Autotransplantation of an impacted mandibular third molar to replace a severely impacted mandibular second molar: A borderline case

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ABSTRACT

The alveolar bone support around the transplanted tooth, the stage of root development and apical closure are accepted as basic clinical factors that affect the success of tooth transplantation. Due to its high failure ratio, tooth transplantation is not common in the field of dentistry; however, major advantages of the technique such as continuing physiological root development, formation of interdental papilla, and rapid generation of alveolar bone with a lower cost should be considered. The aim of this report was to present autotransplantation of a third molar into adjacent deep-impacted second molar extraction socket without sufficient alveolar bone support. A 15-year-old healthy male patient referred to Department of Orthodontics due to dental crowding. For left mandibular quadrant, it was multidisciplinary planned to surgical removal of deep-impacted vertically positioned second molar and adjacent impacted mesioangular third molar was re-implanted to its extraction socket. Patient was followed for 4 years; clinical and radiological results were thoroughly sufficient. Even in this borderline case where there is only alveolar bone support on lingual site, autotransplanted tooth can survive successfully.

Key words: Impacted second molar, Impacted third molar, Root development, Tooth autotransplantation, Tooth Re-implantation, Tooth transplantation

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INTRODUCTION

Autogenous tooth transplantation (ATT) have a long and difficult history, as the procedure have been carried out for centuries, but failed due to healing complications. With the invention of new technologies and different techniques, ATT is now an option with a 75% success rate that may be useful in concrete situations, such as substitution of tooth agenesis, ectopic inclusions that cannot be treated by a combination of surgery and orthodontics, or loss of front teeth due to dental trauma, especially in young patients.[1,2]

The alveolar bone support around the transplanted tooth, the time that tooth is outside of the bony socket, periodontal damage, the stage of root development, and apical closure are important clinical factors that affect the prognosis of tooth transplants. Insufficient alveolar bone support can significantly worsen the prognosis of tooth autotransplantation.[3] The aim of this paper was to present a borderline clinical case for the autotransplantation of an impacted third molar to an adjacent deep-impacted second molar extraction socket without sufficient bone support.

CASE REPORT

A 15-year-old healthy male patient was referred to the Department of Orthodontics due to dental crowding [Figure 1]. A left mandibular impacted mesioangular third molar and an adjacent deep-impacted second molar were detected in a panoramic radiograph [Figure 2]. First, a guided eruption of the second molar was considered

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for the left mandibular quadrant. However, following an interdisciplinary examination of left mandibular impacted second molar, the treatment choice was changed. Instead, an extraction of the deep-impacted second molar and an autotransplantation of the adjacent impacted mesioangular third molar were planned. The root formation and apical closure of the third molar were incomplete; therefore, a root canal treatment was not performed. An informed consent was taken both from the patient and his parent.

Surgical procedure

After the surgical extraction of the second molar, third molar was carefully extracted. The length of time that the tooth spent outside of the extraction socket was kept at a minimum, in keeping with Andreasen's surgical sequence.[4] The third molar was placed without any occlusal contact [Figure 3].The transplanted third molar only had support from the alveolar bone on the lingual side. Rigid fixation of the third molar was performed from both the buccal and lingual sites. A rigid splint with composite and wire was used for 6 weeks [Figure 4]. Antibiotics, analgesic, and anti-inflammatory drugs were prescribed to the patient for 1-week. A soft diet and strict oral hygiene procedures were recommended to the patient for 3 weeks.

Figure 1: Initial occlusal view of the patient

Figure 3: The panoramic radiograph showing transplanted third molar immediately after a surgical procedure

Continued root development of the third molar and new alveolar bone formation around the roots were detected in the postoperative radiograph 6 months later. The patient was followed for 4 years. Periapical healing without any inflammatory pulpal changes, continued root development of the donor-tooth, adequate marginal periodontal attachment, healthy gingival tissue formation, and normal masticatory function without mobility were clinically detected at the final follow-up appointment [Figure 5].

DISCUSSION

Andreasen's research group has established a "good practice" protocol for ATT over the past 30 years.[5-7] In the present case, a surgical procedure and rigid fixation of the transplanted tooth were performed according to Andreasen's protocol; however, the receptor bed could not be accustomed properly and the alveolar bone support was compromised. It was reported that the receptor bed must be approximately 2 mm deeper and 1 mm wider than the donor-tooth to ensure the clinical success of autotransplantation.[4] However, in the present case, the receptor bed was much wider than the donor-tooth due to the mesial angulated and deep-impacted localization of the second molar.

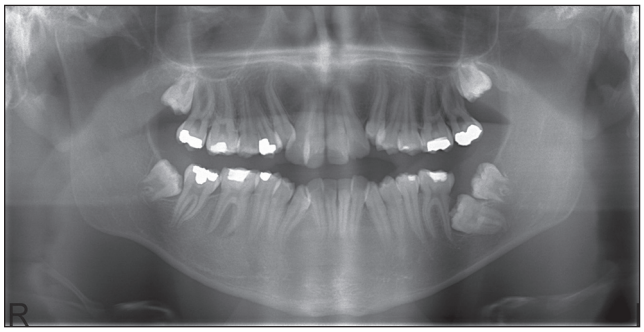

Figure 2: Initial panoramic radiograph revealed the left mandibular impacted mesioangular third molar and an adjacent deep-impacted second molar

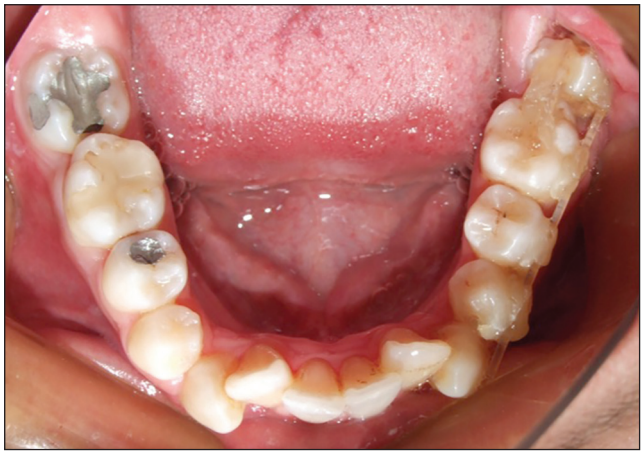

Figure 4: Intraoral view of rigid splint from both lingual and buccal sites

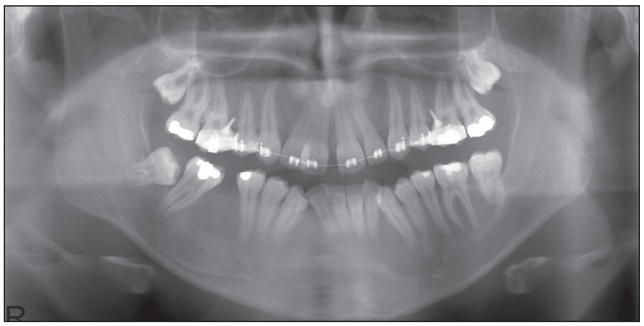

Figure 5: Postoperative 4th year panoramic radiograph showing periapical healing without any inflammatory changes and continued root development of the donor-tooth

There were a few treatment modalities that could have been performed in the present case other than ATT. In the current case, the patient was an adolescent and a dental implant insertion was not preferred due to the continuing mandibular growth. The removal of the alveolar bone for extraction of the deep-impacted second molar also compromised the implant placement and waiting until the end of growing would lead to over-eruption of the antagonist tooth. Orthodontic traction of the impacted second molar with mini-screw anchorage following extraction of the third molar was another alternative treatment option.[8] Distal uprighting via orthodontic traction was compromised due to the anatomical obstacles. Increased thickness of gingiva made the placement of a mini-screw in the retromolar region quite difficult for the orthodontist. Moreover, since the second molar was deeply impacted, it had to be surgically exposed in order to bond the button for orthodontic traction.

Park *et al.*[1] classified the successful healing factors associated with ATT into four categories:

1. patient-related factors,
2. donor-tooth-related factors,
3. clinical-surgical factors, and
4. recipient-site-related factors.

Patient-related factors include younger age, motivation to maintain general oral hygiene, and no presence of systemic metabolic problems or habits. Donor-tooth-related factors are a new formation of periodontal ligament attachment, healing of the dental pulp, continuation of root development, gingival adaptation, and root morphology. As per the root development stage, higher percentages of success are achieved if the donor-tooth has a root length between one-quarter and one-third of its total length.[9] The clinical factors that lead to successful healing are the experience and skills of the clinician.[1,3] An atraumatic procedure provides a higher number of viable cells on the tooth's root surface, which is directly related to successful periodontal "healing".[10]

All of the conditions mentioned above were provided in the current case besides the alveolar bone support of the receptor bed. The recipient site factors related to successful healing are adequate bone width and height to receive the donor-tooth, periodontal ligament attachments, and the amount of time between extraction and transplantation.[1] In the current case, when the adjustment of the extraction socket for the third molar was completed, only alveolar bone support was left on lingual site. Andreasen *et al.*[4] and Tsukiboshi[3] report that the donor-tooth needs to be tried in the prepared recipient bed. However, conducting a "try-in procedure" to find the ideal position was not possible in this case. Therefore, transplanted third molar was fixed both from the lingual and buccal aspects for 6 weeks.

This paper presents a successful borderline case management with 4-year follow-up. It demonstrates that even when there is no adequate alveolar bone support for the root surface, impacted third molar tooth transplantation may be a viable treatment alternative for patients with continuing growth and tooth development.

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