Review Article

It's a Knockout- Management of Avulsed Tooth

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Abstract: This review of the literature has described the biological basis of treatment protocol for replantation of avulsed teeth. The healthy periodontal ligament brings a successful outcome if avulsed tooth is replanted within 15-20 minutes after avulsion. Numerous studies show that this injury is one of the most serious dental injury, and the prognosis is very much dependent on the actions taken at the place of the accident and promptly after the avulsion. Splinting and various adjunctive therapies along with storage media prevents root resorption after replantation.

Keywords: Avulsed Tooth; Dental Injury; Ledermix; Periodontal Ligament; Replantation.

Introduction

Avulsion is a relatively uncommon type of traumatic injury to the permanent dentition.[1] It occurs most frequently between the ages of 7–14 years. The majority of these injuries occur in the maxillary central incisors.[2] Since most avulsions occur before the patient's facial growth is complete it is critical to maintain the tooth and surrounding bone until facial growth is complete and a relatively uncomplicated 'permanent' restoration can be made. Interestingly, most of the injuries occur within a short distance from home, school or a sports venue.[1] Thus, from a theoretical point of view if health providers in these locations were educated as to the best emergency treatment for these cases many more successful outcomes would result.

If the periodontal ligament left attached to the root surface does not dry out, the consequences of tooth avulsion are usually minimal.[2] The hydrated periodontal ligament cells will maintain their viability, allowing healing with regenerated periodontal ligament cells when replanted without causing much destructive inflammation. In time, through physiologic bone remodeling, the entire root will be replaced by bone; a process which has been termed osseous replacement or replacement resorption.[3] Andreasen found in monkeys that under ideal conditions, complete healing of pulp and periodontal ligament of replanted teeth can occur. The clinical strategies are aimed at limiting inflammation as a result of protective layer damage and infection as a result of pulp necrosis.

Emergency treatment at the accident site:

Replant if possible or quickly place in an appropriate storage medium. The single most important factor to ensure a favorable outcome after replantation is that the tooth is replanted within as short time as possible.[4] Complete healing can only be guaranteed if the tooth is replanted in the first 5 min.[5] However, from a practical point of view every effort should be made to replant the tooth within the first 15–20 min.[6] Ideally home guardians, school nurses or sports coaches would have been instructed in the emergency handling of avulsed teeth. Andreasen and Hjorting Hansen found that 90 percent of teeth replanted within 30 minutes did not develop root resorption when reviewed at an interval, ranging between 1 - 13 years, however this much quoted finding was based on 10 teeth and as such the reporting of this as a percentage may be misleading.[7] The tooth should be gently washed and replanted as atraumatically as possible. If doubt exists that the tooth can be replanted adequately, the tooth should be quickly stored in an appropriate medium until the patient can get to the dental office for replantation.

Suggested storage media in order of preference and availability are; milk, saliva (either in the vestibule of the mouth or in a container into which the patient spits), physiologic saline or water.[8] Recently, Iqbal and Bamaas showed that extracted dogs' teeth air-dried for periods up to 60 minutes benefitted from surface treatment with an enamel matrix derivative gel (Emdogain; Biora AB, Malmo, Sweden) before

replantation. Periodontal healing was greater for the treated teeth than for control teeth, and there was less replacement resorption. It has been suggested that Emdogain has the potential to promote regeneration of periodontal ligament from the socket-side periodontal cell populations, and therefore may be useful in enhancing periodontal healing in teeth for which extra alveolar storage has been extended.[9] Cell culture media such as Hank's Balanced Salt Solution (HBSS) in specialized transport containers; have shown superior ability in maintaining the viability of the periodontal ligament fibers for extended periods.[10] When these media have been used they have shown extremely good results.[11] If we consider that more than 60% of avulsion injuries occur close to the home or school[12], it should be beneficial to have these media available in emergency kits at these two sites.

Management in the dental office: If the tooth was replanted at the site of injury, a complete history is taken to assess the likelihood of a favorable outcome. In addition, the position of the replanted tooth is assessed and adjusted if necessary. The medical and accident history is taken and a clinical examination is carried out. The clinical examination should include an examination of the socket to ascertain if it is intact and suitable for replantation. This is accomplished by facial and palatal palpation.

The socket is gently rinsed with saline and, when clear of the clot and debris, its walls are examined directly for the presence, absence, or collapse of the socket wall. Movement of a segment of bone as well as multiple teeth (together) is suggestive of an alveolar fracture. The socket and surrounding areas, including the soft tissues, should be radiographed. CBCT radiographs are particularly helpful in these cases. Three vertical angulations are required for diagnosis of the presence of a horizontal root fracture in adjacent teeth.

Splinting: A splinting technique is one that allows physiologic movement of the tooth during healing and that is in place for a minimal time period results in a decreased incidence of ankylosis. Semi-rigid (physiologic) fixation for 7–10 days has been recommended.[13] a new titanium trauma splint recently been shown to be particularly effective and easy to use.[14] After the splint is in place, a radiograph should be taken to verify the positioning of the tooth and as a preoperative reference for further treatment and follow-up. One week is sufficient to create periodontal support to maintain the avulsed tooth in position. Therefore, the splint should be removed within two weeks.[15]

Adjunctive therapy: Systemic antibiotics given at the time of replantation and prior to endodontic treatment are effective in preventing bacterial invasion of the necrotic pulp and, therefore, subsequent inflammatory resorption. Tetracycline has the additional benefit of decreasing root resorption by affecting the motility of the osteoclasts and reducing the effectiveness of collagenase.[16]

The patient should be sent to a physician for consultation regarding a tetanus booster within 48 h of the initial visit. In second visit, the root canal is thoroughly instrumented and irrigated, then filled with a thick, powdery mix of calcium hydroxide and sterile saline (anesthetic solution is also an acceptable vehicle). The calcium hydroxide is changed every 3 months within a range of 6–24 months. The canal is root filled when a radiographically intact periodontal membrane can be demonstrated around the root. Calcium hydroxide's main effect is that it is an effective antibacterial agent.[17]

The choice of treatment is related to the maturity of the root. Although the advice regarding teeth with a wide open apex is to delay endodontic treatment on the basis that revascularisation of the pulp is possible, this involves a risk of failure due to inflammatory root resorption, and clinicians must be aware of the consequences of too conservative an approach. The antibiotic-corticosteroid paste, Ledermix, is effective in treating inflammatory root resorption by inhibiting the spread of dentinoclasts without damaging the periodontal ligament.

Root filling visit: Traditionally, the re-establishment of a lamina dura is a radiographic sign that the canal bacteria have been controlled. The canal is re-instrumented and irrigated under strict asepsis. After completion of the instrumentation, the canal can be filled by any acceptable technique with special attention to an aseptic technique and the best possible seal of the filling material.

Permanent restoration: Much evidence exist, that coronal leakage caused by defective temporary and permanent restorations result, in a clinically relevant amount of bacterial contamination of the root canal after root filling Therefore, the tooth should be permanently restored either at or soon after the time of filling of the root canal. As with the temporary restoration, the depth of restoration is important for its seal and therefore the deepest restoration possible should be made. Because most avulsions occur in the anterior region of the mouth where esthetics is important, composite resins with the addition of dentin bonding agents are usually recommended in these cases. They have the additional advantage of internally strengthening the tooth against fracture if another trauma should occur. Follow-up evaluations should take place at 3 months,6 months and yearly for at least 5 years.[18]

Conclusion: From a clinical perspective, since avulsions occur infrequently, the average practitioner will not instinctively know how best to treat each (rare) case that he/she encounters. Although some protocols have not yet been adopted in the international guidelines, experimental results are promising and they have therefore been included in the review to stimulate colleagues to further research.

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