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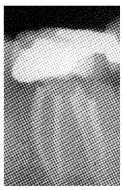

CASE REPORT

Autotransplantation of a maxillary third molar to replace a maxillary premolar with vertical root fracture

T. Tsurumachi[1] & Y. Kakehashi[2]

[1]Department of Endodontics, Division of Advanced Dental Treatment, Nihon University School of Dentistry, Tokyo, Japan; [2]Department of Crown and Bridge Prosthodontics, Division of Advanced Dental Treatment, Nihon University School of Dentistry, Tokyo, Japan

Abstract

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Aim To report the successful autotransplantation of a fully developed third molar that required nonsurgical and surgical interventions for tooth adaptation.

Summary This case report describes the autotransplantation of a third molar with complete root development after the loss of a fractured premolar in a 47-year-old male. To allow better adaptation of the donor tooth, the buccal roots of the third molar were removed using a diamond bur and the canal entrances were filled. Recall examination 6 years after completion of root-canal treatment showed normal periodontal healing with absence of infection, ankylosis or progressive resorption. The transplantation of a third molar is seen as a promising method to replace a lost permanent tooth, and to restore aesthetics and function.

Key learning points

- Autotransplantation is a viable option for the treatment of a missing tooth or for replacement of traumatized tooth when there is a donor tooth available.
- Fully developed third molars are potentially reliable candidates in the absence of other suitable donor teeth.

Keywords: autotransplantation, endodontic surgery, fractured tooth, root-canal treatment, third molar.

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Introduction

Autotransplantation is a viable option for the treatment of a missing tooth or for the replacement of traumatized tooth when there is a donor tooth available (Lee *et al.* 2001). Autotransplantation is defined as the transplantation of teeth from one site to another in

Correspondence: Dr Tamotsu Tsurumachi, Department of Endodontics, Nihon University School of Dentistry, 1-8-13, Kanda-Surugadai, Chiyoda-ku, Tokyo 101-8310, Japan (Tel.: 81 3 3219 8142; fax: 81 3 3219 8348; e-mail: tsurumachi@dent.nihon-u.ac.jp).

the same individual. The recipient site may be an extraction socket or a surgically prepared site. The success rate has been reported to be excellent if the donor teeth were transplanted before completion of root formation (Schwartz *et al.* 1985). Kristerson (1985) and Andreasen *et al.* (1990) showed the importance of transplanting premolars at a certain root formation stage to obtain an optimal transplant prognosis. On the other hand, it has been reported that autotransplantation was a reliable method with a good prognosis for donor teeth with both open and closed apices (Lundberg & Isaksson 1996). Clinically, autotransplantation of a third molar for replacement of a lost or seriously damaged tooth is sometimes a suitable alternative to conventional prosthetic rehabilitation or implant treatment (Akiyama *et al.* 1998, Mejare *et al.* 2004, Teixeira *et al.* 2006).

The purpose of this article is to report the successful autotransplantation of a fully developed third molar that required nonsurgical and surgical interventions to allow optional tooth adaptation.

Case report

A 47-year-old male was referred to the Endodontic Department at Nihon University School of Dentistry for evaluation and treatment of his maxillary right second premolar (tooth 15). The medical history was noncontributory. Clinical examination revealed that tooth 15 was fractured vertically, and thus not suitable to support a crown (Figs 1 and 2). Tooth 14 was missing. Radiographic examination with a gutta-percha point inserted into the fistula demonstrated its origin (Fig. 3). The patient was informed about the fractured tooth and extraction was advised. Clinically and radiographically, the maxillary third molar (tooth 18) was completely erupted and positioned within the dental arch, making it possible for tooth autotransplantation (Figs 4 and 5).

First, the fractured tooth 15 was removed with an elevator and the socket was irrigated with normal saline solution (Fig. 6). The third molar was then carefully extracted (Fig. 7) and positioned into the recipient site to check its adaptation. Because of differences in root shape, the buccal roots were removed with a high-speed turbine using copious water. The third molar was held gently by the crown with wet gauze during the procedure, and the canal entrances were filled with zinc-free amalgam (Fig. 8). Before transplantation, blood clot was aspirated from the socket, and the replanted tooth was rinsed with saline to remove all debris. The transplanted third molar was seated in the recipient site with firm finger pressure and stabilized with silk sutures and adhesive 4-META/MMA-TBB dentine bonding resin (Super Bond C&B; Sun Medical Co., Kyoto, Japan) (Figs 9 and 10). The entire time from extraction to transplantation

Figure 1 Pre-operative buccal view of the fractured tooth 15.

Figure 2 Pre-operative palatal view of tooth 15 showing the fracture line clearly.

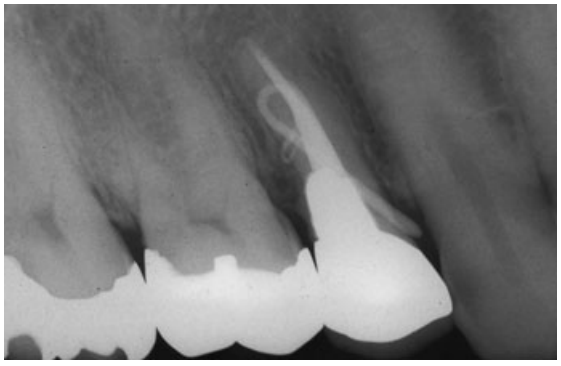

Figure 3 Pre-operative radiograph of tooth 15 with a gutta-percha point inserted into the fistula.

Figure 4 Pre-operative view of the maxillary third molar and second premolar.

was 20 min. The patient was seen 1 week after operation for a post-operative checkup and suture removed. The replanted tooth was splinted to adjacent teeth for 3 weeks. Root-canal treatment was performed within 2 weeks of transplantation. Under rubber

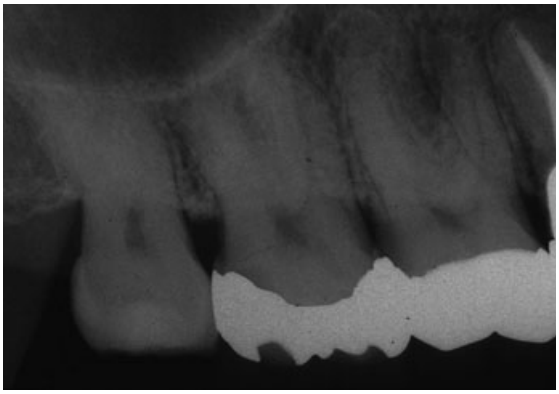

Figure 5 Pre-operative radiograph of the third molar.

Figure 6 Palatal view of the extraction socket.

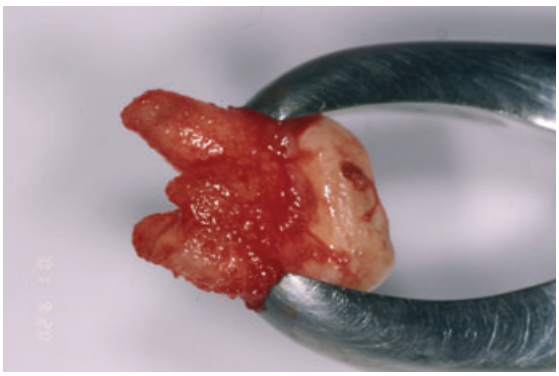

Figure 7 The extracted third molar with three roots.

dam isolation, working length was established and chemomechanical preparation performed with 2.6% sodium hypochlorite solution as irrigant. After drying the root canal with paper points, a calcium hydroxide paste was applied and the access cavity temporarily sealed with Cavit (ESPE, Seefeld, Germany). The patient returned after 2 months, the calcium hydroxide paste was removed and the root canal was filled with gutta-percha and zinc oxide-eugenol sealer (Canals; Showa Yakuhin, Tokyo, Japan) using

Figure 8 Amalgam filling into the site of root amputation.

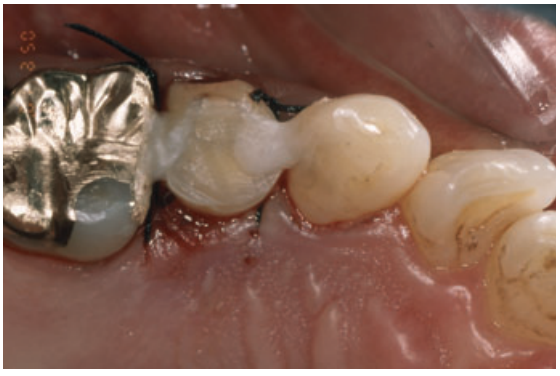

Figure 9 Transplanted tooth splinted to adjacent teeth with adhesive resin.

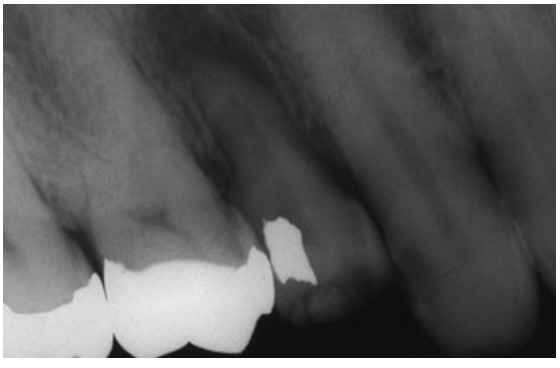

Figure 10 Radiograph immediately after transplantation.

lateral condensation. A post-operative radiograph was taken (Fig. 11). The patient was recalled for periodic checkups and healing was uneventful. Approximately 18 months after transplantation, the tooth was restored with a full-coverage crown. The recall

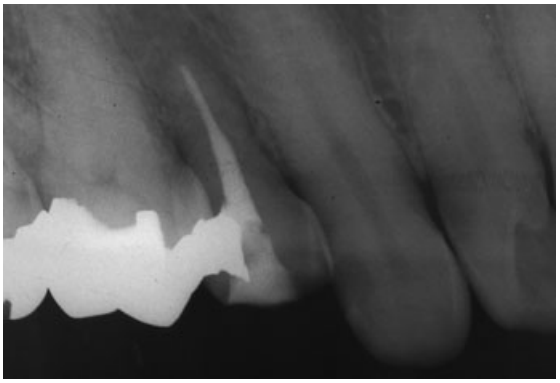

Figure 11 One-month follow-up radiograph after the root filling of root canal.

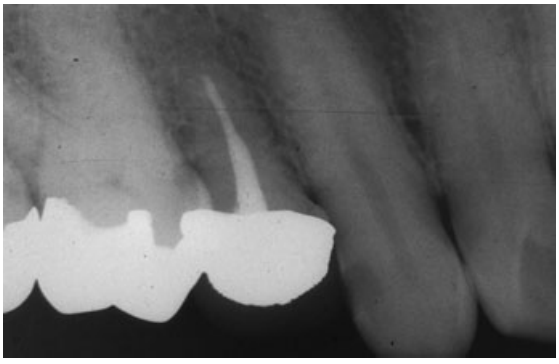

Figure 12 Three-year follow-up radiograph of transplanted tooth.

Figure 13 Six-year follow-up radiograph of transplanted tooth.

examination after 3 and 6 years revealed asymptomatic and healthy periodontal conditions (Figs 12–14).

Discussion

One of the problems in tooth transplant is how to precisely prepare the recipient bone site. Unlike other organ transplants, tooth transplant requires size compatibility between the transplanted tooth and recipient site. In this case, the third molar had

Figure 14 Post-operative view of the permanent fixed crown, revealing satisfactory aesthetics.

two buccal and one palatal roots. Thus, extraoral removal of the buccal roots was performed to achieve better adaptation to the recipient site. Root removal was a less invasive and quicker than modification of the recipient bone site. Close contact of the autotransplanted tooth with the alveolar bone of the recipient site may provide better blood supply and adequate nutrition to the periodontal ligament cells (Kallu *et al.* 2005), and may be one of the most important factors for a successful prognosis. After adequate adaptation of the donor tooth into the recipient site, the transplanted tooth was splinted to adjacent teeth with 4-META/MMA-TBB dentine bonding resin. This adhesive resin was used as the adhesive material because of its superior adhesion and biocompatibility (Sugaya *et al.* 2001). On the other hand, the denuded root surface was expected to be subject to ankylosis or resorption because of the lack of periodontal membrane. Similar conditions induced ankylosis and root resorption in an experimental study using monkeys (Andreasen & Kristerson 1981). Most ankylosis is diagnosed within the first 2–3 years after replantation of human-avulsed teeth (Andreasen *et al.* 1995). Fortunately, 6 years after the transplantation, signs of ankylosis and root resorption were not observed. The reason why the problematic signs were not present after long-term observation is not fully understood. However, it is possible that small areas of resorption had occurred in radiographically undetectable areas. The presence of intact and viable periodontal ligament cells and good tissue adaptation on the palatal root surface is the critical factor that determines a successful tooth transplant (Andreasen 1981, Lee *et al.* 2001).

In this case, root-canal treatment was essential and calcium hydroxide medication was employed before the gutta-percha filling was placed. The critical factor for inflammatory root resorption after transplantation is the presence of an infected root-canal system. Mechanical debridement of the root-canal system in the third molar was difficult, but the combination of chemomechanical instrumentation and the use of calcium hydroxide appear to have been sufficient. Documentation of the clinical usefulness of calcium hydroxide as an intracanal medication in endodontics was provided by Cvek *et al.* (1976) and Byström *et al.* (1985). The use of a calcium hydroxide medication is expected to favour bone repair and inhibit root resorption because of its high pH, providing an antimicrobial effect and stimulating the healing process. Also, long-term root-canal treatment with calcium hydroxide is the method of choice in preventing and treating inflammatory resorption (Tronstad 1988).

However, there is potential for an eventual long-term periodontal problem, because there was no covering bone and epithelial attachment over the denuded root surface. Periodontal care will be an important issue for predicting long-term prognosis.

Conclusions

This case demonstrates that autotransplantation of a third molar may be a reliable and predictable procedure and could be considered more often. At a 6-year follow-up, the transplanted third molar was clinically healthy and continued to satisfy aesthetic and functional demands.

Disclaimer

Whilst this article has been subjected to Editorial review, the opinions expressed, unless specifically indicated, are those of the author. The views expressed do not necessarily represent best practice, or the views of the IEJ Editorial Board, or of its affiliated Specialist Societies.

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