



Emergency Trauma: Treating the Unexpected

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Abstract

Patients expect their dentist to be capable of priority management of their dental injury. However, unless a dentist regularly attends emergency calls at a hospital or clinic, he or she may be “rusty” when faced with the unexpected arrival of an injured, upset patient. The dentist must deal with the schedule disruption, prioritize treatment or referral, deal with informed consent for minors and adults, and sort out contradictory treatment protocols that are often out of date and inconsistent with scientific evidence.

Most dentists keep themselves and their staff current on a wide variety of techniques and issues but may not have reviewed management of dental injuries for years. Nevertheless, patients expect dentists to be able to manage dental injuries efficiently and correctly. Even dentists who have predominantly adult practices can be faced with the injured grandchild of one of their best patients. Their patient’s continued trust is dependent upon management of an injury the dentist may not have seen for a decade.

Because bookings are often filled weeks in advance, an emergency phone call or the arrival of a bloodied, upset preadolescent in the reception area can disrupt an otherwise predictable day. This scenario presents problems of scheduling, unfamiliarity with the injury, knowledge gaps and consent issues. Unlike routine dentistry, trauma cases often involve third parties such as private insurance carriers or lawyers. Consequently, the dentist’s treatment decisions and management is more apt to be scrutinized and records subpoenaed when dealing with trauma.

Time Management

Most cases of trauma can be managed within a half hour if some preplanning has taken place.¹ If the initial contact is by telephone, staff can quickly determine the age of the (new) patient so that the dentist will know if the injury is to primary or permanent teeth.

This will save disrupting the schedule for the bumped primary incisor of a 5- to 7-year-old that was due to exfoliate naturally. Parents often interpret the crown of the erupting permanent incisor as a piece of “broken tooth” due to the presence of mamelons on the incisal edge. The dentist can easily deal with such cases immediately by telephone, save the parent a trip to the office, or fit the child in for an observation and documentation appointment at a later date.

When an injured patient arrives at a dental office, the dentist has a responsibility to treat or refer. Referral should be to another dentist, a pediatric dentist, or oral and maxillofacial surgeon who will agree to treat the case. Simple injuries can be dealt with by supplying telephone numbers and a follow-up call the next day. However, simply supplying telephone numbers and dismissing patients with severe dental injuries could be interpreted as abandonment even if they are not yet patients of record. Initial registration and history can be completed by an assistant/ hygienist while the dentist pro-



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ceeds with scheduled patients. If the dentist needs radiographs for diagnosis before making the referral decision, then a release of information form must be signed, and the radiographs and records given to the patient to take to the referral dentist. Dentists may wish to stock double film sets for such situations so that both parties have original radiographs.

Prior to initiating specific dental treatment, the dentist should determine whether the patient requires medical attention for shock, or possible aspiration of tooth fragments, and make a direct telephone referral to a hospital emergency or dental department and talk doctor-to-doctor. As soon as a verbal agreement to treat is completed, it should be documented in the patient's chart and include the name of the doctor spoken to and description of radiographs sent with the patient. While most trauma cases can be dealt with within a half hour, even the simple ones and referrals require so much documentation and scheduling/referring time that it is rare to complete them in less than 30 minutes.

Severe permanent tooth luxations or avulsions usually take an hour to complete pre- and postoperative care, reduce/replant, and splint. If the dentist chooses to treat such cases, staff may identify a patient further down the day list and reappoint them.

Treatment Priorities

It is essential the dentist understand what is "emergent" treatment and what aspects of treatment can be dealt with later the same day, the next day, or next week. Patients who are in pain, distress, or are bleeding deserve immediate attention. However, the precise effects of treatment delay on periodontal and pulp pathosis are not clear. It appears that if treatment of luxations or root fractures is completed within three hours, the outcomes are unlikely to be affected.² Similarly, chipped or fractured teeth, with or without pulp exposure,

can be treated up to 48 hours after injury without demonstrable effects on long-term outcomes.^{2,3} One other aspect of "emergent" care is understanding how much treatment is required at the emergency appointment and what can be postponed until a future, if only the next day, appointment. While it may be enjoyable to restore a crown fracture completely at the time the patient presents, it is possible to temporize the tooth with calcium hydroxide, glass ionomer cement and a resin bandage, and reappoint the patient to a more convenient time slot.^{4,5}

Evidence shows that delayed replantation (greater than five minutes) will invariably lead to root resorption and eventual loss of the tooth regardless of storage medium.

Textbooks generally describe injuries on a tooth-by-tooth basis, but most often, patients present with multiple dentoalveolar injuries, sometimes accompanied by lacerations. Each clinician must decide whether to repair facial lacerations or refer such cases after stabilizing the dentition. Local anesthetic, analgesics, some Steristrips, a good cleaning and debridement go a long way toward making the patient more comfortable and reducing the anxiety of all in attendance. The dentist can then secure informed consent that includes radiographs, replantation, reduction of luxations, splinting, photographs and the patient's follow-up responsibilities.

Clinical Outcomes and Consent

The most important determinant of survival of an avulsed tooth is immediate replantation at the accident site.⁶⁻⁹ Furthermore, evidence shows that delayed replantation (greater than five minutes) will invariably lead to root resorption and eventual loss of the tooth

regardless of storage medium.⁶ Likewise, if the pulp is not removed and endodontic treatment completed, survival will be compromised by the likelihood of inflammatory resorption and rapid tooth loss.^{10,11} Immature incisors have less root mass, so root resorption is more significant and immature apices complicate conventional root canal treatment.¹² Apexification with calcium hydroxide and definitive root canal obturation is required for roots with immature apices. If apexification is not successful it will affect survival.¹² Finally, if replantation is undertaken in a preadolescent or a youth who has not completed growth, replacement resorption and ankylosis will lead to apparent submergence and distortion of the gingival architecture with vertical jaw growth.^{13,14} Young adults who have completed their skeletal growth have longer postreplantation survival rates but the long-term outcome is the same, eventual tooth loss as a direct result of the avulsion.^{6,10,12}

Once a tooth has been out of the mouth more than 15 minutes, chances of regeneration of periodontal ligament over the root surface approach impossibility.⁷⁻⁹ Consequently, healing will proceed by repair mechanisms that include root resorption and ankylosis.¹⁰ In turn, there is no longer a need for the dentist to rush to replantation so it is possible to complete a conventional root canal treatment extraorally.¹⁵ Evidence from investigations of periodontal ligament injury, still not widely disseminated to clinicians, make it clear that beyond 15 minutes, the use of storage media to preserve cell "function" becomes irrelevant.⁷⁻⁹ This evidence will force a major change in both thinking and teaching. In order for periodontal ligament fibroblasts to repopulate the root, the progenitor cells must be vital, able to reproduce and differentiate into functional fibroblasts that can attach to cementum. Outcome studies have shown that periodontal regeneration only occurs if the

tooth is replanted within five minutes, and even then the chances are about 50 percent and reduce to 30 percent beyond five minutes.^{6,16} A functional periodontal ligament is not assured even with immediate replantation.

Although outcomes are predictably poor in cases of delayed replantation, a dentist may be at greater risk of complaints by not replanting a tooth even if the tooth has been out of the mouth for an extended period. The reason is that failure of a replanted incisor may not happen for a number of months or years, but conflicting opinions on the dentist's management of the case can come rapidly. In fact, unlike the survival experience of replantations in preadolescents, such teeth may last many years in patients who have mature roots and have achieved their full jaw growth (youth and adults).¹⁷ This is the area where anecdotal information, probability and clinical experiences lead to conflicting opinions that may cause parents to lose confidence in the clinician who recommended against replantation. Another dentist may correctly tell the patient/parent that he or she replanted a tooth that lasted many years but imprudently suggest that if the patient/parent had come to him or her, the tooth could have been "saved."^{10,16,17} Parents who search the Internet for information find avulsion guidelines that explain how to replant a tooth but lack information on *whether* to replant. Obviously, this can lead to the parent's immediate loss of confidence in the original decision not to replant.

The outcomes of severe intrusions (>6 mm), though predictable, are not encouraging either. This means the dentist must make the patient/parent aware that even if a severe intrusion (>6 mm) is reduced the tooth will never be the same as it was before the accident and will eventually be lost.^{18,19} This information is important to the patient/parent because, in the case of avulsions and severe intrusions of permanent teeth, the alternate choice is not to replant the avulsed tooth or immediate

(surgical) reduction, or extraction of a severe intrusion.

Parents and children faced with the situation of delayed replantation or severe intrusion must be given accurate up-to-date information on the likely outcomes of injury management. Then, without coercion or clinician bias, they must be left to make their decision based on the evidence and their child's specific risk factors. This means that dentists must remain critical and active consumers of the dental literature and patients/parents may elect more often to have avulsed teeth left out of the mouth when faced with the costs and prognosis of replantation now that single tooth implants have demonstrated their reliability and the first-year costs of replantation exceed \$1,000.²⁰

Treatment Protocols/Guidelines

Guidelines for replantation of avulsed teeth have been written by a number of authors and organizations, including the American Academy of Endodontists (based on and licensed from) the International Association of Dental Traumatology, and the Royal College of Dental Surgeons of England.²¹⁻²³ All of these guidelines fail to address the evidence that unless a tooth is replanted immediately ankylosis, root resorption and eventual tooth loss is inevitable. In addition, informed consent based on outcomes, responsibilities and the question of whether or not it is in the patient's best interest to replant a tooth are not described. Guidelines for dealing with intrusions are less well disseminated despite the experience that severe intrusions are more lethal than avulsions.^{18,19,23}

Frustrated by information missing from published guidelines and the importance of securing informed consent from minors' parents, the members of the Toronto Dental Trauma Research Group produced a series of matching handouts for each specific luxation injury geared for patients/parents and for clinicians. The parents' handout

describes things that can cause a tooth to fail, what is known about the injury, responsibilities of the dentist and responsibilities of the patient/parent. The matching handout for the clinician adds the pertinent literature and the methods used to treat each injury and to determine outcomes. This information is not provided in any of the conventional guidelines. These documents, available in PDF form and revised annually, are available from The Hospital for Sick Children website, www.sickkids.ca/dentistry/default.asp and click on "Resources." Clinician handouts are under "Clinician information"; "Trauma Info" and laypersons' handouts are under "Parents/Caregivers Information."

Conclusion

With the exception of hospital dental departments and emergency or sports-associated clinics, the arrival of an injured patient can cause an unexpected and often unplanned disruption. Time management and some preparation will streamline the procedures of registration, treatment or referral, and consent issues. However, while actual management of such injuries is described in published guidelines, they fail to address research that clearly describes the dismal fate of rootside periodontal ligament cells that have been torn from the socket or sheared and compressed by socket bone. Healing proceeds by repair mechanisms that lead to root resorption, ankylosis, and eventual tooth loss if replantation occurs beyond five minutes or the tooth is severely intruded. The preadolescent and teen population, the age when most injuries occur, have the added complication of ankylosis and facial growth. The inevitable infraocclusion of maxillary incisors is frustrating to clinicians who plan orthodontic treatment or esthetic dental treatment years after the injury. This inevitability must be discussed with the patient/parent before treatment proceeds, as this is part of dealing with the unexpected but inevitable.

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