ASIAN JOURNAL OF DENTAL RESEARCH (AJDR)

VOLUME 1, ISSUE 1

Re-implantation of an avulsed maxillary incisor after prolonged dry storage in a fourteen year old adolescent: A Case Report

Siddharth Anand[1]*, Updesh Masih[2], Ramakrishna Yeluri[3]

BDS, Post Graduate Student, Department of Pedodontics, K. D. Dental College and Hospital, Mathura[1]*
MDS, Professor, Department of Pedodontics, K. D. Dental College and Hospital, Mathura[2]
MDS, F.P.F.A., Professor, Department of Pedodontics, K. D. Dental College and Hospital, Mathura[3]
drsiddharthanand@yahoo.co.in[1*]

I. ABSTRACT

Dental avulsion is a complete displacement of tooth out of socket along with severed periodontal ligament with or without fracture of the alveolar bone. Re-implantation of the avulsed tooth is considered as a best treatment modality due to its biological and psychological advantages. The viability of periodontal ligament cell on the root surface determines the prognosis of re-implanted tooth. Following avulsion and re-implantation, teeth are at risk for infection and infection related resorption. Severe discolorations of tooth crowns and cervical root fractures are common. Management of tooth avulsion in the permanent dentition often presents a challenge. Definitive treatment planning and consultation with specialists is seldom possible at the time of emergency treatment. Re-implantation of the avulsed tooth can restore esthetic appearance and occlusal function shortly after the injury. This article describes the management of a child with an avulsed maxillary permanent incisor that had been air-dried for about 18 hours. Follow up of one year showed
that the re-implanted incisor has retained its esthetic appearance and functionality.

Key Words: *incisor injuries; tooth avulsion; tooth re-implantation*

II. INTRODUCTION

Tooth avulsion is defined as total displacement of the tooth out of its alveolar socket. It accounts for 0.5% to 16% of traumatic injuries in the permanent dentition. Avulsion of permanent teeth occurs most often in children 7 to 9 years old, an age when the relatively resilient alveolar bone provides only minimal resistance to extrusive forces, and the maxillary central incisors are the teeth most commonly affected. Management of avulsion of the permanent dentition often poses a challenge. Healing with a normal periodontal ligament (i.e., regeneration) after re-implantation will occur only if the innermost cell layers along the root surface are vital.[1] Clinical studies have shown that the prognosis is best for teeth replanted within 5 minutes after avulsion, yet such optimal treatment is not always possible.[2-6]

Prolonged non-physiological storage of avulsed teeth before re-implantation results in total necrosis of the periodontal ligament, and healing by replacement root resorption (i.e., repair) becomes the only option.[5] In this situation, the periodontal ligament, as well as the root surface of the re-implanted tooth, is resorbed and replaced by the surrounding alveolar bone, a process that results in ankylosis.[1] Ankylosis of the teeth in young patients eventually leads to infraocclusion, because of growth.[7] If the resorption process exposes dentinal tubules and root canals that contain infected necrotic tissues, inflammatory root resorption may also occur.

Nevertheless, if managed properly, avulsed teeth with a vital periodontal ligament can be re-implanted and will remain functional for some years.[8] The objective of this paper was to present a case with the management of a child with an avulsed maxillary permanent incisor that had been air-dried for 18 hours.

III. CASE REPORT

A fourteen year old male patient was brought by his father to the Department of Pedodontics and Preventive Dentistry with a chief complaint of tooth loss in upper anterior region of the jaw after trauma (Figure 1). He had suffered a fall one day before in school premises resulting in avulsion of upper right central incisor. The avulsed tooth had been left dry in some vessel before bringing it to the clinic. The patient's medical history was unremarkable, but he was due for an anti-tetanus booster. On examination, the patient did not show any signs or symptoms of neurological or extra oral injury. Intraoral examination revealed a full set of permanent dentition status except 11. In occlusion, he showed incisal overjet of 5 mm and class I molar relationships. Oral hygiene ststus was fair, and no carious lesions were detected clinically.

Tooth 11 was avulsed (Figure 2), and a blood clot was found in the alveolar socket. No other oral injury was detected clinically. The adjacent teeth i.e. 12, 21 and 22 showed subluxation. A maxillary intra oral peri-apical radiograph was obtained, and no other hard-tissue injury was detected in that region (Figure 3). Examination of the avulsed tooth revealed that the crown was intact and that the root had a closed apex, but the root surface was covered with dried remnants of periodontal tissue. The available treatment options were explained to the parents, and it was decided to re-implant the avulsed incisor as an intermediate treatment.

Endodontic treatment was performed with avulsed tooth extra orally and was obturated with metapex. The scaling and root planning was performed and the conditioning of the root was done with 10% phosphoric acid. The root was thoroughly washed for 10 seconds to remove the dead periodontal tissue. Then it was immersed in APF gel for twenty minutes followed by metronidazole solution again for twenty minutes. Local anesthetic was administered and the socket was explored. The tooth was then re-implanted into its socket and adjacent teeth i.e. 12, 21 and 22 were repositioned and were splinted to the adjacent teeth with 0.018 × 0.025 inch stainless steel round wire and composite (Figure 4). Another maxillary intra oral peri apical radiograph was obtained to confirm proper positioning of the re-implanted incisor (Figure 5), and the splint was left in place for 6 weeks. A 7-day course of systemic penicillin was prescribed and an anti-tetanus booster was given. The patient was seen again at 2, 6 and 12 weeks after re-implantation and then half-yearly.

The re-implanted incisor developed mild infraocclusion (of about 1 mm) and progressive replacement root resorption (Figure 6). Nevertheless, it remained functional and was esthetically acceptable. All of the adjacent anterior teeth remained symptomless and showed no sign of pulp degeneration or root resorption. Because both the patient and his parent wanted to avoid orthodontic treatment in the future, it was decided to keep the replanted incisor as long as possible. The patient and his parent were informed that the infraocclusion would become more severe as the patient grew and that esthetic buildup of the incisal edge with composite resin might be needed followed by full coverage restoration. Long-term treatment may also include prosthodontic replacement with an implant when the patient finishes his pubertal growth. The patient had been told about the resorbtion part and that the tooth longevity is questionable?

IV. DISCUSSION:

Relative to other tooth injuries, avulsion is a more serious assault on the gingiva, the periodontal ligament and the pulp. In clinical studies, teeth re-implanted within 5 minutes after avulsion had the best prognosis and the chance of pulpal and periodontal healing was inversely related to the stage of root development and the period of dry storage.[3-6] In the optimal scenario, the avulsed tooth should be replanted immediately or should be stored in a physiological medium such as saline for only a short period before re-implantation.[9,10] The re-implanted tooth should be splinted flexibly to the adjacent teeth for 7 to 10 days to enhance periodontal healing.[10] If the tooth apex is closed or almost closed, prophylactic root canal treatment should be carried out on the day of splint removal to prevent the onset of inflammatory root resorption.[1,10]

In this case report, the avulsed incisor had a closed apex and had been air-dried for a prolonged period, so it was anticipated that the chance of pulpal and periodontal healing would be extremely low. The tooth was immersed in APF gel to harden the root surface that would result in delayed resorption of the re-implanted tooth and to maintain the aseptic condition of the tooth in oral environment; it was further immersed in the metronidazol solution for twenty minutes. As a result, the management of this case differed from the accepted re-implantation protocol. The treatment objective was to retain the avulsed incisor to maintain esthetic appearance and occlusal function, to prevent inflammatory root resorption and to achieve periodontal healing with replacement root resorption. Therefore, the avulsed incisor was splinted to the adjacent teeth with rigid wire for 6 weeks to facilitate rapid, solid ankylosis.[1,8] The root of the avulsed incisor was also filled extraorally. Given that replacement root resorption was inevitable after the prolonged period of dry storage, it was thought that further drying and handling of the root surface was unlikely to worsen the prognosis.[1,10] Systemic antibiotics are often recommended after re-implantation, but their effectiveness in preventing root resorption is questionable.[9] To date, the value of antibiotic therapy in re-implantation has been demonstrated only in the experimental setting.[11,12] Andreasen and others,[5] in their prospective study, showed that systemic antibiotics had no effect on periodontal healing clinically.

In cases of avulsed teeth with a vital periodontal ligament, treatment with various agents such as tetracycline before re-implantation have been suggested in the hope of slowing down the resorption process.[13] Andreasen and Andreasen[1] recommended that, after planing of the root to remove necrotic periodontal tissue, such teeth be soaked in 2.4% acidulated sodium fluoride solution (pH 5.5) for 20 minutes before extra oral root filling and re-implantation. After that it was immersed in metronidazole solution for another 20 minutes to minimize the bacterial load so as to prevent resorption of the root after re-implantation. Teeth re-implanted after 60 minutes of dry storage become ankylosed and are resorbed within 7 years in young patients, whereas teeth re-implanted under similar conditions in patients older than 16 may remain functional for considerably longer periods.[14] Ebeleseder and others[7] also found that replacement resorption of re-implanted mature teeth was more extensive and the overall prognosis worse for children and adolescents than for adults. It has been suggested that the more rapid resorption of teeth in children is related to the higher rate of bone remodelling in children than in adults.[9]

Ankylosis of the incisors in young patients also results in infraocclusion as the patient grow.[7] Severe infraocclusion causes esthetic problems and may lead to tilting of the adjacent teeth if left untreated. If the avulsed incisor had not been re-implanted in the present case, other treatment options might have included prosthetic replacement of the missing incisor, space closure with orthodontic treatment or auto transplantation of the premolar together with orthodontic treatment of the malocclusion.[15] However, definitive treatment planning and orthodontic consultation with a specialist are seldom possible at the time of emergency treatment. Re-implantation can restore the patient's esthetic appearance and occlusal function shortly after the injury, and the re-implanted incisor can remain functional for some years. Nevertheless, re-implantation is usually not recommended if the avulsed tooth has a very immature root and has been air-dried for a prolonged period or if the patient's medical condition contraindicates re-implantation.[10]

V. FIGURES:

FIGURE 1- FRONTAL VIEW

FIGURE 2- AVULSED INCISOR

FIGURE 3 – IOPA OF ANTERIOR REGION

FIGURE 4 – IMMEDIATELY AFTER REPOSITIONING AND SPLINTING

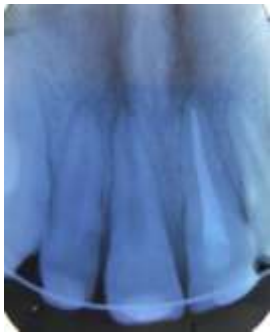

FIGURE 5 – IOPA AFTER 6 WEEKS

FIGURE 6 – AFTER TREATMENT

VI. CONCLUSION

In conclusion, in cases of avulsed permanent teeth with prolonged non-physiological storage, re-implantation should be performed if the patient and his or her parents are aware of the outcomes and request such treatment, although the risk of progressive replacement resorption and subsequent tooth loss is high.

VII. REFERENCES

1. Andreasen JO, Andreasen FM. Avulsions. In: Andreasen JO, Andreasen FM, editors. Textbook and colour atlas of traumatic injuries to the teeth. Copenhagen: Munksgaard; 1994. p. 383-425.
2. Andreasen JO, Borum MK, Jacobsen HL, Andreasen FM. Replantation of 400 avulsed permanent incisors. 1. Diagnosis of healing complications. Endod Dent Traumatol 1995; 11(2):51-8.
3. Andreasen JO, Borum MK, Jacobsen HL, Andreasen FM. Replantation of 400 avulsed permanent incisors. 2. Factors related to pulpal healing. Endod Dent Traumatol 1995; 11(2):59-68.
4. Andreasen JO, Borum MK, Andreasen FM. Replantation of 400 avulsed permanent incisors. 3. Factors related to root growth. Endod Dent Traumatol 1995; 11(2):69-75.
5. Andreasen JO, Borum MK, Jacobsen HL, Andreasen FM. Replantation of 400 avulsed permanent incisors. 4. Factors related to periodontal ligament healing. Endod Dent Traumatol 1995; 11(2):76-89.
6. Kinirons MJ, Gregg TA, Welbury RR, Cole BO. Variations in the presenting and treatment features in reimplanted permanent incisors in children and their effect on the prevalence of root resorption. *Br Dent J* 2000; 189(5):263-6.
7. Ebeleseder KA, Friehs S, Ruda C, Pertl C, Glockner K, Hulla H. A study of replanted permanent teeth in different age groups. *Endod Dent Traumatol* 1998; 14(6):274-8.
8. Duggal MS, Toumba KJ, Russell JL, Paterson SA. Replantation of avulsed permanent teeth with avital periodontal ligaments: case report. *Endod Dent Traumatol* 1994; 10(6):282-5.
9. Barrett EJ, Kenny DJ. Avulsed permanent teeth: a review of the literature and treatment guidelines. *Endod Dent Traumatol* 1997; 13(4):153-63.
10. Gregg TA, Boyd DH. Treatment of avulsed permanent teeth in children. UK National Guidelines in Paediatric Dentistry. Royal College of Dental

Surgeons, Faculty of Dentistry. *Int J Paediatr Dent* 1998; 8(1):75-81.

11. Hammarstorm L, Blomlof L, Feiglin B, Andersson L, Lindskog S. Replantation of teeth and antibiotic treatment. *Endod Dent Traumatol* 1986; 2(2):51-7.

12. Sae-Lim V, Wang CY, Choi GW, Trope M. The effect of systemic tetracycline on resorption of dried replanted dogs' teeth. *Endod Dent Traumatol* 1998; 14(3):127-32.

13. Selvig KA, Bjorvatn K, Claffey N. Effect of stannous fluoride and tetracycline on repair after delayed replantation of root-planed teeth in dogs. *Acta Odontol Scand* 1990; 48(2):107-12.

17. Andersson L, Bodin I, Sorensen S. Progression of root resorption following replantation of human teeth after extended extraoral storage. *Endod Dent Traumatol* 1989; 5(1):38-47.

18. Stenvik A, Zachrisson BU. Orthodontic closure and transplantation in the treatment of missing anterior teeth. An overview. *Endod Dent Traumatol* 1993; 9(2):45-52.