

Autotransplantation of a Fully Developed Third Molar Using Root-end CEM Filling to Replace a Maxillary First Molar with Vertical Root Fracture: A 3-Year Case Report

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ABSTRACT

Autogenous tooth transplantation (ATT) preserves the periodontal ligament (PDL) and alveolar remodeling. This case report describes the 3-year outcome of ATT using a fully developed maxillary third molar to replace a non-restorable maxillary first molar (#26) with vertical root fracture (VRF) and a large endodontic-periodontic lesion. A 41-year-old female with a hypererupted, caries-free maxillary left third molar (#28) presented with grade III mobility and deep probing depths on tooth #26. After atraumatic extraction of #26 and careful PDL-sparing extraction of #28, the donor tooth underwent extraoral root-end resection (1 mm), 3-mm retrograde cavity preparation, and obturation with calcium-enriched mixture (CEM) cement. Total extraoral time was 9 minutes (extraction: 2 min; preparation/filling: 5 min; moistening: 2 min). The recipient socket was larger than the donor root, providing no primary stability. The tooth was seated 0.5 mm infraocclusion and retained only with crossed silk sutures. The patient was instructed on a soft-diet protocol (for 1 month) and to avoid chewing on the transplanted tooth. Clinically, at 3-year recall, the tooth was functional/asymptomatic with normal mobility and probing depths <3mm. Radiographically, bone healing and no root resorption/ankylosis were evident at the same recall. ATT of a mature molar with root-end filling/sealing with CEM, thorough extraoral moisture control, and soft tissue suture-only retention, achieved long-term stability/function. This biologically driven surgical approach needs validation through large sample clinical trials.

Keywords: Calcium-enriched mixture; Endodontic biomaterials; Mineral trioxide aggregate; Periodontal ligament; Tooth autotransplantation; Tooth resorption

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INTRODUCTION

Vertical root fractures (VRF) usually lead to combined endodontic and periodontal breakdown and tooth extraction [1]. Autogenous tooth transplantation (ATT) effectively preserves the periodontal ligament (PDL), maintains natural proprioception, and maintains alveolar bone remodeling [2]. While ATT is traditionally preferred for immature teeth, advancements in surgical techniques/biomaterials have significantly improved success rates even for mature donor teeth, including wisdom teeth [3, 4].

Current surgical protocols emphasize atraumatic extraction, accurate socket preservation, minimal handling of root(s), short extraoral times, and the use of bioactive root-end fillings/sealing with calcium silicate-based cements (CSCs) such as ProRoot mineral trioxide aggregate (MTA) or calcium-enriched mixture (CEM) cement [5]. Utilizing CSCs for root-end filling/sealing provides a hermetic apical seal, excellent biocompatibility, and promotes periodontal regeneration and cementogenesis [6, 7]. This CARE-compliant case report presents a 3-year clinical and radiographic follow-up of autotransplantation of a mature wisdom tooth into a first molar site affected by VRF.

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CASE PRESENTATION

Patient information: A 41-year-old woman with no significant medical history reported ongoing discomfort in her upper left molars.

Clinical findings: Maxillary left first molar (tooth #26) had grade III mobility, probing depths > 6 mm buccally, and inflamed gingiva. The crown was structurally compromised, suggesting VRF. The maxillary right third molar (#28) was hypererupted and without caries/opposing tooth.

Diagnostic assessment: Panoramic radiograph (Figure 1A) showed a wraparound lucent lesion consistent with VRF of tooth #26 and a large periradicular/furcation radiolucency. The wisdom tooth exhibited a mature apex and intact PDL. Periapical radiograph (Figure 1B) confirmed a fracture line in the mesial aspect of the palatal root and extensive bone destruction, diagnosing tooth #26 as non-restorable.

Therapeutic intervention: After discussing implant/fixd prosthodontics, the patient elected ATT. Under local anesthesia, tooth #26 was atraumatically extracted. The donor #28 was then extracted with care to protect the PDL (touching only the crown). The donor had a conical fused root with a single apical foramen. Root-end resection (≈ 1 mm) was done using a high-speed handpiece with a sterile fissure bur under irrigation. The root-end cavity (≈ 3 mm) was dried with paper points and filled/sealed with CEM cement (BioniqueDent, Tehran, Iran). Total extraoral time: 9 minutes (extraction: 2 min; root-end prep and fill: 5 min; handling/moistening: 2 min). During this period, the tooth was wrapped in saline-moistened gauze and kept moist with saline irrigation every 2-3 minutes. The recipient socket was irrigated with sterile saline. The donor tooth was carefully seated into the socket with attention to three-dimensional alignment. The tooth was retained using crossed soft-tissue silk sutures (no rigid splint) as primary stability was lacking; the tooth was kept 0.5 mm infraocclusion (Figure 1C)[8, 9].

Follow-up and outcomes: The patient was prescribed painkillers and a 4-week soft diet with no chewing on the transplant. Follow-up was carried out at 1 week, 1 month, 6 months, and annually thereafter. Clinically, the transplanted tooth remained asymptomatic/functional with physiological mobility and probing depths < 3 mm. Two-year radiograph (Figure 1D) demonstrated considerable bone healing, normal PDL, and no inflammatory/replacement resorption. At three-year follow-up, the transplanted tooth showed a stable bone level slightly apical to the Cementoenamel junction, which was attributed to residual defect from the original VRF lesion rather than active pathology. No progressive bone loss, resorption, or ankylosis was observed (Figure 1E).

DISCUSSION

This case confirms that ATT of a mature wisdom tooth can achieve long-term success with careful case selection, atraumatic technique (including minimal manipulation of the donor tooth root surface, preservation of PDL, and avoidance of drying), and short extraoral time (9 minutes) [7, 10]. Research indicates that PDL cell survival decreases suddenly after tooth extraction; thus, our short extraoral time and continuous moistening were crucial to preventing related complications such as resorption/ankylosis.

Postoperative occlusal management followed established protocols. The transplanted tooth was maintained 0.5 mm out of occlusion, with avoidance of chewing for approximately one month, followed by gradual functional loading. Previous

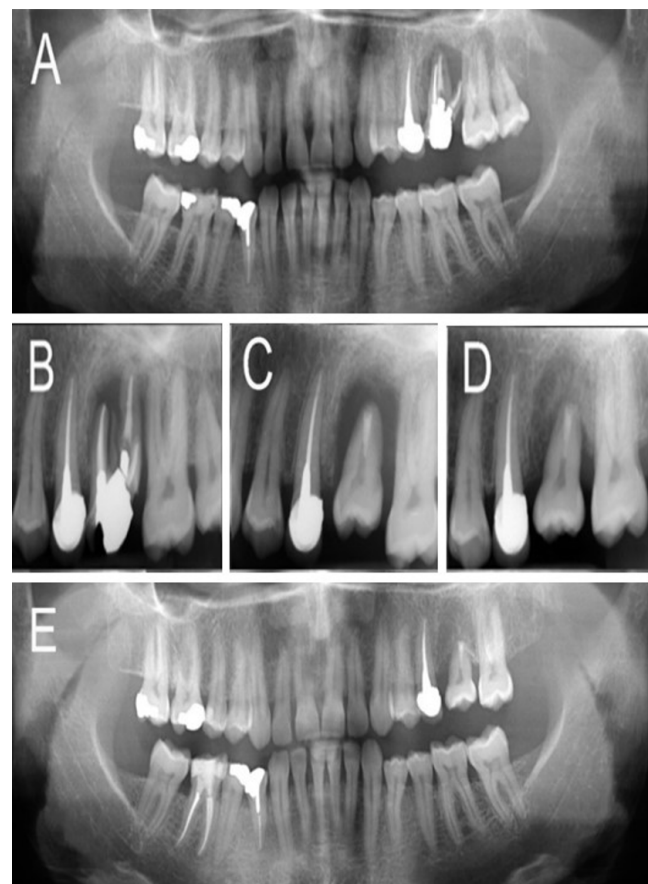


Figure 1. Sequential radiographic documentation of the autogenous tooth transplantation (ATT) case. A: Initial orthopantomogram (OPG) demonstrates a severely compromised upper left first molar showing a vertical root fracture (VRF) associated with a huge wraparound endodontic-periodontic lesion. The adjacent maxillary wisdom, with a fully developed root/apex and no opposing tooth, appears healthy/suitable as a donor tooth. B: Pre-op periapical radiograph reveals the fracture pattern and advanced bone destruction surrounding the first molar's roots, deciding on tooth extraction and replacement via ATT. C: The immediate post-operative radiograph shows the donor tooth positioned within the socket of the extracted first molar. The single root-end cavity has been retrogradely filled/sealed with calcium-enriched mixture cement to provide a tight seal and promote periodontal regeneration. D: Two-year follow-up periapical radiograph shows substantial bone healing of the alveolar defect; the transplanted tooth shows no radiographic signs of root resorption or ankylosis, with a visible periodontal ligament space (thin radiolucent line). E: At the three-year recall, the OPG confirms that the bone remains stable and there is a harmonious occlusal relationship. It is important to note that the bone level is still slightly below the cemento-enamel junction. This is due to a residual defect from the original VRF lesion, as well as the typical anatomical position of a mature third molar.

studies showed that controlled loading after four weeks promotes periodontal ligament healing and reduces replacement resorption [11, 12].

The use of CEM root-end filling/sealing contributed to the favorable outcome due to its sealing ability, antimicrobial effect, and bioactive properties that support bone healing and cementogenesis [6]. This is especially beneficial in mature teeth, where prolonged root canal treatment may increase extraoral time. CEM retrograde filling provided effective apical sealing while preserving tooth structure and improving donor tooth strength [7]. The procedure was also performed by a clinician with more than 20 years of experience in endodontic microsurgery and autotransplantation.

Our findings agree with recent evidence reporting high long-term survival of mature tooth autotransplantation when extraoral time is minimized [3]. Likewise, studies suggest that suture-only retention without rigid splinting can achieve satisfactory healing if occlusal relief is maintained [10]. Unlike previous reports recommending splinting for mobile autotransplants, the present case maintained PDL integrity without splinting, supporting the trend toward minimal fixation [7, 13].

Although splinting is generally advised when primary stability is lacking [14]. The donor tooth in this case was stabilized with crossed sutures despite a recipient socket larger than the donor root. Complete occlusal relief (0.5 mm infraocclusion), a strict soft diet for four weeks, and minimized extraoral time were also maintained [11]. Similar support for suture-only retention has been reported in a narrative review [8].

Compared with implants, ATT preserves PDL proprioception and adaptive capacity. The progressive bone healing observed in this case further highlights the regenerative potential of the periodontium. However, as this is a single case report, the findings cannot be generalized. In addition, the absence of CBCT imaging limited accurate assessment of root morphology, sinus proximity, and volumetric bone healing, although conventional panoramic and periapical radiographs were adequate for treatment planning and follow-up. Because treatment outcomes are operator dependent, larger clinical studies are required to confirm the predictability of ATT with mature teeth and CEM root-end filling/sealing.

CONCLUSION

Autotransplantation of a mature wisdom tooth with CEM root-end filling may provide a biologically favorable option for replacing teeth affected by VRF by preserving the natural periodontal ligament and supporting long-term stability.

However, larger clinical studies are needed to validate these findings.

ETHICAL DECLARATIONS

Acknowledgments

The author thanks the patient for her cooperation.

Ethics Approval and Consent to Participate

This case report was a retrospective study of a single clinical case arising from routine clinical practice. According to ICER institutional policy, ethical approval is not required for the publication of individual case reports, provided that patient anonymity is strictly maintained and informed consent is obtained. This study conforms to the Declaration of Helsinki ethical principles for medical research. Informed consent was obtained from the patient for participation.

Consent for Publication

Informed consent was obtained from the patient for publication of this case report and any accompanying images. A copy of the signed consent form is retained by the corresponding author and is available for review by the journal editor upon request.

Availability of Data and Material

Not applicable.

Competing Interests

The author declares that there is no conflict of interest.

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Use of Artificial Intelligence

Artificial intelligence has been used solely for English editing.

Authors' Contributions

SA: Conceptualization, investigation, data curation, methodology, writing-review and editing. The author read and approved the submitted version.

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