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Avulsion and replantation of a primary incisor tooth

CASE REPORT

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Abstract – Avulsion of a primary tooth is a serious dental trauma, and the guidelines of the International Association of Dental Traumatology and textbooks in paediatric dentistry do not recommend replantation. Such management can result in severe damage to the supporting structures, and together with avulsion itself is commonly associated with developmental disturbances of the permanent tooth. We report the case of replantation in a 9-month-old child with a successful outcome, in a unique situation where conditions were optimal and careful long-term follow up was possible.

Key words: tooth avulsion; primary tooth; replantation; general anaesthesia; healing

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Trauma to the primary dentition is common with maxillary incisors most frequently involved (1). The occurrence of injury to primary teeth has been shown to be over double that of permanent teeth, with avulsion accounting for around 5% of these injuries (2).

Severe dental trauma to a primary tooth such as avulsion has the potential to seriously disrupt the growth and development of the permanent successors (3), and guidelines of the International Association of Dental Traumatology (IADT) do not recommend replantation (4). Removable appliances are usually a valid treatment option to minimize space loss and restore aesthetics where required. However, there have been little published on children under 1 year of age and cases often have short follow-up periods. This age is very early in dental development with the crowns of the permanent incisor teeth forming distant from the incompletely formed primary tooth roots. The following report describes the successful replantation of a primary maxillary central incisor in a 9-month-old boy under exceptional circumstances and with optimal conditions. Clinical and radiographic follow up over a 6-year period are provided.

Case report

A 9-month-old boy was referred to the Faculty of Dentistry, University of Otago by an Ear Nose and Throat surgeon for evaluation and suture removal 5 days following avulsion and replantation of his upper left central primary incisor (tooth 61), which had occurred when a mouth-prop dislodged during surgery for a tonsillectomy. Associated with the injury was a gingival laceration and labial frenal tear. Medically the child was otherwise well. The surgeon informed the child's parents and sought the opinion of an endodontist.

Reimplantation in a unique and exceptional situation

At the time of injury only the incisal tip of tooth 61 had emerged into the mouth. The parents were told of the unknown prognosis for the tooth and possible complications including damage to the permanent successor, but they were keen to have the tooth replanted for aesthetic reasons. The tooth was stored in the child's buccal sulcus for 10 min prior to replantation. Tooth 51 did not appear to have any injuries. The socket of 61 had been checked and there were no fractures. The root of tooth 61 had a very wide, open apex with 50% root development. Given the age of the child and the stage of dental development, it was agreed to immediately replant the tooth. Care was taken to avoid further damage to the periodontal ligament during replantation. The tooth was able to be replanted in a stable position and a single 4-0 Vicryl® (Ethicon Inc., Somerville, NJ, USA) mattress suture was placed as a sling from labial to palatal. The suture acted as a splint allowing physiological movement and a favourable environment for periodontal ligament reattachment. The gingival tissues and frenum were thin and both

were left to heal by secondary intention. The child was prescribed a 5-day course of oral amoxicillin and paracetamol. Topical 0.2% chlorhexidine was swabbed around the incisor region twice daily for 1 week.

Treatment result

At 5 days postoperatively in consultation with a paediatric dentist, there were no apparent colour changes in teeth 51 or 61. Tooth 61 had some marginal gingival inflammation but no clinical signs or symptoms of infection. Attempts to obtain a diagnostic baseline occlusal radiograph were unsuccessful. After 1 week, the patient was symptomless with no excessive mobility of tooth 61, which was continuing to erupt.

At 4 weeks postinjury, tooth 61 was in a slightly intruded position. Mobility, colour and soft tissues were within normal limits. A maxillary anterior occlusal radiograph (Fig. 1) showed all maxillary incisors had erupted into the mouth. The periapical region of tooth 61 was slightly more radiolucent than that of the 51, and it was confirmed that the apex of tooth 61 was some distance from the permanent successor. A slightly larger radiolucency was apparent around the coronal portion of the 21 compared with the 11. At the 8-week review, there was slight labial gingival recession associated with tooth 61 (Fig. 2). Further follow ups were carried out at 3, 6, 12 and 18 months and then yearly, with the parents understanding that treatment should be sought for the child if there was concern or changes in the incisor region. At 12 months, root development of tooth 61 was atypical (with ingrowth of hard tissue) but continuing, and development of teeth 11 and 21 favourable (Fig. 3). By 3 years postinjury (age: 3 years 9 months), tooth 61 was slightly yellow in colour, had a stained enamel fracture, and was in an infraoccluded position with a grade I mobility (Fig. 4). Radiographi-

Fig. 1. Maxillary occlusal radiograph taken 4 weeks after replantation.

Fig. 2. Clinical photograph 8 weeks after replantation.

Fig. 3. Radiograph 12 months after replantation.

Fig. 4. Clinical photograph 3 years after replantation.

cally, physiological root resorption was apparent with the pulp chamber almost completely filled with opaque tissue (Fig. 5). At 5 years postinjury, in addition to providing information on the periapical region of 61 and the developing successors, the radiograph also alerted clinicians to the likelihood that tooth 12 was congenitally absent and that tooth 22 had a 'peg shaped' appearance (Figs 6 and 7). The child reported an 'odd feeling in his front teeth'. Attempts at determining the vitality of teeth 51 and 61 using conventional sensibility tests were inconsistent and so laser Doppler flowmetry (MBF-3D; Moor Instruments, Axminster, UK) was used and demonstrated pulsatile blood flow in both teeth. At almost 6 years following replantation, tooth 61 exfoliated naturally and tooth 21 erupted uneventfully with no evidence of enamel hypoplasia or other damage (Fig. 8). Tooth 12 is absent and the child is under the care of an orthodontist. Further reviews to monitor the dentition will occur on a yearly basis.

Discussion

There is a risk of dental injury particularly to anterior teeth during intubation for anaesthesia and with the use of unstable mouth-props. This is especially so in young patients with small mouths and developing dentitions (5, 6). The use of a silicone putty shield over the teeth or a plastic cover over the prop has been suggested for protection of the dentition (7).

The IADT guidelines in managing an avulsed primary tooth do not recommend replantation because of the potential risk of damage to the developing tooth germ (4). Furthermore, many replanted teeth have been extracted after a short time because of infection, mobility or root resorption (8, 9). In this case, however, the circumstances in which the injury occurred were unique and unusual. Factors that have contributed to a successful outcome are the age of the child and stage of dental development, the minimal contamination of the tooth, the rapid replantation, and the ability to regularly review the dentition and soft tissues.

Fig. 5. Radiograph 3 years after replantation.

Fig. 6. Clinical photograph 5 years after replantation.

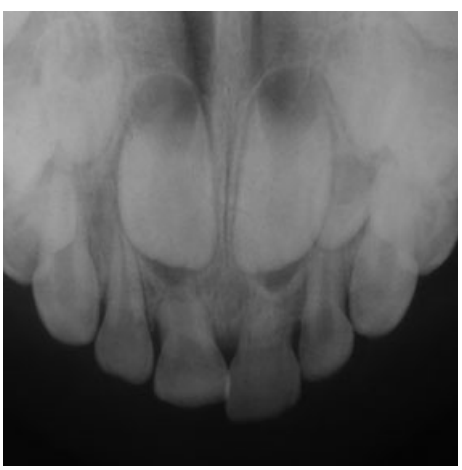

Fig. 7. Radiograph 5 years after replantation.

Fig. 8. Clinical photograph showing permanent teeth.

Severe dental trauma such as avulsion has the potential to disrupt the growth and development of the permanent successors because of the close anatomical relationship between the developing tooth germ and the apices of the primary teeth. Avulsion has been

found to represent the second highest cause of secondary damage, accounting for 33% of developmental defects in the permanent dentition (3, 10). It is likely that the developing tooth will have been affected by the trauma and replantation may cause further damage. In addition, the risk of pulp necrosis and infection in the region of the developing successor, root resorption and ankylosis are significant considerations in replantation.

Replantation has an economic cost but most significant is that it commits the child to dental visits with increased radiation exposure, and prognosis of tooth survival and treatment outcomes are largely unknown. The presence of an infraocclusion (seen at the 1 year review) highlighted this. The area was carefully reviewed both clinically and radiographically to ensure that the occlusal disparity was not progressive which may indicate ankylosis.

There have not been any prospective outcome studies of replantation of avulsed primary teeth. Most of the literature consists of isolated case reports and so evidence for replantation is lacking, with inconsistencies in management and prognosis after replantation (8, 9, 11). Most comprehensive is a Japanese study (9). The outcomes of eight primary incisors replanted without pulp removal were described in children aged from 9 months to nearly 4 years and with follow-up periods of up to five years. Half were subsequently extracted because of infection or pathological resorption, three exfoliated physiologically and one was retained. One permanent incisor had an enamel defect (9). Despite the small sample size, this suggests that replantation can be a successful treatment option in circumstances similar to our case. It can offer the ability to maintain aesthetics and preserve bone for the eruption of permanent successors.

In very young children, the stage of root development may favour healing/regeneration of the apical tissues following replantation. In this case, as well as being a distance from the permanent successor, the replanted incisor was immature in terms of its root development and in close proximity to a blood supply for healing. In immature permanent teeth with wide open apices, pulpal revascularization is possible and highly desirable. Andreasen, et al. (12) in a study of avulsed and replanted permanent teeth showed a greater incidence of pulpal revascularization in teeth with open apices and short distances from the apical foramen to the pulp horns, and so it was assumed that in this case, there may also be a chance of pulpal revascularization. Laser Doppler flowmetry is recognized as means of determining the presence of pulpal blood flow in primary incisors (13), and the positive findings in this case, together with some continued root development, indicated some healing/regeneration had occurred within the pulp-dentine complex. It is unknown what type of tissue formed in the pulp space.

Regular clinical and radiographic reviews involving specialists from several disciplines are critical in the management of dental trauma and especially when there is trauma to primary teeth with underlying permanent successors.

Conclusions

In most instances, the accepted guidelines of not replanting an avulsed primary tooth should be adhered to. Replantation of an avulsed primary tooth may be a viable treatment under near ideal conditions provided there is the opportunity for regular recall and it is made clear to parents/caregivers that the prognosis is unknown. Protection of the permanent dentition is paramount, with treatment performed in the best interests of the child and assessed on an individual basis.

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