HOKKAIDO UNIVERSITY

Title	Immediate oral surgical management of external dental fistula : Technical note of immediate tooth autotransplantation
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ABSTRACT

Tooth auto-transplantation, that is the surgical movement of a tooth from its original location to another site within the same person, is an alternative to dental implantation because it can save time, provide faster healing and function, and has esthetic advantages. A unique sensory system can be maintained, and the procedure promotes proper healing of the periodontal environment. We report on a case of external dental fistula with apical periodontitis, in which immediate tooth auto-transplantation of the right mandibular posterior tooth (tooth 47) was performed with a favorable outcome 6 years postoperatively. An important advantage of this procedure is that the transplanted tooth functions early at the recipient site and this procedure is minimally invasive therapy for apical periodontitis of mandibular molars accompanied with an external dental fistula.

Keywords

Tooth auto-transplantation; external dental fistula; minimally invasive therapy

1. Introduction

Tooth auto-transplantation is the surgical movement of a tooth from its original location to another site within the same person. It can be performed in patients with traumatic tooth loss, impacted or ectopically positioned teeth, congenitally missing teeth, large endodontic lesions, and localized apical periodontitis [1-3]. Tooth auto-transplantation is an alternative to dental implantation because it can save time, provide faster healing and function, and has esthetic advantages [3, 4]. Moreover, it also has advantages of maintaining a unique sensory system and promoting proper healing of the periodontal (PDL) environment to sound tissue [3, 5].

We report a case of external dental fistula with apical periodontitis, in which immediate tooth auto-transplantation in the right mandibular posterior tooth (# 47) was performed with a favorable outcome 6 years postoperatively.

2. Case report

A 27-year-old woman presented to our department in November 2013 with a chief complaint of localized redness and swelling of the right lower jaw. Clinical examination revealed a 2 cm diameter depression on the skin buccal lesion (Fig. 1A). There was no intraoral acute inflammation, such as swelling and redness of the surrounding gums (Fig. 1B). In addition, tooth 47 exhibited no mobility, tenderness, or percussion pain. Panoramic radiographs and dental x-ray revealed radiolucent transmission in the root apex portion of tooth 47 with the right mandibular wisdom horizontal impacted tooth (tooth 48; Fig. 1C, D). Based on clinical and imaging findings, the therapeutic strategy included extraction of teeth 47 and 48, and auto-transplantation of tooth 48 to the tooth 47 position.

The upper and lower parts of the buccal alveolar bone of tooth 47 remained (Fig. 1E, F). We believe that this tooth auto-transplantation was possible if we could prevent damage to the buccal alveolar bone and periosteum of tooth 47 and gain a bone bridge formation for defect between the upper and lower alveolar bone. Teeth 48 and 47 were extracted, and periapical granulation was enucleated completely after scraping. During surgery, we removed a cord structure connected to a lump just under the skin (Fig.2A-E). The depression in the skin that suggested an external dental fistula disappeared (Fig. 3A). The transmitted image of the root apex of the auto-transplanted tooth remained, but the auto-transplanted tooth had no clinical and radiographic problem (Fig.3.B, C). Engraftment of the transplanted tooth was successful, and the external dental fistula disappeared.

While a bone defect in the tooth 47 buccal bone cortex was found on preoperative cone-beam computed tomography (CBCT), new bone formation in the buccal side was confirmed 3 years after transplantation (Figs. 3D, E). There is no significant change in the permeability of the root apex of auto-transplanted tooth after surgery. We consider that there is probably partial

scar formation in apex area. In addition, the patient had no esthetic concern. At 6 years postoperatively, the progress of the transplanted tooth was satisfactory (Figs. 4A, B). Auto-transplanted tooth did not present any significant clinical or imaging problems at 7 years postoperatively (Figs. 4C, D, E).

3. Discussion

External dental fistula is encountered frequently in dental and oral surgery [6, 7]. The most common tooth causing an external dental fistula is the mandibular first molar [8]. The condition commonly stems from chronic apical periodontitis [6-8]. For most of external dental fistulas, tooth extractions are common. We believe that in our case, conservative treatment involving root canal alone was almost impossible for healing of a dental fistula, since root canals lack predictability. There are several methods in this case. The lower right mandibular second molar had three roots, a large lesion, and a large bone defect on the buccal side. We thought the predictability of root canal treatment for this tooth was poor. In addition, this site was difficult to be operated on, and we concluded that the prognosis for apical root resection was low. In general, the right mandibular second molar is extracted and a prosthetic treatment with a bridge is commonly used. However, there is a demerit of the anterior and posterior teeth that needs to be cut. Another option is to extract the right mandibular second molar and use an implant. However, it is not covered by insurance and the cost is too much for the patient. Extraction of the lower right mandibular second molar and orthodontic movement of the wisdom tooth is considered to be a treatment with high predictability. However, the orthodontic treatment takes a long time and was not accepted by the patient. Therefore, we suggested auto-toothtransplantation, and the patient agreed. Another possible solution is orthodontic therapy including. However, patients sometimes refuse orthodontic therapy because of the time and expense involved.

This patient insisted on maintaining the number of teeth in her arch. Immediate tooth auto-transplantation was selected as the final treatment option. Although some problems exist, such as long-term root resorption, tooth auto-transplantation can provide patients with immeasurable benefits because PDL tissue regeneration can be expected if auto-transplantation is successful [5, 9, 10]. For this purpose, a healthy donor tooth and healthy recipient site are essential. However, some bone resorption and/or bacterial infections can be expected if an infectious lesion remains in cases of immediate tooth auto-transplantation. During surgery, we completely eliminated a periapical infectious lesion of tooth 47 and the cord-like fibrous tissue connected to the external skin fistula. A buccal cortical bone defect was detected during surgery, but the upper alveolar portion was recognized. We paid careful attention not to damage the upper alveolar portion of tooth 47.

A root canal treatment of the transplanted tooth 48 was performed after 3 weeks. Insufficient buccal width in the recipient bone site might cause loss of buccal bone coverage, and consequent loss of PDL integrity [11, 12]. The solid report on auto-transplantation of 50 teeth with mature roots reported lack of buccal bone width as the only significant predictor for tooth transplant failure [11]. The novelty of our report is that osteogenesis to support the transplanted tooth is suggested even in the presence of a large buccal bone defect, if the buccal periosteum remains intact. Fortunately, CBCT showed buccal bone regeneration 7 years postoperatively, with the upper portion of the bone partially connected to the lower portion of the alveolar bone process. Successful transplantation even with an inflammatory periapical lesion as in our case is expected as long as complete elimination of the apical infectious tissue is accomplished, and a wide range of buccal healthy periosteum remains [12, 13].

During tooth auto-transplantation in cases with large bone defects, it is important to preserve the periosteum in respectful way and keep the periodontal ligament viable. Although the periosteum is important in bone healing, the activity of the periodontal ligament is also essential

for healing of the alveolar bone around the grafted tooth. An advantage of auto tooth transplantation is bone healing. A viable PDL of the transplanted tooth can induce alveolar bone. Stem cells derived from PDL can differentiate into osteoblasts [13]. Differentiated osteoblasts form bone tissue around the transplanted tooth. Alveolar bone regeneration can be observed in the recipient socket around the transplant [12, 13].The PDL of teeth plays an important role in bone remodeling. Various biological aspects of alveolar bone formation are partly regulated by the PDL and periosteum [13].

Careful case selection and treatment planning is essential for the success of tooth auto-transplantation [9, 11]. The donor tooth and recipient bone site should be examined carefully for suitability and appropriate dimension using CBCT imaging [13, 14]. The recipient site should have adequate bone buccal support with sufficient attached keratinized gingival tissue to allow tooth stabilization and it should be free of infection [11-13]. In our case, there was a buccal bone defect at the recipient site, but the transplanted tooth and size of the transplant floor were well adapted, and the postoperative transplanted tooth stability was very good. In addition, the total treatment cost usually is lower than with other treatment plans, including implant-based prosthetic rehabilitation, prosthetic restoration, and/or orthodontic space closure.

Favorable adaptation in cervical region of transplanted tooth between the tooth and membrane decreased the infection rate and facilitated uneventful healing and PDL reattachment [13]. In our case, the healing was satisfactory despite the partial bone buccal defect of the transplanted tooth, and the sizes of teeth 48 and 47 were approximately the same. In our case, the transplanted tooth must be treated endodontically, since the vitality is not maintainable. Therefore, root canal therapy is recommended within a short time after transplantation.

The most important advantage of this method is that the transplanted tooth functions at the recipient site during mastication. This method does not require preparation of adjacent teeth for bridge work.

4. Conclusions

Our case experience suggested that immediate tooth transplantation after extraction of a causative tooth is a less invasive therapy for apical periodontitis of mandibular molars accompanied with an external dental fistula.

Ethical approval

Informed consent from the patient has been obtained before submission of this paper.

Conflict of interest

The authors declare no conflict of interest.

Acknowledgment

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Figure legends

Fig.1. Clinical examination revealed a 2 cm diameter depression on the skin buccal lesion (A). There was no intraoral acute inflammation, such as swelling and redness of the surrounding gums (B). Panoramic radiographs and dental x-ray revealed radiolucent transmission in the root apex portion of tooth 47 with the right mandibular wisdom horizontal impacted tooth (C, D). The upper and lower parts of the buccal alveolar bone of tooth 47 remained (E, F).

Fig.2.

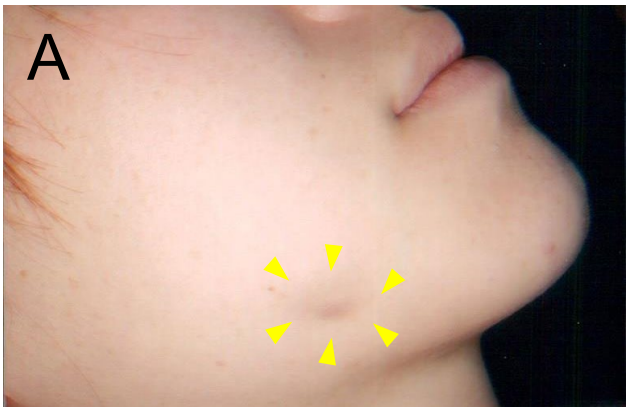
Teeth 48 and 47 were extracted, and periapical granulation was enucleated completely after

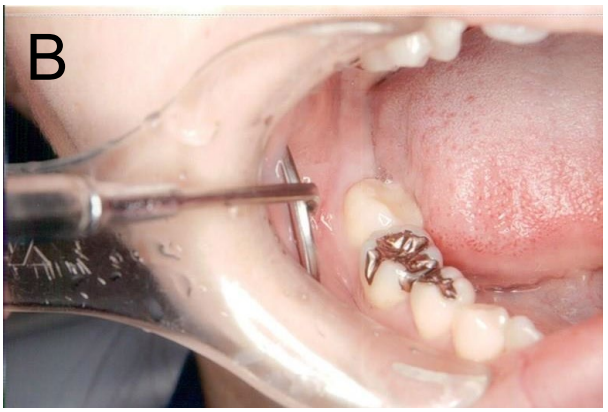
scraping (A). Left side was causative tooth and right side was harvested donor tooth. The lower right mandibular second molar had three roots (B). During surgery, a mucoperiosteal flap was gently elevated at the recipient site buccally and we removed a cord structure connected to a depression just under the skin. There was a buccal bone defect at the recipient site (yellow arrow). Recipient site was prepared after tooth removal. The transplanted tooth and size of the transplant floor were well adapted, and the postoperative transplanted tooth stability was very good (yellow arrow) (D).

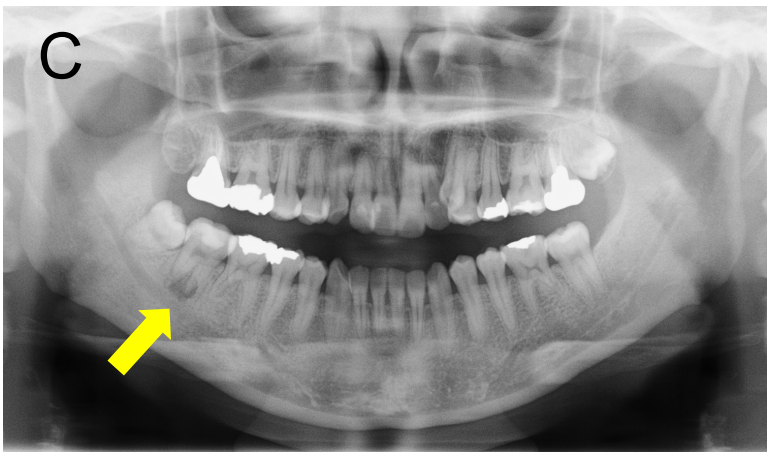
Fig. 3. The skin recesses that suggested an exodontic fistula disappeared (A). The transmitted image of the root apex of the autotransplanted tooth remained, but the autotransplanted tooth had no clinical problem (B, C). While a bone defect in the tooth 47 buccal bone cortex was found on preoperative cone-beam computed tomography (CBCT), new bone formation in the buccal side was confirmed 3 years after transplantation (D, E).

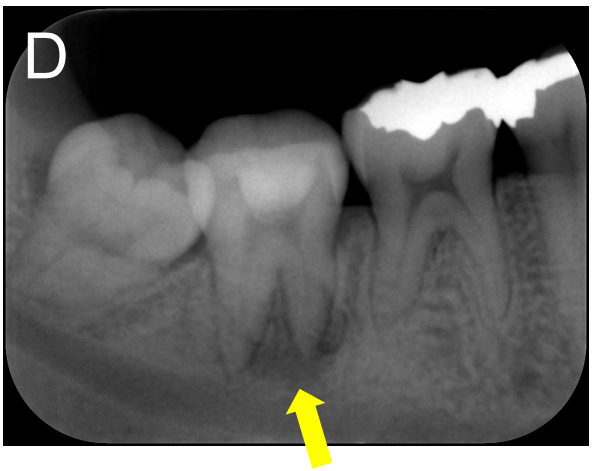
Fig. 4. The patient had no esthetic concern. At 6 years postoperatively, the progress of the transplanted tooth was satisfactory (A, B). At 7 years postoperatively, the progress of the transplanted tooth was satisfactory (C, D, E).

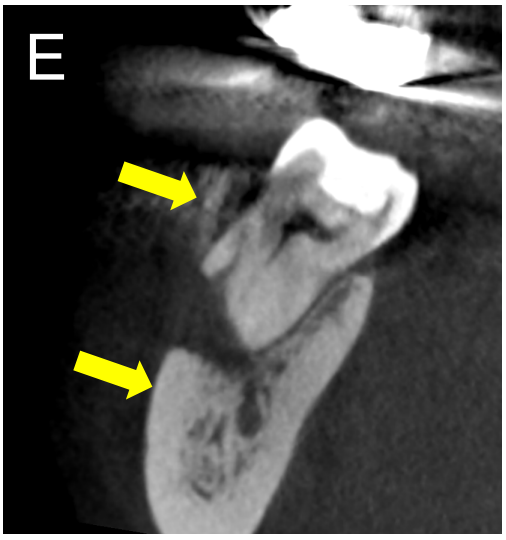
Figure 1











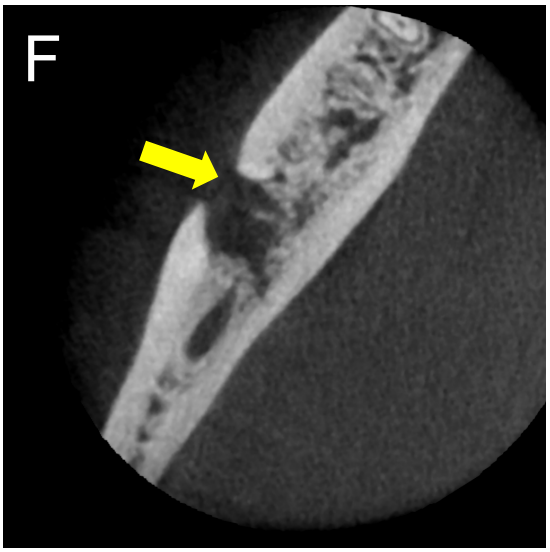
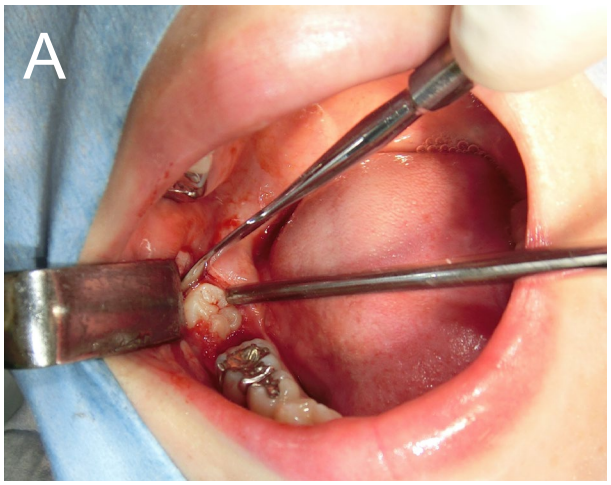


Figure 2





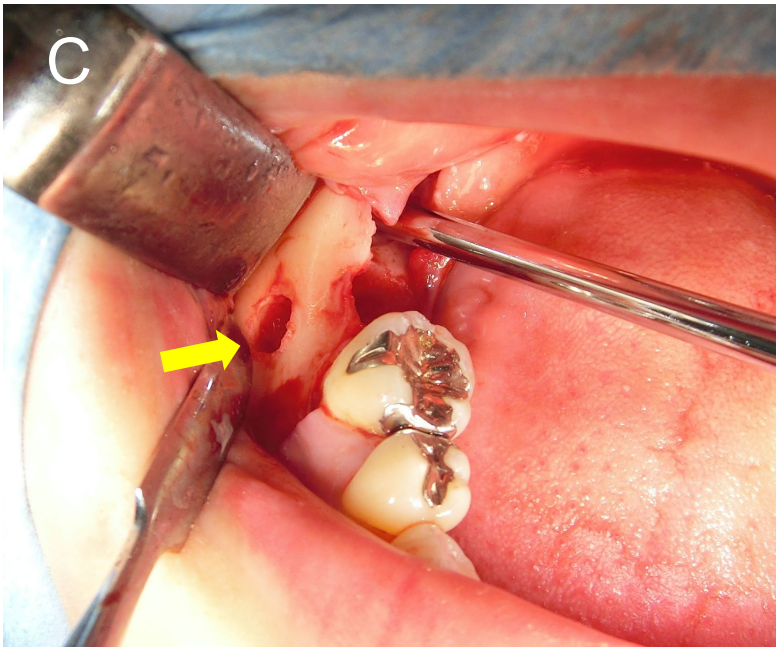
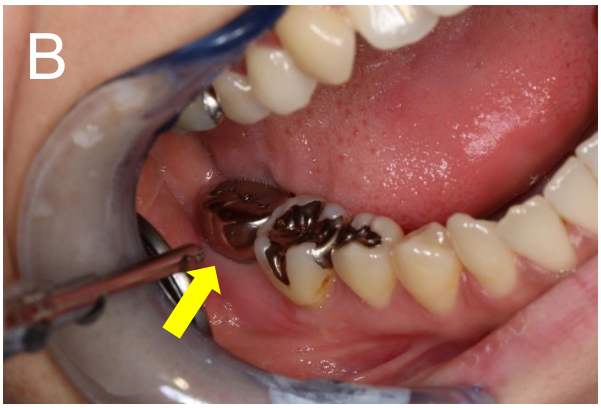


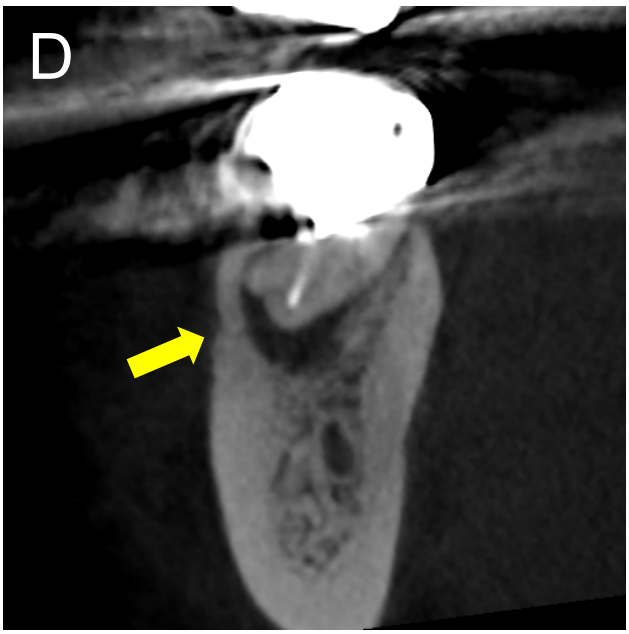


Figure 3









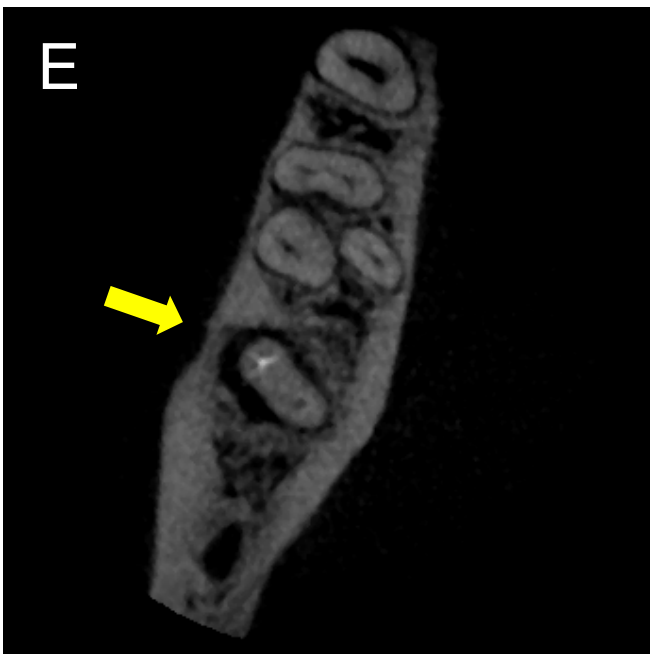


Figure 4



