

The Occasional tooth avulsion

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INTRODUCTION

Traumatic dental injuries are common and account for 5% of bodily injuries in all ages.¹ Tooth avulsion is 1 type of traumatic dental injury and occurs when a tooth is completely dislodged from its socket. Tooth avulsion accounts for 0.5%–3% of all dental injuries.² Considered a dental emergency, tooth avulsion is one of the most serious dental injuries as prognosis is largely dependent on the actions taken at the time of avulsion.² The best chance at optimal outcome requires reimplantation of the tooth within 60 min.² Traumatic dental injuries can impact multiple facets of a patient's life, including dental health, aesthetics and financial and psychological well-being.³

Rural generalists, emergency medicine physicians and triage nurses must have knowledge of the time-sensitive management of tooth avulsion; prompt care is required for a good outcome. In addition, many Canadians present to the emergency department (ED) for dental pathology due to factors such as lack of access to dental services, affordability or presentation outside of regular dental practice hours.⁴ Despite the prevalence of traumatic dental injury in the ED, many studies have shown that more than 50% of emergency physicians do not have adequate knowledge concerning immediate treatment of

dental avulsion.^{5–8} This article will fill this knowledge gap by discussing the immediate treatment of tooth avulsion, the follow-up interval for patients and the reduction of infection risk.

METHODS

We performed a search using OVID-MEDLINE for studies that described an approach to dental trauma from the years 2013 to 2023. We included 13 unique articles.

Anatomy

In describing traumatic dental injury, it can be helpful to understand tooth anatomy and nomenclature [Figure 1]. During a tooth avulsion, the tooth is completely displaced out of its socket, severing the periodontal ligament.⁹ The periodontal ligament is the connective tissue which connects the tooth to the alveolar bone.⁹ This may be accompanied by a fracture of the alveolar bone.⁹ If the alveolar fracture is identified, it is important to note that it will not change ED management of the tooth avulsion.^{9–12}

Dental trauma assessment

The initial assessment of a patient with dental trauma should include a primary and secondary trauma survey.^{9–12} The dental injury itself is

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not life-threatening, but accompanying intracranial and maxillofacial injuries are present in 11% of ED patients presenting with dental trauma.¹¹ Sequelae from trauma such as bleeding, mandibular and maxillary fracture, facial fracture, head injury, cervical spine injury, soft-tissue swelling of the oropharynx and foreign body must be considered.⁹⁻¹²

The clinical examination should include an evaluation of the facial skeleton, lips, soft-tissue lesions and extraoral and intraoral examination.⁹⁻¹² Radiographic assessment of an injured tooth is limited in the ED as specialised intraoral dental radiographs are best able to assess subtle displacement of tooth in the socket and fractures, and these are not available in EDs.⁹ If head injury, facial fracture or foreign body is suspected, a computed tomography (CT) scan should be considered.⁹ If a patient displays difficulty breathing, chest X-ray and/or CT imaging may be considered to rule out a foreign body in the airway or further pathology.⁹

Once a patient is stabilised, focus can be turned to the traumatic dental injury. First, the patient or parent should be questioned on whether the injured tooth is a primary or permanent tooth, and tetanus status should be determined, and updated, if necessary.⁹⁻¹² The distinction is important as primary teeth should not be reimplanted, whereas permanent teeth should be reimplanted as soon as possible. As many patients may have already lost teeth, it is important to determine their dental baseline.

The extraoral and intraoral examination should include inspection for missing, fractured or misaligned teeth, percussion of teeth and gums for tenderness and mobility and probing of soft-tissue injuries to rule out a foreign body.¹⁰⁻¹² Percussion of teeth and gums can be performed with a gloved finger or with a tongue depressor.¹⁰ Tests of facial mobility should be performed to rule out complex midface fractures.

Once a tooth avulsion has been identified, the primary goal is to reimplant the tooth in an attempt to save the tooth and preserve the bone for future treatment.^{2,9-13}

Please see 'The occasional dental fracture'¹⁴ for assistance if fracture of a tooth is suspected.

Contraindications to tooth reimplantation

An avulsed primary tooth should not be reimplanted as it risks damaging the underlying

tooth bud from which permanent teeth erupt.^{2,4,9,10} If the primary tooth is not found, examination and imaging will be required to ensure that the tooth is not intruded or displaced into the socket.^{2,4,9,10} The site of tooth avulsion should be monitored for adequate healing, and referral to a dentist, ideally same day or next day but maximally within 7–10 days, is necessary.⁹

Other patient populations for which tooth reimplantation should not be considered include patients with higher risk of infection and aspiration such as those with severe dental caries, immunosuppression, mechanical heart valves or unco-operative patients.¹¹

Materials

1. Tongue depressor to perform initial percussion of teeth and gums
2. Clean gloves
3. Physiologic storage media: milk, Hank's balanced salt solution, saline or patient saliva
4. Metal or plastic bowl from a suture kit for tooth storage
5. 250 mL bottle of sterile normal saline
6. Local anaesthetic: 3 mL syringe and 25- or 27-gauge needle (0.5-inch length) or topical Lidocaine 2%
7. 10 mL syringe
8. DeBakey forceps
9. Gauze
10. Scissors
11. Metal nose bridge from an N95 face mask.
In situations where these are not available, adhesive skin closures or nylon fishing wire have been used in some cases¹⁵
12. 2-octyl cyanoacrylate (skin glue).

Immediate treatment of tooth avulsion^{2,4,9-13}

1. Locate the avulsed tooth. Handle the tooth by the crown as handling the tooth by the root can damage cells of the periodontal ligament, decreasing the success of attachment to the alveolar bone
2. Rinse the tooth with a stream of milk/normal saline/patient's saliva using the 10 mL syringe. Remove any clotted blood from the socket
3. Place the tooth in the metal or plastic bowl and cover the tooth in physiologic storage media while gathering materials. Examples from

- most to least favourable include milk, Hank's balanced salt solution and saline/patient saliva
4. Administer local anaesthetic, if necessary. For an isolated tooth avulsion, local anaesthetic will not be required unless the patient's comfort level requires it. Local anaesthetic will be required in cases where patients have gingival lacerations that will require suturing after reimplantation of the avulsed tooth

Contraindications to local anaesthetic use include allergy, cardiac congenital abnormalities and infection over the injection site:

- a. If using topical anaesthetic, use gauze to dab and dry the gum surrounding the affected area. Next, apply 1–3 mL topical Lidocaine 2% to a piece of gauze and have the patient hold this to the labial aspect of the gum surrounding the tooth socket for 2–3 min. After this time, the patient can remove the gauze from their mouth
 - b. If using injected local anaesthetic, draw up 3 mL lidocaine 2% (local anaesthetic without vasoconstrictor is preferred) into your 3 mL syringe. Attach your 25- or 27-gauge needle and insert the needle 2–3 mm into the labial aspect of the gum line. Often 0.2 mL of anaesthetic is required to treat the area adjacent to 1 tooth
 - c. If a patient has multiple concurrent dental injuries, a nerve block may be required [Figures 3-5]. Please see referenced article on local anaesthesia techniques in dentistry for the type of nerve block that will best suit your patient's needs.¹⁶
5. Irrigate the tooth socket using normal saline and the 10 mL syringe
 6. Examine the tooth socket. If there is a fracture of the socket wall, reduce the alveolar bone by applying gentle pinching pressure to the affected edge of the socket with DeBakey forceps
 7. Replant the tooth with light force. Be mindful of replanting in an anatomic position, it can be difficult to differentiate between the lingual (outer) and labial (inner) surface
 - a. The labial aspect of teeth will be broader and flat compared to the lingual aspect, which will taper towards the gum line. Please refer to Figure 2 for the correct position of the teeth. Teeth can be repositioned into the

proper location up to 48 h after avulsion. Rapid referral to dentistry for all patients is required but may be even more pressing if there is uncertainty regarding malrotation of tooth.

8. Apply a flexible splint for up to 2 weeks¹⁷
 - a. Use scissors to cut the metal nose bridge from a face mask to create a splint. Cut the splint so that it spans the length of the patient's replanted tooth and the 2 adjacent teeth
 - b. Use the scissors to round any sharp edges of the splint that may cut the patient [Figure 6]
 - c. Take a piece of gauze and gently dry the labial surface of the replanted tooth and the 2 adjacent teeth
 - d. Use the 2-octyl cyanoacrylate with the thin tip and place a small amount of glue on the labial surface of the replanted tooth and the 2 adjacent teeth
 - e. Apply and bond the splint to the replanted tooth and 2 adjacent teeth. Hold the splint under pressure until the 2-octyl cyanoacrylate begins to dry and the splint is stable (~1–3 min).
9. Administer tetanus toxoid if needed
10. Prescribe amoxicillin 500 mg PO q8h × 7d. In the setting of patient-reported penicillin allergy, the PEN-FAST decision-making tool can be used to assess the probability of penicillin allergy.¹⁸ For patients with penicillin allergy,

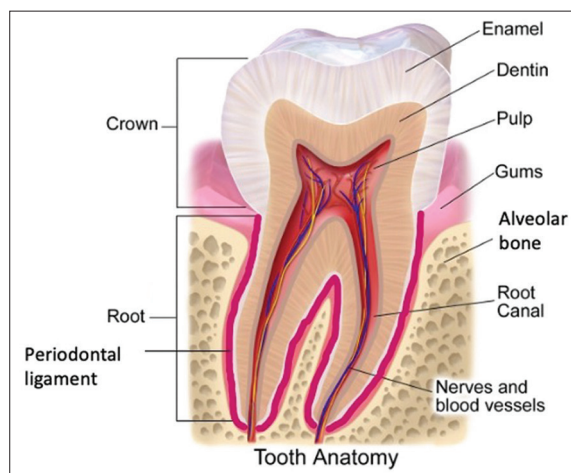


Figure 1: Tooth anatomy. Modified from “Tooth Anatomy” by Blausen Medical 2014. Available from: https://en.wikiversity.org/wiki/WikiJournal_of_Medicine/Medical_gallery_of_Blausen_Medical_2014#/media/File:Blausen_0863_ToothAnatomy_02.png. [Tooth Anatomy].

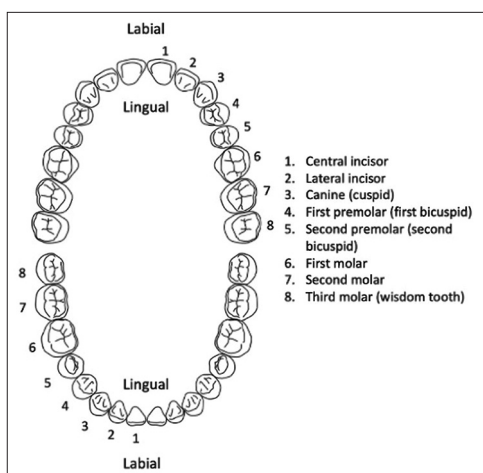


Figure 2: Permanent Teeth Depiction and Nomenclature. Modified from “Human Dental Arches” by Kaligula. Available from: https://commons.wikimedia.org/wiki/File:Human_dental_arches.svg#filelinks [Last accessed on 2023 Dec 20].

azithromycin (loading dose 500 mg PO day 1, followed by 250 mg PO $\times$ 4 days) or clindamycin (300 mg 4 times per day $\times$ 7 days) can be used as an alternative¹⁹

11. Referral to emergent dentistry, same day if possible. The patient will need to be seen within 7–10 days of replantation for follow-up and consideration of root canal treatment.

If the tooth has been replanted before patient’s arrival to the ED, perform the following steps:²

1. Clean the replanted tooth and surrounding region of the oral cavity with water spray, saline or chlorhexidine
2. Verify the normal position of the replanted tooth and adjust if needed. Gentle pressure in the area of the socket can be applied by pinching the ridge after the tooth is implanted.
3. Apply a splint for up to 2 weeks
4. Administer tetanus toxoid if needed
5. Administer amoxicillin 500 mg q8h $\times$ 7 days. In the setting of patient-reported penicillin allergy, the PEN-FAST decision-making tool can be used to assess the probability of penicillin allergy.¹⁸ For patients with penicillin allergy, azithromycin (loading dose 500 mg PO day 1, followed by 250 mg PO $\times$ 4 days) or clindamycin (300 mg 4 times per day $\times$ 7 days) can be used as an alternative¹⁹
6. Refer to the dentist for consideration of root canal treatment and splint removal within 7–10 days

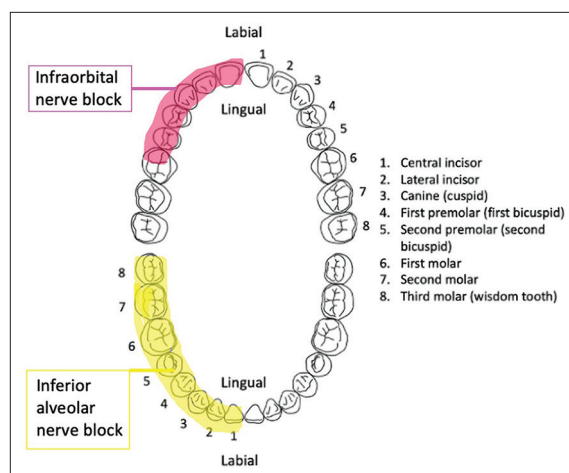


Figure 3: Infra Orbital and Inferior Alveolar Nerve Block Distribution. Modified from “Human Dental Arches” by Kaligula. Available from: https://commons.wikimedia.org/wiki/File:Human_dental_arches.svg#filelinks [Last accessed on 2023 Dec 20].

7. Referral to emergent dentistry, same day if possible. The patient will need to be seen within 7–10 days of replantation for follow-up and consideration of root canal treatment.

Complications

Due to exposure of the pulp of the tooth, patients experiencing tooth avulsion should be started on systemic antibiotics to limit infection risk.¹¹ Despite prophylactic treatment, patients should be cautioned to return to the ED or to seek further medical treatment if any signs or symptoms of infection occur.

Despite reimplantation and splinting of an avulsed tooth, root canal treatment is often required, and tooth discoloration and ankylosis (resorption of tooth root and fusion of tooth to surrounding bone) of the tooth can occur.²⁰

Patient instructions²

Patients should be advised to take the following steps to optimise the healing of the reimplanted tooth:

1. Avoid contact sports
2. Soft diet of liquid or pureed foods for up to 2 weeks
3. Brush teeth with a soft-bristled toothbrush after every meal

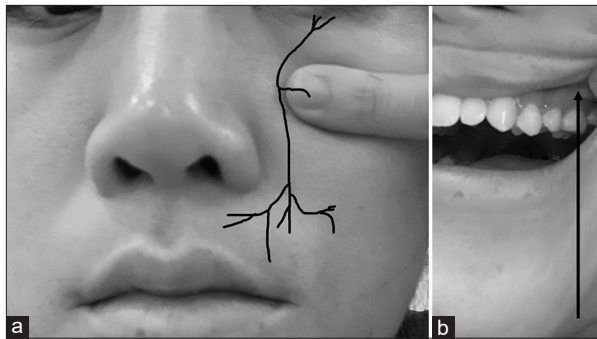


Figure 4: (a) Path of the infraorbital nerve. (b) Infraorbital nerve block. Insert the needle into the mucobuccal fold above the second premolar and advance cephalad.

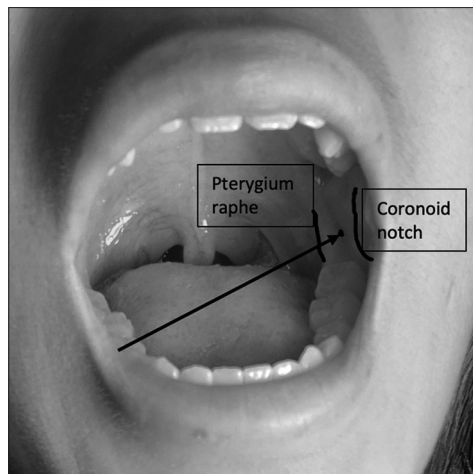


Figure 5: Infra alveolar nerve block. The injection point is between the coronoid notch and pterygomandibular raphe. The angle of entry should be 45 to the insertion point with the barrel of the needle over the contralateral first and second premolars.

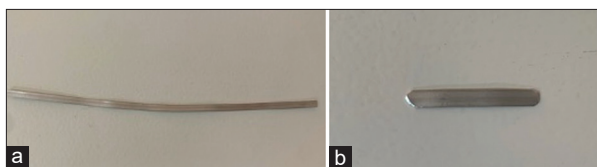


Figure 6: (a) Metal nose piece of face mask after being cut out from face mask. (b) Metal nose piece of face mask fashioned into a splint by cutting to required size and rounding the edges.

4. Use a chlorhexidine (0.1%) mouth rinse twice a day for 1 week.

CONCLUSION

The treatment of tooth avulsion is a time-sensitive dental emergency. The immediate treatment of tooth avulsion can be performed with equipment common to EDs and clinics in

both community and rural settings. The goal of the emergency physician is to provide analgesia, reimplantation of the tooth and stabilisation of the reimplanted tooth. These measures are temporising and emergent dentist referral is required.

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