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RESEARCH ARTICLE

DELAYED REPLANTATION OF AN AVULSED TOOTH WITH 48-HOURS EXTRA - ORAL TIME: A CASE REPORT

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Abstract

Injury to the teeth and associated orofacial structures is quite disturbing to the child and his parents due to contribution of these structures in aesthetics and its subsequent psychological impact. Although all forms of injuries require some immediate attention and management, tooth avulsion (ex-articulation) is a special form of injury in which the prognosis is associated with the duration between the time the tooth is avulsed and when it is replanted. Avulsion is one of the most serious injuries of the tooth which is most commonly seen in young children and adolescents and occurs in the upper front teeth. Immediate transplantation of the avulsed tooth is recommended treatment and results in good prognosis although this may not be always possible. Although recommended, immediate transplantation of the avulsed tooth is not always possible due to the patient's concomitant injuries at the time of accident and lack of knowledge in the management of such injuries at the site of the accident. The present case highlights follow-up of delayed replantation (after 48 h) of maxillary central incisor which was avulsed due to trauma.

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Introduction:-

Avulsion or exarticulation is defined as complete extrusion or displacement of a tooth from its socket. For endodontic treatment of these cases, a complete medical and dental

History in addition to the complete clinical and radiographic examination is mandatory. All treatment protocols should be directed toward the management of the pulp and Periodontal Ligament (PDL) [1]. Follow-up of traumatized teeth is of paramount importance because the exact extent of damage is not discoverable at the first visit. Long term follow-ups may be hardly achievable; however, they can show the true prognosis of the traumatized teeth [7].

This case report describes the endodontic management of a young patient with avulsion with 6 months follow-up

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Case Report:

A 19-year male patient reported to the Department of Bharati Vidyapeeth Deemed to be University Dental College and Hospital, Navi Mumbai with a chief complaint of broken upper front tooth due to trauma 48 hours back (Fig. 1, Fig. 2). The trauma occurred while the patient was playing cricket on the ground and there was no history of loss of consciousness or vomiting. On the day of trauma, it was a public holiday, none of the dental clinics were open so the patient went to a chemist shop near his home wherein the chemist advised him to store the tooth in saline and report to dentist the next day. The patient came to our Department of Conservative Dentistry and Endodontics 2 days after the injury. On examination, there were no other signs of injury intra-orally and extra-orally. Examination of the tooth socket 21 did not reveal any fracture of the bony wall or tooth segment. The adjacent tooth 11 was slightly extruded out of the socket and was luxated palatally thus making the occlusion open bite. Avulsed tooth 21 was inspected for any debris or granulation tissue present.

An intra-oral periapical radiograph was taken to rule out any broken tooth or bony segment inside the socket (Fig. 3). Local anesthesia was administered using Lignocaine with adrenaline 1:200000. The extruded tooth 11 was repositioned back to its original position by biting on to a plastic blade instrument and the occlusion was re-established. Following which, the root surface and the socket of tooth 21 was examined for any fractures, the level of periodontal attachment and signs of contamination and then washed with stream of saline and all the debris was removed gently. Using a stream of saline, the coagulum in the alveolar socket was flushed out. The root surface was then conditioned with Citric acid and subsequently kept in 2% Sodium Fluoride solution for 20 minutes till the patient was prepared for the procedure of replantation. The tooth 21 was placed in the socket and checked radiographically for the proper positioning. Splinting was then done from canine to canine using flowable composite and Ribbond Multiflex wire for one month (Fig. 4). The occlusion of the patient was checked to verify that there were no pre-mature contacts while biting to avoid further injury to the adjacent periodontal tissues. Aesthetics was restored by maintaining the incisal edge of the replanted tooth at same level as the adjacent tooth. A radiograph was also taken at the end to verify the position of re-implanted tooth in the socket (Fig. 5). The patient was kept on antibiotics (Amoxiclav 625 mg twice daily and Ibuprofen 400 mg thrice daily for 3 days). The patient was then recalled after 7 days for endodontic procedure.

After 7 days, the teeth were asymptomatic. There was no pain or bleeding on probing. Isolation was done using rubber dam by split dam technique. Access opening was prepared on the avulsed tooth 21 using diamond points BR-46 and EX-24 and pulp was extirpated from the canal using K files. Working length was determined. Biomechanical preparation was done using ProTaper universal rotary files till size F5 (50/06). The canals were cleaned using 2.5% sodium hypochlorite and re capitulation was done using no 10-K file. The canal was subsequently filled with calcium hydroxide as intra canal medicament and the chamber was sealed with temporary restoration. Patient was recalled after 7 days.

After 7 days the canal was re-opened and the intra canal medicament was removed with the help of H file and saline. The canals were dried using paper points and master cone selection was done. Obturation was done using gutta percha 50/06 (F5) and AHPlus sealer by cold lateral compaction technique. Temporary restoration was given and the patient was recalled after 3 days for a permanent restoration. After 7 days of follow up; the tooth 11 was also access opened as it was slightly tender on percussion. The same protocol was followed as for tooth 21. Chemo mechanical cleansing of the canal was done and obturated using 50/06 (F5) gutta percha points. A post endodontic restoration with light cured composite resin was done following root canal procedure in tooth 11.

After 6 weeks, clinically the patient was asymptomatic with no mobility and hence the splint was removed and radiograph was taken to see for any peri-apical changes. The patient was kept on routine follow-ups for 3 months and 6 months to see for any chances such as ankylosis or resorption. After 6 months, radiographically it was observed there was slight surface resorption occurring at the apical third of avulsed tooth 21. Clinically there were no signs of any mobility or metallic sound on percussion present. Patient was completely asymptomatic and did not want to get any prosthodontic or cosmetic treatment done further.



Pre-operative photo.



Avulsed tooth in saline.



Pre-operative radiograph.



Luxated tooth re-positioned back in socket



Armamentarium used for avulsion.



Conditioning of root with Citric acid.



Emersion in 2% Sodium Fluoride solution.



Etching the teeth from canine to canine.



Frosted appearance of etched enamel.



Application of bonding agent on etched enamel.



Avulsed tooth splinted with Ribbond.



Radiograph post splinting.



After 7 days.



Isolation with Split rubber dam and access opening of avulsed tooth 21



Radiograph showing working length, calcium hydroxide, master cone selection and obturation of tooth 21.



Isolation with Split rubber dam and access opening of luxated tooth 11.



Radiograph showing working length, calcium hydroxide, master cone selection and obturation of tooth 11.



Radiograph showing post obturation restoration with composite resin material in teeth 11,21.



Pre-splinting



Post splinting



Follow up after 3 months and 6 months.



Pre-operative and post-operative photos after 6 months.

Discussion:-

Tooth avulsion is a serious injury resulting in complete displacement of the tooth outside the socket and consequently damaging its supporting apparatus (i.e. periodontal ligament and bone). Tooth avulsion is more prevalent in males (male: female =3: 1) and age group of 7–14 years is most commonly affected [3].

Transport media : The prognosis for avulsed tooth improves if the cells of periodontal ligament (PDL) are preserved. (7,8,9). Soder et al. and Andreasen had shown that when a tooth is avulsed from the socket, PDL cells on the root surface still remain viable if they are kept hydrated (5,10). Vital PDL cells can reattach back when replanted and the viability is best maintained if replanted within the first 15-20 minutes post avulsion (11). There are certain tissue transport medium which have exceptional ability to keep cells alive and are considered to have superior storage time for eg. Viaspan® by DuPont Pharmaceuticals in Wilmington, DE and Hank's Balance Salt Solution (HBSS) (Mediatech, Herndon, VA). Milk, saliva and saline are readily available storage media (12,13,14). Another commercially available antibiotic free protective media is the emt TOOTHSAYER® (SmartPractice, Phoenix, AZ). Water provides hypotonic environment and is not recommended as it damages the PDL cells.

In the present case, we used saline as interim transport media. The extra oral time was 48 hours; hence it was supposed that the periodontal ligament cells were dead [7].

Removal of dead periodontal ligament cells is one of the most important actions which need to be taken to slow down the osseous replacement of the root surface [8], [9]. To achieve this, the root surface was cleaned with soft pumice prophylaxis to remove remaining non-viable periodontal ligament cells which may act as source of infection and subsequently accelerate infection related resorption [7]. Some authors have even suggested periodontal curettes and scalers for removal of these necrotic periodontal ligament cells; however, excessive scraping of cementum may further accelerate the resorptive process instead of decreasing it. Thus, to maintain a balance of avoiding excessive scraping of cemental layer and at the same time completely remove necrotic periodontal ligament cells, we used soft pumice prophylaxis.

The tooth was then conditioned with citric acid and then immersed in 2% sodium fluoride solution for 20 min till the armamentarium and the patient was prepared for the procedure to minimize loss of precious time. The rationale for this fluoride soak is based on evidence that this procedure will delay but not prevent ankylosis [10].

The pre-treatment of root surface with sodium fluoride has been hypothesized since 1968 due to its beneficial effect by decreasing the rate of osseous replacement in replanted teeth of monkeys [11]. A similar study in humans also demonstrated 50% reduction in progression of root surface resorption after replantation [12]. Stannous fluoride is an alternative that can also be used for treatment of root surfaces before replantation; however, its use is associated with long-standing inflammatory reaction in periodontal ligament [13]. Due to this sodium fluoride solution has remained as the only useful and tested method for root-pre-treatment before replantation [12].

Follow-up procedures:

Replanted teeth should be monitored at regular intervals based upon stage of root development and those times where healing complications might be diagnosed. Thus, a radiographic examination 3 weeks after replantation will permit diagnosis of inflammatory resorption and periapical radiolucency, both indications of infected pulp necrosis. If the radiographic findings vaguely suggest these events, further examinations at 1-week interval should be made (i.e., for the 1st month). Otherwise, follow-up again at 6 weeks, 3 months and 6 months after injury. A high percussion tone and diminished mobility will reveal ankylosis earlier than radiographs. However, by 6 to 8 weeks, ankylosis can sometimes be seen radiographically. Immediate endodontic therapy with pulpal extirpation and calcium hydroxide root canal dressing will arrest inflammatory root resorption.

In case of incomplete root formation (i.e. diameter of the apical foramen exceeding 1 mm), pulpal revascularization is a possibility.

In the case of complete root formation, extirpate the pulp at the same appointment as splint removal (i.e. just prior to removal of the splint) and dress the root canal with calcium hydroxide.

In case of a vital PDL (e.g. extra-alveolar dry period more than 1 hour), resorption-preventing treatment is indicated which includes removing the PDL and pulp and then placing the tooth in 2.4% sodium fluoride solution with an acidulated pH of 5.5 for about 20min. Following root canal treatment and obturation with gutta percha and sealer. Replant the tooth. Splint for about 6 weeks.

Essentials:

Replantation of avulsed teeth can result in successful healing if there has been only minimal damage to the pulp and periodontal ligament. The type of storage media and length of storage period have an overwhelming effect upon the healing of tooth. Replantation should be attempted only if the following conditions can be fulfilled i.e. there shouldn't be any absence of gross caries and no major loss of periodontal support prior to injury.

Prognosis:

Primarily dependent upon extra-alveolar period and storage medium. Pulp survival almost nil In teeth with completed root formation and infrequent in teeth with immature root formation. Periodontal ligament healing infrequent and dependent upon the above-mentioned factors.

Outcomes of avulsion:

The speed with which the avulsed tooth is replanted is the most important factor for success (8,9). There are several possible effects on the root surface and attachment apparatus of an avulsed tooth.

Normal PDL healing: complete regeneration of the PDL. Damage cannot be clinically or radiographically detected

Surface resorption: the crushing injury is restricted, inflammatory response is limited and repair can occur with replacement cementum. Clinically, the tooth presents asymptomatic, with normal mobility and percussion sounds. Radiographically, there are no periradicular radiolucencies and no loss of lamina dura (15).

Ankylosis and replacement resorption: occurs when excessive drying damages the PDL cells and evokes an inflammatory response that results in the replacement of the cells with alveolar bone.

Dentoalveolar ankylosis is the term used when precursor bone cells populate the damaged root resulting in a direct bone-root contact void of an attachment apparatus. Replacement resorption occurs when osteoclasts in contact with the root resorb dentin that is eventually

replaced with new bone by osteoblasts. Clinically, the tooth will be immobile and have a high-pitched sound when percussed. Radiographically, there is absence of the lamina dura.

With replacement resorption, the root surface appears moth-eaten (15). In young patients, infraocclusion or submergence results when replacement resorption interferes with the tooth's ability to move with the normal downward growth of the alveolar process.

External inflammatory root resorption: the result of a combination of severely damaged attachment and bacterial contamination of a necrotic pulp. It may rapidly progress. Clinically, it presents as radiolucencies in the root and adjacent bone (15)

Conclusion:-

The time out of the socket, transport medium, treatment of the root surface, kind and duration of splinting, and endodontic treatment are important factors affecting the prognosis of avulsed cases; however, the time elapsed between the accident and replantation is the most important factor. Many of the challenges faced during endodontic management of traumatized teeth may be controlled by a precise and careful clinical and radiographic examination. Clinicians should thus be aware of handling such situations.

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