Pediatric Dentistry

5 th Year



Lateral Luxation

Lec. 10

Displacement of Primary and Permanent Anterior Teeth (CONTINUED)



Avulsion (Knocked out tooth)

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Lateral Luxation:

Displacement of tooth in any direction other than axial.





Clinical Features

1) Tooth is mobile and displaced.
2) Bleeding from gingival crevice.
3) Tooth is tender to percussion and masticatory forces.

Radiographic Features

Widening of PDL space on one side and crushing of lamina dura on other side.

Treatment



1) Administer local anesthesia if forceful positioning is anticipated.
2) Reposition 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 Features

Bleeding socket with missing tooth.



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Radiographic Features:



1) Empty socket.
2) Associated bone fractures.
3) If the wound is recent then lamina dura is visible otherwise, it is obliterated.

Treatment

1. Replantation.
2. If apical foramen is not closed-endodontic therapy is delayed till the first signs of apical closure is seen.
3. If apical foramen is closed -endodontic therapy is done after 1-2 weeks depending on 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 maintainer and often guides the 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 procedure 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.

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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.
- 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. Try to encourage the patient/parent to replant the tooth. Bite on a handkerchief to hold the tooth in position.
4. If repositioning is not possible, place the tooth in a suitable storage medium.
5. 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.

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Notes:

The types of the storage media

- **Tap water:** Its use is not recommended as it is not compatible with PDL cells because of its hypotonic osmolarity, which causes cell lysis, and it is reported to cause replacement resorption in avulsed teeth when they are place in it. It is considered the least desirable storage medium. 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.
- **Hank's balanced salt solution (HBSS):** is a salt-solution with a balanced pH, it contains the essential metabolites needed for viability of PDL cells. It is considered a gold standard for storage media used in transport the avulsed teeth.
- **Saliva:** It is readily available, natural storage medium. Despite this fact, the presence of substances like enzymes and bacteria and its non-physiologic osmolarity, can exert harmful effects on the PDL cells, this can at best be used as an interim storage medium (no longer than 30 minutes). If stored for more than 60 minutes, a significant decrease in functional capacity of PDL cells may occur.



- **Saline:** Has physiologic pH and is isotonic. It is considered acceptable to place an avulsed tooth in isotonic saline rather than storing it dry. It is acceptable to place avulsed teeth in this storage medium for not more than 10 minutes.

- **Milk:** milk can be considered as an acceptable storage medium in most situations. It can maintain the viability of PDL cells from 2hrs to 6 hours. Sour milk should not be used as it is considered to be harmful.
- **Egg white:** This medium has not been found to be significantly different from HBSS in some studies in terms of cell viability and demonstrates greater PDL healing when compared with milk.
- **Oral Rehydration Salt-Liquid (ORS):** It is as efficient as HBSS to maintain the viability of PDL cells; however, it is better than milk.

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 and increased inflammation on replantation. 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

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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 obtaining 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) or inflammatory resorption of the root. 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 lengthy 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.

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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. If the labial enamel surfaces to be etched are not plaque free, they should be cleaned with a pumice slurry, rinsed, thoroughly dried, and isolated with cotton rolls. 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 re sin 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 if placing it on the labial surfaces will interfere with natural occlusion. Because lingual surfaces are more likely to be contaminated 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 curvature 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. If performed properly, this technique results in an excellent 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.

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If the patient has mental disabilities or immature behavior and does not tolerate foreign objects in the mouth well, or if there are 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. Additional studies in this area are indicated.

The recommendations for replanting a tooth based o n 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 Teeth

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

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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 (Ledermix) 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) Early extirpation of the pulp may help to control the early onset of inflammatory root resorption.

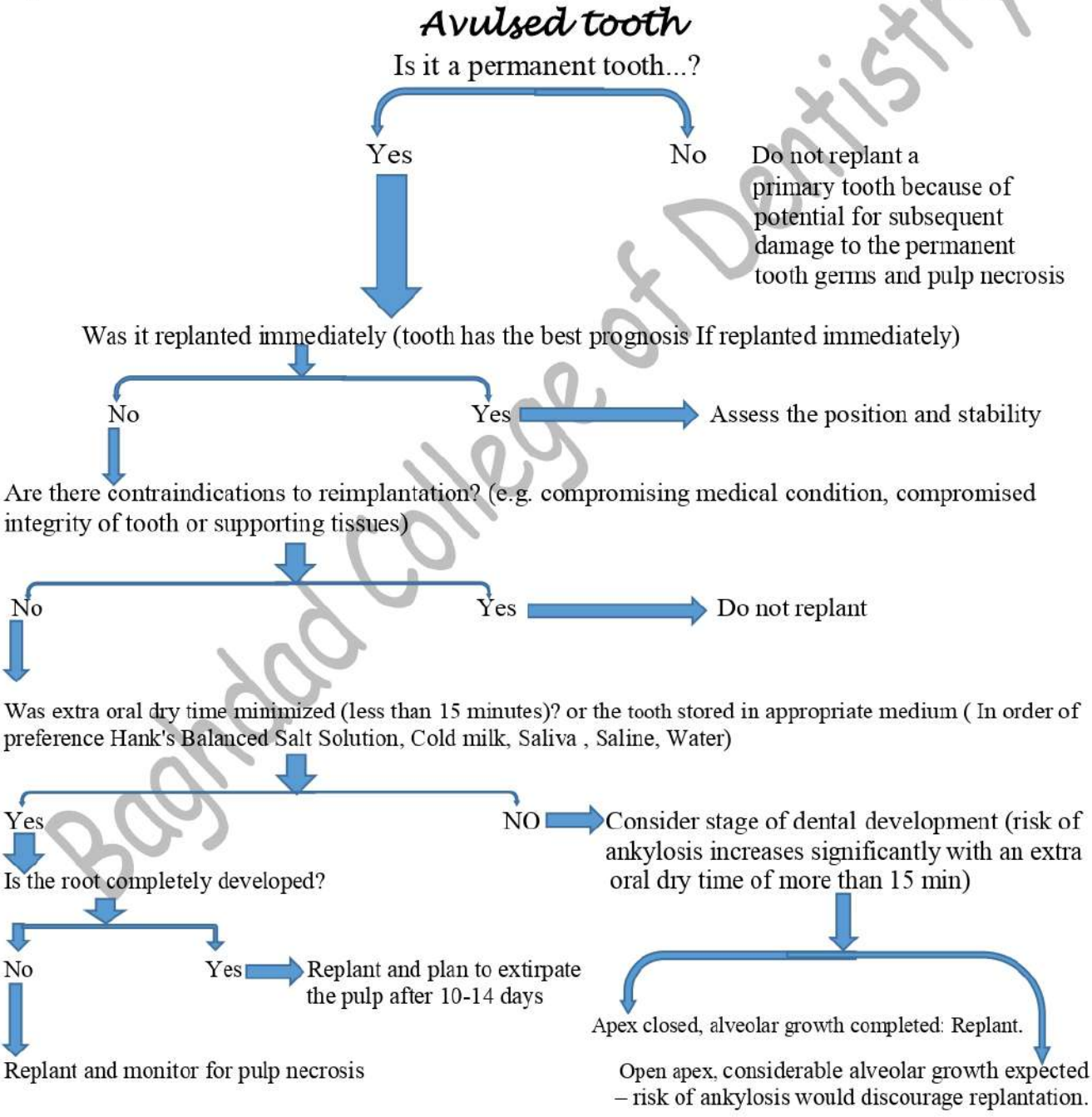
5) Filling the root canal with calcium hydroxide also controls and may even arrest external inflammatory root resorption. If the calcium hydroxide is placed in the canal too soon (before adequate healing of the periodontal ligament), however, it may stimulate replacement root resorption.

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 within 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 prevent the swallowing or aspiration of foreign objects during treatment. If small endodontic instruments are used without rubber dam protection, they should be secured with a length of dental floss to facilitate retrieval in the unlikely event that they are dropped in the patient's mouth.

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The calcium hydroxide material used to fill the root canal should be replaced every 3 to 6 months until a decision is made to fill 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 1 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.



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