

Autotransplantation: Salvaging an odontoma-associated unerupted anterior tooth

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Abstract

Background

Autogenous tooth transplantation is a viable option in cases involving impacted teeth, congenitally missing teeth, tooth loss and ectopic teeth. The method is considered superior to a removable prosthesis, as it maintains proprioception and alveolar bone height. Compared with dental implants, autotransplantation can provide faster healing, function and esthetic improvement at minimal cost.

Case presentation

The first case involved a patient referred for an unerupted maxillary left central incisor associated with

odontomas. The odontomas were surgically removed and the impacted maxillary left central incisor placed into occlusion and held in situ using a composite splint. Root canal therapy was carried out in a single visit at her subsequent appointment. The composite splint was retained for 6 weeks.

The second case involved a patient referred owing to eruption of multiple small tooth-like structures at her maxillary right central incisor. A diagnosis of an impacted maxillary right central incisor secondary to erupted odontomas was made. The procedure of autotransplantation was carried out in stages, first removing the odontomas and clearing the recipient site of infection, followed by surgical repositioning of the impacted maxillary central incisor. Its root canal therapy was completed in a single visit later, and the tooth continued to be retained by a composite splint for the duration of 6 weeks.

Conclusion

Autotransplantation has advantages and disadvantages in the case of tooth impaction. The treatment must be considered individually, and the patient must be fully informed of the procedure involved.

Keywords

Tooth autotransplantation; impacted tooth; odontoma.

Introduction

Autotransplantation is a procedure that entails relocating the patient's own teeth from 1 site in the oral cavity to another. Ectopic teeth, tooth loss or congenitally missing teeth are among the clinical situations for which autotransplantation is indicated.¹ Unlike a removable prosthesis, an autotransplanted tooth provides proprioceptive properties during function and allows maintenance of the alveolar bone mass. Therefore, it not only serves to fill the empty ridge for esthetic



Fig. 1

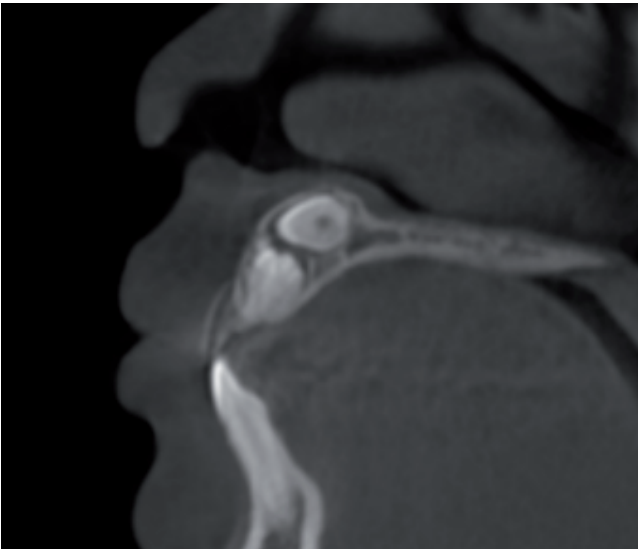


Fig. 2

purposes, but restores a normal, functional dentition at a relatively lower treatment cost compared with implants, a fixed prosthesis or orthodontic closure.

Survival of the transplanted tooth is influenced by the preoperative, peroperative and postoperative conditions. Preoperatively, the donor tooth must be evaluated regarding its suitability for transplantation elsewhere on the ridge. This includes the morphology of its crown and roots, presence of associated pathologies and state of the recipient site. Cautious handling of the tooth during its transfer from its original site to the new bed, the proper surgical technique and good immobilization following that also contribute to the good prognosis of the transplanted tooth. The patient's commitment to maintaining excellent oral hygiene and compliance with the postoperative instructions are no doubt indispensable.²

Odontoma is the most common odontogenic tumor, and its presence may be associated with delayed eruption or total impaction of dentition. Although it can be either complex or compound in nature, the type of odontoma does not have any significant clinical effect. Usually, odontomas can be found in the maxillary anterior region, affecting development and eruption of maxillary central incisors and canines. The diagnosis of odontoma is often a coincidental radiographic finding, resulting from investigation of delayed eruption or absence of a tooth in the arch.

In this article, we highlight 2 cases of autotransplantation of impacted maxillary central incisors after removal of embedded and erupted odontomas, respectively.

Case presentation

Case 1

A 17-year-old female patient was referred to our oral maxillofacial surgery unit for eruption failure of the maxillary left central incisor. She had no contributory medical history that may have been associated with this condition. The patient reported that her primary maxillary left central incisor had exfoliated at the age of 8 years and following that no permanent tooth had come into occlusion. On oral examination, there was no palpable swelling or protuberance that might indicate the presence of the maxillary left central incisor (**Fig. 1**). A cone beam computed tomography (CBCT) scan was taken, and it revealed a cluster of multiple radiopaque tooth-like structures in the maxillary left anterior region. Adjacent to these lay the impacted maxillary left central incisor, in a horizontal orientation close to the nasal floor (**Fig. 2**). A diagnosis of a horizontal impacted maxillary left incisor secondary to odontomas was made. The patient was informed about the treatment options available and she opted for the impacted central incisor to be salvaged.

Under general anesthesia, an intrasulcular incision was made from the maxillary right central incisor to the maxillary left lateral incisor, with releasing incisions made on both ends. A full-thickness flap was raised. Buccal bone was removed to expose the odontoma cluster and a total of 13 denticles were then removed (**Fig. 3**). Just above the cluster of odontomas, the im-

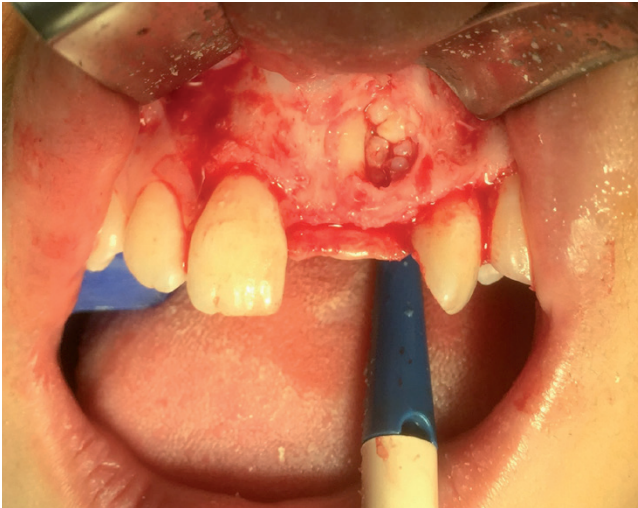


Fig. 3



Fig. 6



Fig. 4



Fig. 7



Fig. 5



Fig. 8

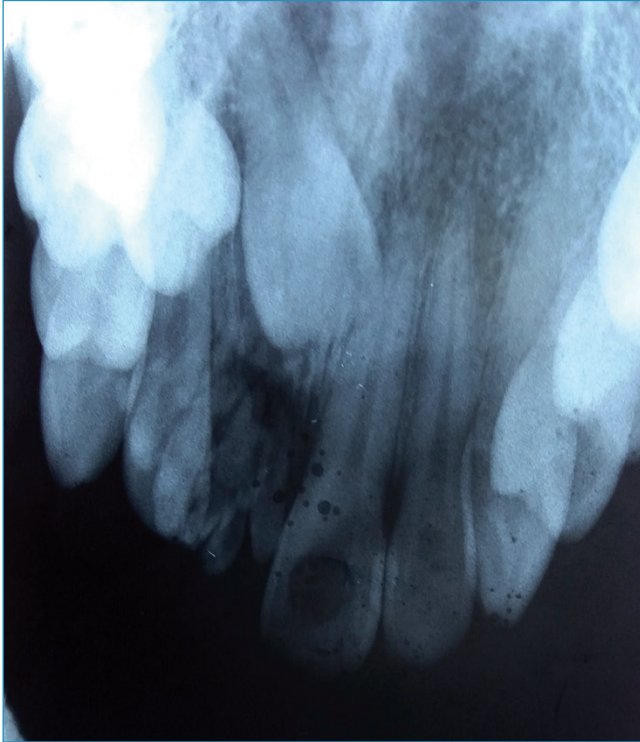


Fig. 9



Fig. 10

pacted central incisor was identified. Care was taken to remove this tooth as atraumatically as possible to avoid fracture, and the patient's own blood was used to preserve it while the recipient bed was prepared (**Fig. 4**). The tooth was then transplanted into position with the best possible occlusion using composite and stainless-steel wire (**Fig. 5**). Four weeks after the surgery, root canal therapy was completed in a single visit, and 2 weeks after that, the splint was removed, leaving the tooth with normal mobility and occlusal function.

Six months after surgery, follow-up examination showed a satisfactory appearance (**Fig. 6**), normal tooth mobility and no discoloration of the transplanted tooth. The dental panoramic tomogram showed good bony healing around the cervical and middle thirds of the root (**Fig. 7**).

Case 2

A 19-year-old female patient was referred to our unit owing to the presence of multiple small teeth occupying her maxillary right central incisor region. She reported that these had erupted after her primary teeth had exfoliated at the age of 7 years. On examination, multiple tooth-like structures were found to be occupying the space between the right lateral incisor and left central

incisor (**Fig. 8**). A slight palpable bulge could be felt at the vestibule above the maxillary right central incisor region. A maxillary occlusal radiograph revealed a cluster of radiopaque tooth-like structures at the alveolar ridge and an impacted maxillary central incisor lying close by (**Fig. 9**). A diagnosis of an impacted maxillary right central incisor secondary to erupted odontomas was made. The possibility of autotransplantation was discussed with the patient and she keenly expressed her full commitment.

Extraction of all the erupted odontomas was performed under local anesthesia and the site was allowed to heal before the transplantation procedure was carried out. This was to clear the future transplantation site of any infection, as it was noted that there was a labial sinus that had highly likely arisen from 1 of the odontoma. The neighboring teeth were all vital without pocketing.

After 2 weeks, local anesthesia was administered, and an incision was made from the maxillary right canine to the maxillary left lateral incisor, with bilateral releasing incisions. A full-thickness flap was raised to expose any remaining odontoma. A single odontoma was revealed and removed. The impacted central incisor was exposed, meticulously luxated and kept in



Fig. 11



Fig. 12

the patient's own blood. Slight guttering was done on the alveolar bone to accommodate the central incisor (**Fig. 10**). The tooth was splinted into position and kept in the best possible occlusion with composite and stainless-steel wire (**Fig. 11**). Root canal therapy was done 4 weeks after the surgery and the splint removed 2 weeks thereafter.

Follow-up examination after 6 months showed a satisfactory appearance, normal tooth mobility and no discoloration of the transplanted tooth (**Fig. 12**). A periapical radiograph was taken and revealed good bony healing around the transplanted tooth (**Fig. 13**).

Discussion

Tooth relocation involving a site previously occupied by odontomas is not common practice, as it is not part of any identified indication for autotransplantation.² Certain cases of an impacted tooth associated with the presence of odontoma can be managed through spontaneous eruption or orthodontics-assisted eruption after removal of the physical obstructions. According to Ashkenazi et al., spontaneous eruption of an impacted tooth correlates with several conditions, such as the distance of the impacted tooth's apex from its proper position, impaction depth, angle of impaction relative

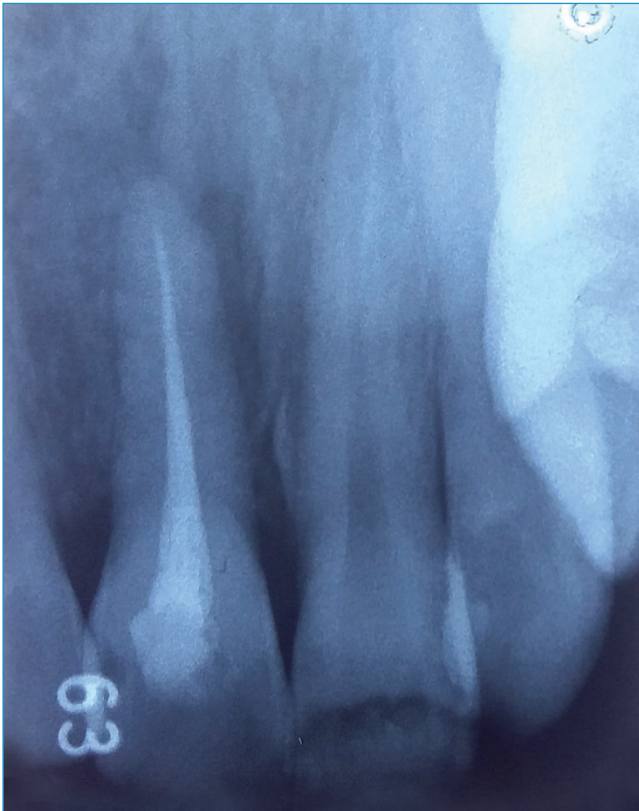


Fig. 13

to the midline, and timing of surgery relative to the expected eruption.³ In a retrospective study of unerupted maxillary incisors associated with supernumerary teeth by Mason et al., three-quarters of the immature teeth erupted spontaneously, while half of the mature teeth needed a second surgery to bring them into occlusion.⁴ Their findings support the theory that unerupted incisors with closed apices are associated with slow eruptive movement.⁵ Both of our patients were not suitable candidates for such treatment methods. Their impacted teeth had fully developed roots and large angles of impaction. Spontaneous eruption was very unlikely. Surgical exposure and orthodontic alignment too were not options owing to the teeth's unfavorable positions and depths of impaction.

In our patients, tooth autotransplantation had been offered as a treatment choice after considering several factors. First of all, radiographic investigation had revealed that the impacted tooth was not associated with a suspicious cystic or other pathological lesion, apart from the odontomas hindering its normal eruption. Morphologically, both of the impacted teeth had

normal crown sizes, and even though their roots were slightly shorter than those of the erupted counterparts, they were nondilacerated. Regarding availability of space, there was ample room for transplantation of the impacted tooth in case 1. The space had been maintained by provision of a maxillary partial denture by the patient's previous dentist and partly by the presence of the odontomas underneath. In case 2, the space for transplantation was slightly limited by the palatally erupted lateral incisor. The oral hygiene of both patients was good, and they were eager to have their impacted teeth brought into position and functional in normal occlusion.

Among the drawbacks of tooth autotransplantation that should be highlighted to patients before embarking on this procedure are the risks of ankylosis of the transplanted tooth, inflammatory resorption, tooth discoloration and possible loss in subsequent years.

The survival rates of autotransplanted teeth vary. Overall, teeth with immature root formation have higher survival and success rates compared with mature teeth.⁶ One study has even shown survival rates of autotransplanted teeth with complete root formation to be as high as 98% for 1 year and 90% for 5 years.⁷ This finding indicates that, even with complete root formation, autotransplantation can be a viable, relatively economical option for replacement of missing teeth.

Autotransplantation is seen as a technique-sensitive procedure for which maintenance of the periodontal ligament is very crucial. Continued vitality of this structure is the most significant determinant for survival of the transplanted tooth.⁶ To allow proper differentiation of periodontal ligament cells, it is essential to minimize inflammation surrounding the transplanted tooth. Sources of potential inflammation must be eliminated, such as through tight suturing of gingival cuff to prevent bacterial ingress⁸ and good timing of root canal therapy (RCT).⁶ It has been suggested that RCT of fully developed donor teeth should be started 2 weeks after transplantation, to keep trauma as minimal as possible during the initial healing phase of reattachment of the periodontal ligament. Further delay will increase the risk of pulpal infection, which in turn will increase the possibility of secondary inflammatory resorption.⁶ RCT in both our patients was started after 4 weeks of transplantation while the tooth

was still in a splinted position. The rationale of this is to allow adequate reattachment of the periodontal ligament and more bone deposition before subjecting the tooth to the motion of the cleaning and shaping of RCT. We decided to complete the RCT in a single visit, as the tooth was asymptomatic in each case. There is insufficient evidence to show whether multiple-visit RCT is superior to single-visit RCT or vice versa.⁹

Other than good alveolar bone support and adequate keratinized tissue, the recipient site must be free from acute and chronic infections.¹⁰ Therefore, apart from an aseptic technique, a systemic antibiotic was given to increase the prognosis of the relocated tooth. Without its use, the occurrence of root resorption has been reported to be 1.4 times higher.⁷ The results clearly demonstrate the clinical benefit of giving systemic antibiotics to increase the survival of autotransplanted teeth.⁷ For an antibiotic regimen, we adopted the guideline for management of an avulsed tooth, which recommends the use of tetracycline or amoxicillin.¹¹ We prescribed to our patients oral amoxicillin (500 mg) 3 times daily for 1 week duration.

Surgical removal of impacted teeth and intraosseous odontomas might necessitate bone grafting to fill up the bone cavity created. The required material may be taken from the patient as an autogenous graft or processed bone granules may be utilized. However, if the cavity is small and the circumference of the bone surrounding the transplanted tooth is good enough, bone grafting may not be needed at all. A scaffold to promote blood clotting and provide a growth factor reservoir can be achieved by oxidized cellulose polymer, which is readily available in the clinic.

The first case report of combined odontoma removal and autotransplantation was by Hwang et al.¹² After 14 months of follow-up, the case had shown a satisfactory result in terms of appearance and periodontal status.¹² Both of our cases resemble theirs, with immediate replantation of unerupted maxillary anterior teeth associated with odontomas in teenage patients. The usefulness of this tooth relocation procedure compared with conventional prosthetic restoration such as a dental implant is that the tooth is biological, and with good preservation of the periodontal ligament, physiological stimulation will maintain the alveolar bone height and width. It is also cost-effective, does not

entail sacrifice of adjacent tooth structure like bridge-work preparation does and is more comfortable, as it can be left in situ, unlike removable partial dentures. The transplanted tooth is hoped to be able to serve its function and esthetic purpose for as long as possible, at least throughout the patient's growing years. The option of osseointegrated implants may present later, when patients have reached adulthood and their jaw growth is stabilized.

Conclusion

Immediate autotransplantation using the salvaged impacted tooth can be considered by surgeons in the management of edentulism, especially in the maxillary anterior regions of growing adolescent patients. The technique is relatively quick and inexpensive for addressing esthetic and functional demands. Nevertheless, it is important for the patient to fully understand the procedure involved, as well as the advantages and limitations of this method of tooth replacement.

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Competing interests

The authors declare that they have no competing interests.

Legends

Fig. 1 – Clinical preoperative photograph of the patient with absence of the permanent maxillary left central incisor.

Fig. 2 – Sagittal view of the CBCT scan showing the presence of an impacted tooth in relation to the odontoma.

Fig. 3 – Intraoperative photograph of the odontomas.

Fig. 4 – Prepared recipient site.

Fig. 5 – Placement and splinting of the transplanted tooth.

Fig. 6 – Six-month postoperative photograph showing no discoloration of the transplanted tooth.

Fig. 7 – Radiograph showing good bone healing without signs of root ankylosis or root resorption.

Fig. 8 – Preoperative photograph showing erupted odontomas with sinus opening.

Fig. 9 – Occlusal radiograph showing the impacted tooth.

Fig. 10 – Intraoperative photograph of the cavity after removal of the impacted tooth.

Fig. 11 – Transplantation of the impacted tooth.

Fig. 12 – Six-month postoperative photograph showing no discoloration of the transplanted tooth.

Fig. 13 – Radiograph showing good bone healing without signs of root ankylosis or root resorption.

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