



Lower Third-molar Autotransplantation with Intraoperative Root-end Resection and CEM Cement Placement to Replace a Non-restorable Second Molar: An 18-month Case Report

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Abstract

This case report describes the successful autotransplantation of a mandibular third molar to replace a non-restorable mandibular second molar in a 21-year-old female patient. The donor tooth was atraumatically extracted and immediately transplanted into the prepared recipient socket following extraction of the severely carious second molar. Clinical and radiographic evaluations were performed over an 18-month follow-up period. The transplanted tooth remained asymptomatic, functionally stable, and demonstrated physiological mobility, healthy periodontal tissues, and normal occlusion. Radiographic examination revealed normal periodontal ligament space, intact lamina dura, satisfactory periapical healing, and no evidence of root resorption or ankylosis. The procedure provided predictable functional and esthetic outcomes while preserving the periodontal ligament, reducing treatment time, and maintaining alveolar bone architecture. This case suggests that tooth autotransplantation may represent a reliable and cost-effective treatment option for replacing non-restorable teeth in appropriately selected patients.

Keywords: Autotransplantation; Endodontic Treatment; Mandibular Third Molar; Non-restorable Tooth; Oral surgery; Second Molar

Introduction

Autotransplantation is the surgical transfer of a tooth from one site to another within the same patient. Unlike prosthetic replacement, the transplanted tooth retains a periodontal ligament and, when healing is favorable, can preserve proprioception and alveolar bone while restoring function. Contemporary systematic reviews support high survival rates across several clinical indications, including transplantation of teeth with advanced or complete root formation, although ankylosis and inflammatory root resorption remain important complications [1-4].

Mandibular third molars are particularly relevant donor teeth when an adjacent first or second molar is hopeless and a donor of compatible size and morphology is available. The prognosis is influenced by atraumatic donor extraction, preservation of periodontal ligament cells, limited extraoral manipulation, recipient-site compatibility, stabilization strategy, and appropriate endodontic management when pulpal healing is unlikely [3-6].

The present case is notable because the donor third molar underwent extraoral root-end resection and calcium-enriched mixture (CEM) cement root-end filling immediately before transplantation. CEM has been used as a root-end filling/sealing biomaterial in endodontic surgery and intentional replantation, and a previous mandibular third-molar autotransplantation case also reported CEM root-end management [7-9]. This report describes the surgical-endodontic sequence and 18-month clinical and radiographic outcome, with emphasis on the rationale and limitations of extrapolating from a single case.

Case Presentation

Patient information and clinical findings

A 21-year-old woman with no significant systemic disease, known allergy, or regular medication use was referred to the Department of Endodontics, Zahedan University of Medical Sciences and Health Services, because of pain and discomfort from the left mandibular second molar during mastication. There was no facial





Figure 1. A) Preoperative intraoral view of the left mandibular second molar demonstrating extensive coronal destruction; B) Preoperative periapical radiograph of the left mandibular second molar showing extensive destruction of the tooth structure, condensing osteitis in the periapex, and an adjacent unerupted third molar; C) Panoramic radiograph showing the donor third molar and surrounding dentition

swelling or regional lymphadenopathy. Intraoral examination showed extensive coronal destruction of the left mandibular second molar without sinus tract, soft-tissue swelling, or discoloration (Fig. 1A).

The affected second molar did not respond to cold, heat, or electric pulp testing and produced an altered sensation on percussion. Palpation and mobility were within normal limits. Contralateral and opposing control teeth responded normally to sensibility testing. The pulpal diagnosis was pulp necrosis, and the associated periapical radiopaque change was diagnosed as condensing osteitis.

Periapical and panoramic radiographs demonstrated extensive destruction of the second molar and an unerupted ipsilateral mandibular third molar with advanced root development and anatomy judged clinically compatible with the recipient site (Figs. 1B & 1C). On the basis of the remaining coronal structure and the clinical-radiographic assessment, the second molar was considered non-restorable. Autotransplantation of the third molar to the second-molar site was selected after discussion of treatment alternatives and informed consent.

Therapeutic intervention

After treatment planning and written informed consent, the patient rinsed with 0.2% chlorhexidine gluconate. Local anesthesia was obtained with an inferior alveolar nerve block using 1.8 mL of 2% lidocaine with 1:80,000 epinephrine. The donor third molar was extracted atraumatically and immediately placed in Hank's Balanced Salt Solution to minimize periodontal-ligament dehydration [10]. The non-restorable second molar was then carefully extracted.

Extraorally, the apical portion of the donor root was resected using a high-speed diamond fissure bur under continuous water irrigation and magnification with a dental operating microscope. CEM cement (BioniqueDent, Tehran, Iran) was inserted at the resected root end to provide apical sealing. The donor tooth was then seated in the second-molar socket. Total extraoral time was approximately 6 min. A 0.7-mm orthodontic wire splint was bonded to the adjacent first molar, and occlusal contacts were checked and relieved as necessary (Fig. 2). The patient was instructed to maintain a soft diet and careful oral hygiene. The clinical sequence of treatment and follow-up is summarized in Table 1.

Table 1. Clinical timeline of autotransplantation, endodontic management, and follow-up

Time point	Clinical event	Key findings/management
Baseline	Assessment of symptomatic mandibular second molar	Pulp necrosis; condensing osteitis; extensive coronal destruction; adjacent unerupted third molar selected as donor.
Day 0	Autotransplantation	Donor extracted atraumatically and stored in HBSS; recipient second molar extracted; root-end resection and CEM placement performed; donor transplanted; the total extraoral time was ~6 min; orthodontic wire splint placed.
Postoperative day 1	Early review	Healing was uneventful; oral-hygiene and soft-diet instructions reinforced.
2 weeks	Splint removal/endodontic treatment initiated	No abnormal mobility. Tooth did not respond to sensibility testing. Root canal treatment initiated; 5.25% NaOCl irrigation and calcium hydroxide intracanal medication used.
4 weeks	Endodontic treatment completed	Calcium hydroxide removed; canals obturated with gutta-percha by lateral condensation with EndoSeal MTA sealer; permanent amalgam restoration placed.
12 months	Follow-up	A functional, stable, and asymptomatic tooth, with no clinical or radiographic evidence of resorption, ankylosis, or periapical pathosis.
18 months	Final reported follow-up	Physiological mobility, normal probing depths and occlusion, intact lamina dura and periodontal ligament space, no external root resorption or ankylosis; patient was satisfied with function and appearance.



Figure 2. Immediate transplantation stage; A) Periapical radiograph after transplantation showing the donor third molar positioned in the second-molar site following apical root-end filling with CEM cement; B) Immediate postoperative intraoral photograph showing stabilization with orthodontic wire

At the first postoperative-day review, healing was uneventful. Two weeks later, the splint was removed; the transplanted tooth showed no abnormal mobility but did not respond to pulp sensibility testing. Nonsurgical root canal treatment was initiated. Irrigation was performed with 5.25% sodium hypochlorite delivered through a 30-gauge needle, and calcium hydroxide mixed with normal saline was placed as an intracanal medicament. Two weeks later, the medicament was removed, the canal system was obturated with gutta-percha using lateral condensation and EndoSeal MTA sealer (MARUCHI, Wonju, Republic of Korea), and a permanent amalgam restoration was placed (Fig. 3).

Follow-up and outcomes

Clinical and radiographic reviews were performed at 12 and 18 months. At both visits, the transplanted tooth was functional, stable, and asymptomatic. At 18 months, mobility was physiological, periodontal probing did not reveal pathologic pocketing, the tooth was in functional occlusion, and the patient reported satisfaction with both function and appearance.

Periapical radiography demonstrated an intact lamina dura, a continuous periodontal ligament space, and normal adjacent alveolar bone. No radiographic evidence of inflammatory external root resorption, replacement resorption/ ankylosis, or new periapical pathosis was identified (Fig. 4). No adverse or unanticipated events were recorded during the reported follow-up period.

Patient perspective

At the 18-month review, the patient reported that the transplanted tooth was comfortable during chewing and that she was satisfied with the functional and esthetic outcome of treatment.



Figure 3. Post-endodontic periapical radiograph after completion of root canal treatment and definitive coronal restoration

Discussion

This case documents replacement of a non-restorable mandibular second molar with the patient's own unerupted third molar and, more specifically, an uncommon combined surgical-endodontic strategy in which the donor root-end was resected/prepared/filled/sealed with CEM cement before transplantation. At 18 months, the tooth remained functional with no clinical or radiographic evidence of inflammatory resorption or ankylosis. The outcome should be interpreted as an observation from a single patient rather than evidence that the combined protocol is superior to conventional autotransplantation.

Current evidence supports autotransplantation as a viable biologic tooth-replacement option in appropriately selected patients. Recent meta-analyses report high short-term survival across indications and suggest that donor root-development stage alone does not preclude a favorable outcome [1, 2]. For third molars with complete root formation, a meta-analysis of 759 transplanted teeth reported favorable survival, while also identifying root resorption and ankylosis as clinically important complications [3]. Earlier evidence likewise found favorable outcomes for teeth with complete root formation but emphasized the influence of splinting, endodontic management, donor morphology, and preservation of periodontal tissues [4]. Case reports further illustrate both successful third-molar replacement of hopeless molars and the potential for external inflammatory resorption requiring delayed endodontic treatment [7, 11, 12].

The surgical sequence in the present case was intended to minimize periodontal-ligament injury. The donor was extracted atraumatically, stored in HBSS, and returned to the oral environment after an extraoral interval of approximately 6 min. Short extraoral handling and preservation of root-surface viability are biologically plausible contributors to periodontal healing. The 2-week stabilization period is also consistent with approaches intended to provide initial stability without prolonged rigid immobilization [4, 6].

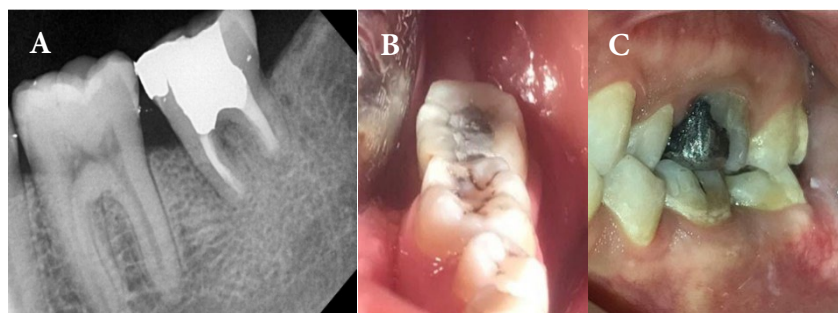


Figure 4. Eighteen-month follow-up: A) Periapical radiograph showing maintained periodontal ligament space and surrounding bone with no evident external root resorption or ankylosis; B, C) Clinical views demonstrating the transplanted tooth in function

Endodontic management of transplanted teeth with advanced or complete root formation remains an area of practice variation. Historically, early postoperative root canal treatment has been advocated to reduce infection-related resorption in mature donor teeth [4, 6]. A systematic review of 24 studies found no clear difference in overall survival or success among postoperative prophylactic, intraoperative, and observation-based RCT strategies, although postoperative prophylactic treatment showed the lowest pooled root-resorption rate [5]. A recent case report also demonstrates that delayed endodontic intervention may become necessary when external inflammatory resorption develops after third-molar autotransplantation [12]. Accordingly, the absence of a sensibility response at 2 weeks in the present case should not, by itself, be interpreted as definitive proof of pulpal necrosis; rather, the RCT timing is best understood as part of a postoperative endodontic management strategy in a donor tooth with advanced root development.

The intraoperative root-end procedure is the most distinctive element of this case. CEM cement has been used clinically as a root-end filling biomaterial in periradicular surgery and intentional replantation [8, 9]. Also, laboratory studies have examined CEM cement under root-end and apically resected conditions, including dye- and bacterial-leakage models [13-15]. Scanning electron microscopy and energy-dispersive X-ray microanalysis have also been used to characterize the surface morphology and elemental distribution of MTA/CEM cement [16, 17]. Beyond these material-level data, CEM has demonstrated acceptable biocompatibility in experimental studies and has been associated with favourable clinical outcomes across pulp-preservation and apical applications [18-22]. These material-level findings support characterization of CEM as an apical biomaterial but do not establish clinical superiority. A directly relevant prior report described transplantation of a mature mandibular third molar with CEM root-end filling and favorable 2-year healing [7]. Nevertheless, evidence for routine root-end resection and CEM placement during autotransplantation remains limited, largely to case-based experience. The favorable outcome observed here

therefore supports feasibility in this specific clinical context, not a general indication for routine apical resection of donor teeth.

The case also illustrates the value of structured longitudinal surveillance. Autotransplantation complications may include inflammatory root resorption, replacement resorption/ankylosis, periodontal breakdown, and eventual tooth loss. Recent reviews emphasize that survival decreases with longer observation and that root resorption remains a major reason for failure [1, 23, 24]. The 18-month findings in this patient are therefore encouraging but should be considered an intermediate rather than definitive long-term outcome.

The principal limitations are the single-case design, 18-month follow-up, and reliance on two-dimensional radiographs. In addition, the independent contribution of the root-end procedure, CEM placement, short extraoral time, splinting protocol, and subsequent root canal treatment cannot be separated. Longer follow-up with standardized periodontal and radiographic assessments is required to determine whether the present favorable outcome is maintained.

Conclusion

Autotransplantation of an ipsilateral mandibular third molar provided functional replacement of a non-restorable second molar in this 21-year-old patient. Intraoperative root-end resection with CEM cement placement, short extraoral handling, short-term splinting, and subsequent root canal treatment were followed by favorable periodontal and radiographic findings at 18 months. This case supports autotransplantation as a tooth-preserving option in carefully selected patients and highlights the need for long-term monitoring for resorption and ankylosis.

Ethical Considerations

Ethics Approval: The case report was approved by the Ethics Committee of Zahedan University of Medical Sciences (Approval No. IR.ZAUMS.REC.1404.351).

Informed Consent: Written informed consent was obtained from the patient for publication of the case report, including anonymized clinical information and images.

Acknowledgment

None.

Conflict of Interest

None.

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None.

Author contributions

Conceptualization: AK/TA, Methodology: TA; Formal analysis and investigation: AK/TA, Writing original draft: AK/TA; Writing review and editing: AK/TA; Supervision: AK. All authors read and approved the final manuscript.

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