

# Management of Avulsed Permanent Teeth



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Traumatic injuries to the teeth are so common among any community; trauma to the face especially to the oral region occurs frequently and comprises 5% of all injuries <sup>(1, 2)</sup>. In preschool children the trauma rate is as high as 18% of all injuries. Among all facial injuries, dental injuries are the most common <sup>(2)</sup> of which avulsions occur in 1–16% of all dental injuries <sup>(1, 3)</sup>.



### Public Awareness:

Public awareness is very significant as a first aid measures to act in case of trauma injuries to the mouth and oral cavity. There is a lot of ignorance among the public regarding this subject. The most concerned personnel to be aware of the first aid for treating traumatized teeth are school teachers and school nurses especially in preschools where the trauma occurs the most. The dental organizations and associations should take this in consideration and start setting seminars and campaigns for school teachers; advertise in the public health

magazines, woman magazines, television and any other type of media that reach the public. There are many informations we can read from time to time regarding so many issues that affect the public as AIDS, bird flu and so forth, we can not find any regarding traumatic injuries of the teeth.

We can help our students and athletes to prevent or at least reduce the chance of traumatizing their teeth by using mouth guard which is an excellent way to protect children teeth during their sport activities, these can be custom made by a professional or can be found ready made in sport equipment stores. The custom made guards are to a far extent better in protecting the teeth since they fit and cover the teeth appropriately but the ready made guards, however, can protect the teeth but not as efficient as the custom made.



Avulsion of permanent teeth is one of the most serious of all dental injuries. The prognosis depends on the immediate response of the traumatized person himself or the person attending the accident when it happens. Skill, knowledge and immediate act are important in this situation. Immediate replantation

of the permanent teeth is the treatment of choice, if it can be performed at the time and place of the accident.

Furthermore, replantation should not be performed when primary teeth have been avulsed because of the risk of injury to the underlying permanent tooth germ. Treatment plan after trauma is important for a good prognosis.

Dentists should always be prepared to give appropriate advice to the public about first aid for avulsed teeth. If a tooth is avulsed, make sure it is a permanent tooth:

- Talk to the patient and keep him calm.
- Find the tooth and pick it up by the crown and avoid touching the root.
- If the tooth is dirty, wash it for about 10 seconds under cold running water and reposition it. Try to encourage the patient/parent to replant the tooth. Bite on a clean piece of cloth to hold it in position.
- If this is not possible, place the tooth in a suitable storage medium, e.g. a glass of milk or in saline. The tooth can also be transported in the mouth, keeping it between the molars and the inside of the cheek. These are transport media that can be used and named according to its viability respectively (milk, saline and saliva). Avoid dry storage or in water.
- Seek emergency dental treatment immediately.

**Recommendations for the dentist:**

1. Medical examination for bleeding, wounds, vomiting or disorientation of the patient.
2. Proper dental examination.
3. Radiographic examination. As a routine, several angles are recommended:
  - a. 90° horizontal angle, with central beam through the traumatized tooth.
  - b. occlusal view.
  - c. lateral view from the mesial or distal aspect of the traumatized tooth.
4. Sensibility tests, electric pulp test or cold test, to determine the condition of the tooth pulp. Initial tests following an injury frequently give negative results, but such results may only indicate a transient lack of pulpal response. Follow-up controls are needed to make a definitive pulpal diagnosis.
5. Patient instructions. Good healing following an injury to the teeth and oral tissues depends on good oral hygiene. Patients should be advised on how to care for teeth that have received treatment after an injury. Brushing with a soft brush and rinsing with chlorhexidine 0.1% is beneficial to prevent accumulation of plaque and debris.

Treatment guidelines as published in some articles (see references) by leaders in traumatic dental injuries can be followed, and I advise my colleague dentists to be a member of the International Association of Dental Traumatology (IADT), to keep them up-to-date with the latest in this field.



### Treatment of avulsed permanent teeth with closed apex:

Clinical situation	Treatment
<p>(1) The tooth has been re-planted prior to the patient arriving at the dental clinic.</p>	<p>Clean the area with water spray, saline, or chlorhexidine. Do not extract the tooth. 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.</p> <p>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), in an appropriate dose for age and weight, can be given as alternative to tetracycline.</p> <p>If the avulsed tooth has contacted soil, and if tetanus coverage is uncertain, refer to physician for evaluation and need for a tetanus booster.</p> <p>Initiate root canal treatment 7–10 days after replantation and before splint removal. Place calcium hydroxide as an intra-canal medicament until filling of the root canal.</p> <p>Patient instructions: Soft diet 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.</p>
<p>(2) The tooth has been kept in special storage media (Hank's Balanced Salt Solution), milk, saline or saliva. The extra-oral dry time is less than 60 min.</p>	<p>stream of saline and place the tooth in saline. Remove the coagulum from the socket with a stream of 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. Verify normal position of the replanted tooth both clinically and radiographically. Apply a flexible splint for up to 2 weeks.</p> <p>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), at appropriate dose for age and weight, can be given as alternative to tetracycline.</p> <p>If the avulsed tooth has contacted soil, and if tetanus coverage is uncertain, refer the patient to a physician for evaluation and need for a tetanus booster.</p> <p>Initiate root canal treatment 7–10 days after replantation and before splint removal. Place calcium hydroxide as an intra-canal medicament until filling of the root canal.</p> <p>Patient instructions: Soft diet 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.</p>

Clinical situation	Treatment
<p>(3) Extra-oral dry time longer than 60 min.</p>	<p>Delayed replantation has a poor long-term prognosis. The periodontal ligament will be necrotic and not expected to heal. The goal in doing delayed replantation is to promote alveolar bone growth to encapsulate the replanted tooth. The expected eventual outcome is ankylosis and resorption of the root. In children below the age of 15, if ankylosis occurs, and when the infraposition of the tooth crown is more than 1 mm, it is recommended to perform decoronation to preserve the contour of the alveolar ridge.</p> <p>The technique for delayed replantation is:                      Remove attached necrotic soft tissue with gauze.                      Root canal therapy can be done on the tooth prior to replantation, or it can be done 7–10 days later as for other replantations.                      Remove the coagulum from the socket with a stream of saline. Examine the alveolar socket. If there is a fracture of the socket wall, reposition it with a suitable instrument.                      Immerse the tooth in a 2% sodium fluoride solution for 20 min                      Replant the tooth slowly with slight digital pressure. Suture gingival laceration. Verify normal position of the replanted tooth clinically and radiographically.                      Stabilize the tooth for 4 weeks using a flexible splint.                      Administration of systemic antibiotics.                      Refer to physician for evaluation of need for a tetanus booster if the avulsed tooth has contacted soil or tetanus coverage is uncertain.</p> <p>Patient instructions:                      Soft diet 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.</p>

**Treatment of avulsed permanent teeth with open apex:**

Clinical situation	Treatment
<p>(1) The tooth has already been replanted prior to the patient arriving in the dental clinic.</p>	<p>Clean the area with water spray, saline or chlorhexidine. Do not extract the tooth. 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.</p> <p>Administer systemic antibiotics. For children 12 years and younger: Penicillin V at an appropriate dose for patient age and weight.                      Refer the patient to a physician for evaluation of need for a tetanus booster if avulsed tooth has contacted soil or tetanus coverage is uncertain.</p> <p>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 may be recommended.</p> <p>Patient instructions:                      Soft diet 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.</p>

Clinical situation	Treatment
<p>(2) The tooth has been kept in special storage media (Hank's Balanced Salt Solution), milk, saline, or saliva. The extraoral dry time is less than 60 min.</p>	<p>If contaminated, clean the root surface and apical foramen with a stream of saline. Remove the coagulum from the socket with a stream of saline and then replant the tooth. If available, cover the root surface with minocycline hydrochloride microspheres (Arestin™, OraPharma Inc, Warminster, PA, USA) before replanting the tooth.</p> <p>Examine the alveolar socket. If there is a fracture of the socket wall, reposition it with a suitable instrument.</p> <p>Replant the tooth slowly with slight digital pressure. Suture gingival lacerations, especially in the cervical area.</p> <p>Verify normal position of the replanted tooth clinically and radiographically.</p> <p>Apply a flexible splint for up to 2 weeks.</p> <p>Administer systemic antibiotics. For children 12 years and younger: Penicillin V at appropriate dose for patient age and weight.</p> <p>Refer to physician for evaluation of need for a tetanus booster if avulsed tooth has contacted soil or tetanus coverage is uncertain.</p> <p>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 may be recommended.</p> <p>Patient instructions:</p> <p>Soft diet for up to 2 weeks.</p> <p>Brush teeth with a soft toothbrush after each meal.</p> <p>Use a chlorhexidine (0.1%) mouth rinse twice a day for 1 week.</p> <p>Follow-up.</p>
<p>(3) Extra-oral dry time longer than 60 min.</p>	<p>Delayed replantation has a poor long-term prognosis. The periodontal ligament will be necrotic and not expected to heal. The goal in doing delayed replantation of immature teeth in children is to maintain alveolar ridge contour. The eventual outcome is expected to be ankylosis and resorption of the root. It is important to recognize that if delayed replantation is performed in a child, future treatment planning must be done to take into account the occurrence of tooth ankylosis and the effect of ankylosis on the alveolar ridge development. If ankylosis occurs, and when the infraposition of the tooth crown is more than 1 mm, it is recommended to perform decoronation to preserve the contour of the alveolar ridge.</p> <p>The technique for delayed replantation is:</p> <p>Remove attached necrotic soft tissue with gauze.</p> <p>Root canal therapy can be performed on the tooth prior to replantation through the open apex.</p> <p>Remove the coagulum from the socket with a stream of saline. Examine the alveolar socket. If there is a fracture of the socket wall, reposition it with a suitable instrument.</p> <p>Immerse the tooth in a 2% sodium fluoride solution for 20 min</p> <p>Replant the tooth slowly with slight digital pressure. Suture gingival laceration.</p> <p>Verify normal position of the replanted tooth clinically and radiographically.</p> <p>Stabilize the tooth for 4 weeks using a flexible splint.</p> <p>Administration of systemic antibiotics.</p> <p>Refer the patient to a physician for evaluation of need for a tetanus booster if the avulsed tooth has contacted soil or tetanus coverage is uncertain.</p> <p>Patient instructions:</p> <p>Soft diet for up to 2 weeks.</p> <p>Brush teeth with a soft toothbrush after each meal.</p> <p>Use a chlorhexidine (0.1%) mouth rinse twice a day for 1 week.</p> <p>Follow-up.</p>

**Follow-up procedures for avulsed permanent teeth:**

**1- Root canal therapy:**

If root canal treatment is indicated (teeth with closed apex), the ideal time to begin treatment is 7–10 days post-replantation. Calcium hydroxide is recommended for intra-canal medication for up to 1 month followed by root canal filling with root canal filling material. An exception is a tooth that has been dry for more than 60 min before replantation, in such cases the root canal treatment may be performed prior to replantation.

In teeth with open apices, that have been replanted immediately or kept in appropriate storage media, pulp revascularization is possible. Root canal treatment should be avoided unless there is clinical and radiographic evidence of pulp necrosis.

**2- Clinical follow-up:**

Replanted teeth should be monitored during the first year (once a week during the months 1, 3, 6, and 12) and then yearly thereafter.

Clinical and radiographic examination will provide information to determine the outcome. Evaluation may include the findings described as follows:

**Favorable outcome:**

(1) Closed apex. Asymptomatic, normal mobility, normal percussion sound. No radiographic evidence of resorption or periradicular osteitis; the lamina dura should appear normal.

(2) Open apex. Asymptomatic, normal mobility, normal percussion sound. Radiographic evidence of arrested or continued root formation and eruption. Pulp canal obliteration is the rule.

**Unfavorable outcome:**

(1) Closed apex. Symptomatic, excessive mobility or no mobility (ankylosis) with high-pitched percussion sound. Radiographic evidence of resorption (inflammatory, infection-related resorption, or replacement resorption).

(2) Open apex. Symptomatic, excessive mobility or no mobility (ankylosis) with high-pitched percussion sound. In the case of ankylosis, the crown of the tooth will appear to be in an infra-occlusal position. Radiographic evidence of resorption (inflammatory, infection-related resorption, or replacement resorption).

**Splinting guidelines for avulsed teeth:**

Replanted permanent teeth should be splinted up to 2 weeks. Thin wire-composite splint has been widely used to stabilize avulsed teeth because it allows physiologic movement of the avulsed tooth, good oral hygiene and are well tolerated by the patients.



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