

# SUCCESSFUL MANAGEMENT OF TOOTH AVULSION ACCORDING TO CURRENT STRATEGIES – A CASE REPORT

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## Abstract

*Avulsion injuries account for up to 0.5-3% of traumatic injuries to permanent teeth. The prognosis of tooth replantation is usually related to the need for an endodontic treatment, which has a direct relationship with the occurrence of root resorption. This case reports the immediate management of avulsed right and left maxillary central incisors with an attempt to use MTA sealer as an obturation material. This case report highlights that, in order to achieve favorable endodontic prognosis in replanted teeth, immediate replantation followed by the use of a biocompatible material with excellent biological properties helps save a tooth. Further research is required to validate the use of biocompatible sealers. In addition to the technical knowledge and clinical experience directed toward the quality of treatment, patient education may favorably influence the survival of replanted teeth*

**Key words:** Avulsion; Immediate replantation; MTA sealer; Favorable healing

Tooth avulsion following trauma deserves great attention in dentistry because of its aesthetic, functional and psychological implications. When a tooth is avulsed, attachment damage and pulp necrosis occurs. The tooth is 'separated' from the socket, mainly due to tearing of the periodontal ligament that leaves viable periodontal ligament cells on most of the root surface.

After avulsion, the tooth should be repositioned in the socket in an attempt to re-establish normality.<sup>1-4</sup> Numerous storage media have been recommended for storage of the avulsed tooth and this been extensively reviewed in recent article.<sup>5, 6</sup>

Regardless of the storage media, it is the speed with which the tooth is replanted which counts the most. Replantation is often of psychological value as it helps reduce the traumatic effect of the accident and restore confidence in the patient.

Replantation also has clinical value as it helps in

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prolonged retention which will improve aesthetic appearance, arch form, chewing, enunciation and integrity of the arch.

Intracanal medicaments may be utilized to kill bacteria, reduce inflammation, control inflammatory root resorption and prevent contamination between appointments. Even though various intracanal medicaments have been recommended for use following replantation, calcium hydroxide remains the medicament of choice due to its good anti-microbial activity.

Calcium hydroxide based sealers have also been recommended due to their excellent biocompatibility and antibacterial properties, but solubility of the sealer is still a concern.<sup>7, 8</sup>

The introduction of MTA in the year 1993 saw a material specifically designed for root-end filling because of its excellent biocompatibility and bioactive nature. The material has subsequently been used for pulp capping, pulpotomy, apexogenesis, apical barrier formation in teeth with open apexes and the repair of root perforations. Studies are yet to prove the efficacy of MTA as a root canal sealer in cases following replantation.<sup>9-16</sup>

Following is a case which reports the successful management of avulsed right and left maxillary

central incisors, stabilization of the replanted teeth using fiber splint, root canal treatment and obturation of the teeth using MTA sealer.

### CASE REPORT

A 14-year-old boy reported to the Department of Conservative Dentistry & Endodontics, from a nearby school with a history of trauma while playing field hockey. The child reported that a hockey stick had collided with his upper jaw which resulted in the avulsion of 11 and 21 (Fig.1a, b). The boy reported to the department within 20 minutes of the incident.

On clinical examination, the socket was bleeding, appeared intact and was suitable enough for replantation (Fig.1a). This examination was confirmed by proper facial and palatal palpation of the alveolus. Fracture of the alveolar bone was ruled out by palpation.



Fig 1a



Fig 1b

Laceration of the lower lip was also detected. On examination of the remaining teeth, it was observed that 22 had undergone luxation and was gently repositioned with digital pressure.

As the most important factor to ensure a favorable healing after replantation is speed, every effort was made to replant the teeth as soon as possible. Tooth replantation was carried out following the present guidelines of the International Association of Dental Traumatology.<sup>17</sup>

□ The teeth to be replanted were held in the crown portion and the root surface and apical foramen were rinsed in a stream of saline and then soaked in the same to remove contamination and dead cells from the root surface (Fig.1c).



Fig.1c



Fig. 1d

- Local anesthesia was administered.
- The socket was irrigated with saline and the tooth was replanted back with slight digital pressure directed apically (Fig.1d).
- The normal position of the tooth was verified clinically and radiographically.
- Splinting of the avulsed tooth was done with a flexible splint (INTERLIG, ANGELUS) for 2 weeks
- Antibiotics were administered to the patient and a tetanus booster dose was also administered.



(Fig. 1e)

- The patient was advised to avoid participation in sports for a few weeks, a soft diet for a few days, to use a soft toothbrush after each meal and to use a chlorhexidine (0.1%) mouth rinse twice a day for a week. 12 days post replantation, healing of the soft tissues was satisfactory and the splint was debonded(Fig.1f).Endodontic treatment was initiated on 11, 21 and 22(Fig 2a). Access cavity preparation was done using sterile Endo Access (Dentsply) burs and the pulp was extirpated.



Fig 1f

The root canals were filled with a thick, powdery mix of calcium hydroxide and sterile saline. Calcium hydroxide medicament was changed every 2 months within a range of 4 months and then during a subsequent visit after 2 months, root canal was obturated using gutta percha and MTA (FILLAPEX, ANGELUS) as a sealer (Fig 2b)



Fig. 2a



Fig 2b

After 6 month recall visits over a period of 4 years, the replanted teeth were found to be clinically asymptomatic with normal radiographic findings (Fig.2d).



Fig 2c





Fig 2d

## DISCUSSION

Favorable healing following an avulsion injury requires emergency intervention. Tooth avulsion considered as one of the most serious dental injuries, the prognosis of which is very much dependent on the appropriate actions taken at the place of the accident. The prerequisites for healing involves the release of a variety of signals that induce neighbor cell populations to respond by proliferation, migration or differentiation and the absence of contamination, foreign bodies and/or bacteria.<sup>1-4</sup>

Healing that takes place after an avulsion injury can be broadly classified as:<sup>5-6</sup>

### 1. Favorable Healing:

- a. Healing with a normal periodontal ligament (without root resorption)
- b. Healing with surface resorption (repair-related resorption)

### 2. Unfavorable Healing:

- a. Healing with ankylosis (replacement resorption)
- b. Healing with inflammatory resorption (infection-related resorption)

Root canal treatment is often indicated following avulsion and the ideal time to begin the treatment

has been recommended as 7-10 days post replantation.<sup>4</sup> Calcium hydroxide aggregates the largest number of desirable properties as an intracanal medicament. The biological characteristics of calcium hydroxide, represented mainly by the excellent antimicrobial potential and tissue-healing capacity, make this substance an intracanal medicament of choice. Several other medicaments have also been suggested recently and gained more acceptance in their ability to inhibit osteoclasts.<sup>4, 7, 8, 16</sup>

Gutta-percha has been used in endodontic therapy for over 100 years and still is the most widely used root canal filling material. It is a product of vegetable origin that presents low tissue toxicity, good adaptation to the root canal walls and good radiopacity.<sup>16</sup>

Several sealers have been suggested to promote root canal seal. Zinc oxide and eugenol-based sealers are the most widely used, despite the reports of periapical inflammatory response to their use. Calcium hydroxide based sealers have been suggested for obturation of replanted teeth because of the gradual and slow release of hydroxyl and calcium ions which maintains the highly alkaline environment subsequent to the placement of an intracanal medicament. The solubility of this group of sealers is still a concern.<sup>18</sup>

MTA has been developed to seal the pathways of communication between the root canal system and the external surface of the tooth. MTA is used primarily to seal lateral root perforations and as a root-end filling material. The mechanism of action of MTA has been well described by Torabinejad.<sup>7-17</sup> Karp et al., reported a case in which MTA was used as a root canal filling material in an avulsed maxillary central incisor.<sup>19</sup>

Recently, studies on the sealing ability of MTA have reported its good sealing potential and its ability to release calcium ions which encouraged the deposition of calcium phosphate crystals. This release of calcium ions dramatically increases the pH of MTA from 10.2 to 12.5, which becomes a part of its therapeutic mechanism.<sup>20</sup> Reports have also suggested that after setting, the cytotoxicity of the sealer decreases and the sealer presents suitable bioactivity to stimulate HAP crystal nucleation.<sup>21</sup>

In the present case, the teeth have been successfully replanted and obturation has been done using MTA ANGELUS (FILLAPEX) as a sealer. Four years after replantation, the tooth was asymptomatic and exhibited clinical and radiographic evidence of periodontal healing. Tooth discoloration was significant (Fig. 2c). Subsequent evaluation of the teeth revealed no signs of resorption.

Replacement resorption can be expected in such cases, hence studies on the use of a suitable material as a root filling material has to be taken into consideration. Limitations of the sealer include difficulty in retreatment or post space preparation and chances of discoloration of the crown. Taking into account the biological properties of MTA, the

material is indeed of use and its true potential as a sealer has to be further researched. Further studies are required to explore its use.

## CONCLUSION

This case report highlights that, in order to achieve favorable endodontic prognosis in replanted teeth, immediate replantation followed by the use of a biocompatible material with excellent biological properties helps save a tooth. Further research is required to validate the use of biocompatible sealers. In addition to the technical knowledge and clinical experience directed toward the quality of treatment, patient education may favourably influence the survival of replanted teeth.

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**Conflict of Interest: *None Declared***