

Clinical protocol for the management of avulsion of permanent teeth

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Dear Editor,

Our purpose in this brief literature review is to develop a clinical protocol for the treatment of one of the most serious dental injuries that a trauma can cause: dental avulsion.

Dental avulsion is the complete displacement of the tooth from its alveolus after a traumatic force is applied to the vestibular region of the tooth. The crown goes toward the palatine region and the apex of the root to the vestibular region,¹ with a total rupture of the apical neurovascular bundle and the fibers of the periodontal ligament, causing damages to multiple tissues, including pulp, periodontal ligament, alveolar bone and cementum.² Thus, it is the trauma that results in greater functional and aesthetic impairment, usually with worst-case prognosis.³

Andreasen & Andreasen⁴ argue that the damage will be proportional to the intensity of the force, the time the tooth stayed outside the alveolus, the stage of root development, as well as the medium in which it was in storage. They also point out that the ideal treatment consists of immediate replantation in order to maintain the vitality of the cells of the periodontal ligament, ensuring a better prognosis. To do this, the tooth must be held by the crown, washed in running water, repositioned in the alveolus with only slight pressure and stabilized with a splint. Follow-up procedures are essential.

If it is not possible to carry out immediate replantation, Trope⁵ affirms that if the element is kept in a suitable storage medium, there is still the possibility of a good prognosis.

According to the International Association of Dental Traumatology (IADT) and the American Association of Endodontists, Hanks balanced storage solution is the ideal medium for storing avulsed teeth because of its appropriate pH and osmolality characteristics that maintain the vitality of the cells of the periodontal ligament for up to 24 hours.⁵⁻⁷ However, it is seldom present at the site of the trauma.

Andreasen & Andreasen,⁴ for this reason, consider milk as a good storage option, since it also has adequate osmolality and pH, protecting the cells of the periodontal ligament.

Water is a hypotonic medium and, therefore, Trope⁸ does not consider it a viable storage option since the solution will lead to the lysis of the cells that envelop the root.

Most of the authors reviewed consider the patient's own saliva as a suitable physiological storage medium and, according to IADT, it may be used when another more appropriate medium is not accessible.⁵⁻⁹

As to the clinical protocol of treatment, standard procedures mainly rely on IADT guidelines, according to the stage of root development and extra-alveolar time, as described in Tables 1 to 4.

Table 1. Treatment for avulsed teeth with closed apex in less than 60 minutes after avulsion

Closed apex	Treatment
Extra-alveolar time	
< 60 min in suitable storage medium	1st consultation: Clean the surface of the tooth and the alveolus with saline solution and soak the tooth in saline solution. Replant the tooth in the socket with slight digital pressure and apply a flexible splint.
	2nd consultation 7 to 10 days after replantation: Initiate root canal treatment.
	3rd consultation: (After 15 days): Remove splint, clinical and radiographic evaluation.

Table 2. Treatment for avulsed teeth with closed apex after 60 minutes after avulsion

Closed apex	Treatment
Extra-alveolar time	
> 60 min	1st consultation: Remove remaining periodontal ligament from the surface, soak element in 2% sodium fluoride solution for 20 min, in order to prevent root resorption. Replant the tooth in the socket with slight digital pressure and apply a flexible splint.
	2nd consultation 7 to 10 days after replantation: Initiate root canal treatment.
	Observation: Root canal treatment can be carried out prior to replantation.
	3rd consultation: (after 4 weeks): Remove splint, clinical and radiographic evaluation.

Table 3. Treatment for avulsed teeth with open apex in less than 60 minutes after avulsion

Open apex	Treatment
Extra-alveolar time	
< 60 min in suitable storage medium	1st consultation: Irrigate the root surface of the element with saline solution, topical application of antibiotic solution (1mg of doxycycline in 20ml of saline) for 5 minutes, in order to stimulate the revascularization process. Replant the tooth in the socket with slight digital pressure and apply a flexible splint.
	2nd consultation 15 days after replantation: Remove splint, clinical and radiographic evaluation.

Table 4. Treatment for avulsed teeth with open apex after 60 minutes after avulsion

Open apex	Treatment
Extra-alveolar time	
> 60 min	1st consultation: Remove remaining periodontal ligament cells from the root surface with a gauze. Soak the tooth in 2% sodium fluoride solution for 20 min. Replant the tooth in the socket with slight digital pressure and apply a flexible splint.
	2nd consultation 7 to 10 days after replantation: Initiate root canal treatment.
	3rd consultation: (after 4 weeks): Remove splint, clinical and radiographic evaluation.

Complementary therapy should be carried out with the administration of systemic antibiotics at the time of replantation and before endodontic treatment, followed by the prescription of nonsteroidal anti-inflammatory drugs and analgesics. The patient should be advised regarding the importance of taking a booster shot against tetanus within 48 hours of the initial consultation.¹⁰

Teeth with open apex maintained in a suitable storage medium and with an extra-alveolar time of less than 60 minutes have a high chance of undergoing pulp revascularization, so endodontic treatment is not initially indicated. These elements should be immersed in a physiological saline solution (20 ml) with 1 mg of doxycycline for 5 min before replantation, in order to stimulate the revascularization process, increasing the chances of root formation and strengthening of the dentinal walls.¹⁰

For cases of open apex teeth with extra-alveolar time greater than 60 minutes, there is a growing discussion about the advantages of replanting the element. According to Andreasen & Andreasen,⁹ the prognosis is very unfavorable

with a potential for ankylosis and root resorption. Contrary to this, Lopes and Siqueira¹⁰ affirm that replantation is still advantageous even if a loss is inevitable later because even if root resorption by replacement occurs the width and length of the alveolar bone will be maintained, favoring rehabilitation with implants afterward.

According to Trope,⁵ the goal of treating a traumatized tooth should be to avoid or minimize after-effects, with ankylosis and root resorption being the most severe ones after replantation.

Dental trauma involving avulsion deserves attention and rapid and accurate intervention in order to avoid or minimize after-effects. However, even if measures are taken in a timely and correct manner, some consequences are expected due to the severity of the trauma, such as changes in crown color, pulp obliteration, pulp necrosis, root resorption, and ankylosis. Therefore, it is necessary to carry out an adequate long-term clinical follow-up of replanted teeth, including radiographic evaluation and pulp vitality testing when applicable.¹¹

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Mini Curriculum and Author's Contribution

1. Alexandre Balestrin – undergraduate student of Odontology. Contribution: bibliographic research and manuscript preparation.
2. Matheus dos Santos - undergraduate student of Odontology. Contribution: bibliographic research and manuscript preparation.
3. Naiana Mello Cançado – DDS and MSc. Contribution: English translation of manuscript.
4. Giovana Domitila Rafagnin – DDS. Contribution: bibliographic research, manuscript preparation, critical review and final corrections.

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