College of Dentistry/University of Baghdad
Pedodontics and Preventive Dentistry Department

جامعة بغداد
كلية طب الاسنان
COLLEGE OF DENTISTRY
University of Baghdad

Pediatric Dentistry

5 th Year

Lec. 9
Reactions of the Tooth to Trauma



Assistant Professor
Aseel Haidar

Assist. Prof. Dr. Aseel Haidar

Reaction of the Tooth to Trauma

1) Pulpal Hyperemia

It may be occurred even with minor trauma. Congestion of blood within the pulp chamber a short time after the injury can often be detected in the clinical examination and that is by directing a strong light to the labial surface of the injured tooth and the lingual surface is viewed in a mirror, the coronal portion of the tooth will often appear reddish compared with the adjacent teeth. The color change may be evident for several weeks after the accident and often indicates a poor prognosis.

2) Internal hemorrhage

Hyperemia and increased pressure may cause rupture of capillaries and the escape of RBC with subsequent breakdown and pigment formation. These may be reabsorbed before gaining access to dentinal tubules if bleeding is minute (in which case little if any color change will be noticeable and what does appear will be temporary). In severe cases there is deposition of these pigments in the dentinal tubules. The change in color is evident within 2-3 weeks after injury and though is reversible, the crown may retain some amount of discoloration for an indefinite period. In cases of this type, there is some chance that the pulp will retain its vitality, although the likelihood of vitality is apparently low in primary teeth with dark-gray discoloration.



Note:

**Gray-black discoloration ⟶ necrotic pulp, so that dark-gray coronal discoloration is the primary diagnostic sign before pulpectomy.

**Discoloration that becomes evident for the first time months or years after an accident, is an evidence of a necrotic pulp.

3) Calcific metamorphosis of dental pulp (Progressive Canal Calcification or Dystrophic Calcification)

There may be partial or complete obliteration of the pulp chamber or canal and although the radiograph may give the illusion of complete obliteration, an extremely fine root canal and remnants of the pulp will persist. The crowns of teeth that have undergone this reaction may have a yellowish, opaque color.

Baghdad College of Dentistry

Primary teeth demonstrating calcific metamorphosis will usually undergo normal root resorption. While the permanent tooth that showing signs of calcific changes as a result of trauma should be regarded as a potential focus of infection and must be kept under observation or treated endodontically if possible. A small percentage of such teeth demonstrate pathologic change many years after the injury.

4. Internal resorption



It is a destructive process generally believed to be caused by odontoclastic action. Appears as a pink tooth. It is observed radiographically in the pulp chamber or canal within a few weeks or months after injury. The destructive process may progress slowly or rapidly. If the progression is rapid it may cause perforation of the crown or roots within a few weeks. Such teeth should be treated endodontically as soon as diagnosed.

This condition can be described as "pink spot" because when the crown is affected, the vascular tissue of the pulp shines through the remaining thin shell of the tooth. The occurrence referred of a perforation as "perforating hyperplasia of the pulp." If evidence of internal resorption is detected early, before it becomes extensive with resulting perforation, the tooth may possibly be retained when endodontic procedures are instituted.

5. Peripheral (External) root resorption



It usually results due to the damage to the periodontal structures and the pulp may not be involved. This condition can be seen in severe trauma in which there has been some degree of displacement of the tooth.

This reaction starts from without, and the pulp may not become involved. Usually the resorption continues unabated until gross areas of the root have been destroyed. In exceptional cases the resorption may become arrested, and the tooth may be retained.

6. Pulpal necrosis

Little relationship exists between the type of injury to the tooth and the reaction of the pulp and supporting tissues. Any type of injury especially the displacement type may cause severance of the apical vessels. This lead to loss of vascular supply to the pulp leading to autolysis and necrosis. Injured teeth with subsequent pulpal necrosis are commonly asymptomatic and the radiograph is essentially normal. The acute symptoms and clinical evidence of infection will inevitably develop at a later date. Bacteriological status of the pulp tissue of root canal of intact but traumatized teeth reveals microorganisms, including anaerobic forms in the pulp canal of traumatized teeth. The source of microorganisms is through gingival sulcus or blood stream or both.

Baghdad College of Dentistry

In a less severe type of injury, the hyperemia and slowing of blood flow through the pulpal tissue may cause eventual necrosis of the pulp. In some cases the necrosis may not occur until several months after the injury. The tooth with a necrotic pulp should therefore be extracted or treated with endodontic procedures, whichever is indicated.

A tooth receiving an injury that causes coronal fracture may have a better pulpal prognosis than a tooth that sustains a severe blow without fracturing the crown. (Why?)

A necrotic pulp in an anterior primary tooth may be successfully treated if no extensive root resorption or bone loss has occurred. The treatment technique is essentially the same as that for permanent teeth. However, trauma to the periapical tissues during canal instrumentation must be carefully avoided.



Note:

Risk of pulp necrosis (from the lowest)

Concussion, Subluxation, Extrusion, Lateral luxation, Intrusive luxation – 100% chances of pulp necrosis and external root resorption (Why?)

7. Ankylosis

It is caused by injury to the periodontal membrane and subsequent inflammation, which is associated with invasion by osteoclastic cells resulting in irregularly resorbed areas on the peripheral root surface. In the histologic sections, repair can be seen that may cause a mechanical lock or fusion between alveolar bone and the root surface. Radiograph shows an interruption in the periodontal membrane of the ankylosed tooth and often the dentin may appear to be continuous with alveolar bone and clinically appears submerged (Clinical evidence of ankylosis is seen as a difference in the incisal plane of the ankylosed tooth and adjacent teeth. The adjacent teeth continue to erupt, whereas the ankylosed tooth remains fixed in relation to surrounding structures).

So: **Ankylosed anterior primary tooth** must be **removed** to allow eruption of the permanent tooth (The ankylosed anterior primary tooth should be removed if there is evidence of its causing delayed or ectopic eruption of the permanent successor).

If **ankylosis of a permanent** tooth occurs during active eruption, eventually a discrepancy between the position of this tooth and its adjacent ones will be obvious. The uninjured teeth will continue to erupt and may drift mesially, with a loss of arch length. **Therefore either surgical repositioning or the removal of a permanent tooth** that becomes ankylosed is often necessary, especially if the ankylosis occurs during the preteen or early teen years.

Baghdad College of Dentistry

Restoration of Fractured Teeth

To aid in the recovery of the pulp after the trauma, the restoration of a fractured tooth is as important as the emergency treatment designed. Several restorations have been advocated, and although the dentist has a wide choice of techniques and types of restorations, the following factors may affect the type of the restoration:

1) The circumstances surrounding the case often dictate the type of restoration for a given patient.
2) The prognosis of pulp healing,
3) The amount of tooth structure remaining,
4) The stage of eruption of the tooth and adjacent teeth,
5) The size of the dental pulp and degree of root closure,
6) The normalcy of the occlusion,
7) The wishes of the patient

All of these factors must be considered in the selection of a temporary restoration, an intermediate restoration, or the permanent restoration. In the young patient, although it is often desirable to wait for continued eruption of the tooth or to determine the outcome of a vital pulp procedure, a delay of even a few weeks is often sufficient to allow the tipping of adjacent teeth, overeruption of opposing teeth, or other undesirable changes in the occlusion.

Notes:

- Permanent filling in young children should not be done from the beginning, because:
  1) The dentinal tubules are widely open. So any cut in the crown or cementation for the crown might affect the pulp because it produces irritation to the pulp.
  2) The full length of the clinical crown is not yet established.
  3) The pulp chamber of newly erupted tooth is wide and any cutting might get pulp exposure.
  4) The root of the tooth continue to develop 3-4 years after eruption.
- Treatment of traumatized teeth usually divided into 3 stages:
  1) Emergency treatment
  2) Intermediate or semi-permanent treatment
  3) Permanent treatment
- Types of semi-permanent restorations:
  1) Colloid crown

Baghdad College of Dentistry

2) Chrom steal crown with window labeling
3) Pin with filling material
4) Cold cure acrylic temporary crown (good esthetic, keep it 4-6 weeks in the month)

- In case of Class III fracture where fracture line below the level of root, try to extend the root orthodontically and do R.C and make post and core.
- **Q:** Why the dentist who provides emergency care for a child after an injury to the anterior primary teeth must be aware of the possibility of damage to the underlying developing permanent teeth?
- You should know that some injuries to the face and jaws may not appear to have caused any dental injuries initially, but the problem may be noticed several months or years later.

Reaction of Permanent Tooth Buds to Injury

1) Hypocalcification and Hypoplasia

Gross malformed crown, small pigmented hypoplastic areas referred as (Turner tooth). Small hypoplastic defects may be restored by the resin-bonding technique.

Note:

A disturbance in enamel matrix formation produces enamel hypoplasia, which is characterized by irregular thickness of enamel and presence of pits and grove in the enamel surface. Any defect in mineralization process the enamel thickness is normal but poorly mineralized. It can be found in both primary and permanent dentition.

2) Reparative Dentine Production

This condition may occur in cases in which the injury to the developing permanent tooth is severe enough to remove the thin covering of developing enamel or cause destruction of the ameloblasts, the subjacent odontoblasts have been observed to produce a reparative type of dentin. The irregular dentin bridges the gap where there is no enamel covering to aid in protecting the pulp from further injury.

Baghdad College of Dentistry



3) Dilaceration

Tooth with sharp bend in crown or root is known as dilacerated tooth. Dilacerations is most commonly seen in maxillary permanent central incisors. Most common cause of dilacerations is trauma to the deciduous teeth (Occasionally occurs after the intrusion or displacement of an anterior primary tooth. The developed portion of the tooth is twisted or bent on itself, and in this new position growth of the tooth progresses. Germination may appear in the part of the tooth formed after the injury). Dilacerated tooth usually fails to erupt but may sometimes erupt into an abnormal position and can cause displacement of adjacent teeth.



**Crown of a permanent tooth or a portion of it develops at an acute angle to the remainder of the tooth

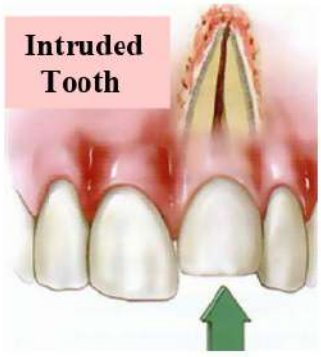
Treatment

1. Unerupted dilacerated tooth usually require surgical extraction.
2. Erupted teeth with root dilacerations should be extracted, if they are in abnormal position. Since, it is difficult to move by orthodontic force.
3. Following extraction, extracted space should be maintained by prosthesis or closed by orthodontic treatment.

Displacement of Primary and Permanent 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.



Baghdad College of Dentistry

PRIMARY TEETH

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 as previously described, and radiographs should be made to detect evidence of root fracture, fracture of the alveolar bone, and damage to permanent teeth. However, predicting whether the permanent successors will show evidence of inter rupted growth and development is impossible unless actual encroachment of their space can be seen radiographically.

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 reeruption, 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 future 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.

Baghdad College of Dentistry

PERMANENT TEETH

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:

1) 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 repositi oned surgically and stabilized by means of a flexible splint. Endodontic therapy is often required, however, and the tooth should be monitored closely while a decision on endodontic therapy is pending.

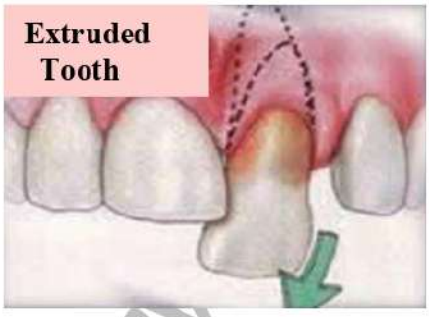
It appears that spontaneous eruption results in the fewest complications in immature teeth, regardless of the degree of intrusion.

The frequency of pulpal necrosis in teeth with complete root development is higher than in those with incomplete root development. Teeth with uncomplicated crown fractures 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.

Baghdad College of Dentistry

Extrusion: It is also called peripheral displacement or partial avulsion. It is partial displacement of tooth out of its socket **(it appear longer)**. The extrusive 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, as described later, if conditions warrant.

Baghdad College of Dentistry