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Tooth Autotransplantation of A Mandibular Third Molar Followed by Delayed Root Canal Treatment to Manage External Inflammatory Resorption: A Case Report

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Abstract

Tooth autotransplantation (TA) is indicated in cases of structurally compromised teeth with poor prognosis when a donor tooth is available. This case report describes the TA of a mandibular right third molar (48) into the position of the mandibular right second molar (47) in a 32-year-old male patient. Clinically, extensive coronal destruction and a sinus tract were observed in tooth 47, rendering retreatment unfavorable. The tooth was diagnosed as previously treated, with a chronic apical abscess. Therefore, tooth 48 was autotransplanted into the 47 position. Four months later, apical external inflammatory root resorption was observed. However, root canal treatment was performed one year after TA because the patient did not adhere to follow-up recommendations. After two years, the tooth remained asymptomatic, with no signs of periapical lesions or periodontal changes. In conclusion, TA may serve as a viable strategy for replacing structurally compromised permanent molars, thereby preserving the function of the natural dentition.

Keywords: Autotransplantation; Endodontics; Oral surgery; Tooth replantation

Introduction

Tooth autotransplantation (TA) is a viable surgical option in cases of tooth loss or when teeth are indicated for extraction [1-4]. The goal of TA is to replace a structurally compromised tooth with a donor tooth that retains healthy dental tissues. However, careful planning is required for successful execution of the procedure [2].

For a TA to be successful, certain criteria must be met: there should be a tooth with an unfavorable prognosis that can be replaced by a donor tooth, which should be easily extracted [2, 5]. Additionally, TA may offer several advantages over other treatment modalities such as dental implants, bridges, or removable dentures, particularly in terms of treatment duration, cost, aesthetics, preservation of the native dental structure, and biological compatibility [2]. However, despite these potential benefits, TA has not yet been widely adopted in routine clinical practice, primarily due to variable success rates, the complexity of the procedure, and the limited availability of suitable donor teeth[6, 7]. The impact of age on treatment outcomes has also been a topic of debate; some studies suggest that TA may be more effectively performed in patients under 30 years of age [2], or under 45 years of age [8]. Regardless, conservative alternatives are generally preferred over extraction [9], as well as the patient's preference choice [10].

The primary complications following TA are loss of periodontal attachment, ankylosis, and root resorption [11]. External root resorption affects the outer root surface and can be classified into five types: surface, inflammatory, cervical, replacement, and transient apical breakdown [12]. Inadequate management of root resorption adversely affects the prognosis of the affected tooth and may ultimately lead to extraction [12]. When root canal treatment is not performed within the first two weeks, the risk of root resorption increases because of infection spread [11]. This case report describes the management of a mandibular third molar TA followed by delayed root canal treatment to address external inflammatory root resorption.

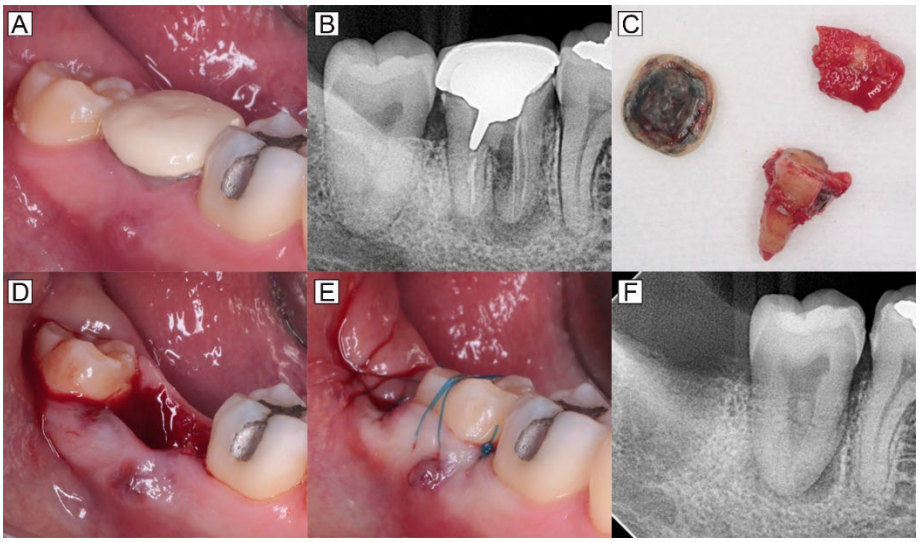

Figure 1. *A*) Clinical photograph showing a sinus tract; *B*) Initial periapical radiograph; *C*) Extracted tooth 47; *D*) Prepared recipient socket; *E*) Autotransplantation of tooth 48; *F*) Postoperative periapical radiograph

Case Presentation

A 32-year-old male patient with no relevant systemic conditions presented for a general dental evaluation. Clinically, tooth 47 exhibited a deteriorated porcelain-fused-to-metal crown and a sinus tract (Fig. 1A). Radiographically, apical periodontitis extending toward the furcation was observed (Fig. 1B). The tooth was diagnosed as "previously treated" and associated with a "chronic apical abscess". Treatment options were discussed with the patient, and TA was proposed because of the favorable root morphology of tooth 47, namely, the absence of curvatures that could complicate extraction. Additionally, tooth 48 was fully developed, with a diagnosis of "normal pulp" and "normal periapical tissues." Therefore, the TA of tooth 48 into the alveolar socket of tooth 47 was planned.

Following local anesthesia with 2% lidocaine and epinephrine (1:80,000), tooth 47 was extracted (Fig. 1C) and kept in gauze moistened with saline for 12 minutes before TA. The recipient socket was prepared using a 3.4 mm implant drill (Arcsys Surgical Implant Drill System, FGM, Joinville, SC, Brazil) operated at 800 rpm and 40 Ncm torque. A copious saline irrigation was used during drilling to mitigate heat. A gentle alveolar curettage was subsequently performed under copious saline irrigation (Fig. 1D). Tooth 48 was extracted using spurless forceps wrapped in sterile gauze moistened with saline solution and positioned in infra-occlusion. After transplantation, splinting was performed using 4-0 nylon sutures (Figs. 1E & 1F).

After 30 days, soft tissue adaptation was observed (Fig. 2A), and root canal treatment was scheduled; however, the patient failed to return for follow-up. Four months later, the patient returned, and radiographic examination revealed apical periodontitis and inflammatory external root resorption in the apical region (Fig. 2B). Although root canal treatment was indicated, the patient was uncooperative and chose to postpone the procedure. One year after transplantation, radiographic evidence showed progression of structural loss (Fig. 2C). At that point, root canal treatment was finally performed.

Instrumentation was performed using the Reciproc Blue system (VDW, Munich, Germany) up to the R50 file, with irrigation using 4.25% sodium hypochlorite. The preparation was complemented with hand files up to a K-type #80 (Dentsply Maillefer, Ballaigues, Switzerland). Calcium hydroxide (Ultracal, Ultradent, South Jordan, UT, USA) was applied as an intracanal medicament for 15 days. A provisional restoration was placed using Teflon as a base and temporary resin (Temp-it, Spident, Incheon, South Korea). After 15 days, an apical plug was created using bioceramic cement (MTA Angelus, Angelus, Londrina, PR, Brazil), followed by continuous wave condensation (Fast Pack and Fast Fill, Eighteeth, Changzhou, China). The final restoration was completed using fiber-reinforced composite resin (Ever X Posterior, GC, Tokyo, Japan) and nanohybrid resin (Palfique LX5, Tokuyama Dental, Tokyo, Japan).

At the two-year follow-up, the tooth remained asymptomatic with normal masticatory function, no pocket depth on probing (2–3 mm, with no sites exceeding 4 mm), no gingival recession or loss of attachment (Figs. 2D & 2E). Tooth mobility was classified as Miller's 0. Tomographic evaluation revealed no signs of apical periodontitis and confirmed that root resorption had ceased (Figs. 3A–3E). Additionally, the patient reported high satisfaction with both the functional and esthetic results.

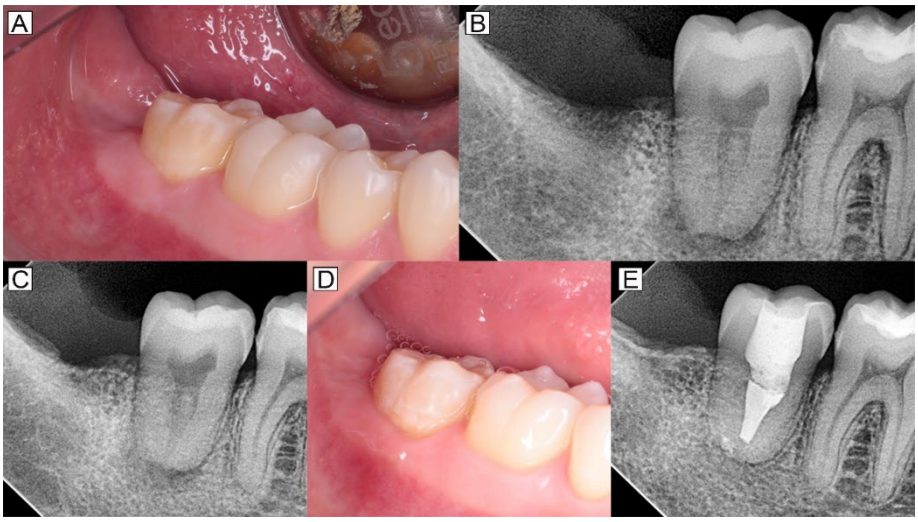

Figure 2. *A*) Clinical photograph one month after autotransplantation; *B*) Periapical radiograph at four months, showing slight inflammatory external root resorption in the apical third; *C*) Periapical radiograph at one year showing progression of resorption; *D*) Clinical photograph at two-year follow-up; *E*) Periapical radiograph at two-year follow-up

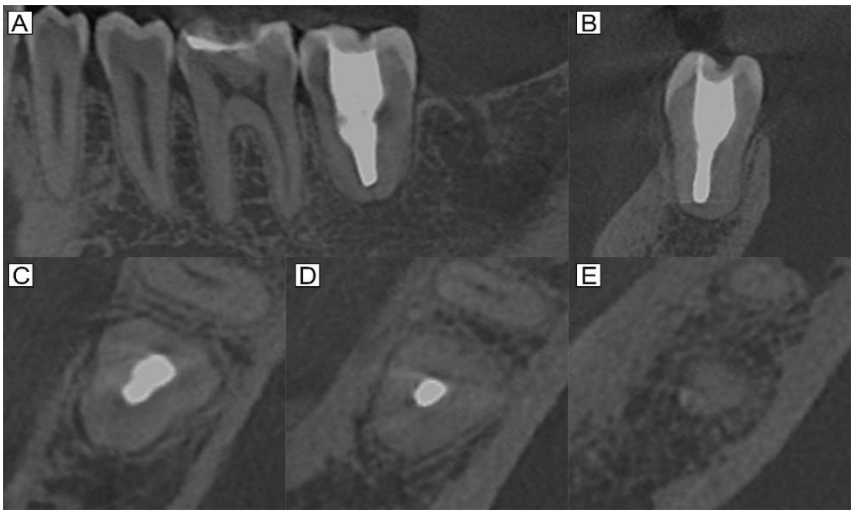

Figure 3. Tomographic sections two years after autotransplantation, showing healthy periapical tissues.; *A*) Sagittal section; *B*) Coronal section; *C*) Axial section of the coronal third; *D*) Axial section of the middle third; *E*) Axial section of the apical third.

Discussion

TA enables the replacement of a tooth indicated for extraction with another tooth that retains structural integrity [1, 2, 6, 13]. Patient satisfaction following TA has been reported to range from 90% to 100%, even in unsuccessful cases, since many patients value the effort to preserve their natural dentition [6, 14, 15].

It is important to emphasize that when initial endodontic treatment fails (in this case, tooth 47), non-surgical retreatment is prioritized over a surgical approach [9]. In the present case report, considering that the condition of tooth 47 was unfavorable and the condition of tooth 48 was favorable, TA was chosen. Surgical approaches such as TA are often recommended over extraction and dental implants [9]. The rationale is based on several reasons. First, although the evidence regarding the survival rate of dental implants is high (94.6%) [16], TA has a survival rate of 98% and 90.5% at 1 and 5 years of follow-up, respectively [17]. Furthermore, TA uses the patient's own tissue, which can improve biological acceptability and reduce the risk of rejection [2], and it provides periodontal ligament support instead of the osseointegration that occurs with a dental implant [5]. In terms of cost-effectiveness, TA is less expensive compared to dental implants [15].

TA can be performed at any stage of root development that is, in teeth with either complete or incomplete root formation [15, 18]. The favorable prognosis for TA depends on factors such as patient age (being better in those under 45 years old), extraoral

time of less than 15 minutes, and maxillary donor tooth [8]. In this case report, two of the three criteria were met: the patient was 32 years old, and the extraoral time was 12 minutes. A mandibular donor tooth is usually associated with lower survival rates due to extraction difficulties [8]. However, in the present case report, the donor tooth (48) was easy to extract, thus maximizing the survival of periodontal ligament cells [19].

It has been noted that fewer complications are associated with greater long-term success in autotransplanted teeth. The most common complications related to TA include inflammatory root resorption, ankylosis, pulp necrosis, lack of periodontal healing, and reduction of final root length [11, 19]. In mature permanent teeth, small amounts of pulp may have leaked through the apical foramen or lateral canals, which, if not addressed promptly, can lead to pulp necrosis and external root resorption [20], as occurred in this case. External root resorption has been reported in approximately 8% of cases, most frequently within the first three years following TA [11, 21]. In contrast, the prevalence of internal root resorption in autotransplanted teeth has been reported to be 1.1% [21]. Nevertheless, root resorption may either arrest or progress slowly, thereby extending the survival time of the transplanted tooth [18]. The patient's lack of cooperation negatively impacted the treatment, as the necessary clinical and radiographic tests to assess the case's progression could not be performed. This inattention contributed to the development of apical periodontitis and inflammatory external root resorption in the apical region.

The biological principles of TA involving teeth with complete root development emphasize the importance of periodontal ligament cells, since bone formation and the healing of surrounding tissues depend on them [22]. To reduce the risk of failure in cases involving complete root formation, the extraction of the donor tooth should be as atraumatic as possible to preserve the periodontal ligament and minimize the risk of complications [23]. In the present case, inflammatory external root resorption was observed after four months (Fig. 2B), with further progression after one year (Fig. 2C). Inflammatory external resorption is a common consequence of dental trauma and is typically caused by bacterial contamination. Root canal treatment should be performed as early as possible, since bacterial reduction may arrest resorption. If left untreated, root resorption can result in significant structural loss [12].

It has been suggested that endodontic treatment should be performed within 2 to 4 weeks following TA [1, 13, 23, 24]. In the present case, endodontic treatment was performed one year after the TA because the patient did not comply with the clinical and radiographic follow-up. When the patient eventually returned, the autotransplanted tooth exhibited signs of resorption, which ceased following delayed root canal treatment. This was a limitation of the management in the present case report, as the clinical guidelines were not followed, and necrotic pulp led to apical periodontitis and inflammatory external root resorption in the apical region [3]. A previous study showed that success can decrease to as low as 28% when root canal treatment is not performed [20]. However, although such factors affect the prognosis, they did not contraindicate root canal treatment [25], thus avoiding extraction. This highlights the importance of routine clinical and radiographic follow-up to enable early detection of complications and timely intervention [21].

Tsukiboshi *et al.* [18] reported a case series that included a TA of an ectopic tooth into the alveolus of an upper second premolar. In that case, inflammatory external resorption was detected after two months. The authors reported that they performed the management of the case in two sessions using calcium hydroxide as an intracanal medication. Similarly, in the present case, inflammatory external resorption was noted four months after TA, which led to delayed root canal treatment. Calcium hydroxide was likewise used. This case report highlights the need for early endodontic treatment when performing TA, which can prevent future complications such as inflammatory external root resorption.

Conclusions

TA is an effective treatment option for preserving tooth function in cases where extraction or dental implants appear to be the only viable alternatives. Its success depends on careful planning, precise execution, and consistent clinical follow-up. Complications such as root resorption or ankylosis may develop over time, underscoring the importance of regular follow-up and early intervention.

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Authors' contributions
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