Case Report: A combined avulsion and root fracture/avulsion trauma with ten years review


Abstract

Background: The management of trauma involving anterior permanent teeth can be very complicated, particularly when more than one type of injury occurs. In some instances the advised treatment for one type of injury may conflict with that of another. In the present case a child had an avulsion and a root fracture/avulsion. Case Report: A patient, aged 14 years at the time of the injury in 1998, had a root fracture avulsion of the maxillary right permanent central incisor (11) and an avulsion of the maxillary left permanent central incisor (21). The management strategies were conflicting with regards to the type and duration of splinting. The dilemma of either having flexible splinting (10 days) for avulsed teeth as opposed to rigid splinting for root fractured (12 weeks) teeth was an important clinical decision since the patient had sustained both injuries together. Treatment: The patient had semi-rigid splinting of 11 for 4 weeks and 21 was released from the splint at 8 days. Initial root canal therapy was carried out using non-setting calcium hydroxide and both these teeth were obturated with gutta percha. The teeth had an extra-alveolar period of 90 minutes and were placed in milk within 15 minutes of the trauma. Previous studies indicated that an extra-alveolar period of over 45 minutes leads to a poor long-term prognosis [Andreasen et al., 2004; Boyd et al., 2000] and this case is a rare example of long-term survival of 11 and 21. Follow-up: Regular clinical and radiographic reviews took place over ten years from the injury and both 11 and 12 are currently successfully functional in the arch.

Background

When a child presents with more than one type of trauma to anterior permanent teeth there is sometimes a dilemma as to the appropriate treatment for all the teeth involved. Replantation of avulsed permanent teeth in general dental practice has been reported [Sharma and Duggal, 1994] and therapeutic protocols for avulsed teeth have been reviewed [Ram and Cohenca, 2004]. In a study by Welbury et al. [2002] treated root-fractured permanent incisors were assessed with respect to pulp vitality, root tissue union, and tooth survival. Root fractured permanent teeth have been treated using removable splints designed to stabilize mobile anterior teeth and eliminate occlusal trauma due to malocclusion [Qin et al., 2002]. The most common approach for root fractures is to use rigid splinting for 12 weeks, but its benefits are questionable.

The splinting method appears to be related to healing of root fractures [Andreasen et al., 2004], with a preference to pulp healing and fusion of fragments with a certain flexibility of the splint and possibly also to non-traumatogenic splint application. Splinting for up to 4 weeks has been suggested so as to influence the healing pattern.

When one tooth is avulsed the question is whether to try and replant the tooth into its socket, depending on the duration of extra-alveolar time. In addition, whether a storage medium has been used or not is pertinent. It has become common practice that if the extra-alveolar period is over 20 minutes, with dry storage and root formation is complete, then the prognosis of avulsed teeth is not as good; giving a poor prognosis as pulpal necrosis can develop.

Thus, what should be the approach if a child presents with both an avulsed tooth and a root fracture, perhaps involving different teeth? Just such an occurrence occurred and this case report details the successful approach.

Case Report

The patient (aged 14 yrs at the time of injury) attended Leeds Dental Institute (LDI) for emergency treatment following an assault by two boys on his way to school. The trauma occurred at 08.15h (March 1998) and the patient’s parent was advised by telephone to attempt reimplantation of the teeth (11 and 21), which was not possible and it was therefore advised to place these teeth in milk and attend LDI urgently. The patient attended at 09.45h with the teeth stored in milk. The priority was to replant the avulsed teeth as soon as possible as the extra-alveolar time was already 90 minutes. Whilst the teeth were being replanted a history and examination was performed with the completion of a trauma form. The patient, who had no relevant medical history, was in the permanent dentition, caries-free and had good oral hygiene.

Treatment. The immediate treatment was reimplantation and splinting of the avulsed 21 and the root fracture avulsion of 11 (Figures 1a-d and 2a-d). Prior to reimplantation the exact lengths of the avulsed 21 and the root fractured 11 were measured for future reference during root canal therapy (RCT). Local analgesia was used and irrigation of the sockets was carried out to remove the coagulated blood clots so that full repositioning would be possible. The teeth were then

Key words: Avulsion, Root Fracture, Dental Trauma.

Postal address: Dr. S.B. Misra., Orthodontic Department, Manchester Dental Hospital, Minshul Street, Manchester, England
Email: sbmisra2003@yahoo.co.uk
splinted using a semi-rigid/physiological splint with 0.5mm orthodontic wire and acid etch composite. Periapical radiographs were taken after replantation which showed very good repositioning (Figure 2d).

Penicillin V tablets 250mg qds for 5 days and 0.2% Chlorhexidine gluconate (CHX) mouthwash were prescribed. The patient’s anti-tetanus status was checked. The interesting feature of this case was that there was a combined avulsion and root fracture avulsion. The dilemma was whether the splinting should have been rigid or flexible and should the duration of splinting have been for 10 days (avulsion) or for 3 months (root fracture)? The 21 was released from the splint at 8 days and the splint totally removed at 4 weeks. Root canal treatment was completed for both teeth after use of non-setting calcium hydroxide. Gutta percha was used for root canal obturation with the 11 being root filled to the fracture line.

Follow-up. Close follow-up showed no problems for the next three years but granulation tissue formation between the two fractured fragments of the maxillary right central incisor was evident (Figure 3). In May 2001 the patient attended for review and periapical radiographs of 11 and 12 were taken. A dark radiolucency was observed around the gutta percha root filling of 11 that indicated internal resorption had commenced (Figure 4a-b). However, this was found to be due to ingrowth of granulation tissue which was removed and the 11 was re-root filled with gutta percha using the Obtura II system. The patient was last reviewed in March 2008 (10 years post-trauma) and clinically there was no aesthetic change in the crown shades of 11 and 21 (Figure 5) and there were no clinical signs of mobility, tenderness to percussion, pain or ankylosis. Periapical radiographs confirmed the absence of periapical pathology or ankylosis and there have been no further complications since (Figure 6).

Discussion
Traumatic injuries to permanent teeth include coronal and root fractures, subluxations, luxations, and avulsions. The main risk following avulsions and root fractures are: pulpal or periodontal (PDL) necrosis, root ankylosis and resorption [Andreasen et al., 1995a and 1995b].

Root Fracture and Avulsion injuries. There are different schools of thoughts on management of root fractures. The most commonly used management technique for root fractures is rigid splinting for 12 weeks but its benefits are questionable. The treatment of root-fractured permanent incisors has been assessed with respect to pulp vitality, root tissue union, and tooth survival [Welbury et al., 2002]. The effects of clinical and radiographic parameters and rigid splinting on the outcome were also examined. The findings were that the hard root tissue union was significantly affected by pulp necrosis and luxation of the coronal fragment. Survival was poorest for root fractures within the gingival third of the root. Splinting with rigid fixation had no significant effect on pulp vitality and type of root tissue union.