

Case Report

Defying Ankylosis/Replacement Resorption with Biodentin: A Novel Dentin Substitute

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Abstract

Favorable healing after an avulsion injury requires quick emergency intervention followed by evaluation and possible treatment at decisive times during the healing phase. Clinical practice has shown that most avulsed teeth are replanted after a delayed extra-alveolar time that compromises the prognosis of replantation. In cases of delayed replantation, the use of adequate media for storage and transportation of the avulsed teeth may improve this prognosis considerably. The article reports the case of an accidentally avulsed permanent right maxillary central incisor with immature open apex that was stored in a dry medium for more than 12 hours. Prior to replantation, apical barrier placement using biodentine, endodontic treatment followed by root conditioning was performed at the emergency visit. One year of follow-up revealed absence of root resorption, ankylosis or abnormal mobility.

Keywords: Replantation, root resorption, ankylosis, biodentine, apical plug

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Introduction:

Although dentoalveolar traumas are most commonly observed in children and adolescents, particularly boys, they may affect individuals of any age.¹One of the greatest concerns in tooth replantation has been the understanding of the mechanisms that rule healing process because if these

mechanisms are better controlled, the organism might have better conditions to promote repair of the injured tissues.²In teeth with extra-oral time >60 min, the chance of revascularization is extremely poor.^{3,4} Therefore, no attempt is made to revitalize these teeth. An apexification

procedure is initiated at the second visit if root canal treatment was not performed at the emergency visit. If endodontics was performed at the emergency visit, the second visit is a recall visit to assess initial healing only. Biodentine, because of its material properties, was considered to be an interesting alternative to conventional root-end filling materials that offers similar properties to those of MTA minus the high alkaline pH and prolonged setting time, thus decreasing the possibility of tooth fracture owing to highly alkaline pH & incomplete calcification of the bridge. Biodentine powder mainly contains tricalcium silicate, calcium carbonate, and dicalcium silicate, the principal components of MTA and once mixed, its setting time is around 12 minutes.⁵ Teeth replanted under favorable conditions, which include preservation of periodontal ligament vitality, cementum integrity⁶ and minimal bacterial contamination^{7,8} usually have a good prognosis and survival rate. These conditions are directly related to the extra-alveolar time, storage medium and alteration so rootsurface.⁹ This article reports, the case of an accidentally avulsed right permanent maxillary central incisor with immature apex that was stored in dry medium from the moment of trauma until its replantation, 12 hours later. The use of Biodentine as an apical barrier which followed successful clinical and radiographic findings observed after 1-year follow up are described in this report.

Case Report

A 9 year old female presented to the department of Dentistry. SKIMS college and hospital with an avulsed immature maxillary right central incisor Fig1. Patient gave a history of trauma 1 day before the presentation Fig2. Since the tooth was stored in a dry medium for more than 12 hours, tooth was sterilized by placing it in

sodium hypochlorite. Access cavity was prepared, and the canal was irrigated copiously with 1% NaOCl solution. Cleaning and shaping was done by light hand filing since the dentinal walls were thin.



Figure 1: Avulsed immature maxillary right central incisor



Figure 2: Preoperative radiograph showing missing tooth

After a final flush with NaOCl, the canal was rinsed with 5 mL 17% EDTA to remove the smear layer & a final rinse with 2% chlorhexidine. After drying the canal using paper points, apical barrier was placed using Biodentine (septodont) which was triturated for 30 seconds according to the manufacturer's instructions. The mix was placed with MTA carrier in the coronal portion of the canal. Increments were then condensed using butt end of paper points (size-80) giving a more proprioceptive control. Obturation was

done by cold lateral condensation technique and the access cavity was sealed with composite. The root was cleaned / scrapped of remaining PDL fibres followed by root conditioning using sodium fluoride and doxycycline. Socket was inspected for any alveolar fracture, coagulum was removed from the socket and the socket was irrigated with doxycycline saline solution. The tooth was then reimplanted using light digital pressure, splinted in place for 4 weeks. (Figure 3)

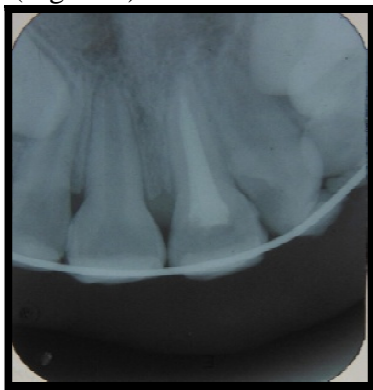


Figure 3: Immediately after splinting



Figure 4: 1 year follow up

The patient returned after 1 month for splint removal and 3 months, 6 months and 1 year for clinical and radiographic follow-up examination and was asymptomatic Fig4. No signs of replacement resorption or ankylosis were evident with radiographs showing encouraging results.

Discussion

Although in cases of delayed replantation the presence of necrotic periodontal ligament might compromise the survival rate of the replanted tooth, replantation of avulsed teeth should always be encouraged, regardless of the viability of the periodontal ligament remnants. The replanted teeth might remain in function in the oral cavity for years before a prosthetic treatment is required.¹⁰ As regards to the removal of necrotic root periodontal ligament, the authors who employed the chemical removal with sodium hypochlorite, justify its use because this technique preserves the cementum layer^{11,12} which is an important barrier against the external root resorption. If replantation has been delayed, endodontic therapy can be commenced after replantation in mature teeth but, for technical reasons, there may be an advantage in carrying out the endodontic therapy prior to replantation in teeth with open apices and which have experienced long delays (greater than 60 minutes). Also it has been observed that the necrotic pulp and its toxins affect the periodontal ligament cells through the dentinal tubules and play a decisive role in the resorption process.¹⁴⁻¹⁶

Another aspect of dental replantation is the preparation of socket, which consists of removal of obstructions as blood clots and bone fragments in order to facilitate the replantation.^{17,18} Contention of replanted teeth is another variable that might affect the prognosis of tooth replantation. Basically, it should not interfere with oral hygiene, allow physiological mobility and remain for a short time in order to reduce the incidence of ankylosis.¹⁹

The goal of antibiotic therapy is to avoid bacterial proliferation in the area of ongoing process and contribute to the prevention of inflammatory resorption. Ideally a broad-spectrum antibiotic should

be administered for seven days.²⁰ Systemic antibiotic therapy was administered and tooth was endodontically treated to prevent inflammatory resorption.

Biodentine fulfills the requirements for a suitable root-end filling material in that it exhibits biocompatibility, moderate pH, long-term sealing of the cavity, antimicrobial properties, and the ability to induce hard-tissue regeneration; it is also stable, insoluble, non-resorbable, hydrophilic, and easy to prepare and place.²¹ Nevertheless, in the case presented in this paper, the 1-year clinical and radiographic controls showed maintenance of root integrity, intact lamina dura periradicularly and no signs of replacement resorption which are indicative of successful replantation.

Conclusion

Although the prognosis for an avulsed tooth must always be guarded, replantation as soon as possible followed by a brief period of flexible splinting and endodontic therapy has been shown to be the most effective method of treatment. The minimum manipulation of the tooth surface and the socket, and the use of appropriate root conditioners have been identified as factors that minimized subsequent root resorption. Biodentine, a novel dentin substitute with a moderate pH has surely played a successful role in defying ankylosis and arresting any form of inflammatory resorption in this particular case.

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