

Intentional replantation of maxillary second molar; case report and 15-year follow-up.

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Abstract: Intentional reimplantation is a procedure in which tooth extraction is performed followed by reinsertion of the extracted tooth into its own socket after performing the desired procedure. In this article, intentional reimplantation is described and discussed as a treatment approach for aperiapical lesion that is in maxillary second molar. After 15 years, the patient was asymptomatic, the tooth was still functional and a recall intraoral periapical radiograph showed an intact periodontal ligament space and lamina dura with no evidence of gross root resorption or ankylosis.

Keywords: Intentional replantation, calcified canals, mineral trioxide aggregate

I. Introduction

Intentional replantation (IR) involves the purposeful removal of a tooth and its reinsertion into the socket after proper endodontic manipulation and repair [1,2]. Intentional replantation is a treatment option when more conventional forms of treatment either fail or are impossible [3]. Generally it is thought that it may be considered as a viable mode of treatment in certain situations to preserve the natural dentition [4].

Phillips and Pfaff describe the use of tooth replantation and recommended root end resection for long teeth, followed by root – end filling with wax or lead prior to replantation. [5] Kingsbury and Weisenbaugh reported on 151 Mandibular premolar and molar teeth that were extracted, treated, and replanted. They evaluated these teeth over a 3-year period and reported a success rate of 95%. [6] Koenig and associates reported on a study involving 192 extracted and replanted teeth. Following an evaluation period of between 6 and 51 months, they reported a success rate of 82%. [7] More recently, Bender and Rossman reported on 31 cases of extraction/replantations. They reported a success rate of 80.6% with an observation period of up to 22 years.

Grossman, in 1982, defined intentional replantation as “the act of deliberately removing a tooth and following examination, diagnosis, endodontic manipulation, and repair returning the tooth to its original socket.” [8]

At the eleventh century AD, Abulcasis described the first account of replantation and use of ligatures to splint the replanted tooth [6]. Pierre Fauchard, in 1712 [9], reported an IR, fifteen minutes after extraction. In 1768, Thomas Berdmore reported IR for mature and immature teeth [10]. In 1783, Woofendale reported IR of diseased teeth [11]. In 1778, John Hunter believed that boiling the extracted tooth prior to replantation may help to remove the tooth disease [12]. In 1890, Scheff [13] addressed the periodontal ligament (PDL) role in prognosis of replanted teeth. In 1955, Hammer [14] described the importance of leaving an intact PDL on intentionally replanted teeth. He believed that a healthy PDL is essential for reattachment and retention of replanted teeth. He stated 'an average 10 years life span could be expected when replantation was accomplished in a technically flawless manner.' In 1961, Loe and Waerhaug [15] tried to replant teeth immediately to keep the PDL vital. Resultantly, ankylosis was not seen; however, all teeth showed resorption repaired with cementum. These results have been confirmed by Deeb in 1965 [16] and Edwards in 1966 [17]. In 1968, Sherman [18] showed that normal PDL could.

Messkoub reported success rate in retaining replanted teeth vary between 52- 95%. The main reason of failure in replanted teeth is root resorption, specifically ankylosis or replacement resorption. This is directly related to the amount of time the tooth is out of the mouth during the procedure. [3]

Kratchman has given a thoroughly listed and well illustrated description of both indications and contraindications for intentional reimplantation. [19]

Dryden and Arens described the histological perspective of intentional reimplantation and included indications, contraindications, technique, and an extensive review of the literature pertaining to this subject. [20]

Mineral trioxide aggregate (MTA) has satisfactory properties, for solving many endodontic problems, including: biocompatibility, favourable sealing ability, mechanical strength and a capacity to promote periradicular tissue healing. Originally developed as a surgical root-end filling material, MTA has been used successfully in several clinical applications such as pulp capping, pulpotomy,

perforation repair treatment of traumatized teeth with immature apices and for treatment of root resorptions. [21]

However, specific **indications include:**

- A) all other endodontic non-surgical and surgical treatments have failed or are deemed impossible to perform;
- B) limited mouth opening that prevents the performance of non-surgical or peri-radicular surgical endodontic procedures;
- C) root-canal obstructions; and
- D) restorative or perforation root defects that exist in areas that are not accessible via the usual surgical approach without excessive loss of root length or alveolar bone

II. Contraindications May Include:

- A) long, curved roots;
- B) advanced periodontal diseases that have resulted in poor periodontal support and tooth mobility
- C) multi-rooted teeth with diverging roots that make extraction and reimplantation impossible; and
- D) teeth with non-restorable caries

In order to provide the best long-term prognosis for a tooth that is to be replanted intentionally, the tooth must be kept out of the socket for the shortest period possible, and the extraction of the tooth should be atraumatic to minimise damage to the cementum and the periodontal ligament [1,2,7,8]. The periodontal ligament attached to the root surface be kept moist in saline, Hank's Buffered Salt Solution (HBSS), Viaspan or Doxycycline solution for the entire time the tooth is outside the socket.

We have documented three clinical cases to exemplify the potential of intentional replantation as a viable treatment option in select endodontic [1,2].

The purpose of this article is to report case of intentional reimplantation is described and discussed as a treatment approach for periapical lesion that is in maxillary second molar. After 15 years, the patient was asymptomatic, the tooth was still functional and a recall intraoral periapical radiograph showed an intact periodontal ligament space and lamina dura with no evidence of gross root resorption or ankylosis.

III. Case Report And Clinical Procedure

A 45-year-old female patient reported to my private dental clinic with chief complaint of slight pain in the upper left back tooth region with previous dental history of root canal therapy. Periapical radiograph reveal a separated instrument and root perforation in the mid root. All efforts to remove the instrument were futile, as instrument tightly screwed into the root canal. Apical surgery was ruled out because accessibility to the mid root perforation would have been limited. We decided to replant the tooth intentionally and discussed this treatment option with the patient, who agreed to our proposal. Once we had obtained adequate anesthesia, the tooth was extracted atraumatically with an extraction forceps. We did not use surgical elevators and took care that the beaks did not go beyond the cemento-enamel junction, as this may have damaged the cementum and the periodontal ligament. (Fig. 1) (Fig. 2)

Following extraction, we kept the tooth moist by saturated gauze constantly bathed with Hanks Balanced Salt Solution. The fractured instrument is retrieved. Thereafter, the mid root perforation and root-end filling was done with mineral trioxide aggregate (MTA). The extra-buccal period lasted 20 min. The extraction socket was then irrigated with normal saline and gently suctioned to remove blood clots. The tooth was carefully reinserted into its socket and brought into occlusion with digital manipulation and patient bite force. The tooth was stabilized in its socket with a splint. The patient was re-evaluated after seven days, and splint was removed. (Fig. 3) (Fig. 4)

The following postoperative instructions were given: putting a cotton swab with chlorhexidine gluconate 0.12% over the site three times per day for 7 days. Analgesics and antibiotics were prescribed. The patient was instructed to be on a soft diet for 2 weeks. Clinico-radiographical follow-up examinations were done which revealed the patient to be asymptomatic, the tooth to be functional and a recall film showed no evidence of root resorption. The patient was recalled after 1 week for suture removal and for evaluation of the surgical site. After 2 weeks, the soft tissues appeared pink in colour with minimal inflammation and pain upon biting had diminished. After one year (Fig. 5), three years and 15- years (Fig. 6), the patient attended for evaluation and radiographs were taken of the tooth. The radiographs showed no evidence of resorption and the patient was asymptomatic (Fig. 6).

IV. Discussion

Intentional replantation is an accepted endodontic procedure in cases in which intracanal and surgical endodontic treatments are not recommended. Although not frequently used, intentional replantation is a treatment option that dentists should consider under these conditions. If the standard protocols during intentional replantation are not followed, root resorption and ankylosis may be observed within 1 month and 1–2 months,

respectively. [22,23] Most resorptive processes are diagnosed within the first 2–3 years. However, although rare, new resorptive processes could occur even after 5 or 10 years.[22]

Araujo and others demonstrated that processes including root resorption, ankylosis and new attachment formation characterized healing of a replanted root that had been extracted and deprived of vital cementoblasts. It was also demonstrated that Emdogain treatment, i.e., conditioning with ethylenediaminetetraacetic acid (EDTA) and placement of enamel matrix proteins on the detached root surface, did not interfere with the healing process.[24]

Peer reviewed cases of intentional replantation that illustrated the feasibility of the procedure for a variety of indications. Only 1 case of replantation showed evidence of pathosis, reflected by root resorption or ankylosis. His report suggests that intentional replantation is a reliable and predictable procedure and should be considered more often as a treatment method to maintain the natural dentition.[25]

Yu and others reported a case where a combined endodontic–periodontic lesion on a mandibular first molar was treated by intentional replantation and application of hydroxyapatite. Four months after the surgery, a porcelain–metal full-crown restoration was completed. At the 15-month follow-up examination, the tooth was clinically and radiographically healthy and functioned well.[26]

Shintani and others performed an intentional replantation of an immature lower incisor that had a refractory periapical lesion. The incisor was extracted and the periapical lesion was removed by curettage. The root canal of the tooth was then rapidly irrigated, and filled with a calcium hydroxide and iodoform paste, after which the tooth was fixed with an arch wire splint. Five years later, no clinical or radiographic abnormalities were found, and the root apex was obturated by an apical bridge formation.[27]

Kaufman[28] reported successful results of a maxillary molar tooth after 4 years follow-up period, which was treated with intentional replantation. A mandibular first molar, which was replanted, by Czonstkowsky and Wallace [29] had no signs of resorption and ankylosis after 6 months[14]. Different investigators reported success rates varying from % 52 to % 95 with follow-ups between 1 to 22 years in posterior teeth[2,15-17].

Bender and Rossmann(19) reported a success rate of 77.8 % in the molar teeth. Among 14 mandibular molars, success rate in first molars was 85.7%, and %71.4 in second molars. Of the four maxillary molars there were three first and one second molar with a failure of one maxillary first molar, with a 66.7% success rate[2].

Raghoobar and Vissink replanted 29 teeth consisting of 2 mandibular first, 17 mandibular second, one mandibular third and 9 maxillary second molars and evaluated for an average of 62 months. The success rate was 72 % and 25 of them were still in function[18].

Demiralp and others[31] evaluated the clinical and radiographic results of intentional replantation of periodontally involved teeth after conditioning root surfaces with tetracycline-HCl. Thirteen patients (7 women and 6 men; age range: 35–52 years) with 15 periodontally involved “hopeless” teeth were included in this study. During the replantation procedure, the affected teeth were gently extracted and granulation tissues, calculus, remaining periodontal ligament and necrotic cementum on the root surfaces were removed. Tetracycline-HCl, at a concentration of 100 mg/mL, was applied to the root surfaces for 5 minutes. The teeth were then replaced in their sockets and splinted. After 6 months, no root resorption or ankylosis was observed radiographically. Although the period of evaluation was short, the authors suggest that intentional replantation can be an alternative approach to extraction in cases where advanced periodontal destruction is present and no other treatment can be considered.[31]

Al-Hezaimi and others treated a radicular groove, which predisposed a 15-year-old girl to a severe periodontal defect, with a combination of endodontic, intentional replantation and Emdogain therapy. At 1-year follow-up, the patient was comfortable and active healing was evident.[32]

Aqrabawi evaluated 2 cases of intentional replantation and retrograde filling of mandibular second molars. At the 5-year recall visit, radiographs showed no evidence of pathologic changes.[33]

Majorana and others(followed 45 cases of dental trauma for 5 years, recording complications and responses to treatment. Root resorption was observed in 45 cases (17.24%); of these, 9 were associated with luxation injury (20%) and 36 (80%) with avulsion. The authors identified 30 cases of inflammatory root resorption (18 transient and 12 progressive) and 15 cases of ankylosis and osseous replacement.[34]

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The success or failure of the intentional replantation depends on vitality of PDL cells. These cells can be kept vital while the tooth is out of the socket by keeping the tooth moist and in aseptic condition. The extraoral time is crucial which should be limited to 20 - 30 minutes. Proper planning and team work is the key.[36]

Some factors influencing the periodontal healing includes:

1. The extra-alveolar time: This is probably the most important factor that should be considered. Thirty minutes appears to be the maximum time limit. More extraoral time can increase the possibility of root resorption.[1,2,36]
2. Presence of preoperative radiolucency: Teeth with radiolucency are more inclined to healing without root resorption, which may be due to the facility of the extraction of teeth with apical radiolucency which results in less damage of the root. [37]
3. Patient's age: Inflammatory resorption is more frequent in the age group of 10 to 30 years than in older age patients, which may be due to the wider dentinal tubules in younger patients. [1,36]
4. Root end filling: Replantation of teeth sealed by a filling material seems to be more successful than replantation without root canal filling.
5. Care should be taken to minimally manipulate the root surfaces: Replanting teeth with the intact PDL attached encourages periodontal remodelling and inhibits ankylosis and root resorption. After two weeks, the PDL has two-thirds of its original adhesion. [36,37,38]

Filippi et al. investigated the outcome of intentional replantation using resection of the ankylosed sites and observed that such treatment following intentional replantation prevents or delays the recurrence of ankylosis in 7 of 15 teeth.[39]

Tang et al. successfully, treated a case of intentional replantation of a mandibular molar that had severe periodontal destruction resulting from iatrogenic perforation of the furcation and suggested the possibility of a successful surgical technique for the otherwise hopeless condition.[4]

In another case report, Filho et al. concluded that intentional replantation could be indicated correctly as an alternative treatment for cases, in which conservative endodontic therapy or surgical technique cannot be performed.[40]

Various studies advocate the filling of the root canal after repair of the perforation defect. On the other hand, Hsien et al. had repaired an iatrogenic root perforation with MTA after root canal filling had been completed .[41]

Experimental studies of Loe H and Waerhaug shows if the tooth is replanted just after extraction, maintaining the vitality of periodontal ligament, ankylosis and resorption do not occur [15]. Nasjleti et. al. reported that resorption and ankylosis were not observed in intentional replanted teeth in monkeys in 3 weeks to 4 months time [42].

In the case we described, the patient came to the clinic presenting an unsatisfactory endodontic treatment, chronic pain, and sensitivity to percussion and palpation. Intentional replantation was chosen as the treatment option on the basis of the clinical indication and the patient's refusal to undergo a periapical surgery. The long-term follow-up confirmed the successful management of the case. The above description indicates that there is a relation between tissue repair and age. It means repair is better in early age than older age.

V. Conclusion

Intentional replantation is not frequently the treatment of choice. However, in cases where a dental implant, nonsurgical retreatment or surgical treatment is not possible, intentional replantation may be a viable treatment option. This case presented some characteristics that required intentional replantation and the follow-up result suggested that the technique applied represented a viable treatment option.

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Legendes

Fig. 1; Initial RCT completed.



Fig. 2; Sinus tract persists



Fig. 3; Non-surgical retx completed and symptoms persist

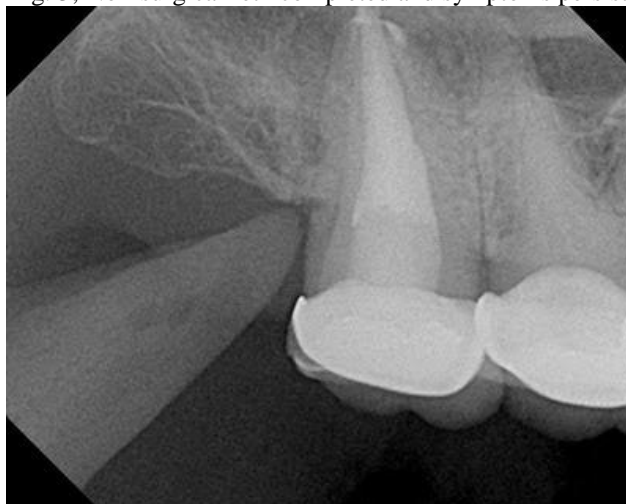


Fig. 4; Atraumatic extraction, immediate resection

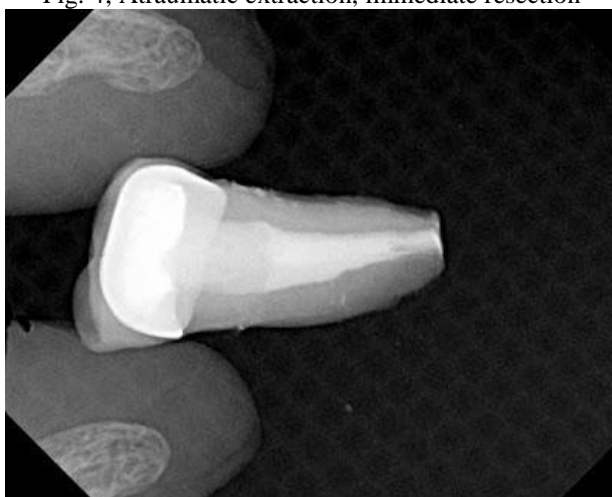


Fig. 5; Replantation completed



Fig. 6; Tooth asymptomatic and completely functional. **15-year follow-up**

