External replacement resorption in an avulsed reimplanted permanent incisors

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ABSTRACT:
An avulsed permanent tooth is one of the few real time dental emergencies wherein a potential unscheduled diagnostic and treatment decision outside the regular practice experience of the dentist awaits him. Prognosis is dependent on the decisions taken in the “Golden Hour” aftermath the accident.

Reimplantation is the treatment of choice as there are chances of successfully saving a tooth. The condition is compounded by the lack of public awareness and the presence of a proper avulsion management protocol that has been tested by prospective longitudinal studies. This article discusses an unusual case of total replacement resorption along with a comprehensive review of the etiology, pathology, clinical features and the management of the condition.

Key words: Replacement resorption, Ankylosis, Inflammatory resorption, Reimplantation

INTRODUCTION:
Avulsion of permanent teeth is one of the rare and serious dental injuries and ranges from 0.5% to 16% of all traumatic injuries. The maxillary central incisors are the ones most frequently involved. On avulsion, the “tearing” of the periodontal ligament occurs leaving behind viable periodontal ligament cells on most of the root surface. The hydration of the periodontal ligament cells helps in maintaining the viability of tooth; by allowing healing with regenerated periodontal cells which in turn reduce the initial destructive inflammatory resorption. In case, if the periodontal ligament dries due to increased extra oral time then an increased inflammatory response leads to inflammatory resorption.

As most of the avulsions occur in the pre-adolescent and adolescent period so it is imperative to maintain the tooth and surrounding bone until facial growth is complete.
This case report discusses a case of total replacement resorption wherein two avulsed central incisors with an extra oral dry time of 5 min were reimplanted within 40 min and despite all the guidelines being adhered to; total replacement resorption was seen over a period of seven years, contemplating the possible role of host response and also highlighting the fact that despite immaculate coronal seal or proper obturation; ankylosis followed by total replacement resorption could occur as in this case.

**CASE PRESENTATION:**

**Chief Complaint:**

A 20-year-old male reported with chief complaint of discoloration, mild mobility & poor appearance of upper front teeth which hampered his social interactions (Figure 1).

**History:**

Fall from bicycle and trauma/avulsion of both maxillary central incisors seven years ago. Patient had picked up the avulsed teeth and reported to a dentist within 5 min of avulsion. His older case records revealed that the endodontic treatment was performed on both the central incisors within 40 mins of avulsion which included dipping in doxycycline solution for 5 min prior to their reimplantation. The incisors were splinted with acid etched bonded splints for 7 days with administration of 500 mg Amoxycycline thrice daily; 400mg Metronidazole twice daily and a combination of Paracetamol and Ibuprofen (325mg+ 400mg) twice daily for a week and 0.2% chlorhexidine mouth wash for 14 days. Patient was instructed to maintain regular recall follow up appointments.

As the teeth were symptomless so the patient failed to report for scheduled recall appointments. Now, after a gap of 07 years and 02 months, patient reported with the present chief complaint.

**Clinical examination:**

Miller’s class II recession in 31 and 41; mobility in 11 and 21 was observed. The mobility was confirmed through Periotest (Figure 2). Intra oral periapical radiograph (Figure 3A) and radiovisiography (Figure 3B) confirmed total replacement resorption in both the upper centrals. As the centrals were mobile so extraction of the crowns with removal of gutta-percha was performed and for the maxillary ridge deficiency an immediate RPD was planned. The patient is on observation and would be taken up for ridge augmentation followed subsequently by placement of implants.

**DISCUSSION:**

Trauma to the oral region occurs frequently and comprises 5% of all injuries and this figure could rise to as high as 18 % for preschool children. Avulsion is the most serious among these dental injuries. Reimplantation is the treatment of choice except in some non ideal situations (e.g., severe caries or periodontal disease, fractures, non-cooperating patient, severe medical conditions-immunosuppression and severe cardiac conditions). Prognosis is dependent on the decisions taken in the “Golden Hour” aftermath the accident.

The pulp necrosis following luxation and avulsion injuries is susceptible to bacterial contamination; and the combination of bacteria in the root canal with cemental damage, to the external root surface results in external inflammatory root resorption. To avoid infection related resorption, an extraoral root canal treatment should be performed at the time of intentional reimplantation and is an important treatment step to avoid the loss of reimplanted teeth.

**Endodontic treatment**

This aspect of the treatment of replanted teeth has continuously changed overtime and has been the most controversial. In early human clinical studies and animal experimental studies endodontic treatment (biomechanical preparation followed by obturation with gutta-percha and sealer) was performed extra orally. Guidelines now recommend endodontic treatment to be postponed in an effort to minimize the extraoral time unless the tooth has a closed apex and has been stored under dry conditions for more than 2 h. For such teeth, the endodontic treatment may be performed either intraorally or extraorally, prior to reimplantation.

Reimplantation may successfully save the tooth though inflammatory resorption followed by ankylosis which is always a potential complication. Ankylosis is seen to occur because of the survival of insufficient number of functional cellular elements which suppress osteogenic activity, as well as due to the inflammatory changes and mechanical alterations occurring in the periodontal ligament. The detection of ankylosis is based on clinical signs...
by evaluation of lack of physiological mobility; the characteristic sound emitted on tapping of tooth and by radiographic interpretation.

Ankylosis and replacement resorption can be diagnosed by equipments like Periotest and the Osstell. Recently, it has been verified that the Periotest can confirm a diagnosis of ankylosis by comparison with intact incisors, but a low Periotest value alone cannot be considered diagnostic for ankylosis.\textsuperscript{11}

Radiographic examination is considered to be of limited value in the early detection of ankylosis because of the two-dimensional nature of the image. The initial location of ankylosis is often on the labial and lingual root surfaces thus further complicating radiographic detection. The observation of progressive infra-occlusion during adolescent growth is another late indicator of ankylosis.\textsuperscript{12-14}

Ankylosis of teeth can dramatically alter the local growth and the development of the alveolus, leading to progressive infra-occlusion with distortion of the gingiva and underlying bone; producing functional and aesthetic deficits in jaw growth which would later require an augmentation procedure.\textsuperscript{14}

**Replacement Resorption**

Replacement resorption is seen after ankylosis and the cause of same at the cellular and molecular levels is not exactly known. The various reasons proposed to predispose to dentinal resorption are: Loss of intermediate cementum; increase in extra oral dry time; loss of cementoblasts & Epithelial rests of Malassez; presence of large dentinal tubules and thin radicular walls; young age; decreased viability of Periodontal ligament cells on root surface; contamination of teeth.\textsuperscript{15}

**Splinting**

Current evidence has shown that periodontal and pulpal healing is promoted if the replanted tooth is given a chance for slight motion and therefore the use of short-term, flexible splints for splinting is recommended. Acid etch bonded splints as in our case have shown to be well tolerated and allow for...
good oral hygiene. Splinting is preferred for 07-10 days since longer splinting time and rigid splints have shown to predispose to ankylosis.5

**Antibiotics and Mouthwashes**

Hammarstrom et al found that administration of parenteral antibiotics prior to extraction and immediately following reimplantation resulted in less inflammatory root resorption.16 Though, all guidelines recommend antibiotic coverage but do not specify a particular drug or its duration.

Systemic antibiotics given at the time of reimplantation and prior to endodontic treatment are effective in preventing bacterial invasion of the necrotic pulp and therefore, subsequent inflammatory resorption.17 Tetracycline has an additional benefit of decreasing root resorption by affecting the motility of the osteoclasts and reducing the effectiveness of collagenase. Dipping the tooth in doxycycline solution prior to reimplantation has been shown to decrease the inflammatory resorption, increase pulp revascularisation.18

Chlorhexidine rinses have shown to be useful in controlling the bacterial content of the gingival sulcus19. This case report highlights the importance of host response as despite all guidelines being followed, the patient still suffered from replacement resorption with aesthetic defect causing depression and low personal esteem.

**CONCLUSION**

Timely diagnosis of ankylosis and replacement resorption can save the patient from altered local growth and development of alveolus further leading to functional and aesthetic defects in addition to saving from the psychological trauma. The presence of a proper avulsion management protocol tested by prospective longitudinal studies is the need of hour. The dissemination of this appropriate emergency and treatment plan knowledge through public awareness campaigns by health care professionals; mass media campaigns; teachers and parents would go a long way for a good prognosis.

**REFERENCES:**