

- In certain unusual cases all of these diagnostic aids may be necessary to arrive at a comprehensive diagnosis.
- Certainly no oral diagnosis can be complete unless the dentist has evaluated the facts obtained *<u>by medical and dental history taking</u>*, inspection palpation,exploration (if teeth are present), and often imaging (radiographs, etc.).
- For a more evaluation read the textbook ***<u>Burket's Oral Medicine</u>***.

PRELIMINARY MEDICAL AND DENTAL HISTORY

- It is important to be familiar with the medical and dental history.
- Familial history may also provide information in some hereditary disorders.
- Before the dentist examines the child, the **dental assistant**

1. Provide the knowledge of the child's general health
2. **Alert the dentist** to the need for obtaining additional information

- Ask the questions informally and then to present the findings to the dentist and offer personal observations and a summary of the case.

- The questions included on the form will also provide information about any previous dental treatment.

- The child's social and psychologic development is important.

- Accurate information reflecting a child's learning, behavioral, or communication problems.

- Behavior problems are related to the child's inability to communicate with the dentist.
- This inability may be attributable to a learning disorder.

- Dental assistant while asking questions about the child's learning process.
- for example, asking a young school-aged child

how he or she is doing in school

- A notation should be made if a young child has been hospitalized previously for General Anesthetic and surgical procedures.

- **Hospitalization and a GA** procedure can be a traumatic psychologic experience for a preschool child and may sensitize the child to procedures.

- If the dentist is aware of previous hospitalization and the child's fear of strangers in clinic clothes,
- Necessary time and procedures can be planned to help the child overcome the fear.

- when the parents report significant disorders, conduct the medical and dental history interview.
- When the parents meet with the dentist privately, they are more likely to discuss the child's problems openly

- In case of an acute or chronic systemic disease or anomaly, the dentist should consult the child's physician to learn

- ✓ The status of the condition,
- ✓ The long-range prognosis,
- ✓ The current drug therapy.
- ✓ Whether the patient is ready for dental treatment or not.
- ✓ Need for prophylactic AB or stopping certain drugs or not.

- Dentist may decide to record additional data concerning the child's current physical condition, such as BP, temperature, heart sounds , height and weight, pulse, and respiration.
- Before treatment is initiated, certain laboratory tests may be indicated and special precautions may be necessary. (BG,BT,CT)
- A decision to provide treatment in **a hospital and possibly under general anesthesia** may be appropriate.

- be alert to identify potentially communicable ***infectious conditions*** that threaten the health of the patient and others as well.
- Knowledge of the current recommended **childhood immunization schedule is helpful**.
- It is advisable to postpone nonemergency dental care for a patient exhibiting signs or symptoms of acute infectious disease until the patient has recovered.

- A brief summary of important medical information serves as a convenient reminder to the dentist and the staff, because they refer to this chart at each treatment visit.
- CNS , CVS ,GIT ,RS ,etc

- The patient's dental history should also be summarized on the examination chart.
- This should include :
- A record of previous care in the dentist's office
- The facts related by the patient and the parent regarding previous care in another office.

- oral hygiene habits and previous and current fluoride exposure

- For example, if the family drinks well water, a sample may be sent to a water analysis laboratory to determine the fluoride concentration.

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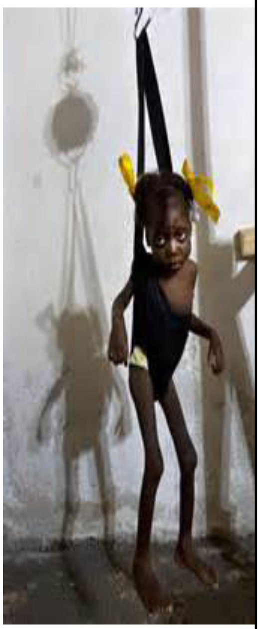
CLINICAL EXAMINATION

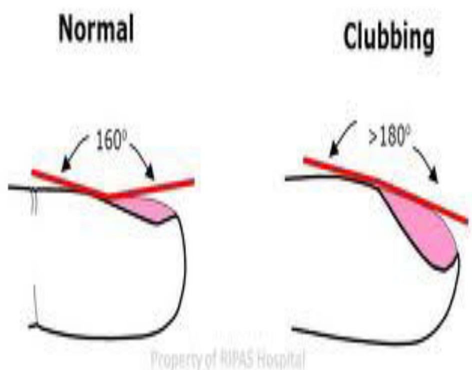
- Thorough clinical and radiographic examination in the oral cavity,
- The dentist should also note the patient's size, stature, gait, or involuntary movements.
- Malnutrition may come from observing a patient's abnormal size or standing.
- observing a weak, unsteady gait of laziness and malaise



- Attention to the patient's hair, head, face, neck, and hands
- The dentist may first detect an elevated temperature by holding the patient's hand.
- Cold, clammy hands or bitten fingernails may be the first indication of abnormal anxiety in the child.

- A rough or unusually clean digit suggests a persistent sucking habit.

- Clubbing of the fingers or a bluish color in the nail beds suggests congenital heart disease.



- Inspection and palpation of the patient's head and neck
- Unusual characteristics of the hair or skin should be noted.
- The dentist may observe signs of head lice , ringworm , or impetigo

- Proper referral is indicated immediat

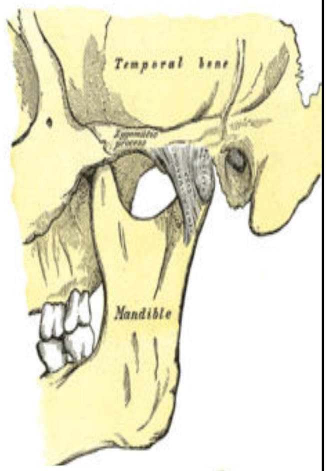
- contagious condition + dental emergency = **appropriate precautions**

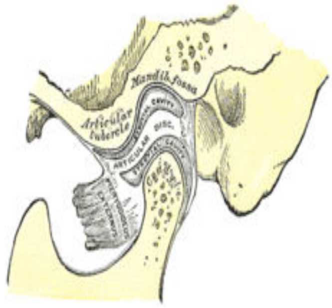
to prevent spread of the disease

Further treatment should be postpone

- Variations in size, shape, symmetry, or function of the head and neck structures

TEMPOROMANDIBULAR EVALUATION





- One should evaluate temporomandibular joint (TMT) function by
- palpating the head of each mandibular condyle and observing the patient while the mouth is closed (teeth clenched), at rest, and in various open positions

TMJ

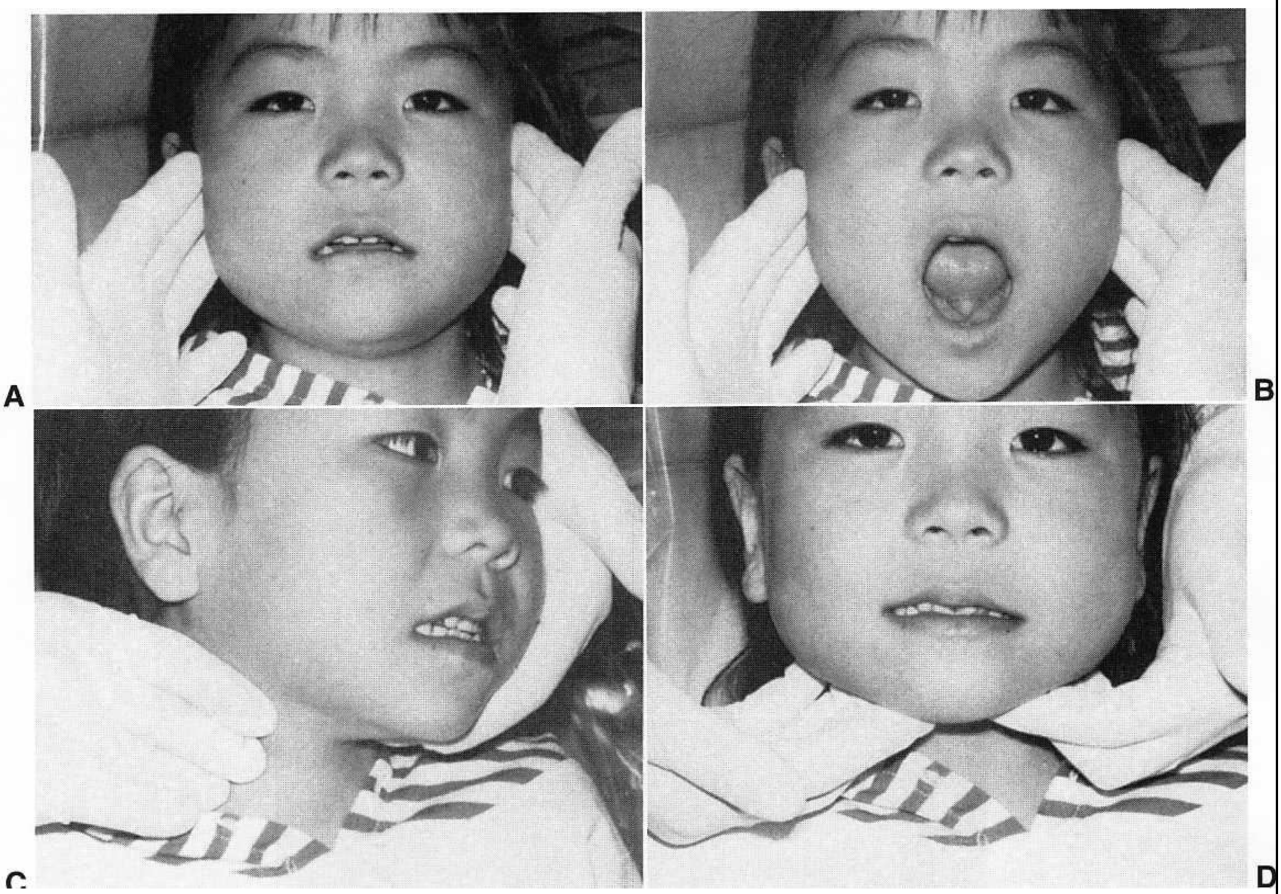
- Movements of the condyles or jaw that are not smoothly flowing or deviate from the expected normal should be noted.
- Similarly, any crepitus that may be heard or identified by palpation, or any other abnormal sounds, should be noted.

- Sore masticatory muscles may also signal TMJ dysfunction.

- Such deviations from normal TMJ function may require further evaluation and treatment.

TMJ disorders in children can be managed effectively by the following conservative and reversible therapies:

- Patient education,
- Mild physical therapy
- Behavioral therapy
- Medications.
- Occlusal splints.



The extraoral examination

- continues with palpation of the patient's **neck and submandibular area** .
- Again, deviations from normal, such as unusual tenderness or enlargement,

- If the child is old enough to talk, *speech should be evaluated.*
- The positions of the tongue, lips, and paraoral musculature during speech, while swallowing, and while at rest may provide useful diagnostic information.

The intraoral examination

- carious lesions.
- dentist should first evaluate
- The condition of the oral soft tissues a

- The status of the developing occlusion.
-

- The buccal tissues, lips, floor of the mouth, palate,and gingivae should be carefully inspected and palpated .

- The use of the periodontal screening and recording program (PSR) is often a helpful adjunct in children.

- The tongue and oropharynx should be closely inspected.
- Enlarged tonsils accompanied by purulent exudate may be the initial sign of a streptococcal infection, which can lead to rheumatic fever.

- The dentition and resulting occlusion may undergo considerable change during childhood and early adolescence.
- Facial profile and symmetry; molar, canine, dental midlines; and relation of arch length to tooth mass .
- Diagnostic cast and cephalometric analyses may be indicated relatively early in the mixed dentition.

FIGURE 4 - Cephalometric X-ray and pretreatment tracing (continuous line). The pretreatment trac ing is overlying the Bolton standard tracing. Note that the superimposition shows the maxilla in good anteroposterior position, but vertically deficient. The nose is well proportioned ("Bolton Stan dards of Craniofacial Development & Growth", Bolton-Broadbent-Golden, Case Western Reserv University - Cleveland, Ohio)

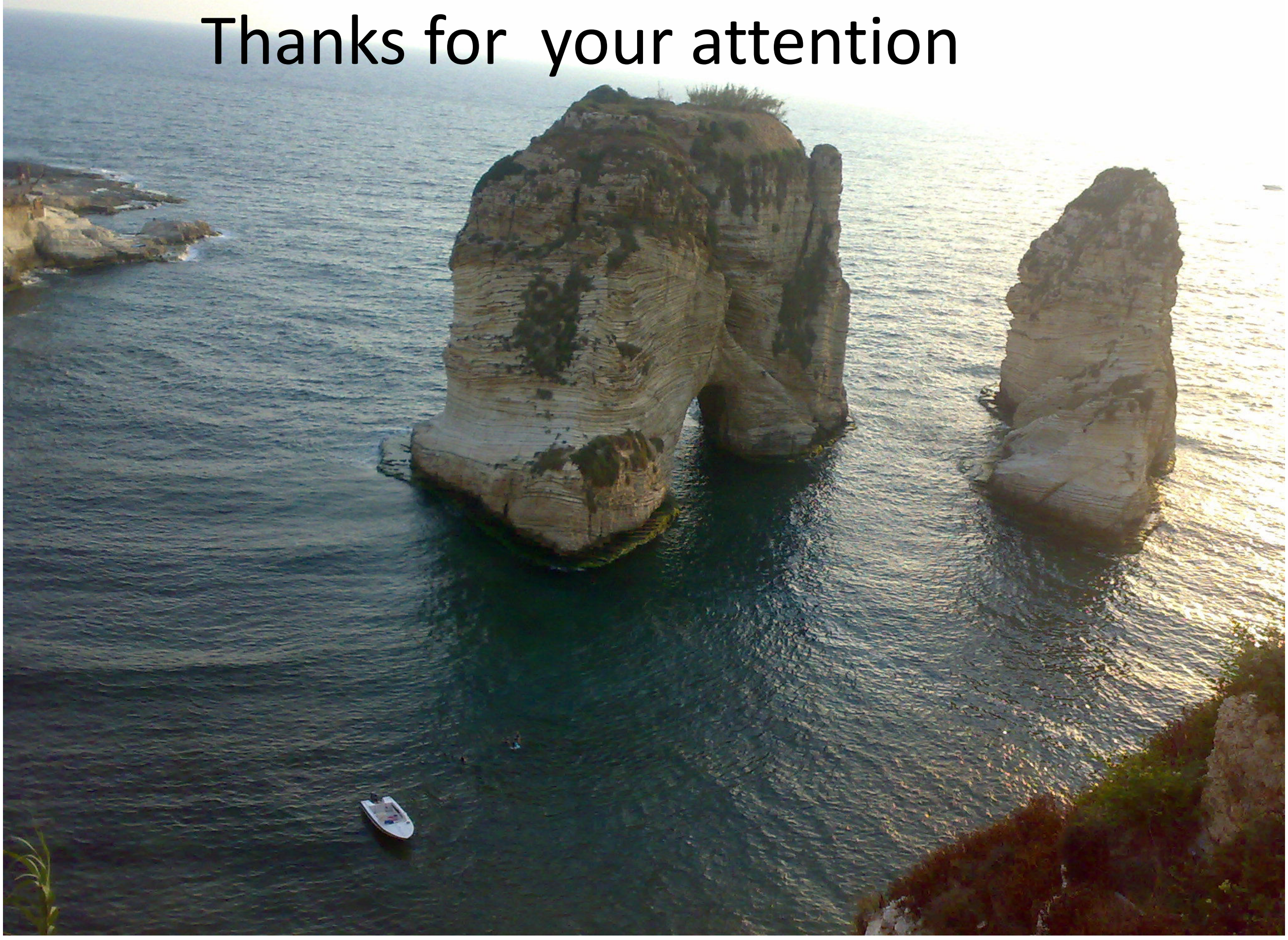
- The teeth should be inspected carefully for evidence of carious lesions and hereditary or acquired anomalies.
- Specially critical in young patients because the lesions may progress rapidly in early childhood caries if not controlled
- The teeth should also be counted and identified individually to ensure recognition of supernumerary or missing teeth.

- Clinical examination before the radiographic and prophylaxis procedures,
- Tooth should be dried individually and inspected under a good light.
- The decision as to whether to place a sealant or to restore a defect depends on

1. the patient's history of dental caries,
2. the parents' or patient's acceptance

- In patients with severe dental caries,
- Caries activity tests
- **Diet analysis** may contribute to the diagnostic process by helping to:

Define specific etiologic factors.


Thanks for your attention

Management of Children with Systemic Diseases

Management of Children with Systemic Diseases

Systemic disease in children cover a wide range of conditions, which include diseases involving one or more organs or systems of the body, thereby affecting the general health of the child.

A number of systemic conditions affect the oral tissues and require modifications during routine dental treatment.

The systemic disease may have a profound effect on the health of the oral tissue and vice versa.

For examples:

- Oral manifestation of systemic disease(glossitis seen in anemia)
- Systemic condition might increase the risk of oral disease (dental erosion seen in a child with anorexia nervosa).
- Medication used for the treatment of the systemic disease might increase the risk of oral disease (gingival hyperplasia on administration of Dilantin).
- Oral disease may pose a greater risk for the child to develop systemic disease (bacteremia from odontogenic infection in bacterial endocarditis).

ENDOCRINOPATHIES

Hyperthyroidism

Patients with Hyperthyroidism are of a great concern to the dental surgeon. In children with untreated or poorly treated thyrotoxicosis, dental treatment, infections or trauma can precipitate an acute emergency called thyroid crisis or thyroid storm.

Causes of thyrotoxicosis

Ectopic thyroid tissues
Graves' disease (Appears to be due to an autoimmune disorder in which a substance is produced that abnormally stimulates the thyroid gland)
Multinodular goiter
Thyroid adenoma Pituitary gland disease

Note: Thyroid hormones are important for metabolic functions that are involved with utilization.
Thyrotoxicosis means increased amount of thyroid hormones, thyroxine and triiodothronine in blood.

Management in the dental clinic

- Consultation with child's physician.
- Avoid elective dental treatment until thyrotoxicosis is under control.
- Acute infections must be dealt with antibiotic therapy to prevent thyroid crisis.
- Avoid use of adrenaline and other vasoconstrictors.
- Thyroid storm may be precipitated due to trauma, surgery, stress, or infections. Early recognition and management is important. It includes ice applied on skin, intravenous administration of hydrocortisone, glucose, etc. and cardiopulmonary resuscitation, if required.
- Patients under good medical control can be managed as normal.

Hypothyroidism

It does not manifested as sever, life-threating condition and in children it is called **cretinism**.

Oral manifestations

Delayed eruption of teeth Malocclusion
Enlarged tongue

Oral manifestations in children

Premature loss of primary teeth and early eruption of permanent teeth.
Early development of the jaw bones.
Increased periodontal disease.

Hyperparathyroidism

A lower level of calcium level stimulates release of parathyroid hormone which:
Increase bone resorption.
Retains calcium by reabsorption in the kidneys. Favorsn absorption of calcium in the intestine.

The net effect is increased serum calcium level which inhibits further parathyroid hormone secretion.

Oral manifestations

- Drifting and loosening of teeth
- Malocclusion
- Pathological fracture of jaw bones
- Radioluscencies representing bone cysts (osteitis fibrosa cystica), loss of lamina dura
- *A generalized ground glass or moth eaten appearance of bone may be seen*

Management in the dental clinic

- Consultation with child's physician.
- *Determine serum calcium, phosphate and alkaline phosphatase level.*
- Avoid routine dental treatment in patients with severe renal failure. Emergency dental treatment must be provided with proper medical advice.
- Dental treatment of malocclusion, missing teeth... etc. should be done after the treatment of the cause of hyperparathyroidism.

Hypoparathyroidism

Commonly seen following surgical procedures involving thyroid gland and inadvertent excision of parathyroid gland (damage to the gland during surgery). Severe cases of hypoparathyroidism may lead to tetany.

Oral manifestations

Hypoplasia of teeth Blunting of molar roots

A sharp tap over the facial nerve in front of the ear causes twitching of facial muscles around the mouth (Chvostek sign).

Management in the dental clinic

- Consultation with child's physician.
- Avoid elective treatment in case of severe hypocalcemia with serious cardiac problems.

Diabetes Mellitus

It is a disease complex of disordered metabolism characterized by hyperglycemia, altered protein and lipid metabolism as a result of absolute or relative deficiency of insulin.

Clinically it can be classified as:

1. Insulin dependent mellitus
2. Non-Insulin dependent mellitus

Symptoms of Diabetes Mellitus:

Excessive thirst

- patients may drink huge volumes of fluid
- cause more urine will be produced and making the person thirstier as a result.

Fatigue and tiredness

- Because of imbalance of sugar level in blood.

Others general symptoms

- urinating a lot
- losing weight
- having blurried vision

Management in the dental clinic

To minimize the risk of an operative emergency, clinicians need to consider some issues before initiating dental treatment:

1. **Medical history**: Take history and assess glycemic control at initial appointment, that's by:
   - ✓ Glucose levels
   - ✓ Frequency of hypoglycemic episodes
   - ✓ Medication, dosage and times.
   - ✓ Consultation

Other symptoms include:

Recurrent bed wetting, Repeated skin infections, Marked irritability, Headache, Drowsiness, Malaise, Dry mouth

Oral manifestation:

1) Gingivitis, increased severity of periodontitis, bone loss.
2) Xerostomia
3) Delayed wound healing
4) Pulpitis in non-carious tooth
5) Burning sensation in tongue
6) Acetone smell in breath
7) Oral ulcers
8) Oral candidiasis
9) Increase the susceptibility to dental caries

Miscellaneous conditions such as: Neuropathies: may affect cranial nerves (facial).

Drug side-effects: lichenoid reaction may be associated with sulphonylureas (chlopropamide)

Ulcers

2. Scheduling of visits:
   Morning appointment
   Do not coincide with peak activity.

3. Diet:
   Ensure that the patient has eaten normally and taken medications as usual

4. Blood glucose monitoring: Measured before beginning. (<70 mg/dL)

5. Prophylactic antibiotics: To get rid of the establishment of infection.

6. During treatment: The most common complication of DM occur is: Hypoglycemic episode.
   Hyperglycemia

7. After treatment: Dietary intake
   Medications: salicylates increase insulin secretion and sensitivity ➔ avoid aspirin

MANAGEMENT OF SYNCOPE:

Treat the underlying cause

Immediate symptomatic therapy includes:
- Recognition of unconsciousness
- "Shake & shout"
- Check for protective reflexes

Management
- Position victim-supination
- Assess & open airway-head tilt, chin lift
- Airway patency, breathing, circulation-look, listen & feel
- Artificial ventilation & cardiac massage-cardiopulmonary resuscitation

Cystic fibrosis

It is an autosomal-recessive disorder occurring in 1 of every 2000 births. It is the most common lethal genetic disorder affecting whites. The genetically altered protein affects exocrine gland function. The defective exocrine gland function leads to microobstruction of the pancreas, which results in cystic degeneration of the pancreas and, ultimately, a digestive enzyme deficiency producing malabsorption of nutrients.

The defective gene products cause abnormal water and electrolyte transport across epithelial cells, which results in a chronic disease of the respiratory and gastrointestinal system, elevated levels of electrolytes in sweat, and impaired reproductive function. In the lungs, retention of mucus occurs, which causes obstructive lung disease and increased frequency of infections.

Children with cystic fibrosis have a high incidence of tooth discoloration when systemic tetracyclines are taken during tooth formation. With the advent of alternative antibiotics, the incidence of tooth discoloration is decreasing.

The incidence of dental caries in children with cystic fibrosis is low secondary to long-term antibiotic therapy, buffering capacity of excess calcium in the saliva, and pancreatic enzyme replacement therapy.

There is a high incidence of mouth breathing and open-bite malocclusion associated with chronic nasal and sinus obstruction.

Patients with cystic fibrosis may prefer to be treated in a more upright position to allow them to clear secretions more easily.

The use of sedative agents that interfere with pulmonary function should be avoided, and the patient's physician should be contacted before nitrous oxide–oxygen sedation is used in a patient exhibiting evidence of severe emphysema.

Dental management of cystic fibrosis

- Those children suffer from delayed dental development, more commonly have enamel opacities and are more prone to calculus
- They need to have higher caloric intake and may have frequent refined carbohydrate snacks –
- May also have cirrhosis of liver -> clotting defects -> haemorrhaging following surgical procedures
- May be prescribed tetracycline to prevent chest infections -> intrinsic dental staining
- General anaesthesia should be avoided

Renal disease

In renal disorders there is increased susceptibility to:

Infection and immunosuppression, bleeding tendency, decreased ability to excrete drugs, existence of A-V shunt, cross infection.

Dental management of renal disorders:

- Prevent dental diseases- OHI and education
- Strict cross-infection control
- Consult patient's physician before performing dental treatment
- Monitor BP pre-op and post-op
- Treat all infections aggressively and consider prophylaxis
- Use additional hemostatic measures
- Be careful with prescribing drugs
- Never subject those patients to out-patient general anaesthesia
- Remember veins are precious
- Poor bone density -> frequent denture adjustments
- Try to perform dental treatment just after dialysis if possible

Oral Manifestations of Renal Disease and Dialysis:

Enlarged (asymptomatic) salivary glands i.e. Parotitis
Decreased salivary flow, Xerostomia
Dry mouth
Odor of urea on breathe, ammonia like taste and smell
Metallic taste
Increased calculus formation
Low caries rate
Enamel hypoplasia
Extrinsic (secondary to liquid ferrous sulfate therapy), dark brown stains on crowns
Intrinsic (secondary to tetracycline staining)

Note: Chronic renal failure is the irreversible deterioration in renal function which results from a diminished mass of the excretory, metabolic and endocrine functions of the kidney which leads to the development of the clinical syndrome of uremia, so:

UNDER CONSERVATIVE CARE

- Consultation with patient's physician
- Check lab values, blood urea nitrogen
- Avoid dental treatment if the disease is unstable.

- Monitor blood pressure closely
- Pay meticulous attention to good surgical technique
- Avoid nephrotoxic drugs
- Adjust doses of drugs metabolized by the kidney
- If medical parameters permit:

  Try to eliminate all foci of infection
  Keep only the easily maintainable teeth
  Insist on keeping a good oral hygiene
- If patient is in advance stages, dental care may best be provided after physician's consultation and in a hospital like setting
- Because of the potential bleeding problems:

1. Pretreatment screening for bleeding time and platelet count PTT, PT, platelet count.
2. A hematocrit level and hemoglobin count should be obtained to assess the status of anemia.

- If an orofacial infection exists, aggressive management is necessary using culture and sensitive tests and appropriate antibiotics. Consider corticosteroid supplementation as indicated.

NEPHROTOXIC DRUGS:

Tetracyclines, Streptomycin, Vancomycin, Gentamycin, Acyclovir, Acetaminophen Phenacetine, NSAIDs, Asprin, Antihistamines, Phenobarbitones

So you should give:

Cloxacillin, erythromycin, minocycline, codiene, diazepam, lidocaine.

PATIENT RECEIVING DIALYSIS

Those patients at high incidence of serum hepatitis, high incidence of anemia, significant incidence of secondary hyperparathyroidism, uremic stomatitis may exist, may undergo heparinization during hemodialysis, and may have arteriovenous shunt or fistula. So keep in mind:

- The work will be the same as conservative care conditions
- Beware of concerns of arteriovenous shunt
- Consult with the physician about risk for infective endocarditis
- Avoid blood pressure cuff and IV medications in arm with shunt
- Avoid dental care on day of treatment; best to treat on day after
- Consider antimicrobial prophylaxis
- Consider corticosteroid supplementation as indicated
- Assess status of liver function and presence of opportunistic infection in those patients because of increased risk for carrier state of hepatitis B and C viruses and human immunodeficiency virus.

Dental management

1 Screen for HBsAg and HBsAb
2Antibiotic prophylaxis to prevent endarteritis of arteriovenous fistula
3-Prevent hypoxia
4 Provide treatment on the day after hemodialysis
5Be careful to protect the fistula or shunt when patient on dental chair
6-Refer the patient to physician if uremic stomatitis is noted to develop

Renal transplant patient

Infection in such patients is life –threatening. Before transplantation only maintained teeth should be determined by dental team approach, however, teeth with furcation involvement, periodontal abscesses, or extensive surgical requirements should be extracted.

Dental management

1- Emergency treatment only for 1st 6 months
2- HBs Ag screening
3-Prophylactic antibiotics according to AHA recommendations
4- Erythromycin is contraindicated in patients on cyclosporins
5- Immunosuppressed patients requires supplemental corticosteroids.

RESTORATIVE DENTISTRY

In Pediatric Patient

Objectives of the lecture

- To review the ideal dental office setup
- To review the moisture control and isolation
- To review the restorative materials used in pediatric dentistry
- To review the Matrices & bands
- To review different cavity preparation techniques and some modifications
- To review crown restorations for posterior & anterior teeth

Restorative Goals

- Relief pain & Cease disease process
- Restore function
- Improve esthetics
- Preserve space for permenant dentition

Moisture Control In Restorative Pediatric Dentistry

Introduction

Objective: Maintain an environment that keeps the operating field free of excess water, saliva, blood, tooth fragments, and excess dental materials.

Oral Evacuation Systems

- The process of removing excess fluids and debris from the mouth.
- **Two systems:**
  - Saliva ejector
  - High-volume evacuator (HVE)

Saliva Ejector

- Small, strawlike oral evacuator used during less invasive dental procedures.
- **Indications for use:**
  - Preventive procedures such as a prophylaxis or fluoride treatments.
  - Helps control saliva and moisture accumulation under the dental dam.
  - For the cementation of crown or bridge.
  - During an orthodontic bonding procedure.

HVE

- Used for most dental procedures, especially when the dental handpiece is in use.
- **Indications for use**
  - Keep the mouth free of saliva, blood, water, and debris.
  - Retracts the tongue and cheek away from the field of operation.
  - Reduces the bacterial aerosol caused by the high-speed handpiece.

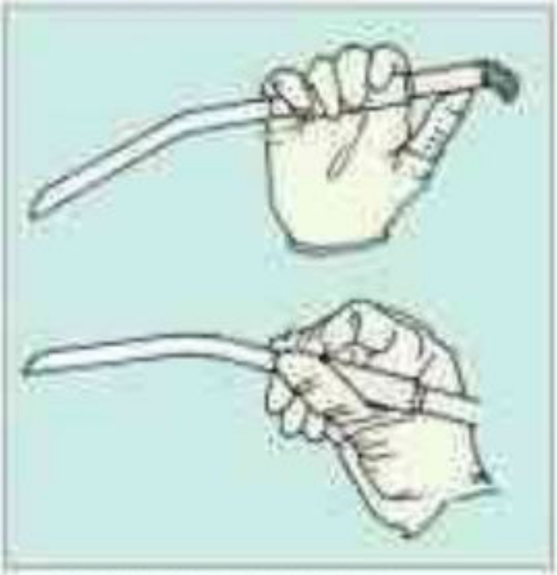
HVE– cont'd

- **Oral evacuation tips**
- **Operative suction tips**
  - Designed with a straight or slight angle in the middle.
  - Beveled working end.
  - Made of durable plastic or stainless steel.
- **Surgical suction tips**
  - Much smaller in circumference.
  - Made of stainless steel.

Grasping the HVE

- Thumb-to-nose grasp
- Pen grasp
  - Right hand

Fig. 36-4 Grasping the HVE.



IDEAL ISOLATION

Objectives of Ideal Isolation

- Provide optimum visibility and access to operative site.
- Prevent moisture contamination of teeth.
- Retract and control soft tissue of tongue, lip, and mucosa.
- Protect patient against aspiration of dental instruments and materials.
- Provide patient comfort.
- Be easily and rapidly accomplished.

Dry-Angles

- A triangular absorbent pad placed over the Stensen's duct blocks the flow of saliva and protects the tissues in this area.

The Dental Dam

- A thin stretchable latex material becomes a barrier when appropriately applied to select teeth.

Rubber Dam Application

Types of Dental Materials

- F release material
  (Glass Ionomer)
  Resin Modified Glass Ionomer
- Composite
- Amalgam
- Stainless Steel

Fluoride-Releasing Materials
Glass Inomer & Resin Modified Glass Inomer

Glass Inomer Cement loses and gains water easily:

- Early moisture contamination leads to increased solubility and poor esthetics, (protect for first 7 minutes).
- Later desiccation causes shrinkage and crazing, (maybe even months later).

GIC - Fluoride Release

- "halo" effect around restoration ~ 3 mm.
- Level around restoration ~ 10 ppm.
- Level in saliva of average patient ~ 0.08 ppm.
- Fluorine release from GIC does not lead to restoration breakdown.

Classification OF GI

ADA Classification

- **Type I:** luting agents (Ketac-Cem, Fuji I)
- **Type II:** restorative material
  - a = tooth-colored (Ketac-Fil, **Fuji IX**)
  - b = reinforced (Ketac-Silver, "Miracle Mix")
- **Type III:**
  - fast-set liners and bases (Ketac-Bond)

GIC – Physical Properties

Strengths:

- Ionic exchange leads to adhesion to tooth structure (chemical bond).
- Fluoride release and “rechargeable”.

GIC – Physical Properties

Weaknesses

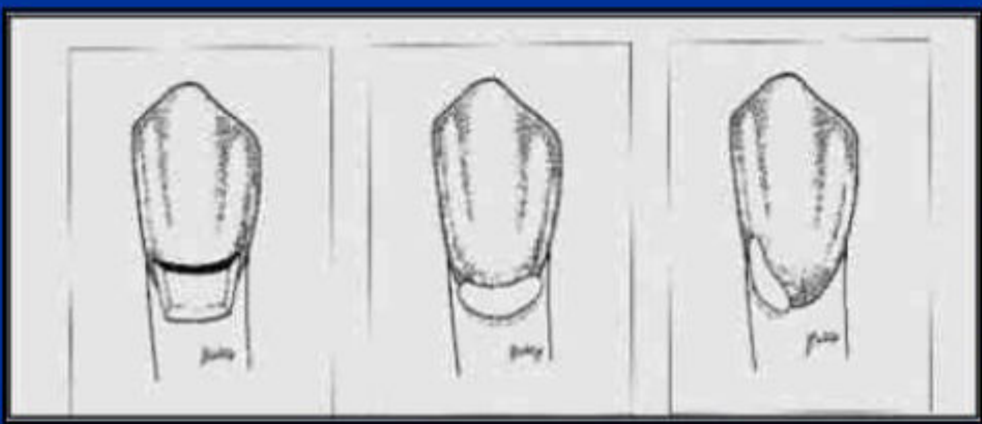
- Moisture sensitivity.
- Lack of command cure, i.e. doesn’t cure with light.
- Esthetics.
- Not recommended for stress-bearing areas.
- Difficult handling.

GIC INDICATIONS

- High caries rate patient
- Atraumatic restorative treatment ART
- Gross caries control
- Pediatric dentistry
- Class V restoration
- Luting agent (crown and bridges)
- Cavity Liner and bases

Steps of Clinical Use of Glass Inomer

1. Mechanical retention in preparation advised (no bevels).



Steps of Clinical Use of Glass Inomer

2. Dentin conditioning (10 % polyacrylic acid for 10-20 seconds).

3. Inject into preparation. Overfill the preparation.

Steps of Clinical Use of Glass Inomer

4. Trim excess with finishing bur (wet, with very light pressure as the cement material cuts easily!) and polish (if necessary). Be cautious not to over-reduce, the material is “softer” than composite resin.

5. Dry the surface and paint on a thin layer of light-cured unfilled resin (smoothes the surface and prevents desiccation but lowers fluoride release. (optional)

Glass Ionomers

- Advantages
  - Bond to tooth structure
  - Physical properties similar to dentin
  - Moisture tolerant
  - Release fluoride (5 years)
  - Fluoride rechargable
  - Less microleakage

Glass Ionomers

- Disadvantages
  - Not as strong
  - Poor wear
  - Increased setting time
  - Not as esthetic as composite

Glass Ionomer Indications

- Smooth surface lesions
- Small anterior proximal lesions
  - i.e. areas of low stress
- High caries risk patients
- Sealants
- Base underneath deep carious lesions
- Good cement for stainless steel crowns and brackets and bands
- Interim Therapeutic Restorations

Resin Modified Glass Ionomer

- Mixture of glass, an organic acid, and resin polymer that harden when light cured

Resin Modified Glass Ionomer

- Advantages
  - Increased wear and fracture toughness
  - Some fluoride release
  - Comand cure
  - Increased esthetics
- Disadvantages
  - Not as strong as composite or amalgam
  - Less fluoride release than glass ionomer

Amalgam

- mixture of mercury (43%-54%) and powdered alloy (silver, tin, zinc and copper)
- Once mixed sets automatically

Amalgam

- Advantages
  - Quick and easy manipulation
  - Less moisture sensitive
  - Microleakage decreases with time
  - Good mechanical properties
  - economical

Amalgam

- Disadvantages
  - Non bonding
  - Bulk for strength
    - Proper preparation to prevent fracture
    - Wide isthmus
    - Rounded line angles
  - Poor esthetics
  - Dental amalgam controversy

Composite

- Mixture of powdered glass and plastic resin
- Polymerization reaction initiated by light
- Various level of filler particles can change esthetics, mechanical properties, and viscosity

Composites

- Advantages
  - Micromechanical Bond
  - Esthetic and polishable
  - Conservative preparation
  - Preventative
    - Sealants

Composites

- Disadvantages
  - Moisture sensitive
  - Technique sensitive
    - Multiple steps
    - Time consuming
  - Polymerization shrinkage leads to microleakage

Composite Indications

- Small pit and fissure caries
- Class I, II, III, IV and V restorations in primary and permanent teeth

Anterior Strip Crowns

- Anterior Restorations
- Primary anterior crown forms

Stainless Steel

- Pre-fabricated
- Full coverage restoration
- Pre-crimped with 6 sizes
- Adapted to tooth

Stainless Steel

- Advantages
  - Strongest
  - Preventative
  - Can be adapted for space maintainer
- Disadvantages
  - Poor esthetics
  - Post op discomfort

Stainless Steel Indications

- Pulpotomy
- Extensive caries
- Fractured teeth
- Hypoplastic molars

Stainless Steel Crown Indications

- Space Maintainer
  - Distal Shoe / loop
- High caries risk children
- Patients that require general anesthetic for dental treatment

Stainless Steel Crown

- Crown and loop
- Placed on tooth that has extensive decay with space maintenance needs

Anterior Stainless Steel Crowns

- Anterior SSC with windows
- Flowable composite
  - Acid etched
  - Micromechanical and mechanical retention

Matrix Systems for Restorative Dentistry

Introduction

A **matrix system** provides and takes the place of the proximal tooth surface that was removed to restore the proximal contours and contact to their normal shape and function.

Types of Matrices

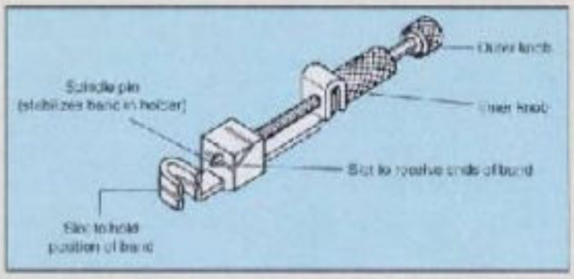
- Tofflemire
  - does not fit contour of primary tooth well
  - difficult to fit multiple matrices
  - T-band
- Spot welded
  - allows for multiple matrix placement
  - requires a spot welder chairside
- Automatrix - costly

Posterior Matrix System

- **Universal retainer**
  - Also referred to as the *Tofflemire retainer.* This device holds the matrix band in position. The retainer is positioned most commonly from the buccal surface of the tooth being restored.

Components of a Universal Retainer

Components of Universal Retainer



Outer knob: Used to tighten or loosen the spindle within the diagonal slot; this holds the matrix band securely in the retainer.

Inner knob: Used to increase or decrease the size of the matrix band loop; when placing the band over the tooth, the size of the loop circumference should be the largest size and then tightened after placement.

Spindle: Internal screwlike pin that fits into the diagonal slot to secure the ends of the matrix band; when assembling the retainer, the spindle point must be clear of the slot into which the band slides.

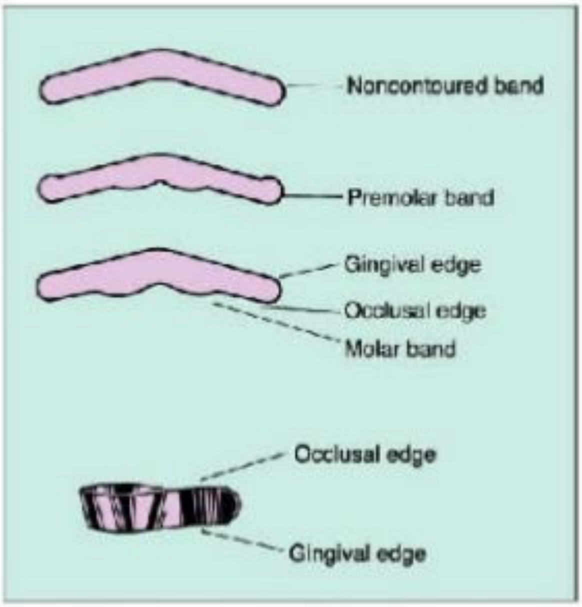
Diagonal slot: Slot within the main body of the retainer that is used to position the ends of the matrix band into the vise; the retainer is always positioned in the mouth with this slot facing *toward the gingiva.*

Guide slots: Slots used to position the matrix band for either the left or the right quadrant.

Posterior Matrix System–cont'd

- **Matrix bands**
  - Matrix bands are made of flexible stainless steel and are available in premolar, molar, and universal sizes and thicknesses.
    - The *larger* circumference of the band is the *occlusal edge* and is always placed toward the occlusal surface.
    - The *smaller* circumference of the band is the *gingival edge* and it is always placed toward the gingiva.

Fig. 49-2 Types of matrix bands.



Automatrix System

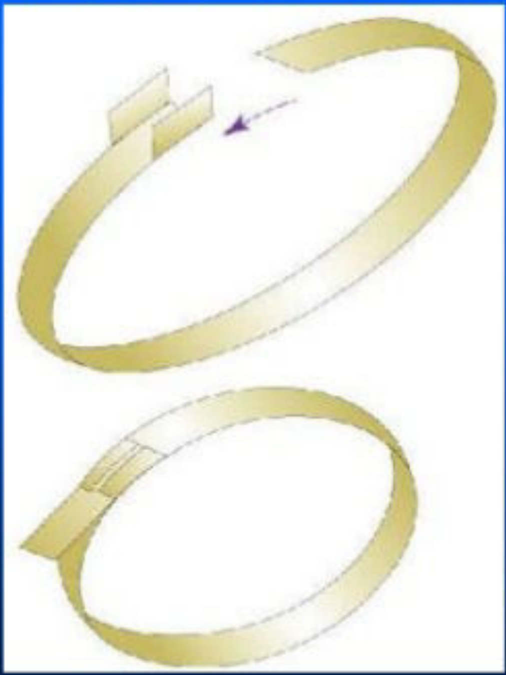
- The automatrix system is an alternative to a universal retainer.
- There is no retainer used to hold the band in place.
- Bands are already formed into a circle and are available in assorted sizes in both metal and plastic.
- Each band has a coil like autolock loop.
- A tightening wrench is inserted into the coil and turned clockwise to tighten the band.
- When finished, the tightening wrench is inserted into the coil and turned counterclockwise to loosen the band.
- Removing pliers are used to cut the band.

Fig. 49-9 Automatrix system.
(Courtesy of Dentsply Caulk.)

Matrix Systems for Primary Teeth

- The **T-band** is a T-shaped copper band.
- When formed, the top portion of the T allows the straight portion to adjust and fit the circumference of the primary molar.

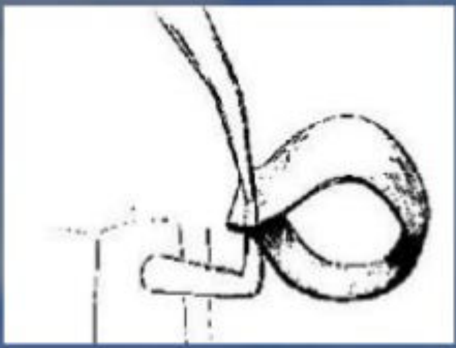
Copper T-band used for primary molars.



Additional Matrix Systems for Primary Teeth

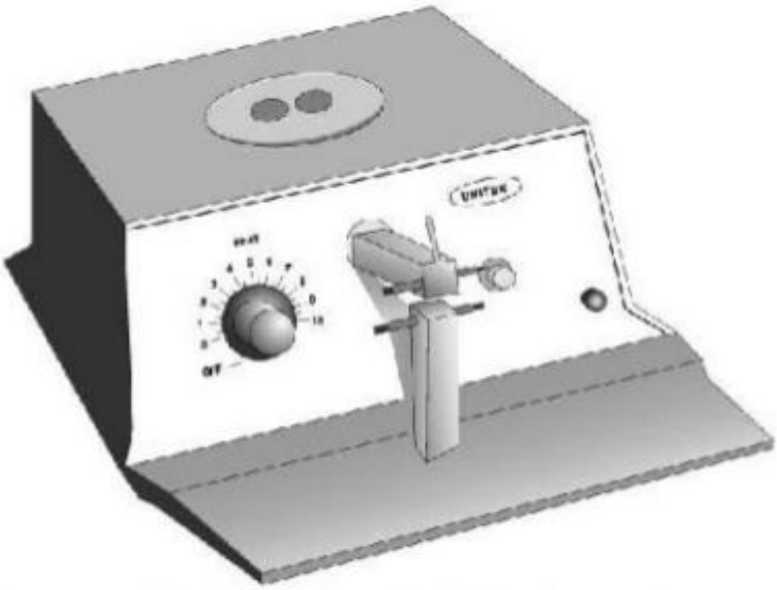
- A **spot-welded band** is a form-fitted band placed around a prepared tooth, then removed and placed in a smaller form of a welder that fuses the metal together to make a custom band.

Spot Welded Matrix



- Cut matrix and spot weld ends
  - 3/16 " wide and thin (..002") matrix
- Form a loop
- Hold ends in spot welder
- Weld at low setting

Fig. 49-8 Spot-welded band.



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Matrices for Composite Restorations

- A plastic matrix, also referred to as a **celluloid matrix** or **mylar strip**, is used for class III and IV restorations in which the proximal wall of an anterior tooth is missing.

A clear matrix system.
(Courtesy of Premier Dental Products.)

The Use of a Clear Matrix

- The matrix is placed interproximally before the etching and priming of a tooth. This protects adjacent teeth from these materials.
- After placement of composite material, a matrix is pulled tightly around the tooth to help reconstruct its natural contour.
- The clear plastic matrix allows the curing light to penetrate the material and complete the curing process.

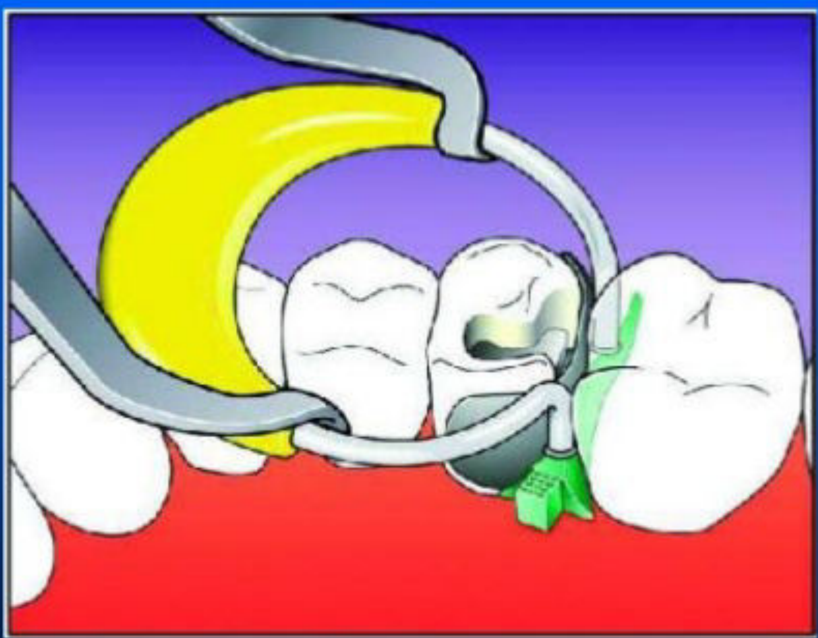
Sectional Matrices

- A thin polished **palodent**-type band and a tension ring produce a tight anatomic contact for composite resin materials for class II restorations.

Fig. 49-10 Sectional matrices.

Sectional matrices.

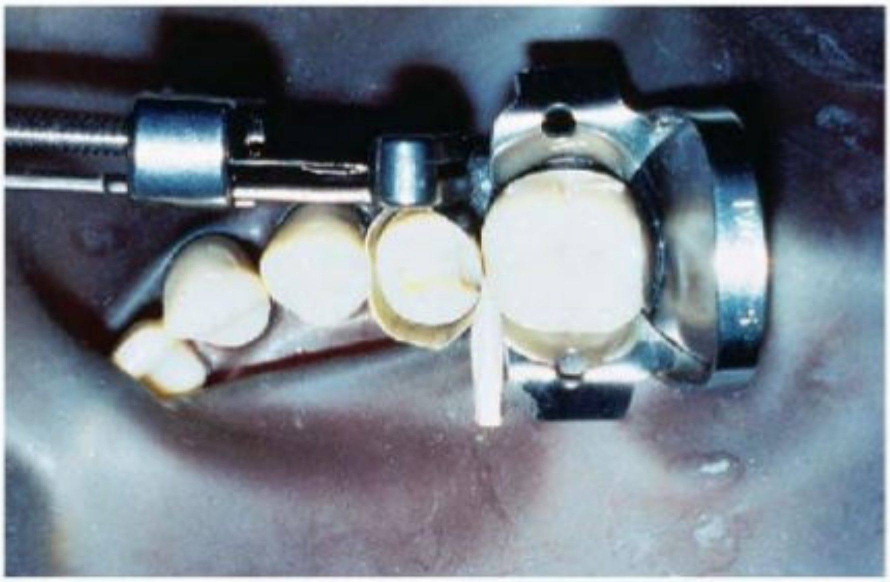
(Courtesy of Garrison Dental Solutions.)



Wedges

- A **wedge** is either triangular or round and made of wood or plastic.
- The wedge is inserted into the lingual embrasure to position the matrix band firmly against the gingival margin of the preparation.

Fig. 49-6 A wedge correctly positioned.



Restorative Dentistry for Children

BY DR SAMI MALIK ABDULHAMEED.

Cavity Preparation

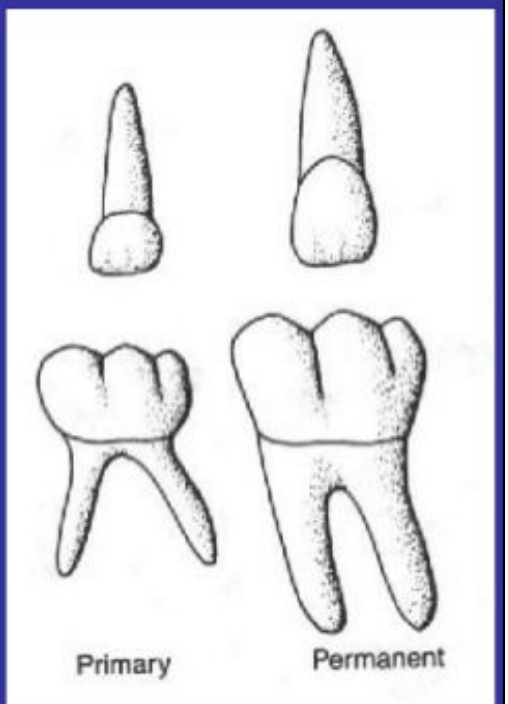
- *Dr. Sami malik abdulhameed*

Objectives

- To be able to identify and distinguish morphologic differences between primary and permanent teeth. To apply the knowledge of morphology in clinical procedures for pediatric patients

Morphological Considerations in the Primary Dentition

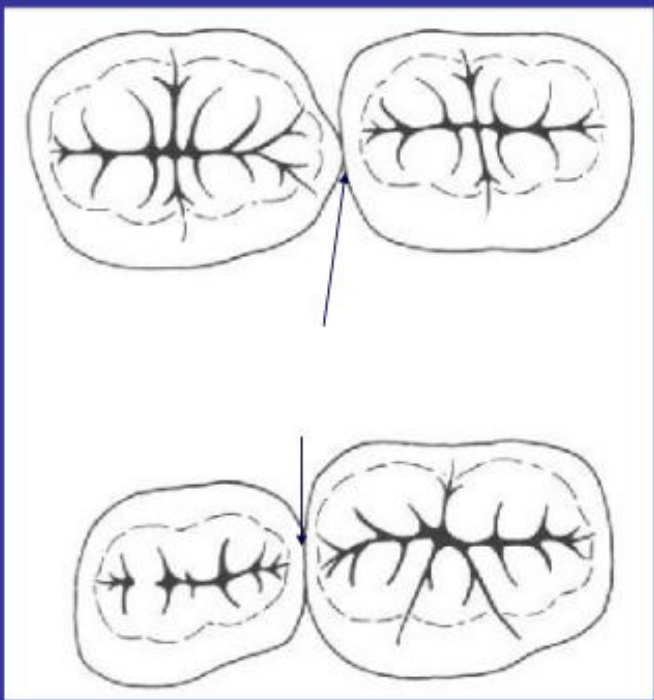
- The crowns of primary teeth
  - are shorter
  - have a narrower occlusal table
  - have a more pronounced cervical constriction
  - have thinner enamel and dentin layers



Morphological Considerations in the Primary Dentition

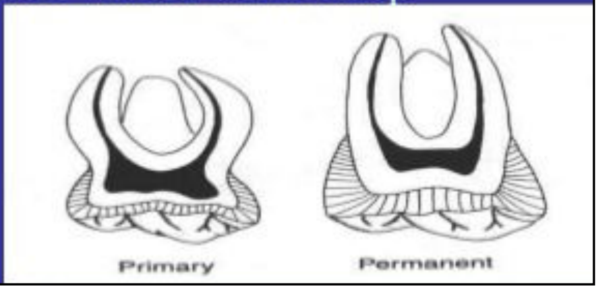
- The crowns of primary teeth
  - have enamel rods that run in a slightly occlusal direction from the DEJ
  - have broad flat contact areas between primary molars
  - have nearly the same mineral content as permanent teeth
  - have a lighter, more homogeneous color

Contact Area

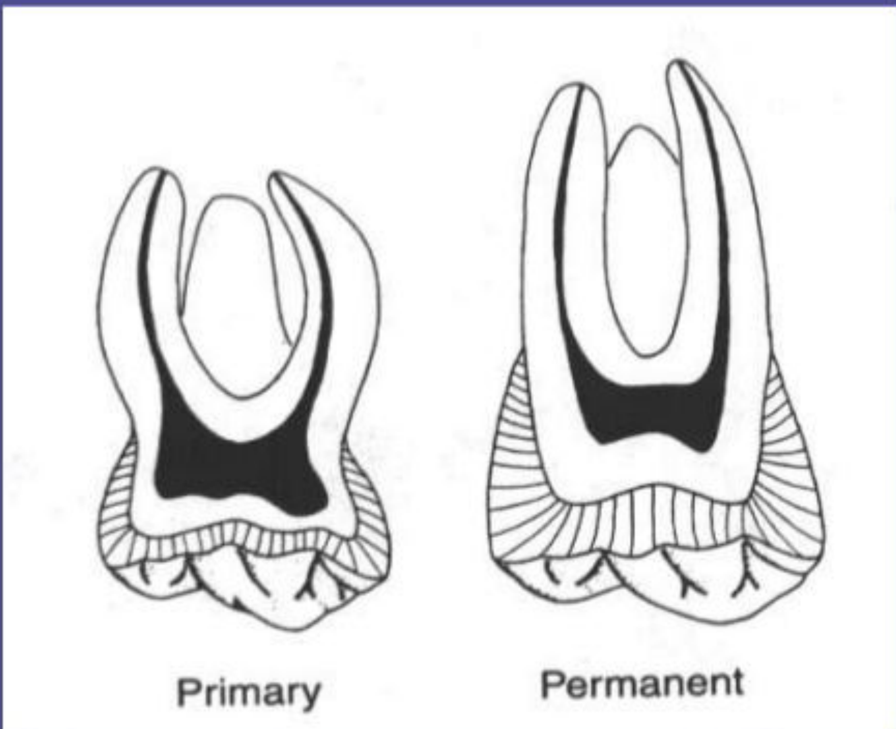


Morphological Considerations in the Primary Dentition

- The pulps of primary teeth
  - are larger than that of the permanent tooth in relation to crown size
  - are closer to the outer surface of the tooth
  - the mesial pulp horn is pronounced occlusally
  - more closely follow the surface of the crown
  - usually have a pulp horn under each cusp

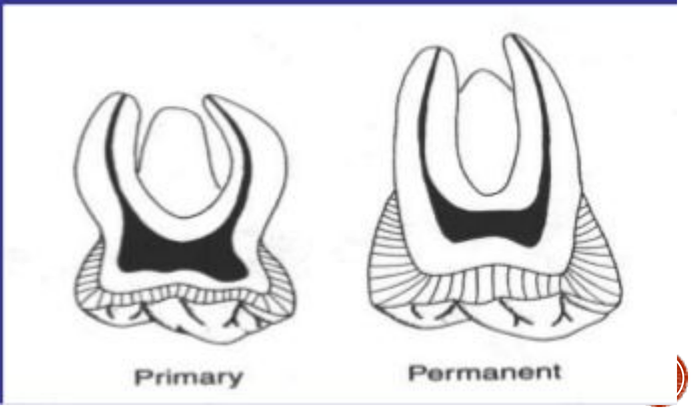


Comparison of Pulps



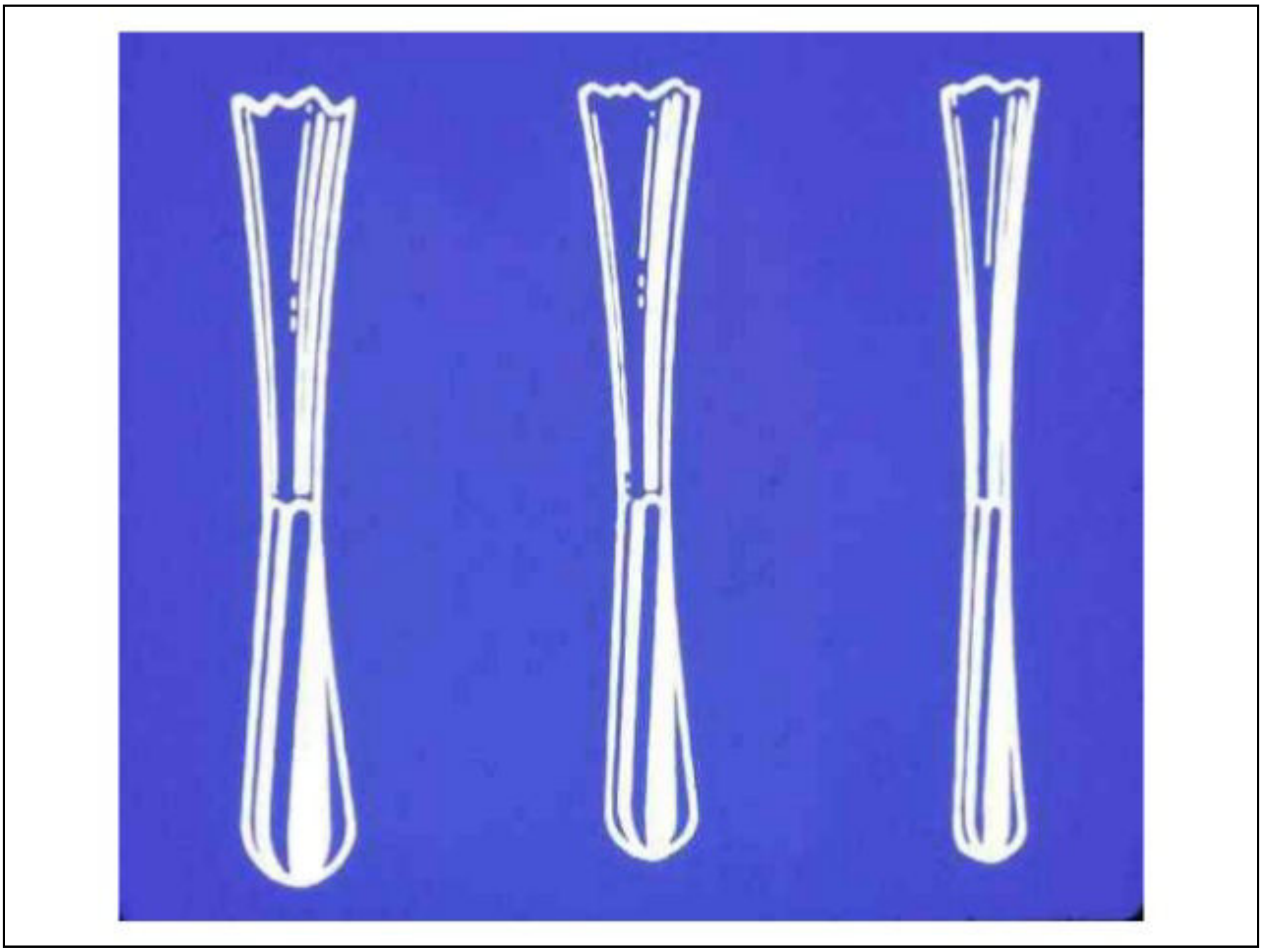
Influences of Primary Tooth Morphology

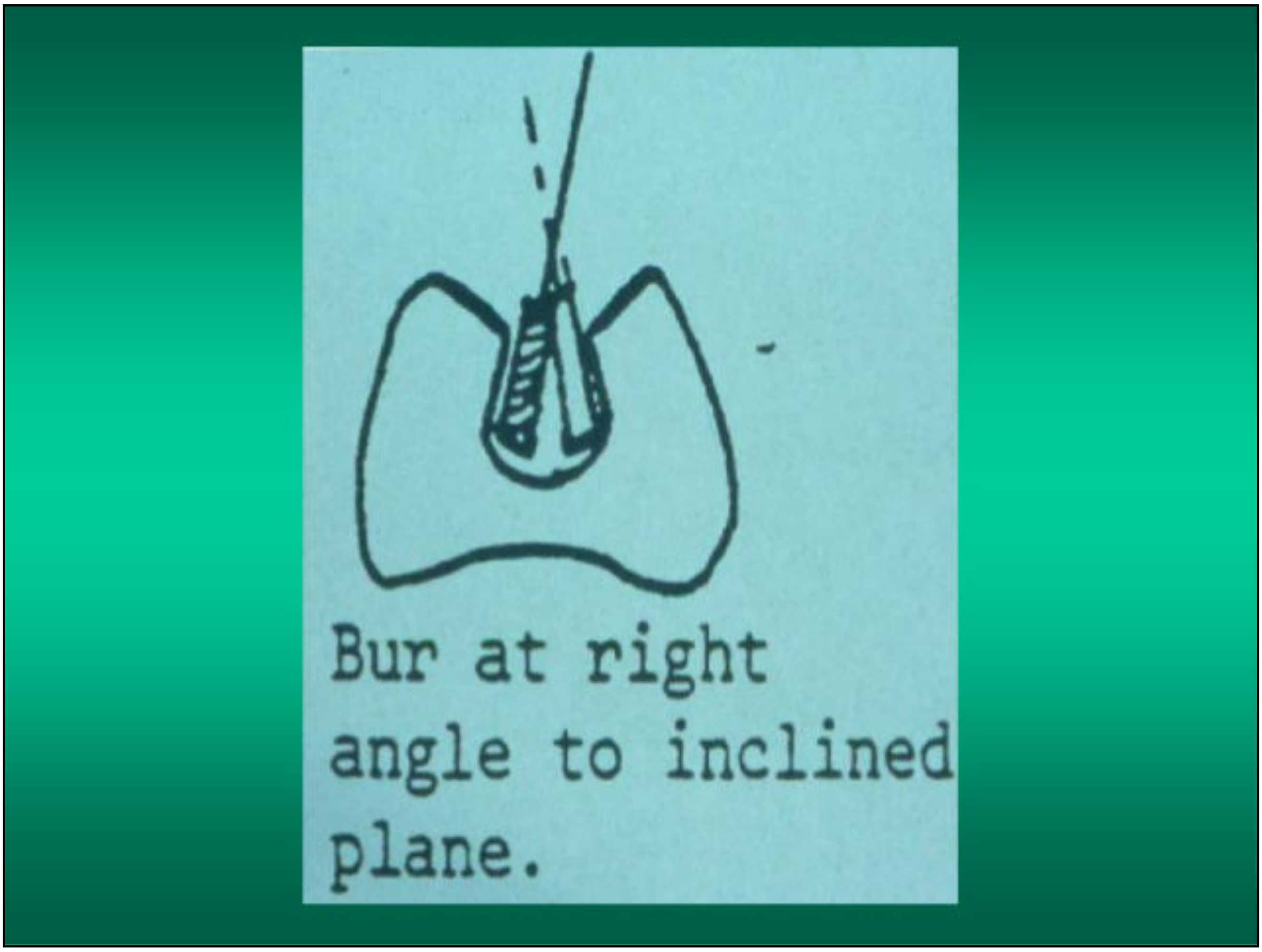
- Tooth Preparations
  - Need to take into account tooth size, pulp size and enamel and dentin thickness



Instrumentation

- Utilize a # 245 bur
- Tip -
  - measure width and length of cutting shank
- High speed
- Minimal use of hand instruments

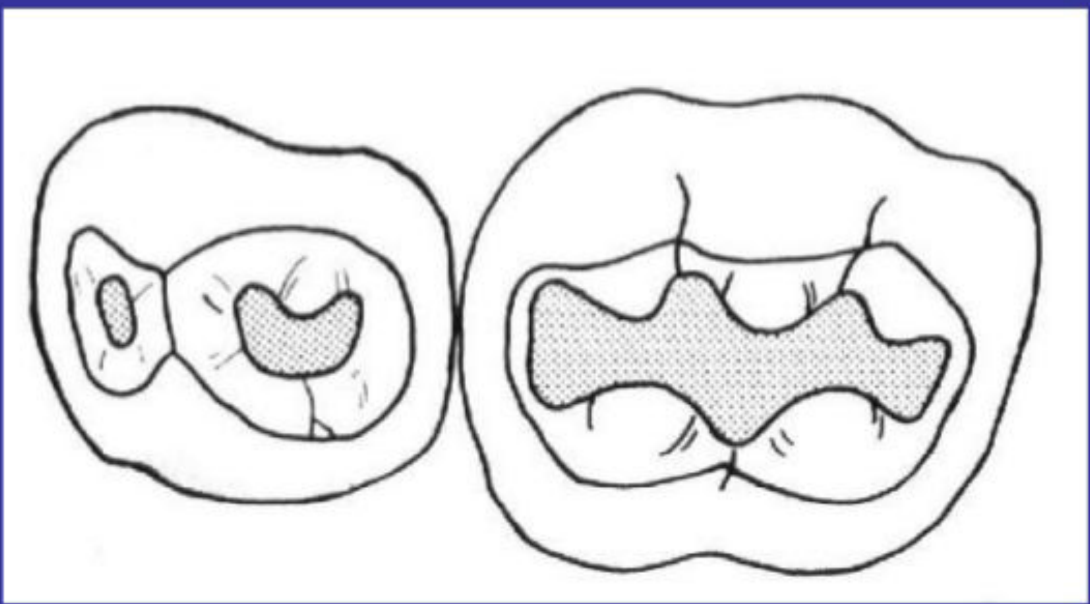



Bur at right
angle to inclined
plane.

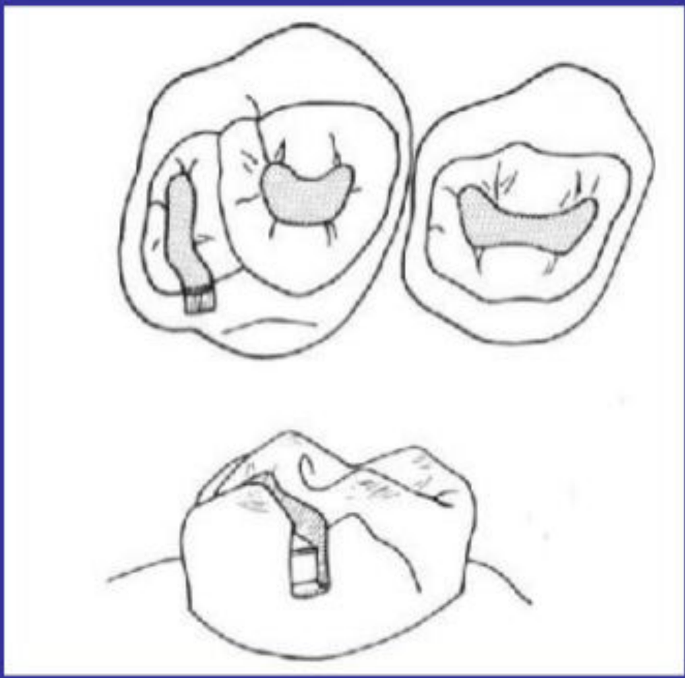
Class I Amalgam Preps

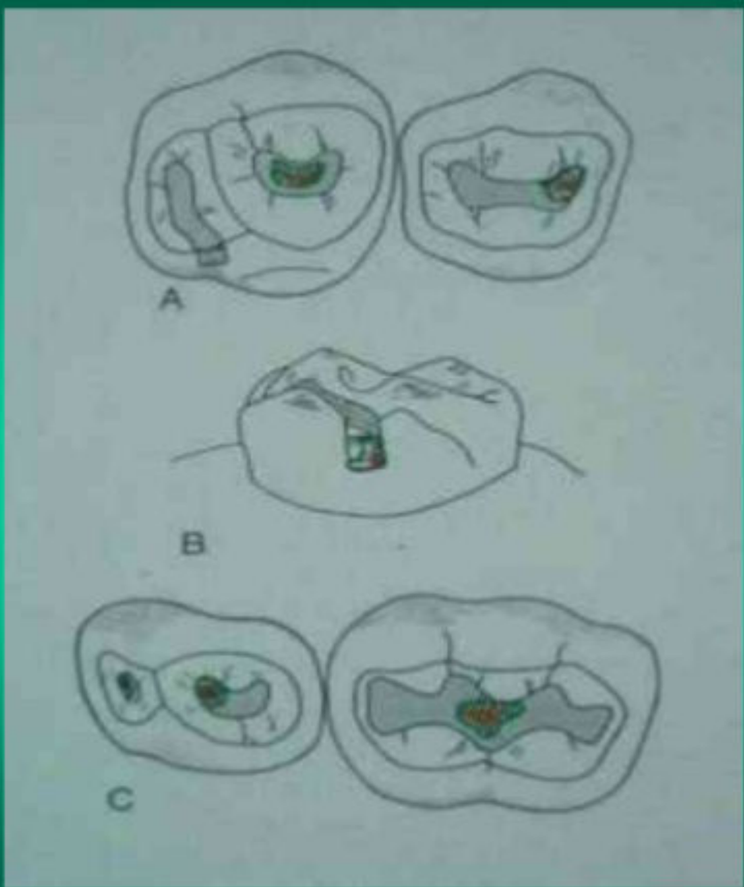
- Pulpal Floor Depth -
  - .5 - 1 mm into dentin
  - primary molars - 1.25 to 1.50mm
- Intercuspal width - 1/3rd
- Rounded internal line angles
- B-L walls slightly undercut
- M-D walls flare at marginal ridges

Mandibular Molars Outline Form



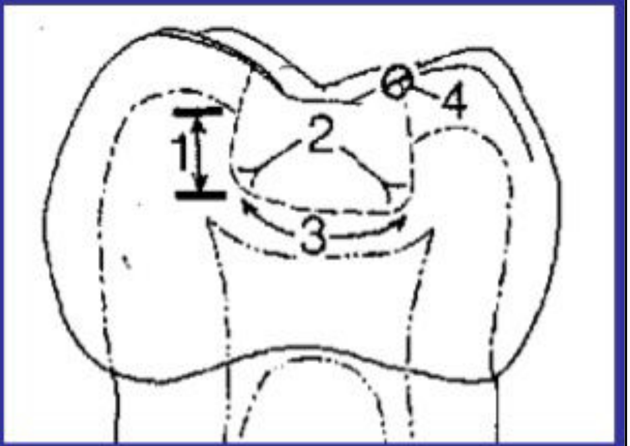
Maxillary Molars Outline Form





Internal Form of a Class I Prep

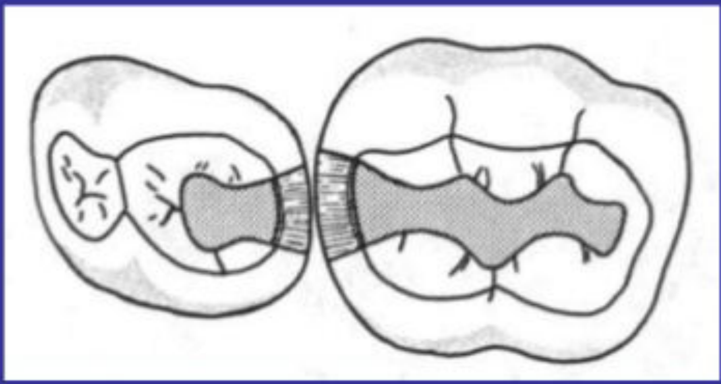
- 1) depth .5 - 1mm into dentin
- 2) angle of floor and walls is rounded
- 3) slightly rounded pulpal floor
  - Avoids pulp
- 4) sharp cavo-surface angle



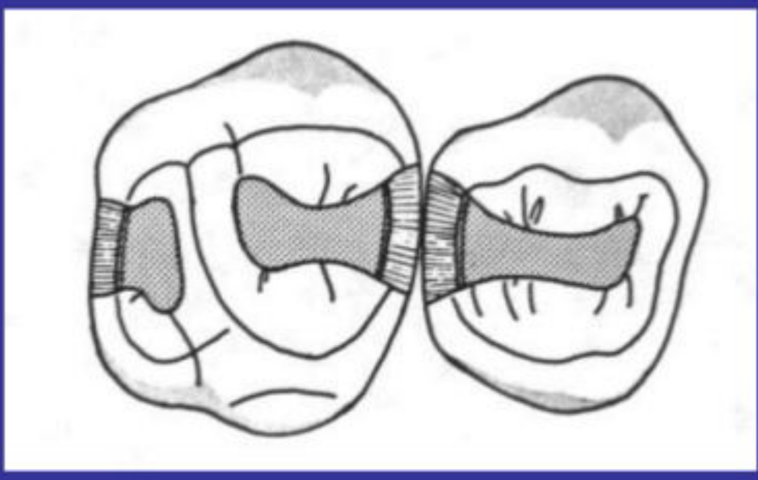
General Considerations

- Adhere to GV Black's principles with respect to outline, resistance, retention and convenience form and finishing of enamel walls.

Class II Cavity Prep - Mandibular



Class II Cavity Preps - Maxillary



Class II Amalgam Preps

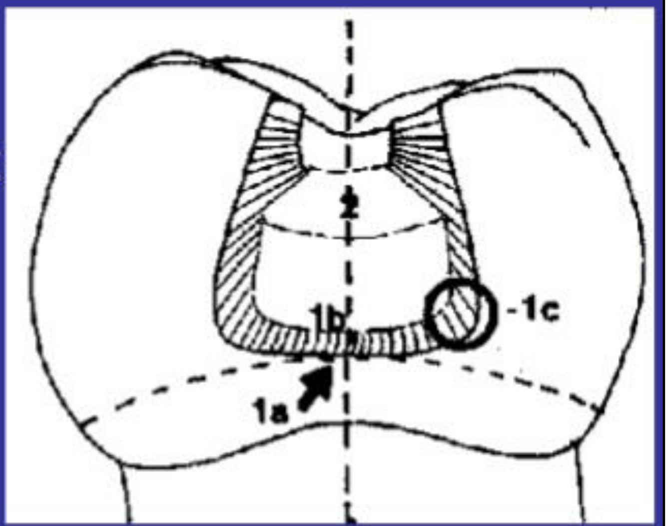
- Accomplish occlusal outline form
- Extend proximal box into self cleaning area
    - leave 90 degree cavosurface margins
    - isthmus width 1/3
- Proximal box in an occlusal gingival direction is parallel to the long axis of the tooth

Class II, continued

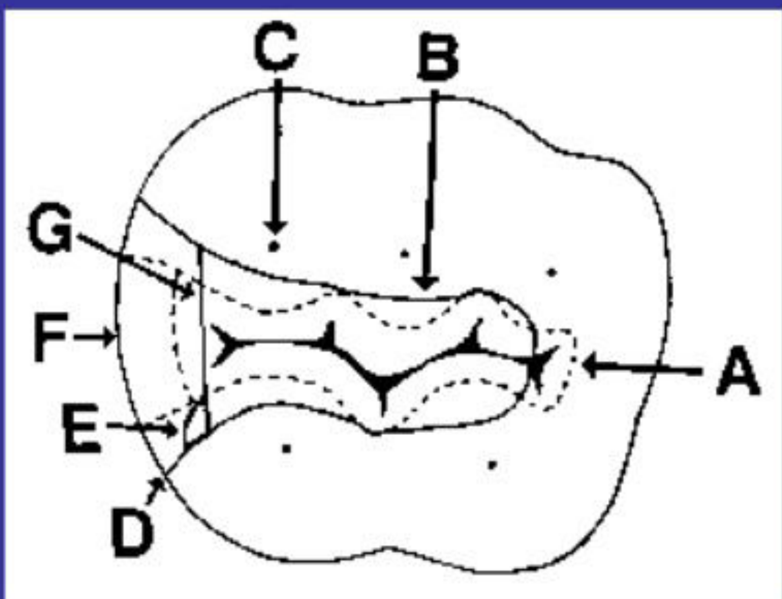
- B-L walls of box should converge occlusally
- Gingival floor should be beneath the contact, at, or just beneath the gingival tissue
- Axial wall should follow the contour of the tooth
    - 1 mm in width

Cross-sectional View of Class II

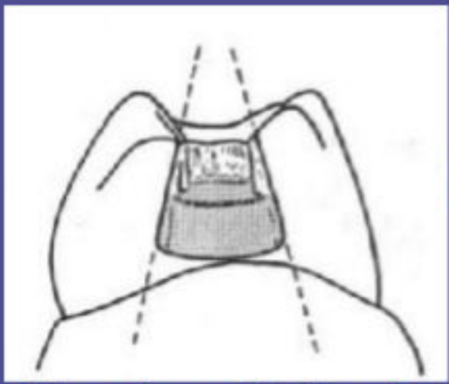
- 1a) gingival floor position 1b) box is perpendicular to long axis
- 1c) rounded angles



Common Errors - Class II's



Modifications

B  L

View from distal surface of primary 1st molar

- Concave pulpal floor and gingival seat
- Rounded internal line angles
  - both decrease stress in the restoration

Modifications

- Relatively wider isthmus width
  - one-third the intercuspal distance
- Conservative proximal extensions
  - you can see light, but cannot pass an explorer tip through

Modifications

- No proximal grooves
- No reverse curves

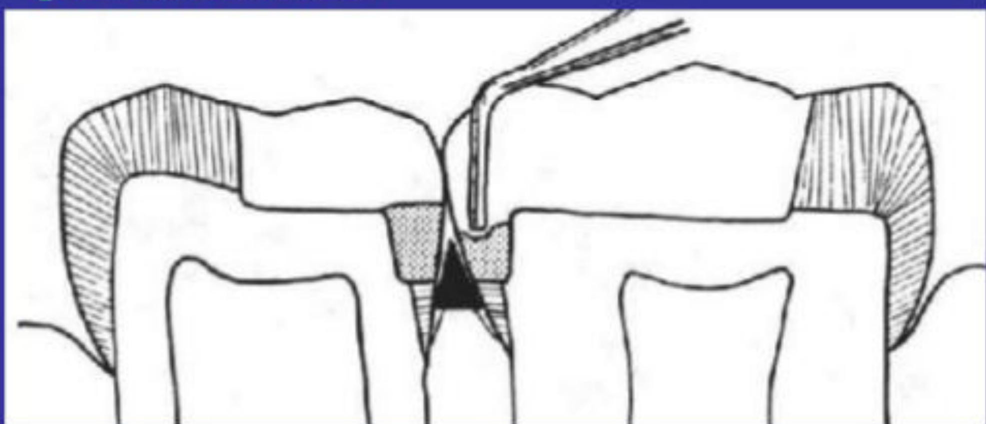
Class 2 slot preparation

Class V Restorations

- A **class V** restoration is classified as a smooth surface restoration. These decayed lesions occur at:
  - The gingival third of the facial or lingual surfaces of any tooth.
  - The root of a tooth, near the cementoenamel junction.

Condensation and Carving

- "Back to back" condensation of Class II's
- Carving described as "hill and valley"
- Polishing procedure is same as taught for permanent teeth



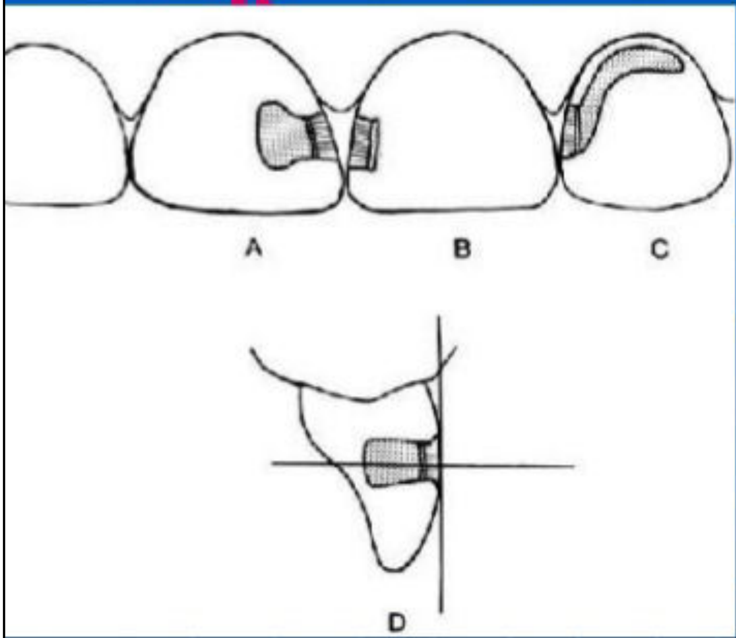
Polishing!

Failures of Amalgam Restorations

- Fracture of the isthmus of a Class II
  - due to insufficient bulk of amalgam
- Marginal failure in proximal box area
  - due to excessive flare of the cavosurface margin
- Recurrent caries
  - failure to extend preparation adequately

Class III Cavity - Incisors

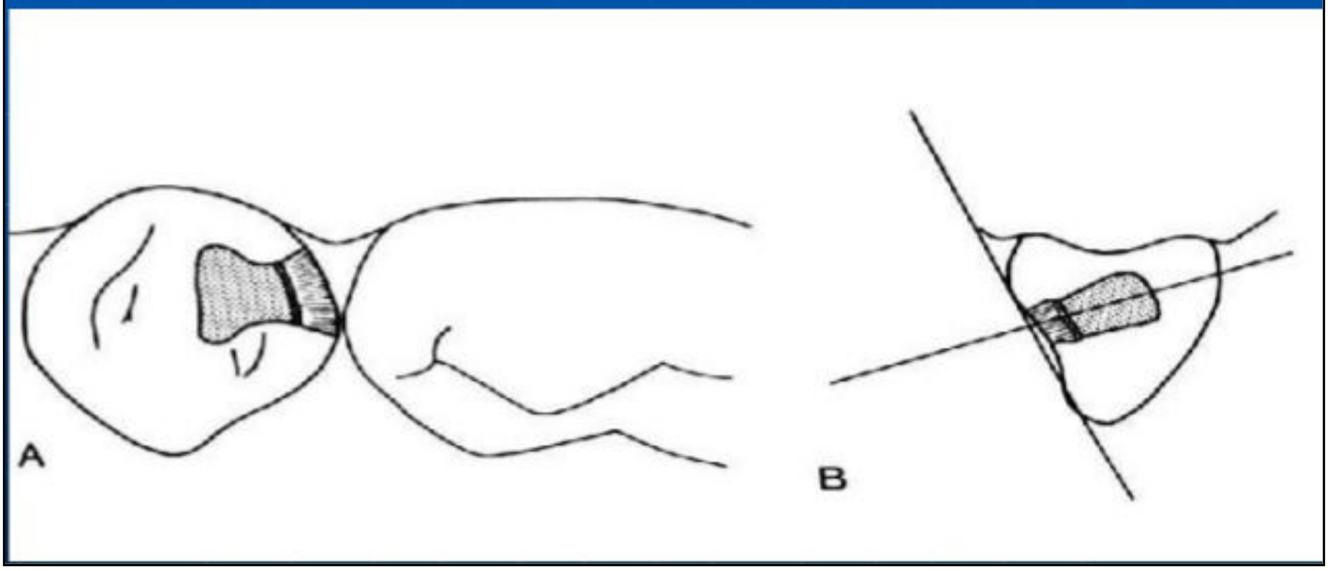
What type of spacing would make a patient more susceptible ?



Class III Cavity - Cuspids

Dovetail is placed on lingual of maxillary cuspids and the facial of mandibular cuspids.

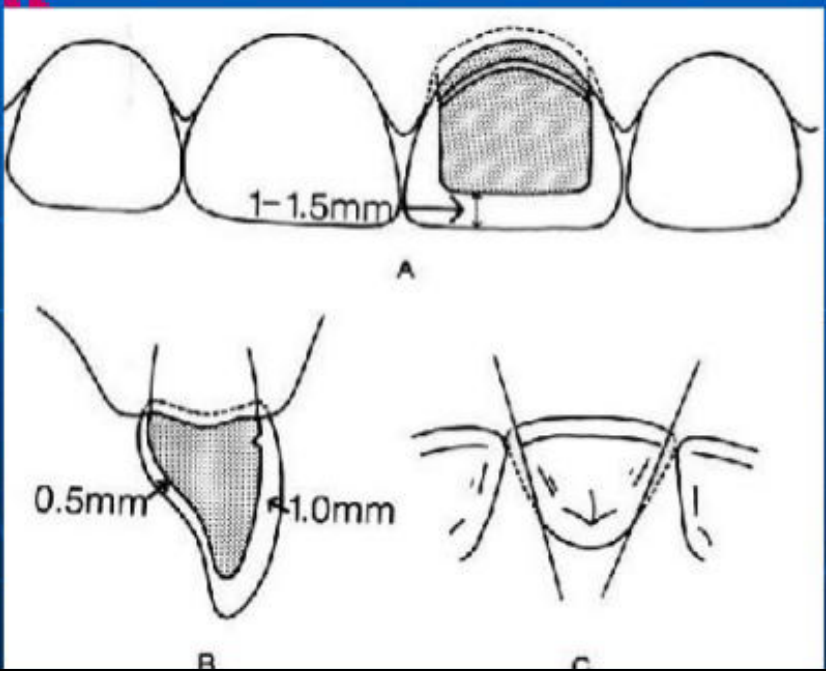
Proximal box is placed perpendicuar to a line tangent to the surface on which the dovetail is placed.



Restoration of Proximal-Incisal Caries in Primary Anterior Teeth

- Esthetic Resin Restoration
- Stainless Steel Crown
- Open-Face Steel Crowns
- Direct Resin Crowns

Composite (Strip) Crowns



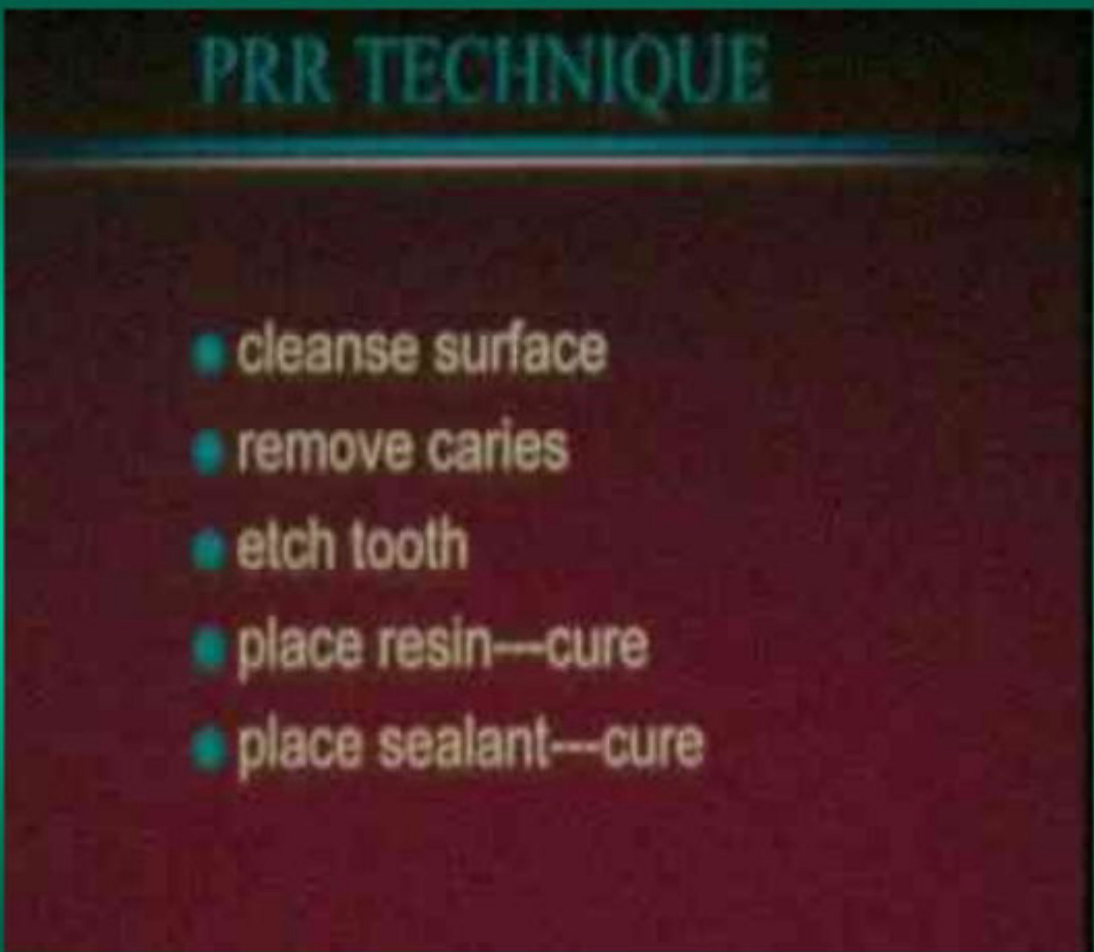
Preventive resin restoration

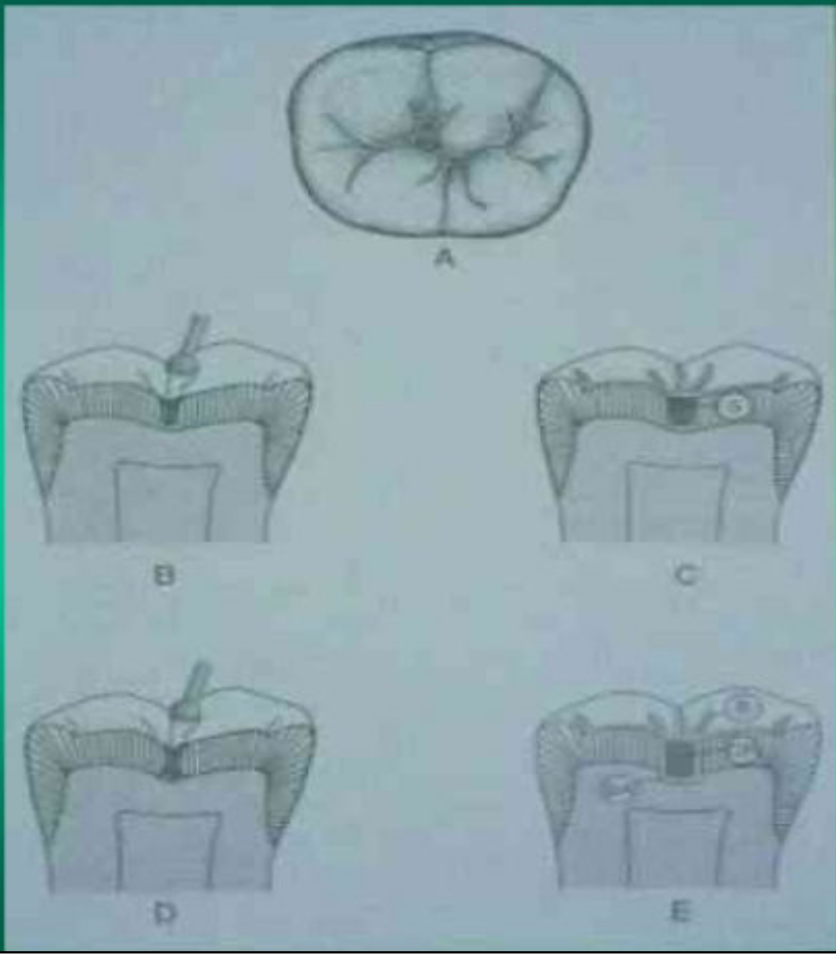
PREVENTIVE RESIN RESTORATION (PRR)

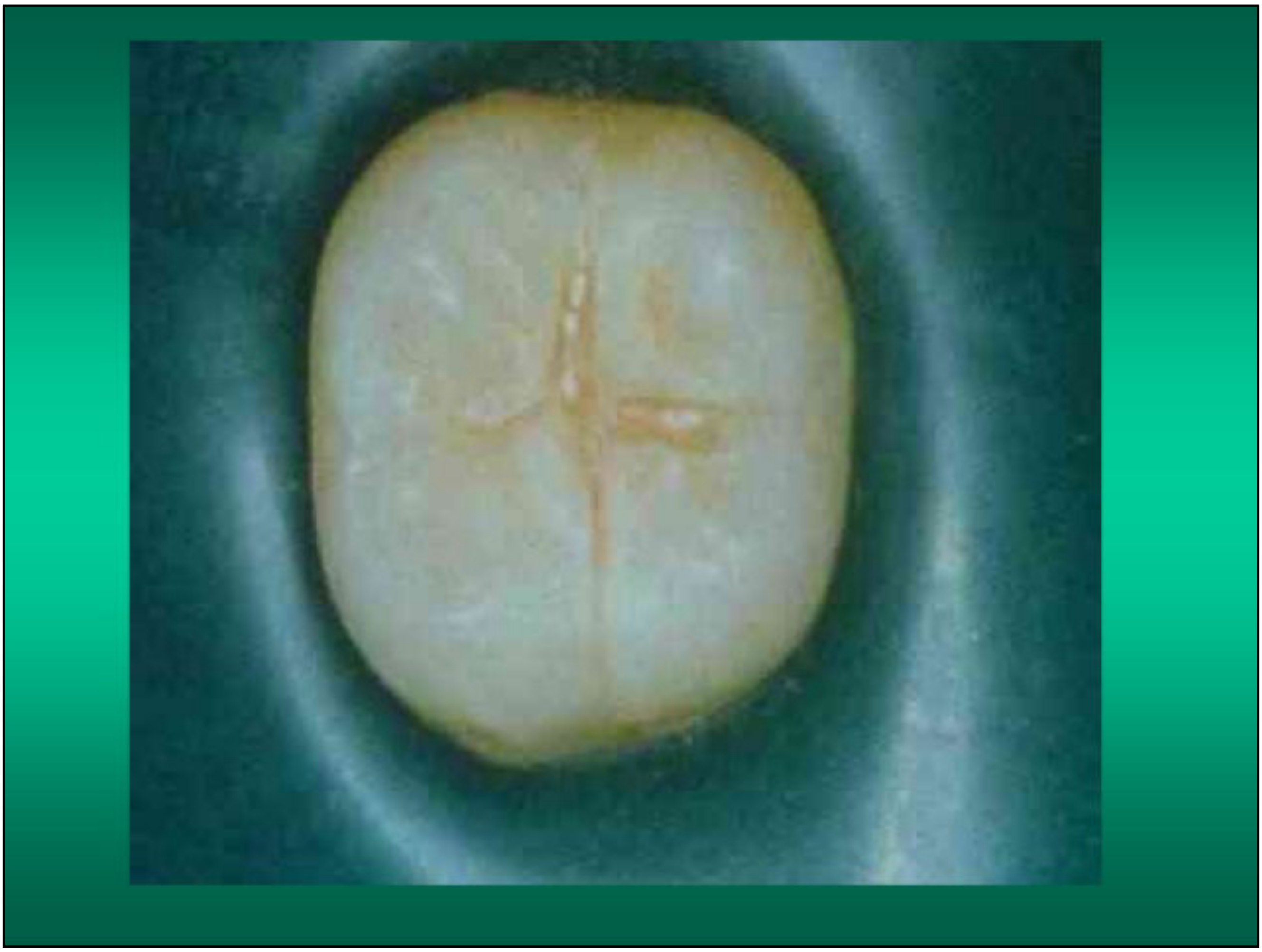
OBJECTIVES:

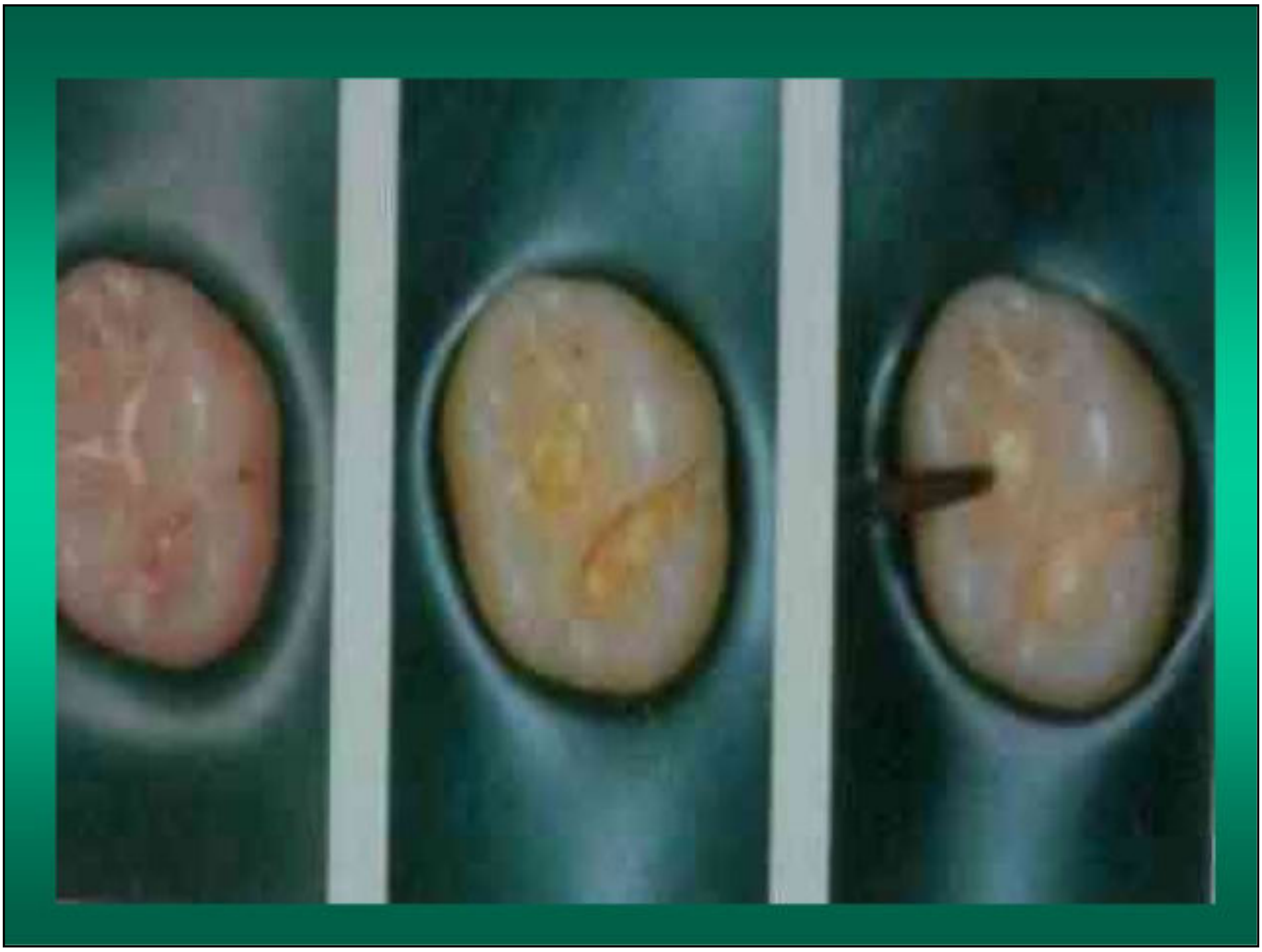
1. List the indications and contra-indications for PRR for primary and permanent teeth.
2. Describe the PRR materials.
3. Describe the clinical procedures for PRR.
4. Identify the advantages of using PRR and their cost effectiveness.

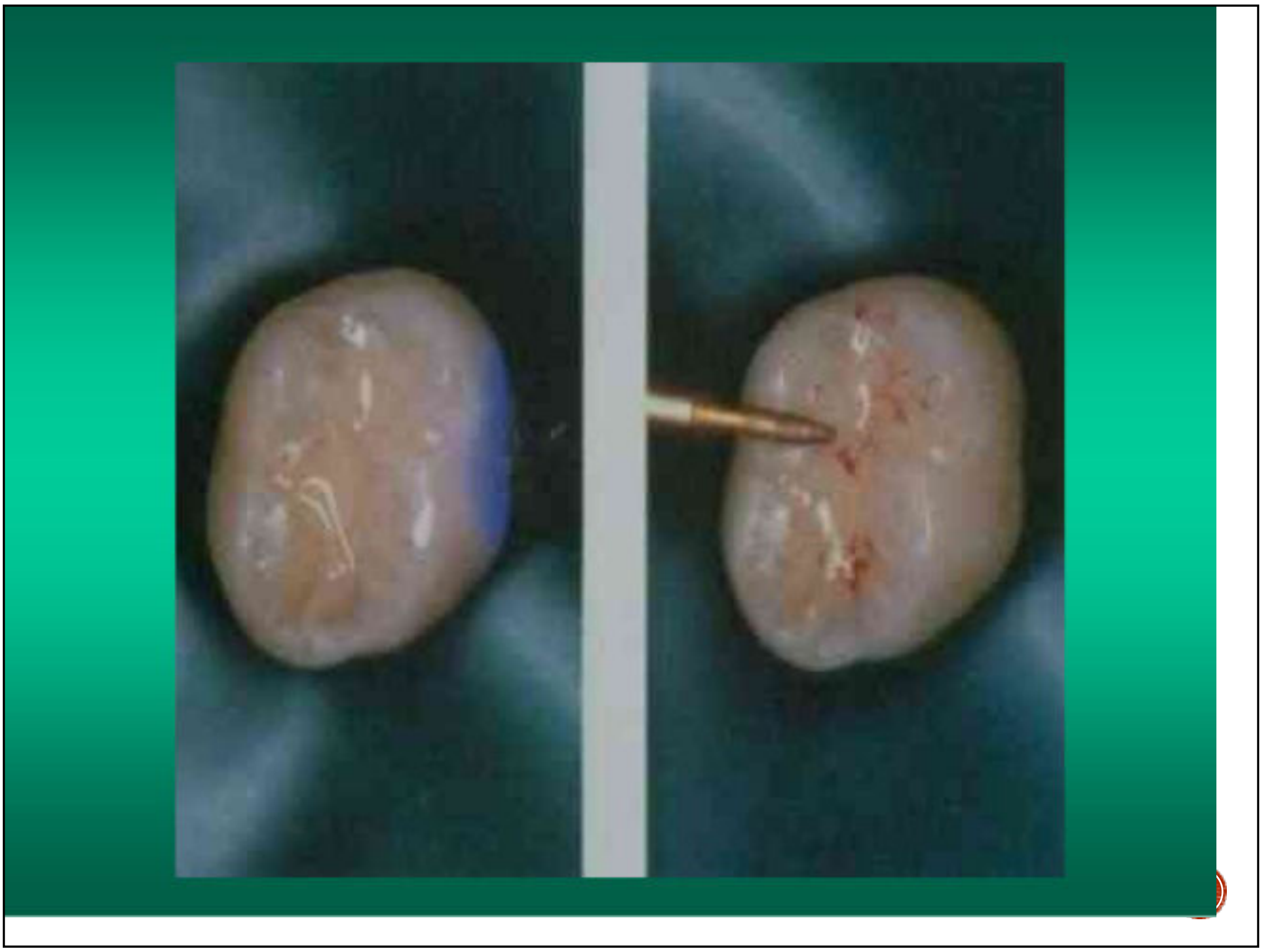
Preventive resin restorations were first described a long time ago in paediatric dentistry. Today the technique is still very pertinent, and has been extended to include teenagers and adult patients. New flowable composites have made it possible to extend the indication area for preventive resin restorations. Although mostly considered as a base material for posterior restoration, flowable composites are now proving very useful for many different types of minimally invasive cavity preparations such as carious fissures

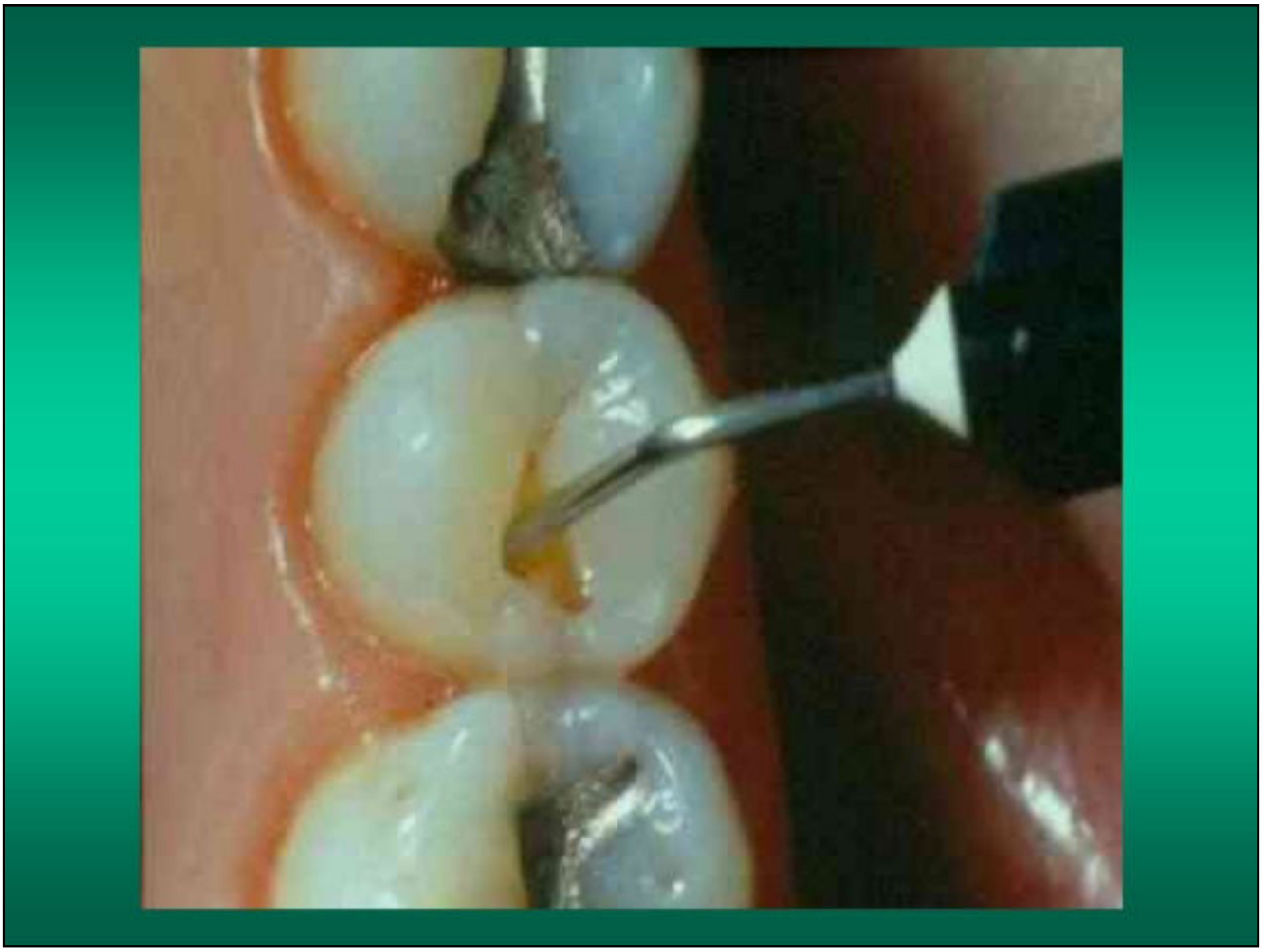


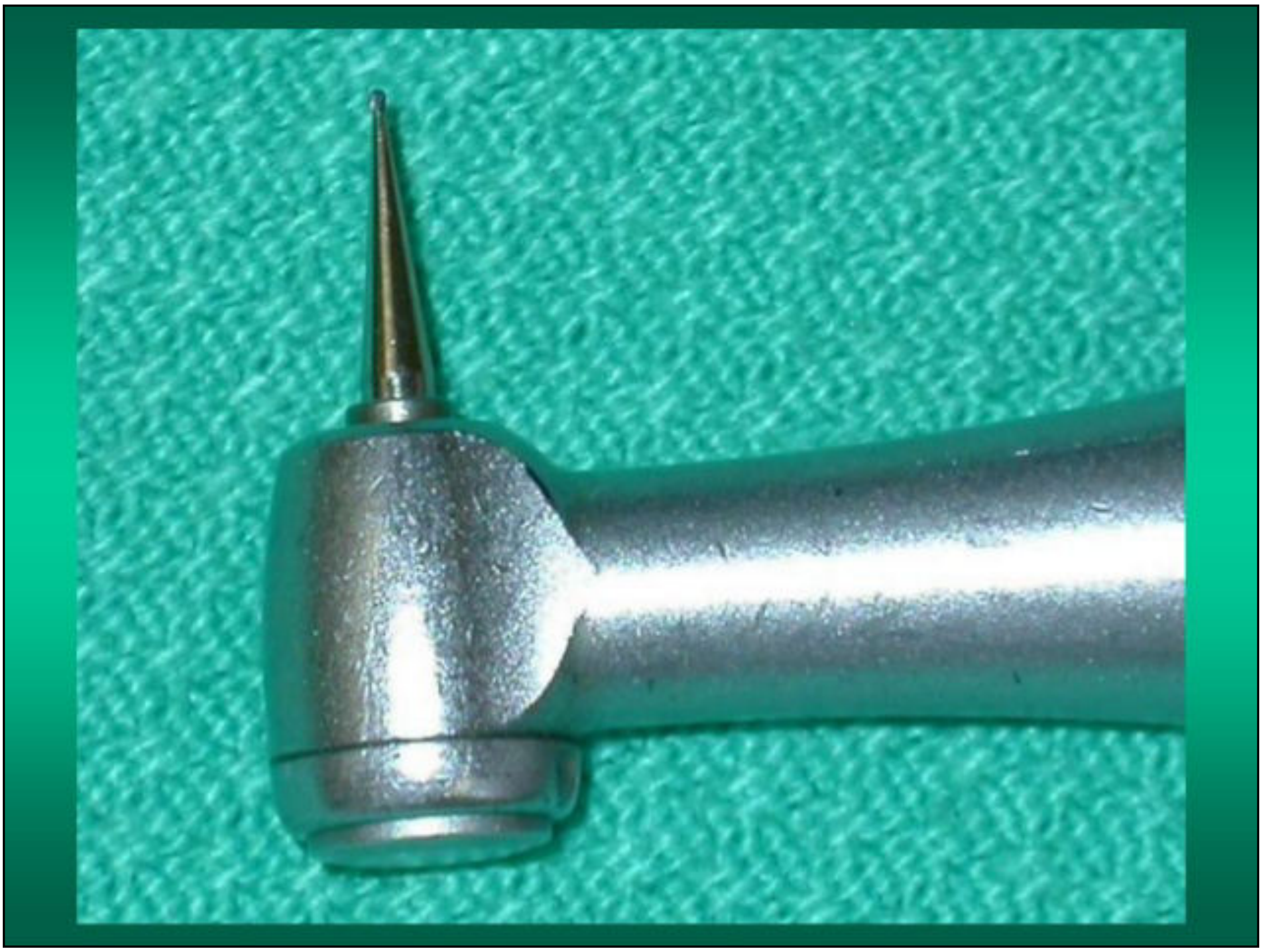

A
B
C
D
E

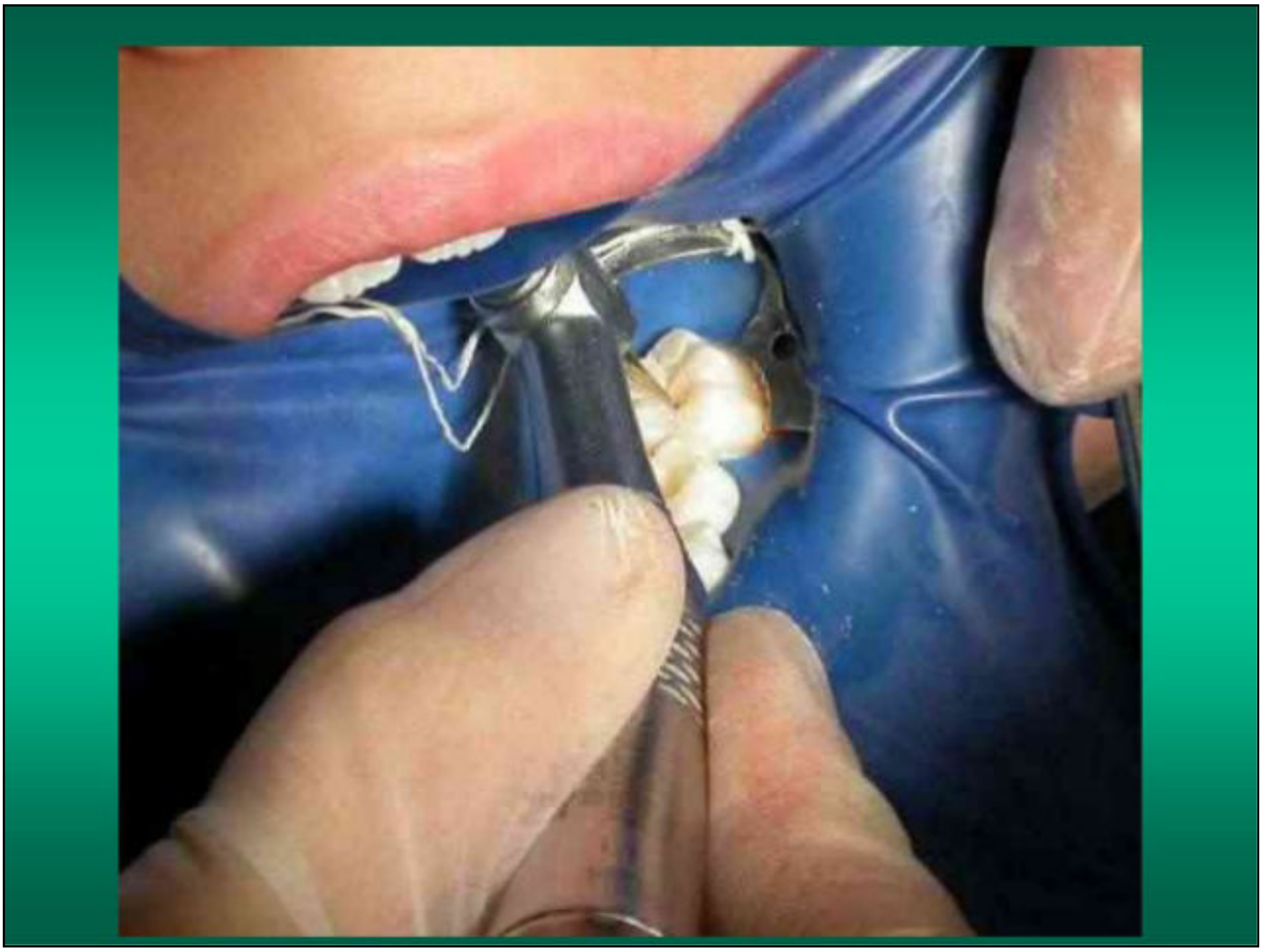


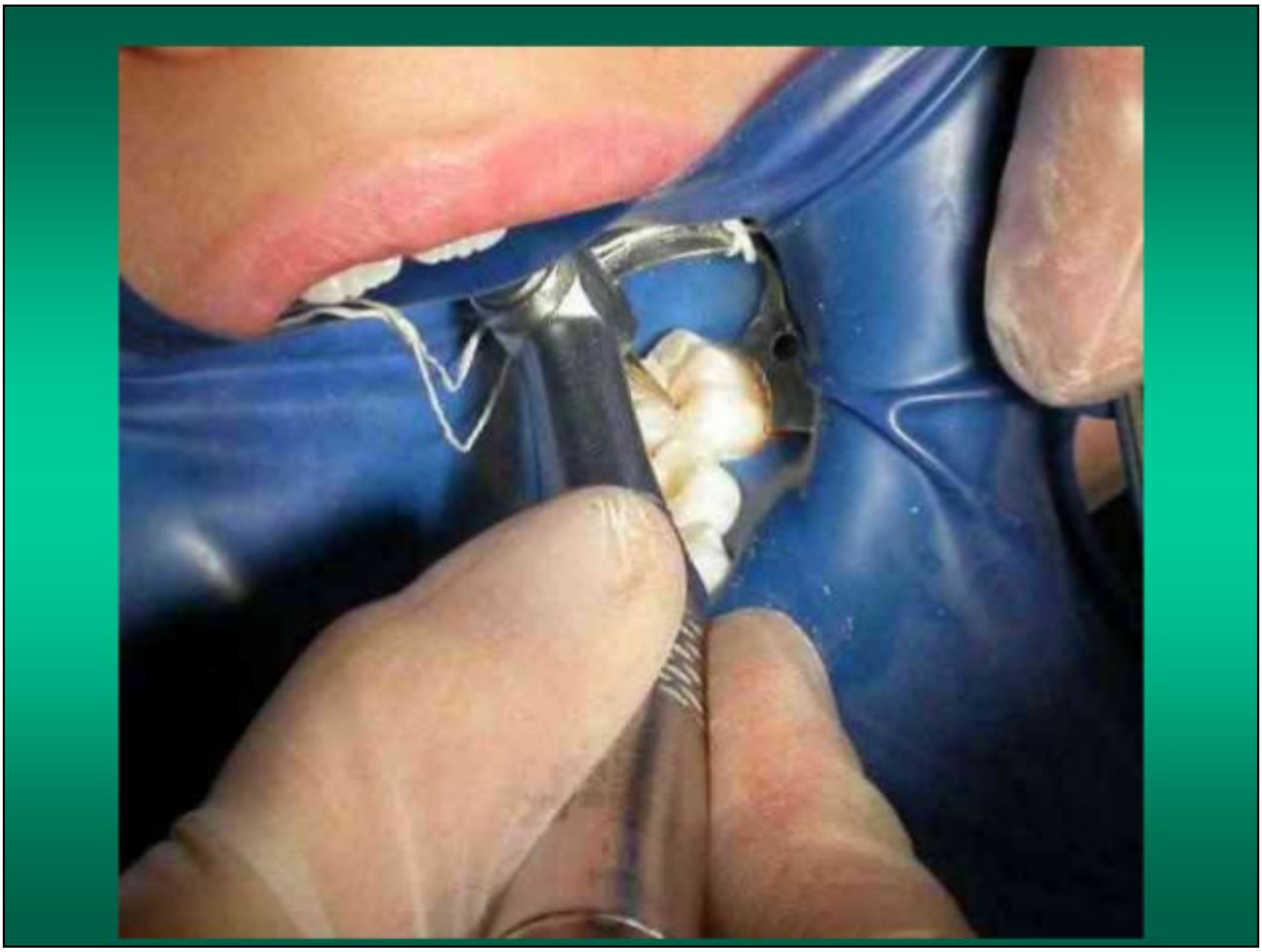


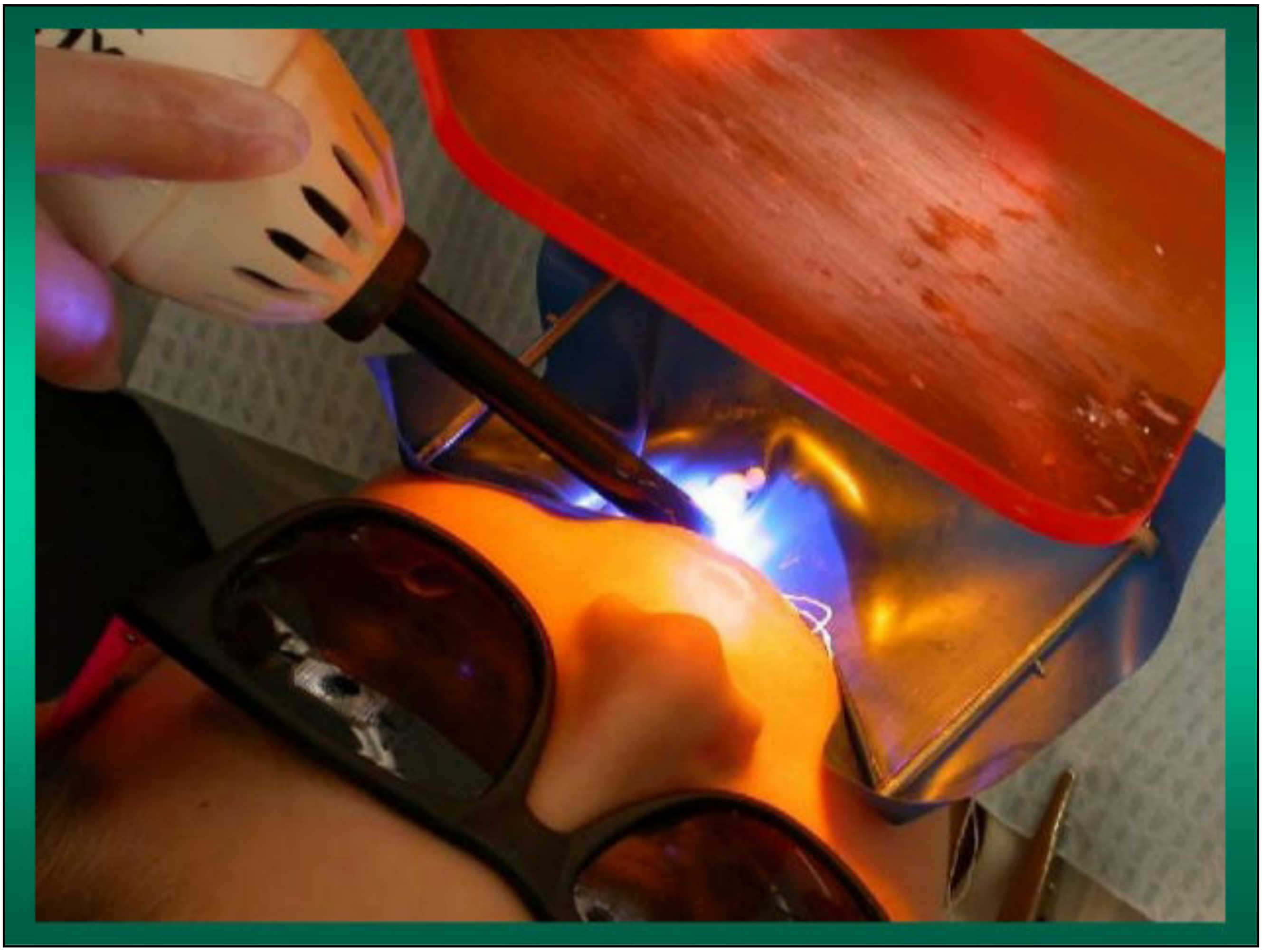












The patient presented with infiltration of the fissures an eroded amalgam

The decayed fissures were opened using special burs, allowing the retention of healthy tissue to be maximised. The amalgam restoration was removed.The dentine was properly cleaned of carious tissue.

ATRAUMATIC RESTORATIVE TREATMENT

A.R.T

INTRODUCTION

- Atraumatic restorative treatment (ART) is a procedure that involves removal of carious substance from the tooth using hand instruments and restoring with adhesive restorative material.
- This is being developed for less industrialized communities in special groups such as refugees and people living in financially deprived communities who are unable to obtain a restorative dental care.
- ART has broken many barriers and allowed delivery of dental restorative treatments possible despite unavailability of electricity or communities that can not afford dental treatment.

CONTINUED…

- Glass Ionomer is the material of choice for ART that can be applied to early stages of caries development that would halt or slows the caries progression due to the slow release of fluoride.
- It is important to understand that ART is only a branch of oral health care that need to start with health promotion messages, healthy diet and good oral hygiene.
- With ART one attempts to conserve as much tooth structure as possible to prevent further decay to achieve the goal of "Teeth for Life'".

CONTINUED…

- Instrument needed for ART is very convenient to carry around by bus or bicycle in a bag.
- In addition delivering this treatment oral care workers travel to rural communities for oral health education.
- ART is a very friendly procedure to patients that could be utilized to be effectively used on children and fearful adults.
- For this reason, ART is widely used even in industrialized countries because it supports minimal intervention and minimal invasion of the patient.

Interim Therapeutic Restorations

- Removing carious tissues using hand instruments only
  - Less traumatic
  - No need for electricity
  - Conservation of tooth structure
  - Low cost
- Glass Ionomer
  - Bonds to tooth
  - Releases fluoride

ART Applications

- Great technique for root caries
- Good alternative in field conditions
- Excellent for fearful children
- Good alternative in medically compromised patients
- Good alternative in mentally compromised

- **Quality of restorations depends on:**
  - **Material**
  - **Operator**
  - **Patient**

RESEARCH

- ART was pioneered in mid 1980s in Tanzania. In 1991 community field trial was started in Thailand comparing the difference between ART with traditional portable drilling equipment and amalgam.
- In 1993 another community field trial in Zimbabwe was set up based on experiences in Thailand. This showed that careful application yielded 85% of one surface fillings in permanent dentition survived for 3 years.
- In 1995 in Pakistan, a community field trial showed that pain is rarely experienced with this approach.

PRINCIPLES OF ART

- 2 main principles of ART are:

1. Removing carious tooth tissues using hand instruments only
2. Restoring the cavity with a restorative material that sticks to the tooth.

Why GIC?

- It bonds chemically to both enamel and dentine, it is fluoride releasing and it does not inflame gingiva or pulp.

Indication and Contraindications

Indications:

- There is a cavity involving dentine
- Able to access the cavity with hand instruments.

Contraindications:

- Presence of infection (abscess or fistula)
- Pulp is exposed
- Chronic inflammation of pulp
- Cavity is inaccessible with hand instruments.

Preparing the Cavity

- Place a cotton roll and dry the working tooth.
- Use the dental hatchet to gain access and excavators to remove soft caries and unsupported enamel.

It is very important that:

1. All soft caries is removed at enamel-dentine junction.
2. To avoid exposure of pulp in deep cavities, leave a small portion of affected dentine near pulp region.

Cleaning the Prepared Cavity

- The purpose of cleaning the cavity walls is to improve chemical bonding of GIC to tooth structure. Cavity could be cleaned by:

1. Dentine conditioner (10% Polyacrylic acid)
2. The liquid supplied by GIC itself.

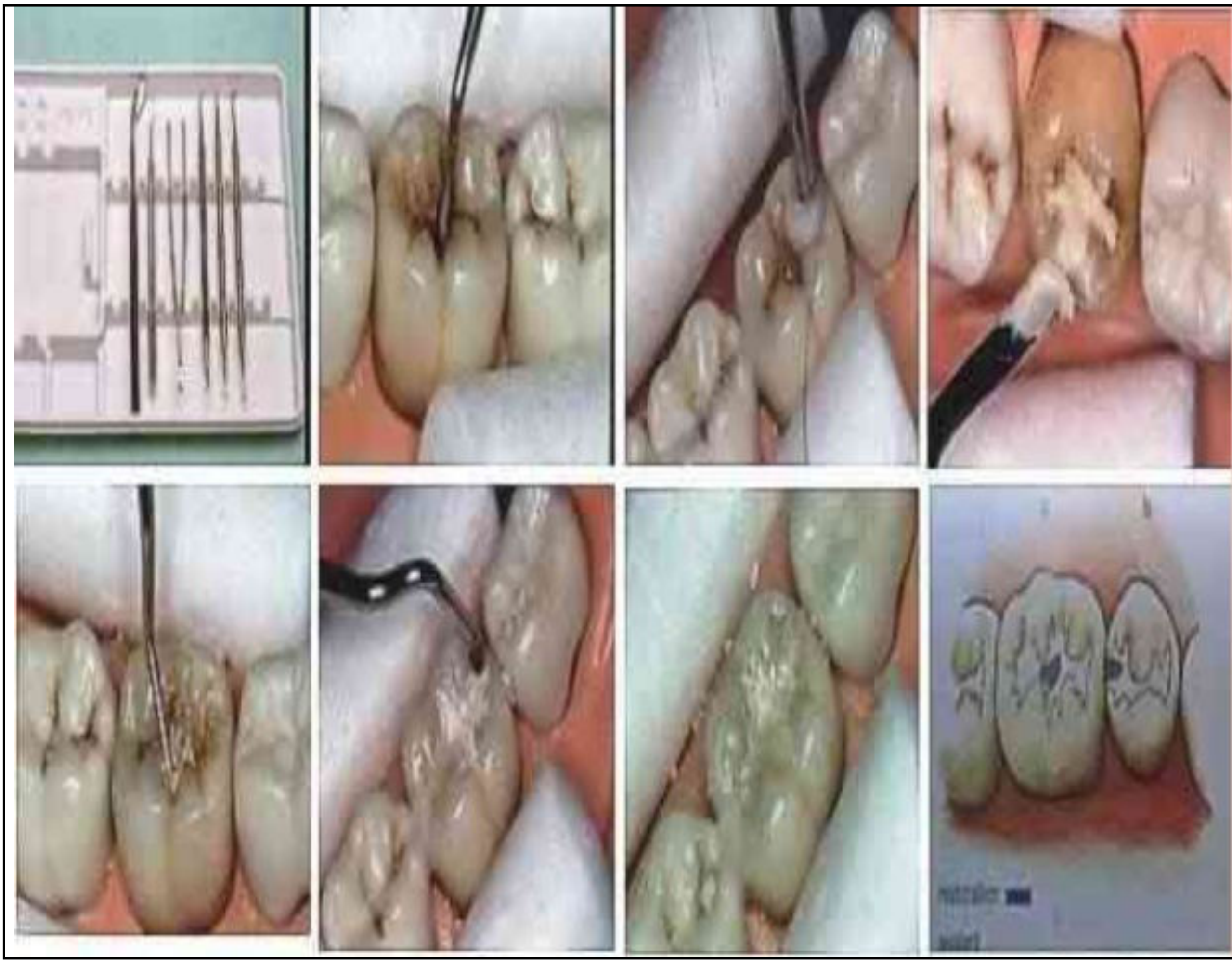
- With dentine conditioner clean the cavity walls for 10-15 seconds and dry with cotton wool pellets. Repeat the procedure if contaminated by blood or saliva.

Restoring the Cavity

- After cavity is washed and dried, start mixing GIC powder and liquid.
- Insert in small amounts using applier/carver to avoid air bubbles and build the restoration slightly high on occlusal surface.
- Insert material into corners and unsupported enamel first.
- With petroleum jelly on the gloved index finger press the soft material into the cavity, this is called “the press-finger technique”.
- Do not disturb the restoration during hardening phase.

Continued…

- After 1-2 minutes check the occlusion.
- If the ART restoration too high, remove the stained portion of restoration with a carver blade.
- Ask the patient not to eat for an hour.



PROCEDURE FOR RESTORING MULTIPLE SURFACE CAVITIES

- Prepare the cavity in a dry environment using cotton rolls.
- Place a matrix strip between teeth with a wedge for support under the contact point and gum margin.
- Condition the cavity and fill it with GIC completely.
- Use "the finger press technique"
- Remove excess and wait for 1-2 minuets.
- Check the occlusion and it is important to have non occluding contacts with the opposing tooth.

Press-finger technique

Press-finger technique

After pressing

Survival of GIC sealants

2 year old glass-ionomer sealant

Monitoring

- It is important to collect any information if any pain is being experienced and if ART restoration was accepted.
- Assess if the patient is satisfactory with the restoration within first 4 weeks.
- The clinical evaluation is planned annually or biannually depending on the risk statues and oral hygiene.

Failed or Defective Restoration

- A restoration is no longer satisfactory when :

1. It is completely missing
2. Fractured restoration
3. Much of the restorative material is worn away.
4. Caries have developed at the restoration margin or else where on the tooth surface.

- THANKS FOR GOOD ATTENTION

Pharmacological Management of Patient Behavior

Enteral Route

Enteral sedation is achieved by drugs that are swallowed and absorbed through the GI

The practice of having parents administer oral medications to children prior to arrival at the office should be avoided onset approximately 30 minutes after administration, with peak effect noted by 60 minutes.

The taste may be quite objectionable, especially to very young children.

This can usually be overcome when the drug is mixed with a palatable liquid.

Advantages	*Disadvantages*
• Universally accepted • Ease of administration • Low cost • Decreased incidence and severity of adverse reactions • No pricks (needles, syringes), No equipment is required. • No special training	• Reliance • Prolonged latent period • Unpredictable & incomplete absorption of drugs from GIT • Inability to titrate • Prolonged duration of action • Inability to radially lightened or deepened the level of sedation

Rectal route

Rectal administration of sedative drugs with suppositories has a limited history in pediatric dentistry.

Drugs administered through this route are absorbed through two different vascular systems, one of which delivers agents to the liver while the second bypasses the liver. As a result, wide variations of bioavailability are seen after rectal administration.

Absorption is often irregular and incomplete. For this reason, and because of the tendency toward mucosal irritation from drugs delivered via this route, rectal administration is not recommended for pediatric sedation.

Complication

- Rectal mucosal irritation
- Initiation of bowel movement
- Risk of over sedation

Indications

- Unwilling to take orally
- Nausea & vomiting
- Patient objecting injection
- Post-op control of pain

Advantages	*Disadvantages*
● Low cost ● Ease of administration ● No pricks ● Absorb directly into systemic circulation (rapid onset of action) ● Bypassing entero hepatic circulation	● Inconvenience to the administer ● Variable absorption ● Inability to reverse ● Inability to titrate ● Possible intestinal irritation ● Prolonged recovery

Intra muscular route

Intramuscular administration relies upon the high vascularity of muscle tissue to achieve a moderately rapid onset of action, usually within 5 to 10 minutes.

When properly administered, intramuscular injection provides a more rapid onset and offset as compared with enteral techniques.

Indications

- Other controllable routes are unavailable or have proved ineffective.
- Prior to IV sedation or general anesthesia.

Complications

- Nerve injury
- Intra-vascular injection
- Air embolism
- Periostitis
- Hematoma
- Abscess
- Cyst
- Necrosis

Intravenous Route

The IV route of drug administration represents the <u>**most effective method**</u> of ensuring predictable and adequate sedation in virtually all patients. Effective blood levels of drugs are achieved quite rapidly.

The use of intravenous conscious sedation in pediatric dentistry is somewhat restricted to **certain types and ages of** patients. Venipuncture is **difficult** to accomplish in the very **young** or the combatant child.

Such difficulty is attributable to **smaller vein size** and availability together with the need to restrain the patient. Because of this, the technique is often more suitable for the apprehensive preteen and adolescent patient.

Advantages	***Disadvantages***
● Rapid onset of action ● Easily titrated ● Rapid recovery ● Minimal side effects ● Emergency IV access available	● Venipuncture is required ● More monitoring necessary ● Hematoma at the site of injection ● Most agents cannot be reversed by antagonistic agents

Inhalation

- The inhalational route is a highly effective route of administration, allowing nonirritating gases and volatile drugs to be inhaled and absorbed directly through the pulmonary epithelium and mucous membranes of the respiratory tract into the circulation.
- The almost instantaneous absorption of agents delivered through this route is due to the large surface area of the lung.
- Equilibrium is quickly established among the partial pressure of the drug in the alveolar gas space, serum, and target tissues in the brain. As a result, inhaled anesthetic gases are easily titrated by adjustment of the amount of inhaled gas, provided the rate and depth of ventilation are adequately controlled.

Advantages	Disadvantages
● Rapid onset of action ● Maximum clinical effect within 30min ● More reliable absorption than oral or rectal sedation ● Pt cooperation is not required	● Inability to titrate ● Inability to reverse the drug action ● Prolonged duration of drug effect ● Injection needed and its possible injury

- **Indications**
- Anxiety
- Medically compromised patients
- Gagging

Contraindications

- Severe behavioral problems
- Acute respiratory conditions
- Inability to communicate and Learning difficulties
- Very young children
- Fear of the mask

Advantages	***Disadvantages***
● Rapid onset	● High cost equipment
● Peak clinical actions	● Space in dental office
● Titration possible	● Potency
● Depth of sedation can be altered	● Training of staff
● Rapid and complete recovery	● Occupational hazard
● Duration at discretion of administration	● Cooperation is required
● No injection	● Raise pain reaction threshold
● Safe and no systemic effects	● Potential problems with chronic exposure
● Can be used instead of topical anesthesia	

DRUGS AND AGENTS USED FOR SEDATION

Hydroxyzine (Atarax, Vistaril)

Antihistamine with weak sedative, anticholinergic, and antiemetic properties.

It produces sedation by inhibiting the hypothalamic H-1 histamine receptors involved in governing the sleep-wake cycle in humans.

In normal doses, it has no cardiovascular or respiratory depressant effects.

Absorption through the gastrointestinal tract is relatively rapid, with the onset of action occurring in 15 to 30 minutes. Peak levels occur at 2 hours.

Recovery is slow, reflected by the mean half-life of 3 hours.

It is available in two forms, hydroxyzine hydrochloride (Atarax) and hydroxyzine pamoate (Vistaril).

Administration is preferably by the oral route, I.M must be deep in a large muscle mass.

The drug should not be injected subcutaneously or I.V → potential tissue necrosis and hemolysis.

Preparation: **tablets, elixir**

Dosage: 0.5 to 1.0 mg/kg
Also available as IM inj. 1mg/kg

Side effects: prolonged drowsiness, ataxia, dry mouth. In children, paradoxical reactions may occur at sedative doses

.BENZODIAZEPINE AGONISTS AND ANTAGONISTS:

Midazolam (Versed)

It is a water-soluble type of benzodiazepine. The clinical potency of midazolam is estimated to be 2 to 5 times the potency of diazepam. Onset of action 3-5 minutes after IV administration and recovery take place in 2-6 hrs.

The elimination half-time of midazolam is 1 to 4 hours, which is significantly shorter than that of diazepam. Cognitive testing in adults shows return of normal mental function within 4 hours.

Adverse drug reaction

Respiratory depression dose, defendant risk of apnea, more often when used with narcotics, Hypertension has also been reported when used in combination.

Preparation: syrup, parenteral injection solution.

Pediatric dose:

0.05 - 0.1 mg/kg (IV. IM.)
0.03 – 0.75 mg/kg orally
0.4 – 1 mg/kg rectally
0.2 -0.3 mg/kg nasally

Note: Flumazenil should be available in the emergency drug kit as it is a direct, specific **reversal** agent used in clinical practice to treat benzodiazepine overdose (reverse sedation).

SEDATIVE-HYPNOTICS

Barbiturate

Can produce all levels of CNS depression, ranging from mild sedation to general anesthesia and deep coma. Their use are of **very limited value for pediatric patients.**

Chloral Hydrate

Chloral hydrate is an aldehyde compound that is metabolized in the liver. It is a chemical irritant to the skin and mucous membranes and is associated with a high rate of nausea and vomiting, particularly when administered on an empty stomach, so it should be diluted in a flavored vehicle. oral administration, characterized by a slow onset time (30 to 60 minutes) and had a duration of action of 4 to 8 hours, with an elimination half-life of 8 to 11 hours.

Children given chloral hydrate would often enter a period of disinhibition resulting in **excitement and irritability** before reaching a level of clinically useful sedation.

The drug causes prolonged drowsiness or sleep and respiratory depression. I n large dose it produces general anesthesia. Large doses sensitize the **myocardium** to the effects that resulting in **arrhythmias**, and thus should be avoided in patients with cardiac disease.

The **lethal dose of chloral hydrate** is stated to **be 10 g** in adults, yet ingestion of 4 g has been associated with a fatal outcome.

Because the drug dose not reliably produce sedation of a degree to permit operative procedures at lower doses, there is tendency to push the dosage higher to achieve the necessary sedation. **With such a wide range of reported toxicity, this drug may be an unwise choice for many pediatric patients.**

It is recommended that young children receive not more than 1 g as a total dose.

Chloral hydrate is no longer available commercially in the United States.

Risks are increased when it is accompanied with nitrous oxide, narcotics or local anesthetic agents.

Dosage: 25-50 mg/kg to
a maximum of 1 g
Supplied: oral capsules
500 mg
Oral solution: 250 and 500 mg/5ml
Rectal suppositories: 324 and 648 mg.

Narcotics

Demerol (Meperidine)

Meperidine is a **synthetic opiate** agonist, closely related to fentanyl in chemical structure.

It is **water-soluble** but is incompatible with many other drugs in solution.

Meperidine may be administered through either enteral or parenteral administration; however, oral administration is only about half as effective as intramuscular injection.

It is rapidly and well absorbed from the GI tract, reaching peak effect in about 60 minutes.

Approximately 90% of an oral dose undergoes biotransformation via first-pass metabolism to normeperidine and meperidinic acid.

Normeperidine is an active metabolite with approximately 50% of the analgesic activity as the parent compound, and manifests an elimination half-life of 15 to 40 hours.

Normeperidine also possesses CNS stimulation and can become proconvulsant with prolonged accumulation of the metabolite.

Its use is **contraindicated in patients with a history of hepatic disease**, renal disease or dysfunction, or seizure disorders.

Supplied: oral tablets—50 and 100 mg; oral syrup—50 mg /5 mL; parenteral solution—25, 50, 75, and 100 mg/mL

Dosage: oral, subcutaneous, or intramuscular—

1.0 to 2.2 mg/kg, not to exceed100 mg when given alone or 50 mg when in combination with other CNS depressants.

Note: Overdose or rapid administration can lead to respiratory depression, apnea, rigidity and bradycardia; if these remain untreated, respiratory arrest, circulatory depression or cardiac arrest may occur.

Nitrous oxide N_2O

It is the most frequently inhalation agent used in pediatric sedation .Nitrous oxide is a slightly sweet-smelling, colorless, heavier than air, and inert gas.

It is compressed in metal cylinders as a liquid that vaporizes on release.

The gas is nonflammable but will support combustion.

Very potent analgesic but weak anesthetic.

It is absorbed quickly from the alveoli of the lungs and is physically dissolved in the blood with no chemical combination anywhere in the body.

It is carried in the serum portion of the blood and excreted through the lungs without any biotransformation, small amount may be found in the body fluids and intestinal gas.

OBJECTIVES

The objectives of nitrous oxide sedation, as stated by the American Academy of Pediatric Dentistry, include the following:

- Reducing or eliminating anxiety
- Reducing untoward movement and reaction to dental treatment
- Enhancing communication and patient cooperation
- Raising the pain threshold
- Increasing tolerance for longer appointments
- Aiding in the treatment of a patient with mental and/or physical disabilities or a medically compromised patient
- Reducing gagging
- Potentiating the effects of sedatives.

Disadvantages of nitrous oxide–oxygen inhalation may include:

- Lack of potency
- Dependence on psychological reassurance
- Interference of the nasal hood with injection to the anterior maxillary region
- Need for the patient to be able to breathe through the nose
- Nitrous oxide pollution and potential occupational exposure health hazards.

Action (Pharmacodynamics) of N_2O

- Create an altered state of awareness without impairment to the motor function and it is a CNS depressant.
- Increase the respiratory rate and decrease the tidal volume.
- Cardiac output is decreased and peripheral vascular resistance is increased (important in the cardiac patients).
- Rapid induction and reversal may induce vomiting.

Absorption, metabolism and excretion

Onset: Anywhere from a few seconds up to 3-5 minutes Crosses the blood-brain barrier rapidly

Enter the blood by crossing the pulmonary epithelium and depends upon the concentration gradient.

During early phases of administration, the brain, heart, liver and kidney absorbs the major portion of N_2O from blood.

Elimination

- Rapid elimination
- Unchanged with exhalation from the lungs so (Do not hold a child close to your face while they are "waking up")
- No significant metabolism by the liver or kidneys
- Not stored in the tissues

Requirements of the equipment used for the induction of N_2O:

1. Should have a continuous flow design with flow meters capable of accurate regulation.
2. Automatic shut down if the O_2 level falls < 20 %.
3. Flush level for easy and immediate flushing of the system with 100% O_2.
4. Can be either mobile units or operating from a central supply to a wall mounted with mobile head.
5. Good and efficient scavenger system.
6. Nasal hood should be of adequate size for adults and children.

Types of Inhalation Sedation units

1 Intermittent (demand flow) gases delivered according to the patient, respiratory demand and requirements.

2 Continuous flow: continuous flow of gases (more safe and accurate).

Components of the continuous flow unit

1- Compressed gas cylinders and pressure gauge.

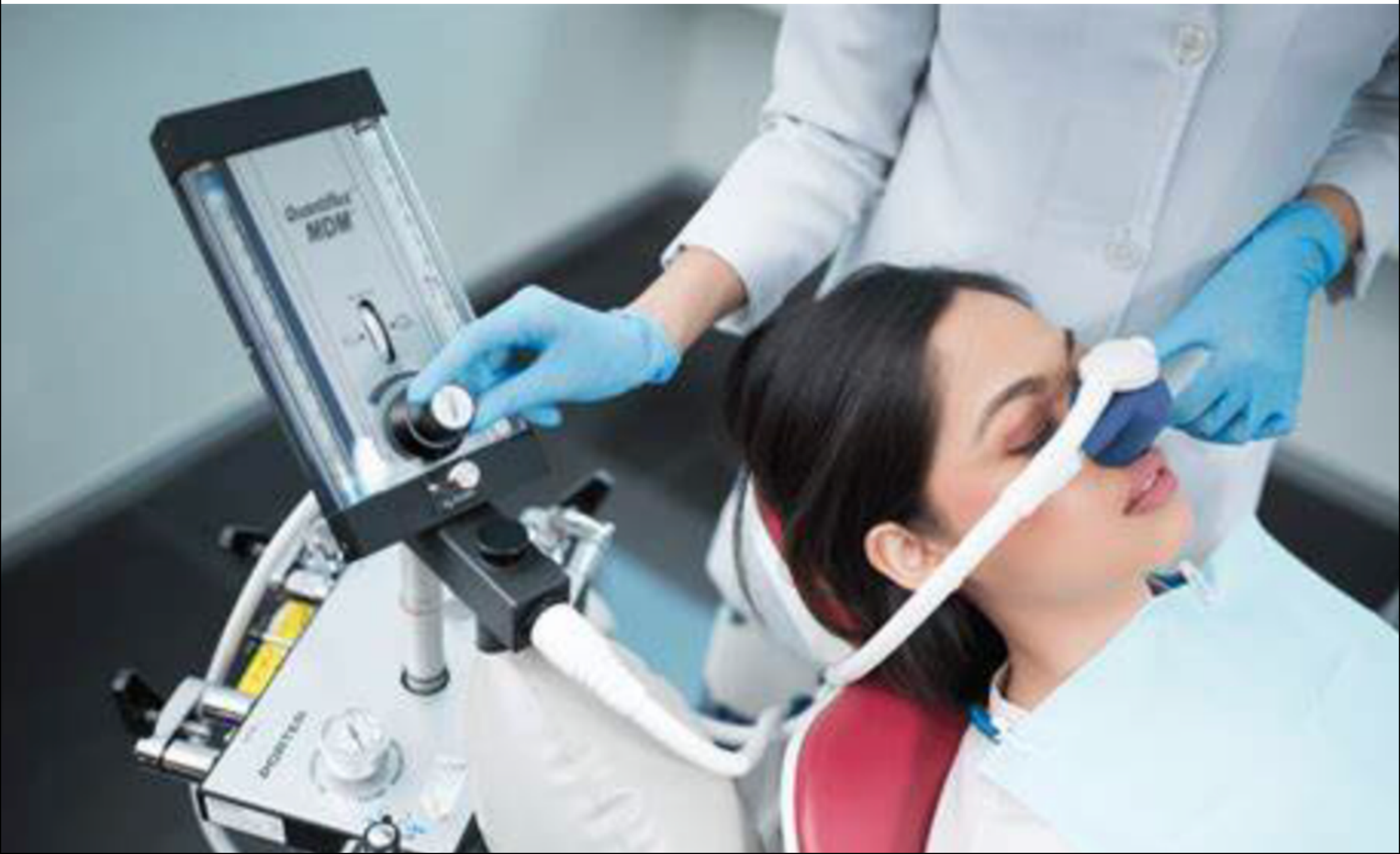
2- Reducing valve (regulator)

3 Flow meter

4 Reservoir bag

5 Conducting tubing

6 Nasal hood, full face mask or nasal cannul



Preparation of Patient

- Patient in reclined position
- Use TSD
- Describe sensations in advance

Four Plateaus of Analgesia with N_2O (Stages of Sedation):

1. Tingling sensation (Paresthesia - tingling of hands, feet).
2. Followed by a warm feeling (Vasomotor - warm sensations).
3. Feeling of well-being, hearing may dissolve into electronic throbbing. (Drift - euphoria, pupils centrally fixed sensation of floating).
4. Sleepiness, Nausea sets in, dream can occur (Dream - eyes closed but will open in response to questions, difficulty in speaking, jaw falls open).

Techniques

The acceptance of the nosepiece by the patient is very important in the procedure for effective conscious sedation. If the patient exhibits resistance then this method is not advisable for such a child.

1- Slow induction technique

The bag is filled with 100% oxygen and delivered to the patient for 1 or 2 minutes at an appropriate flow rate, typically between 4 and 6 L/min. With an appropriate flow rate, movement covering one quarter to one half of the breathing bag should be observed with each inhalation and exhalation.

With too high a flow rate, the bag will be overinflated, movement will not be seen with each breath, and leakage will occur from around the mask. In this instance, the flow rate should be adjusted downward.

Too low a flow rate will deplete the bag of mixed gases. Once the proper flow rate is achieved, the nitrous oxide can be introduced by slowly increasing the concentration in increments of 10% to 20% until the desired level is achieved.

After stabilization of the nose piece, 100% O_2 is delivered for 3-5 min , then N_2O level is increased slowly to 30-35% for 3-5 min (induction period) during this period the dentist should continuously communicates with the child to promote relaxation and reinforce cooperative behavior.

If the child is older, he can be asked for the physical changes like tingling sensation in the fingers and toes.

The eyes will take a distance gaze with sagging of eyelids, most of the dentists prefer to increase the level of N2O to 50% for 3-5 min to provide the maximum effect for the administration of L.A. **Concentration more than 50% is contraindicated** in dental practice, after administration of L.A. the concentration can be brought down to 30-35 %.

After the treatment:

- Inhalation of 100% O_2 for not less than 5 min should be continued to allow diffusion of nitrogen from the venous blood into the alveoli, which will be then exhaled as N_2O through the respiratory tract and also allow the patient to return to the pretreatment activities, with any incident inadequate oxygenation may produce: nausea, headedness or dizziness.
- The child should be kept in supine position or in his side to maintain air way patency. Upon arriving home, the child should be placed on his side and observed carefully for the first hour and if he wishes to sleep, he can be allowed to do so.

2- Rapid induction technique

Initiation is done by administration of equal parts of N_2O and O_2 for 10-15 min

, this is followed by maintenance phase where N_2O is reduced by half for 40 min, the withdrawal is done by administration of O_2 only which is used to prevent anoxia that may result when N_2O is used alone.

Common problems associated with N_2O

1 Sleep

Patient may go into sleep during the procedure and frequent awakening, or communication is required.

2 Air way obstruction

Frequent repositioning of the head is needed to hyper extend the mandible so that the tongue is brought forward.

3 Vomiting

It could be due to: Over dose of N_2O
Prolonged administration of N_2O
Pre-existing GIT infection or influenza
History of motion sickness or vomiting
(use antiemetic drugs)

Impurities during delivery (rare)
This (vomiting) can be prevented by:

(1)Using min. effective concentration.
(2)Avoid prolong procedure.
(3)Empty stomach inhalation.
(4)Slow return to upright position.
(5)Aspiration is unlikely.

So just ask the patient, to vomit in a chair side emesis basin if there is vomiting.

4 Diffusion Hypoxia

Since gas has a lower blood solubility, it rapidly diffuse into the alveoli and dilutes the alveoli air causing fall in the partial pressure of the oxygen in the alveoli, to avoid this 100% O_2 for 10 min.

5 Increased N_2O concentration

This should be avoided otherwise pressure will be created in the air filled body cavities especially in the middle ear.

6 Hallucinations

This can occur when we give high concentration of N_2O (> 60 %) so reduce the dosage of N_2O.

Chronic Exposure to N2O

"Long-term (chronic) exposure to nitrous oxide in sufficient concentrations can produce **irreversible, toxic changes**, and should be a concern for dental personnel working in environments in which nitrous oxide is administered to patients."

Chronic exposure may cause disorders in the:

- Respiratory system
- Hematological
- Immunological
- Liver
- Kidney
- Neurological such as loss of concentration, numbness and paresthesia, ataxia, loss of bladder control, loss of bowel sphincter control.

Controlling N_2O in the operatory:

To minimize the risk of chronic exposure:

- ✓Good scavenging system
- ✓Adequate circulation of the room air
- ✓Limiting of speech and mouth breathing by the patient
- ✓Chose the proper size of the nasal hood

Note:

Nitrous oxide is not a substitute for the traditional behavior management technique and it should be considered an adjunct to aid in the management of mild to moderate anxious child who is capable to cooperate in the dental chair.

Displacement of primary and permanent anterior teeth (Luxation)

Anterior teeth luxation

The displacement of anterior primary and permanent teeth presents a challenge in diagnosis and treatment for the dentist

INTRUSION

It is the most severe form of luxation injury because it causes severe damage to the periodontal ligament resulting in a greater incidence of external root resorption.

The tooth may be completely or partially intruded into its socket.

Clinically crown appears shorter.
The best approach is to "wait and watch for the tooth to re-erupt on its own.

- Intrusion by forceful impaction of maxillary anterior primary teeth is a common occurrence in children during the first 3 years of life, why?

- Although there is a difference of opinion regarding treatment of injuries of this type, it is generally agreed that immediate attention should be given to soft tissue damage.

- Intruded primary teeth should be observed: with few exceptions, no attempt should be made to reposition them after the accident.

- Most injuries of this type occur at an age when it would be difficult to construct a splint or a retaining appliance to stabilize the repositioned teeth.

- Normally, the developing permanent incisor tooth buds lie lingual to the roots of the primary central incisors.

- Therefore, when an intrusive displacement occurs, the primary tooth usually remains labial to the developing permanent tooth.
- If the intruded primary tooth is found to be in a lingual or encroaching relationship to the developing permanent tooth, it should be removed.

- Such a relationship may be confirmed from a lateral radiograph of the anterior segment.
- The examination should be carried out and radiographs should be made to detect evidence of

1. root fracture,
2. fracture of the alveolar bone,
3. and damage to permanent teeth predicting whether the permanent successors will show evidence of interrupted growth and development

- Primary anterior teeth intruded as a result of a blow may often re-erupt within 3 to 4 weeks after the injury.

- These teeth may even retain their vitality and later undergo normal resorption and be replaced on schedule by their permanent successors.
- During the first 6 months after the injury, however, the dentist often observes one or more of the reactions of the pulp and supporting tissues, the most common of which is pulpal necrosis.
- Even after re-eruption, a necrotic pulp can be treated if the tooth is sound in the alveolus and no pathologic root resorption is evident.

- **Primary teeth** that are displaced but not intruded should be repositioned by the dentist or parent as soon as possible after the accident, to prevent interference with occlusion.
- **The prognosis for severely loosened primary teeth is poor.** Frequently the teeth remain mobile and undergo rapid root resorption.
- The immediate and fixture prognosis for the pulp is more favorable if root formation is still incomplete at the time of the accident.
- Teeth with complete root formation seemed to undergo resorption more frequently than those with incomplete root formation.
- However, when resorption did occur, it was more extensive and progressed more rapidly in teeth with incomplete root development.

- Intruded permanent teeth apparently have a poorer prognosis than similarly injured primary teeth.
- The tendency for the injury to be followed by rapid root resorption, pulpal necrosis, or ankylosis is greater.

The treatment:

- ***I)* For a permanent tooth with a closed root end,**
  - A) Intruded less than 3 mm, is to allow the tooth to erupt without intervention. If no movement is evident after 2 to 4 weeks, the tooth may be repositioned either orthodontically or surgically before ankylosis can take place.
  - B) If the tooth is intruded 7 mm or more, the tooth is repositioned surgically and stabilized for 4 to 8 weeks by means of a flexible splint.
    - In most instances the pulp will become necrotic with intrusive injuries in teeth with complete root formation.
    - Root canal treatment should be initiated, with calcium hydroxide as a temporary canal filling material, 2 to 3 weeks after stabilization.

- *2)* The treatment for an intruded permanent tooth with incomplete root formation is:

- A) To allow it to erupt spontaneously. If no movement is seen within a few weeks, orthodontic repositioning should begin.

- *B)* If the tooth is intruded 7 mm or more, the tooth can be repositioned surgically and stabilized by means of a flexible splint.
- Endodontic therapy is often required. however. and the tooth should be monitored closely

- **It appears that spontaneous eruption** results in the fewest **complications in immature teeth,** regardless of the degree **of intrusion.**
- The frequency of pulpal necrosis in teeth with complete root development is higher than in those with incomplete root development.

- Teeth with uncomplicated crown factures with luxation and crown-fractured teeth with intrusion had a higher incidence of pulpal necrosis than any other types of concurrent luxation.

- **A concurrent luxation injury and complete root development are important risk factors of pulpal necrosis with uncomplicated crown fractures.**

- It seems that both treatment approaches to the treatment of severely intruded permanent teeth (early repositioning or waiting for spontaneous re-eruption) have demonstrated reasonably successful results.

- However, the affected teeth seem to benefit by early calcium hydroxide endodontic therapy with either treatment approach.

- The decision to reposition mechanically or hope for spontaneous re-eruption of intruded permanent teeth remains a matter of clinical judgment that may be based on several conditions associated with the particular case.

-

Extrusion It is also called peripheral displacement or partial avulsion. It is partial displacement of tooth out of its socket **(it appear longer).**

The extensive luxation of a permanent tooth usually results in pulpal necrosis.

The immediate treatment involves the careful repositioning of the tooth and stabilization.

If mature repositioned teeth do not respond to pulp vitality tests within 2 to 3 weeks after being repositioned,

- Endodontic treatment should be undertaken before there is evidence of root resorption, which often occurs after severe injuries of this type.
- The need for endodontic intervention is virtually certain in cases of significant extrusion (more than 2 mm) of mature teeth.
- With extruded immature teeth, the clinician should monitor the situation frequently and be prepared to intervene with endodontic therapy.

•Lateral Luxation

- Displacement of tooth in any direction other than axial
- Clinical features
- 1- tooth is mobile
- 2- bleeding from gingival sulcus
- 3- tooth is tender to percussion and mastication
- Widening of PDL space on one side and crushing of lamina dura on the other side

Treatment

- I Administer local anesthesia if forceful positioning is anticipated.
- 2Reposition the tooth in normal position using digital pressure.
- 3 Splint the tooth for 2 weeks and if there is a marginal bone breakdown then splint for 6-8 weeks.
- 4 Advice soft diet.
- 5 Follow up period of 1 year.

Avulsion and replantation

- Term used to describe complete displacement of tooth from its alveolus.
- It is also called as exarticulation.
- Maxillary teeth are most commonly involved.

Clinical feature

1) Empty socket
2) Associated bone fracture
3) If the wound is recent then lamina dura is visible otherwise it is obliterated

Treatment

- 1- replantation
- 2- if apical foramin is not closed-endodontic is delayed till apical closure seen
- 3-if apical foramin is closed RCT is done after 1-2 weeks depending on the type of reimplantation.

Replantation is the technique in which a tooth, usually one in the anterior region, is reinserted into the alveolus after its loss or displacement by accidental means.

Replantation of permanent teeth continues to be practiced and recommended, however, because prolonged retention is also achieved in many cases, especially when replantation occurs soon after the accident.

Importance of reimplantation:

1) The replanted tooth serves as a space mnintainer and often guides adjacent teeth into their proper position in the arch, a function that is important during the transitional dentition period.

2) The replantation procedure also has psychological value. It gives the unfortunate child and parents hope for success; even though they are told of the possibility of eventual loss of the tooth, the early result often appears favorable and softens the emotional blow of the accident.

The Success of the replantation depend on

1- It is undoubtedly related to the length of time that elapses between the loss of the tooth and its replacement in the socket.

2- The condition of the tooth and particularly the condition of the periodontal ligament tissue remaining on the root surface are also important factors that influence the success of replantation

Notes

Many reports indicated that immediate replacement of a permanent tooth occasionally results in the maintenance of vitality and indefinite retention.

However, replantation should generally be viewed as a temporary measure.

Under favorable conditions, many replanted teeth are retained for 5 or 10 years and a few for a lifetime. Others, however, fail soon after replantation

- The tooth most commonly avulsed in both the primary and the permanent dentition is a maxillary central incisor. Most often, an avulsion injury involves only a single tooth.
- **Avulsion injuries are three times more frequent in boys than in girls and occur most commonly in children from 7 to 9 years of age, when permanent incisors are erupting.
- **Loosely structured periodontal ligament surrounding the erupting teeth favors complete avulsion

- The sooner a tooth can be replanted in its socket after avulsion, the better the prognosis will be for retention without root resorption. The prognosis is therefore more favorable.
- Also, if the apical end of the tooth is incompletely developed at the time of the injury, there is a greater chance of regaining pulp vitality after replantation.
- If the apex is closed, the dentist should proceed with a pulpectomy a few days after the replantation, even if the extraoral time for the tooth was brief.

- If a parent calls to report that a tooth has been avulsed, and it can be determined that the injury is without other oral, neurologic, or higher-priority physical complications, the dentist may instruct the parent to do the following **(primary teeth should not be replanted):**

- 1. Keep the patient calm.
- 2. Find the tooth and pick it up by the crown (the white part). Avoid touching the root

3. If the tooth is dirty, wash it briefly (10 seconds) under cold running water and reposition it.

4-Try to encourage the patient/parent to replant the tooth. Bile on a handkerchief to hold the tooth in position.

5-If re Positioning is not possible, place the tooth in a suitable storage medium.

6-Seek emergency dental treatment immediately, unless the patient was knocked unconscious.

- If the child was unconscious for a period of time, first seek emergency medical evaluation for a concussion.

Hank's balanced salt solution (HBSS): Considered as best transport medium.

Milk: Excellent medium, has a favorable pH and osmolality. Maintains vitality of periodontal cells for about 3hours’

- **Saliva**: Allows storage for 2 hours but it is hypotonic.
- **Saline**: Has physiologic pH and is isotonic
  - **Tap water**: Considered as bad as dry storage, its hypotonicity causes cell lysis. It should be used only if any of the above is not readily available

- If the parent cannot or will not replant it, the tooth must be kept moist during the trip to the dental office.
- Allowing the avulsed tooth to dehydrate before replantation is damaging to a favorable prognosis.
- Hanks' buffered saline, isotonic saline, and pasteurized bovine milk may be the most favorable known storage media.
- Although tap water has been a commonly recommended storage solution (and its use would be preferable to dehydration of the tooth), it is hypotonic, and its use leads to rapid cell lysis.

- The patient should receive immediate attention after arriving at the dental office.
- If the tooth has not already been replanted, the dentist should make every effort to minimize the additional time that the tooth is out of the socket.
- The patient's general status should be quickly assessed to confirm that there are no higher-priority injuries.
- If an evaluation of the socket area shows no evidence of alveolar fracture or severe soft-tissue injury, the tooth is intact, and only a few minutes have elapsed since the injury, the dentist should replant the tooth immediately.

- Under the conditions just described, every effort should be directed toward preserving a viable periodontal ligament.

- That treatment should be directed at avoiding or minimizing the resultant inflammation that occurs as a direct result of the two main consequences of tooth avulsion attachment damage and pulpal infection.

- If the tooth was cleanly avulsed, it can probably be replanted without local anesthetic, and obtainng the initial radiograph can also be delayed until the tooth is replaced in the socket and held with finger pressure.
- The minutes saved may contribute to a more successful replantation.

- If a clot is present in the socket, it will be displaced as the tooth is repositioned; the socket walls should not be scraped with an instrument.
- If the tooth does not slip back into position with relative ease when finger pressure is used, local anesthesia and a radiographic evaluation are indicated.
- Local anesthetic should also be administered

- when fractured and displaced alveolar bone must be repositioned before the tooth is replanted.
- Soft-tissue suturing may be delayed until the tooth has been replaced in the socket; however, the suturing should be performed to control hemorrhage before the tooth is stabilized with a bonded splint.

- The root canals were hermetically sealed with gutta-percha, and the teeth were splinted for 1 month.
- Subsequent microscopic examination under fluorescent and incandescent light revealed deposition of secondary cementum and new alveolar bone, which entrapped the periodontal fibers.
- The preservation of an intact and viable periodontal ligament is the most important factor in achieving healing without root resorption.
- Delicate handling of the tooth, storage in an appropriate moist environment, quick replantation, and appropriate stabilization are all important in preserving the periodontal ligament.

Undesirable periodontal ligament reactions may result in replacement resorption (ankylosis)

Either reaction may cause eventual loss of the tooth unless the resorption can be controlled.

Use of an enamel matrix derivative (Emdogain) has been shown to increase the incidence of healed periodontal ligament when this gel is applied to the root surface of the avulsed tooth and/or inserted directly into the alveolar socket before implantation.

It appears to aid in preventing or retarding resorption and ankylosis.

Stabilization of replanted teeth

After replantation of a tooth that has been avulsed, a splint is required to stabilize it during at least the first week of healing.

Acceptable splint should meet the following criteria:

1. It should be easy to fabricate directly in the mouth, without lengthv laboratory procedures.
2. It should be able to be placed passively without causing forces on the teeth.
3. It should not touch the gingival tissues, causing gingival irritation.
4. . It should not interfere with normal occlusion.
5. It should be easily cleaned and allow for proper oral hygiene.
6. It should not traumatize the teeth or gingiva during application.
7. It should allow an approach for endodontic therapy.
8. It should be easy to remove.

- The splint should also allow mobility of the replanted tooth that is comparable with the normal mobility of a tooth.
- Rigid stabilization seems to stimulate replacement resorption of the root.
- Rigid stabilization of a replanted tooth is detrimental to proper healing of the periodontal ligament.
- The bonded resin and wire splint satisfies all the criteria just described.
- It can be used in most situations requiring the stabilization of one or more teeth if sufficient sound teeth remain for anchorage.

- Rectangular or round orthodontic wire is bent to approximate the arch configuration along the midportion of the labial surfaces of the teeth to be incorporated into the splint.
- At least one sound tooth on each side of the tooth to be stabilized is included.

- The size of the wire is not too critical, but rectangular wire should be at least 0.016 * 0.022 inch and round wire at least 0.018 inch.
- If three or four teeth must be stabilized, a stiffer wire (e.g., 0.028-inch round wire) is required.
- If round wire is used, a right-angle bend should be made near each end of the wire to prevent rotation of the wire in the resin.

- A 20- to 30-pound-test monofilament nylon line is an acceptable substitute for wire in the splint.

- The enamel surfaces are etched with a phosphoric acid etchant; the gel form is convenient. ’the enamel surfaces are thoroughly washed and dried again.

The wire is then attached to the abutment teeth by the placement of increments of the resin material over the wire and onto the etched enamel.

The resin should completely surround a segment of the wire, but it should not encroach on the proximal contacts or embrasures. The replanted tooth is then held in position while resin is used to bond it to the wire.

The resin may be lightly finished, if necessary, after polymerization. The splint is easily removed (usually 7 to 10 days later) by cutting through the resin with a bur to uncover the wire.

The remaining resin may then be removed with conventional finishing instruments.

- If the splint is used to stabilize lower teeth, it may be necessary to affix the wire to the lingual surfaces
- Because lingual surfaces were more likely to be contnminated with saliva during the procedure, however, labial placement is preferred whenever possible.
- Direct-bonded orthodontic brackets may also be placed on the teeth, and a light labial archwire bent to conform accurately to the natural cumature of the arch is then ligated to the brackets.

- The brackets are properly aligned on the archwire and bonded to the abutment teeth first.
- The avulsed tooth is then ideally positioned, and additional bonding material is placed, if necessary. to fill any remaining small space between the tooth and the bracket before being bonded to the splint.
- However, it requires much more accurate and precise wire bending than the bonded resin and wire technique (without brackets) to achieve a passive appliance.

If the patient has mental disabilities or immature behavior and does not tolerate foreign objects in the mouth well, or if there we insufficient abutment teeth available for the bonded resin and wire splint, the suture and bonded resin splint advocated that may be an acceptable alternative.

The titanium trauma splint has been developed to ease the application and removal of the splint and to increase comfort for the patient.

- In general, stabilization for replanted teeth without other complications is required for 7 to 14 days. The periodontal ligament fibers should have healed sufficiently after the first week to allow the splint to be removed. However, the patient should be advised not to bite directly on the replanted tooth for 3 to 4 weeks after the injury and then gradually to begin to return to normal use of the tooth.

- During this time, food may be cut into bite-size pieces and chewed carefully with unaffected teeth.
- The patient should maintain good oral hygiene by brushing and flossing normally and using chlorhexidine mouth rinses.
- Systemic antibiotic therapy is recommended to begin immediately and continue for at least a week following replantation.
- If the apex is closed, extending the antibiotic therapy until the pulp is extirpated seems to be a good way to determine the duration of antibiotic coverage

Antibiotic therapy is effective in preventing the development of external inflammatory root resorption of replanted teeth in which the pulps were not extirpated.

This finding suggests that antibiotic therapy may also be helpful in those cases in which the pulps of immature replanted teeth are allowed to remain while revitalization remains a possibility.

- The recommendations for replanting a tooth based on its status as judged by the clinician's determination of the physiologic condition of the root periodontal ligament cells, the development of the root apex, and the length of extraoral time.
- The dentist should confirm at the time of replantation that the patient is adequately immunized against tetanus

Endodontic management of replanted tooth

All replanted permanent teeth with **complete apical root** development should undergo a **pulpectomy** soon after **replantation regardless of** the **length of time the tooth was out of the mouth.**

Even though a few reports of revitalization exist, the chances for revitalization are remote at best.
Moreover, adverse reactions are virtually certain if degenerating pulp tissue is allowed to remain in the canals for more than a few days.
The risk-benefit ratio for the patient favors pulpal extirpation.

Because replantation should be done as soon as possible after the injury, the dentist should not take time to extirpate the pulp before replantation.
The pulp should be extirpated before the splint is removed, however, and preferably within 1 week after the injury .
A sterile, dry cotton pellet or one dampened with CMCP and blotted on sterile gauze may be sealed in the pulp chamber after debridement and irrigation.

- The canal should be filled approximately 2 weeks after the injury. When the canal is filled, calcium hydroxide paste is the material of choice.

Notes

1) There was a study suggested that the pulp contents be removed at the emergency visit and a tetracycline-corticosteroid combination (Lederinix) be placed in the root canal.

- 2) This combination decreases the inflammatory response after replantation to allow for more favorable healing than in those teeth that do not receive the medicament.
- 3) Root canal treatment should be initiated 7 to 10 days after replantation.
- 4) Earlv extirpation of the pulp may help to control the early onset of inflammatory root resorption.

- 5) Filling the root canal with calcium hydroxide also controls and may even arrest external inflammatory root resorption.
- If the calcium hydroxide is placed in the canal too soon (before adequate healing of the periodontal ligament), however, it may stimulate replacement root resorption.
- 6) 2 weeks after replantation is the ideal time to fill the canal with calcium hydroxide.

- If the avulsed permanent tooth has imm ature root formation with an open apex, the chances of pulpal revitalization after replantation improve considerably, especially if replantation occurs v•ithin 30 minutes after avulsion. If the avulsed tooth has been cared for properly, there is a small chance for revitalization even if the tooth is replanted within 1 hour after the injury. However, many teeth do not revitalize. Those that do respond favorably may still require root canal treatment several months later.

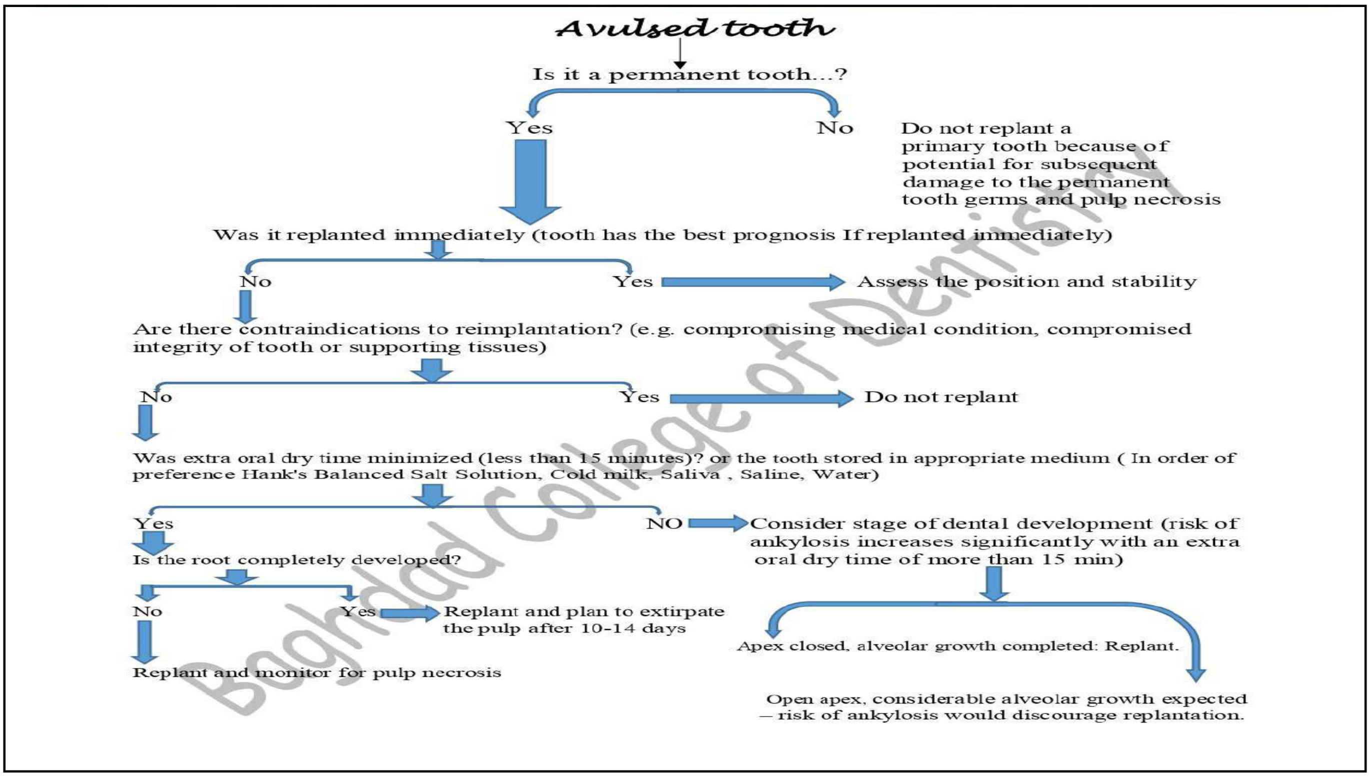
- During the time beyond 1 week that the pulp tissue is allowed to remain, evaluation of the tooth is recommended at weekly intervals until favorable signs of healing without pulpal pathosis are conclusive (vitality tests are unreliable) or until a decision is made to extirpate the pulp.
- The pulp should be extirpated when the first signs of degeneration appear. Rubber dam isolation is always desirable when pulp therapy is performed.

It can usually be used even during the pulp extirpation procedure, while several teeth are splinted together.

Instead of separate holes in the rubber dam for each tooth, a slit is made so that the rubber can be placed over all teeth in the splinted segment.

This does not afford ideal isolation, but it is generally better than the use of cotton rolls In addition, the rubber dam helps present the swallowing or aspiration of foreign objects during treatment.

- The calcium hydroxide material used to fill the root canal should be replaced every 3 to 6 months until a decision is made to fi11 the canal with gutta-percha.
- The optimum duration of the calcium hydroxide treatment is unknown, but generally calcium hydroxide should be kept in the canal for at least 6 months or until root end closure (apical plug) occurs beyond l year.
- In cases in which an adjacent tooth is still unerupted, calcium hydroxide treatment is recommended until eruption of the adjacent tooth. It is believed that eruption may stimulate or accelerate the resorptive process in a nearby replanted root.



Avulsed tooth
Is it a permanent tooth…?
Yes
No
Do not replant a primary tooth because of potential for subsequent damage to the permanent tooth germs and pulp necrosis
Was it replanted immediately (tooth has the best prognosis If replanted immediately)
No
Yes
Assess the position and stability
Are there contraindications to reimplantation? (e.g. compromising medical condition, compromised integrity of tooth or supporting tissues)
No
Yes
Do not replant
Was extra oral dry time minimized (less than 15 minutes)? or the tooth stored in appropriate medium (In order of preference Hank's Balanced Salt Solution, Cold milk, Saliva , Saline, Water)
Yes
NO
Consider stage of dental development (risk of ankylosis increases significantly with an extra oral dry time of more than 15 min)
Is the root completely developed?
No
Yes
Replant and plan to extirpate the pulp after 10-14 days
Replant and monitor for pulp necrosis
Apex closed, alveolar growth completed: Replant.
Open apex, considerable alveolar growth expected – risk of ankylosis would discourage replantation.