

## Case Report

## Eight-year follow-up of autogenous tooth transplantation involving multidisciplinary treatment

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**Abstract:** Although autogenous tooth transplantation is a widely reported procedure, its success is dependent on a number of factors. Here we describe the surgical technique, endodontic treatment and rehabilitation employed for a patient in whom a lower right third molar was transplanted to substitute an adjacent second molar with extensive caries. During an 8-year follow-up period, normal periodontal healing was observed and no infection, ankylosis or progressive resorption occurred. It may be concluded that transplantation of a third molar is a practicable approach for replacement of a lost permanent tooth, with restoration of esthetics and function.

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### Introduction

Tooth transplantation is a means of replacing a lost or missing tooth by transfer of an existing tooth to the socket previously occupied by the missing tooth, or to

a prepared socket (1). Autogenous tooth transplantation is indicated for cases of dental-alveolar trauma, extensive caries with root involvement, tooth agenesis, iatrogenic complications and cases where the patient's socioeconomic condition precludes affordable prosthetic rehabilitation (1,2).

The success of autogenous tooth transplantation depends on the integrity of the periodontal ligament, and is also influenced by surgical expertise so that the extent of trauma, as well as the period of extra-alveolar tooth exposure, are minimized. Additional factors influencing the success of tooth transplantation include absence of periodontal lesions and acute infection in the recipient socket (2,3).

Autogenous transplantation tends to be more successful when it involves teeth with completely formed roots rather than tooth germs with incomplete root formation, but it has become established as a practicable alternative to tooth loss (4). Some authors have emphasized the importance of multidisciplinary planning for achieving higher success rates in terms of esthetics and function (2-5).

Here we report a clinical case of autogenous transplantation involving a tooth with a complete root, for which a multidisciplinary approach was adopted in order to promote tooth rehabilitation, and discuss some of the important factors influencing the success of this technique.

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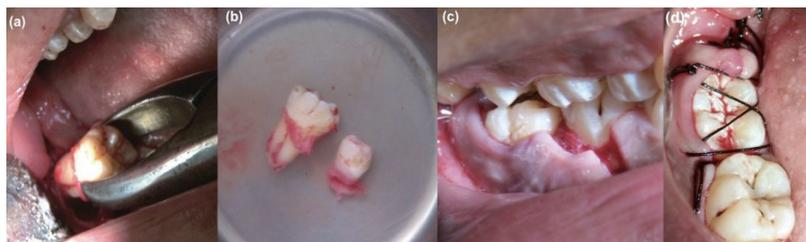
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**Fig. 1** Preoperative panoramic radiograph.



**Fig. 2** (a) Extraction of tooth 48 with minimal trauma. (b) Supernumerary teeth and tooth 48 immersed in saline solution. (c) Checking the occlusion after transplantation of tooth 48 into the socket of tooth 47. (d) Retention suture of the transplanted tooth in infra-occlusion.



**Fig. 3** Postoperative periapical radiograph taken after 3 weeks, showing a periapical radiolucent area of bone repair.



**Fig. 4** After 1 year of clinical follow-up, demonstrating adequate restoration with composite resin.



**Fig. 5** Radiographic view after 1 year of follow-up, showing normal periradicular tissues.

### Case Report

The patient, a 23-year-old female student, presented at the Faculty of Oral-Dental Surgery, Federal University of Ceará, in October 2006 because of severe pain in the lower right back-molar region. Clinical and radiographic examinations revealed extensive caries in the lower right second molar (tooth 47) and impaction of the lower right third molar (tooth 48) (Fig. 1). In addition four supernumerary teeth were evident: two distomolar teeth beside the upper right third molar (tooth 18) and tooth 48, and two in the lower premolar region bilaterally (Fig. 1).

During planning, three possible options of rehabilitation treatment for tooth 47 were presented to the patient. The first option was endodontic treatment, followed by periodontal surgery to establish a biological space and accommodate a fixed prosthesis. The second option was extraction of tooth 47 and rehabilitation with a single implant-supported fixed prosthesis. The third option was extraction of tooth 47, followed by transplantation of tooth 48 into the alveolus of tooth 47. Endodontic treatment and coronal rehabilitation with direct restoration would be performed later. After discussion of treatment expectations, and the various advantages and disadvantages of the three options, the patient elected for lower-cost treatment that did not include any prosthetic placement.

The surgical procedure involved extraction of tooth

47, followed by extraction of the lower distomolar and tooth 48, which was then transplanted into the alveolus of tooth 47. The surgery was performed under local anaesthesia (3% mepivacaine with noradrenaline 1:100.000). The removal of tooth 47 was performed by odontosection in order to minimize the degree of trauma to the roots. During all procedures, copious irrigation with saline solution was performed. The lower distomolar and tooth 48 were then carefully extracted. Tooth 48 was kept immersed in saline solution for about 10 min while the socket was prepared with a low-speed spherical bur under copious irrigation with saline (Fig. 2 a, b). Tooth 48 was then placed into the socket of tooth 47 and kept in infra-occlusion, using retention only with 3.0 silk sutures (Fig. 2 c, d).

Prophylactic medication was performed with 2 g of amoxicillin. After surgery, the patient took systemic antibiotic medication (amoxicillin 500 mg) 3 times daily for 7 days along with an anti-inflammatory drug (nimesulide 100 mg) for 3 days. Mouth rinsing with 0.12% chlorhexidine gluconate was performed for the first 7 days for more efficient antisepsis of the region and avoidance of possible infection.

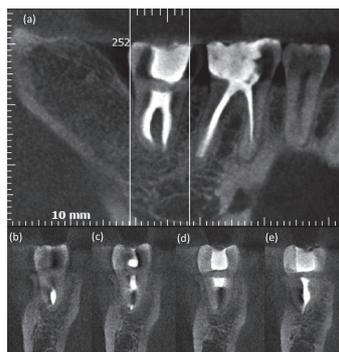
The patient was given a list of post-surgery instructions, including taking special care to avoid masticatory trauma in the region for 2 weeks. The sutures were removed after 15 days, during which the patient had reported neither



**Fig. 6** Intra-oral photographs taken at the 8-year follow-up point. (a) Occlusal view. (b) Details of occlusal face. (c) View of buccal face, showing a suitable appearance of the periodontal tissue.



**Fig. 7** Periapical radiograph at the 8-year follow-up point.



**Fig. 8** Cone beam computed tomography at the 8-year follow-up point. (a) Sagittal axis. (b-e) Images of the transaxial axis, exhibiting absence of external radicular resorption.

sensitivity nor pain, and no infection in the region had developed (Fig. 3).

Postoperative endodontic treatment was carried out by an endodontist for 3 weeks (November 2006). After local anesthesia (3% mepivacaine with noradrenaline 1:100.000) and rubber dam isolation, the chamber pulp was accessed using a spherical bur. The treatment included debridement of the root canal system, and for establishment of the working length, a Root ZX (J. Morita, Irvine, CA, USA) was used. The working length employed was 1 mm before the apex. The root canals were instrumented with NiTi rotary files (ProTaper Universal, Dentsply Maillefer, Ballaigues, Switzerland), using copious irrigation with 2.5% sodium hypochlorite. To remove the smear layer, 3 mL of 17% EDTA was retained within the root canal for 3 min, following by interim root canal filling with calcium hydroxide, which was replaced at 4-week to 2-month intervals. During another appointment, the root canals were rinsed by copious irrigation with 10 mL of 2.5% sodium hypochlorite to remove the calcium hydroxide, and then 3 mL of 17% EDTA was retained within the root canal for 3 min to remove the smear layer. The root canals were dried with sterilized F3 paper points (ProTaper Universal, Dentsply Maillefer)

and then filled with gutta-percha cones and AH Plus sealer (Dentsply Maillefer), using Tagger's hybrid technique. This technique was performed with gutta-condensor drills (Dentsply Maillefer) under hand piece and clockwise for 10 s. After 1 day, coronal restoration was performed with composite resin (Z100, 3M ESPE, Sumaré, Brazil).

After 1 year of follow-up (January 2008), the patient returned for a recall evaluation and reported no pain or sensitivity. Normal periodontal healing with absence of infection, ankylosis or progressive resorption was observed. Masticatory and esthetic functions had fully recovered (Fig. 4). Radiographically, complete periapical bone repair was observed, and thus the outcome was considered to have been successful (Fig. 5).

When the patient returned for a recall after 8 years of follow-up (February 2015), she was asymptomatic and showed no abnormality of the periapical tissues around the transplanted tooth (Fig. 6). Radiographically, periapical healing was intact (Fig. 7) and cone beam computed tomography (Fig. 8) demonstrated absence of any external radicular resorption.

## Discussion

Autogenous tooth transplantation is a practicable treatment for tooth loss, being technically easy to perform, with a low incidence of associated morbidity and low cost in comparison with prosthetic rehabilitation and use of dental implants (4). The use of autogenous tooth transplantation for patients with agenesis has been reported as a conservative approach for improvement of esthetics and masticatory function (1,6).

The success of autogenous tooth transplantation depends on a number of factors that may decisively affect the prognosis; these include the stage of root formation, the integrity of the periodontal ligament, the surgical technique employed, the quality of the recipient socket, and the extra-alveolar time of the transferred tooth (1,6).

The integrity of the periodontal ligament is of great importance for the success of tooth transplantation, and this is related to surgical expertise, the extent of tooth manipulation, and the extra-alveolar time (2,6). These factors impact the viability of the periodontal ligament cells, which, according to some studies, may remain viable for a period as short as about 18 min. After this period, the cells become hypoxic and may subsequently develop necrosis, which can result in inflammatory resorption (7). One way of maintaining the viability of periodontal ligament cells is to maintain the tooth in a favorable environment. In the present case, the transplanted tooth was kept immersed in saline solution for 10

min before placement into the recipient socket.

In the present case, endodontic treatment was started after surgery employing calcium hydroxide-based intracanal dressings, in accordance with several authors (1,7) and the International Association of Dental Traumatology (IADT) recommendations (8). In 2007, the IADT published guidelines for patients seeking treatment for tooth avulsion. This protocol recommends that for avulsed teeth with a closed apex, endodontic therapy should be initiated up to 15 days after any surgical procedure. Another recommendation is that calcium hydroxide should be maintained for intracanal medication for up to 1 month, followed by root canal filling with an acceptable material (8). In the present case, endodontic treatment was started 3 weeks after transplantation surgery, mainly due to difficulty with revascularization and to avoid the development of infection in the root canal system, as reported by several authors (1,2,4,5). The use of calcium hydroxide-based medications for a period of two months is also a suitable option, especially at alkaline pH, to induce mineralization, minimize bacterial activity (1,4,8), and prevent possible inflammatory resorption of dentin.

The period of follow-up for transplanted teeth is also important, as major sequelae such as dental resorption may occur between 24 and 36 months after surgery (5). Sugai et al. (5) reported that the average 1-year survival rate for transplanted teeth was 96%, decreasing to 84% by 5 years. Thus, based on the factors mentioned above, the present case, with an 8-year follow-up period, showed evidence of complete tissue repair and was considered a success in terms of clinical and radiographic evaluation.

The possibilities for rehabilitation of transplanted teeth are quite varied, since direct restorations with composite resin can be adopted. Sugai et al. (5) have obtained excellent prospective results of tooth autotransplantation supported by a multidisciplinary team, consisting of oral surgeons, endodontists, periodontists, prosthodontists and orthodontists. Mejäre et al. (4) have reported that in order to correctly evaluate the prognosis for transplantation of mature wisdom teeth, surgery and endodontic treatment should be performed, as well as logistical timing of surgical and endodontic treatment.

In order to maintain natural teeth with acceptable function and esthetics, it is necessary ensure that both dental professionals and patients have the right mindset. According to Salehrabi and Rotstein (9), patients prefer to keep their own teeth, rather than using implants to replace them, as far as is possible. Gatten et al. (10) compared the quality of life of patients with restored,

single endodontically treated teeth versus patients with single implant-supported fixed prostheses. Clinicians should consider patients' perceptions and preferences as well as the influence each therapy may have on their quality of life, in both the short and the long term. All of the participants in that study expressed a clear desire to retain their natural dentition whenever possible (10). Thus, scientific evidence appears to justify the use of tooth autotransplantation more frequently in dental clinics, as an alternative therapy.

Autogenous transplantation is a viable alternative to tooth loss, since it can be performed with suitable indications and technical criteria, and a multidisciplinary approach can ensure adequate tooth rehabilitation.

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