

Transplantation of ectopic upper canine into its proper position on the jaw: a case report

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ABSTRACT

Introduction: Tooth transplantation is the transfer of one tooth into its new position in the jaw of the same person. The purpose of this case report was to discuss the transplantation of an ectopic upper canine to the proper position where the primary canine was still occupied. **Case report:** a female patient came to the Oral Surgery clinic with a complaint that her left upper canine was growing towards the palate, so that her deciduous teeth did not fall out. The treatment for this patient was the atraumatic extraction of the left deciduous canine teeth and the permanent canine, then the permanent canine was transplanted into a socket of the deciduous teeth that was extracted. The transplanted canines were then fixed with interdental wiring (IDW) for 3 months. At the time of follow-up, the canine was healing well, and was able to work well. A tooth can be transplanted into its new position with the best achieved if the integrity of the periodontal membrane remains vital, the extraction process is as atraumatic as possible, and with a short time of the tooth being outside the mouth. **Conclusion:** an ectopic tooth can be transplanted in proper position in the arch if there is sufficient space, the integrity of the periodontal ligament is maintained, time outside the mouth is short, and is accompanied by adequate fixation.

Key words

ectopic, interdental wiring (IDW), canine, transplantation

Transplantasi kaninus rahang atas yang mengalami ektopik pada lokasi yang seharusnya di rahang: laporan kasus

ABSTRAK

Pendahuluan: Transplantasi gigi yaitu pemindahan satu gigi ke tempat baru pada rahang orang yang sama. Tujuan dari laporan kasus ini yaitu membahas mengenai transplantasi kaninus atas yang ektopik ke posisi seharusnya yang masih ditempati oleh kaninus sulung. **Laporan kasus:** pasien wanita datang ke poli Bedah Mulut dengan keluhan gigi kaninus atas kiri tumbuh ke arah langit-langit, sehingga gigi kaninus sulungnya tidak lepas. Perawatan pada pasien ini yaitu dilakukan pencabutan gigi kaninus sulung dan gigi tetap kaninus tersebut secara atraumatik, kemudian gigi kaninus tetapnya ditransplantasikan pada soket bekas gigi kaninus sulung yang dicabut tersebut. Gigi kaninus yang ditransplantasi kemudian difiksasi dengan interdental wiring (IDW) selama 3 bulan. Saat kontrol, gigi kaninus telah mengalami penyembuhan dengan baik serta dapat berfungsi baik. Suatu gigi dapat ditransplantasikan ke posisi yang baru, jika integritas membran periodontal terjaga vitalitasnya, proses ekstraksi sea traumatik mungkin, dan gigi berada di luar mulut sesingkat mungkin. **Simpulan:** Gigi yang ektopik dapat dilakukan transplantasi ke posisi yang seharusnya pada lengkung rahang apabila terdapat ruang yang cukup, integritas ligamen periodontal tetap terjaga, waktu di luar mulut singkat, serta fiksasi yang adekuat.

Kata kunci

ektopik, interdental wiring (IDW), kaninus, transplantasi

INTRODUCTION

Ectopic is a condition where a tooth erupts not in its proper position in the jaw arch. A tooth can be ectopic because of an alteration in the process of eruption in which the tooth erupts away from its normal seat, into vestibular, lingual, or palatal position. This anomaly can be congenital, genetic, or environmental. An ectopic tooth can be the result of an abnormal position of a tooth bud or a lack of space in the dental arch where it should be. Ectopic positions are common in the canines or anterior teeth, and it is very important for an aesthetic perspective, and lip support.¹

Ectopic eruption of the permanent maxillary canines is a significant problem in dentition, affecting approximately 1-3% of the general population or more than 50,000 orthodontic patients in the United States each year. Maxillary canines have the longest period of development, and its final position in occlusion is critical to complete arch shape, functional occlusion, and dentition symmetry and alignment. The most common side effect of ectopic eruption of the maxillary canines is resorption of the adjacent roots. In addition, tooth decay, gingival recession, cyst formation, and tooth malposition are possible as the effects of ectopic maxillary canine eruption.²

There is a variety of treatment modalities for the management of impacted or ectopic teeth, including orthodontic treatment and surgical transplantation.^{1,2,3} Orthodontic treatment is not always accepted by patients, due to longer treatment time involved, localization of ectopic teeth, and ethical and economic considerations. In these situations, and in the presence of sufficient space, tooth transplantation may be a suitable clinical choice.^{4,5} Tooth transplantation is a surgical method in which a tooth is repositioned within the same patient. It can be described as a controlled reimplantation of an extracted tooth into a new, surgically prepared socket or into an extraction site.⁶ Tooth transplantation can be performed in teeth with ectopic, iatrogenic damage, or other anatomic disorders.^{1,3,7} Contraindications to tooth transplantation are complex radicular morphology, furcation lesions, periodontal lesions causing grade 3 mobility, and root caries.^{1,8,9} The first clinical case reports of successful autotransplantation appeared in the 1950s, in which carious first molars were replaced by transplanted immature third molars.⁶

Previous studies have described high survival rates of transplanted teeth with complete tooth formation and have shown few complications with obtaining sufficient final root length.^{6,10} The success of the transplant is determined by the condition of the patient, the teeth, and the location of the recipient. These conditions include the stage of development of the tooth root, type of tooth, surgical trauma, length of time the tooth is outside the alveolar bone, shape and location of the socket, vascularization, and the periodontal ligament. Failure of the transplant itself is a form of inflammation, root resorption and ankylosis. Ankylosis and root resorption can be prevented if the tooth is extracted with minimal trauma to the cementation and periodontal tissues. The success rate in transplantation is 79%.¹¹

Transplant procedures are usually followed by splinting to stabilize and immobilize the tooth, and the tooth must be protected from traumatic stress, assist in mastication, maintain oral hygiene, and increase patient comfort during the healing period. The splinting type consists of flexible, semi-rigid or rigid, using stainless steel wire and composite resin wire. For splinted teeth, it is necessary to select the appropriate wire in order to transmit physiological pressure.¹² The novelty of this case report was that the provision of transplantation action of ectopic canine to its position could be carried out in a short time, with good result, provided that there was sufficient space, and atraumatic surgery technique, as well as regular control. This was conducted as the patient refused to be treated with orthodontics which would take time, thus the consideration of surgery might have become a satisfactory choice. The purpose of this case report is to show that transplantation of an ectopic upper permanent canine into position can be successful, even without orthodontic treatment, if carried out with good procedures and follow-ups.

CASE REPORT

An 18-year-old woman came to the RSGM with complaints of the upper left canine being out of alignment with its normal arch and interfering with appearance and function. Extra oral examination showed no abnormalities. On intraoral examination, there was persistence of the upper left primary canine, and an ectopic upper left permanent canine, located palatally on the first and second upper left incisors (Figure 1).



Figure 1. Preoperative condition of the teeth: A. Frontal view; B. Sagittal view; C. Palatal view

A panoramic radiography was carried out to see the condition of the teeth and other supporting tissues (Figure 2). After examination, the diagnosis of this case was ectopic of tooth 23 with persistence of tooth 63. The treatment plan was extraction of the upper left primary canine, then transplantation of the upper left permanent canine, and continued with interdental wiring fixation in one visit. The prognosis of this case was good.

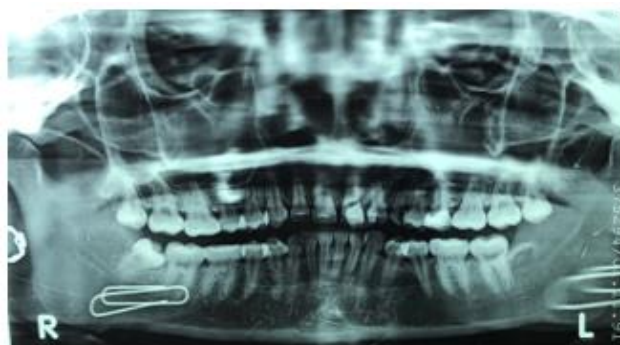


Figure 2. Preoperative panoramic view

Treatment began by giving antiseptic at the operating area, then injection of local anesthesia. First, we extracted the upper left primary canine, and then of the upper left permanent canine. The teeth were stored in 0.9% NaCl solution. A triangular flap was made for access to the upper left canine region and preparation to widen the socket in the post extraction of the upper left primary canine (Figure 3).



Figure 3. Post extraction socket of the upper left primary canine

The mesiodistal width of the upper left permanent canine, the distal surface of the upper left second incisor, and the mesial surface of the upper left first premolar were reduced by a maximum total of 1-2 mm, so that the upper left canine can fit into the post extraction socket of the upper left primary canine. The upper left permanent canine was inserted into the socket, the occlusion was checked. Centric occlusion was obtained whenever possible, and lateral movement was performed to see if there was any obstruction during eccentric occlusion. The buccal and lingual surfaces of the antagonistic premolar were reduced to relieve occlusal pressure against the transplanted canine. After that, the surgical wound was washed with 0.9% NaCl solution, the surgical wound was sutured, and the interdental wiring with arch bar was installed (Figure 4).



Figure 4. A. The permanent canine was transplanted into the donor site; B. An interdental wiring was installed to fix the tooth.

After completion of the surgical procedure, the patient was given instructions for caring for the wound, including monitoring for bleeding, rinsing with 0.2% chlorhexidine gluconate, liquid diet for 1 week, and maintaining oral hygiene with a soft toothbrush. The patient came on the 7th postoperative day for follow-up, and there were no complaints, the surgical wound was good, then the sutures were removed. The patient came for control at the 3rd month, the transplanted teeth were good and intact, and had a centric occlusion, then the interdental wiring was removed (Figure 5).



Figure 5. Intraoral condition and occlusion after 3 months of follow-up: A. right view; B. front view; C. left view

DISCUSSION

This case is about the transplantation of an ectopic upper left canine into its jaw alignment that was still filled with the persistence primary canine. Reposition of an ectopic tooth can be managed by an orthodontic treatment or by a transplantation surgery. In the present case, the patient did not accept orthodontic treatment due to a long treatment time and economic considerations, so surgical transplantation can be a valuable alternative for replacing an ectopic tooth into its new position.^{4,5,13}

The biologic mechanisms underlying intentional transplantation are maintenance of the integrity of the periodontal ligament to keep it vital (a major factor in increasing clinical success), atraumatic extraction (basic for maintaining the vitality of the elements), reduction of storage time outside the mouth, and reduction of osmotic pressure of the ligaments. Storage of the tooth in water (rather than physiological solution) and prolonged time outside the alveoli are associated with substantial root resorption. The advantages of transplantation are esthetic and functional return, reduced bone resorption, shorter time, and reduced risk of dental complications.^{1,8,9} Transplantation can involve other benefits than tooth replacement, the most important of which is the potential for bone induction and the reestablishment of a normal alveolar process. Even if the transplant later fails, there is an intact recipient area that could be used for an implant.⁶

The key to success of tooth transplantation is the preservation and regeneration of the periodontal ligament.⁶ To prevent damage to the periodontal ligament, the use of elevators during tooth extraction should be avoided. In addition, the beaks of conventional forceps must be placed firmly on the crown over the cemento-enamel junction while providing gentle luxation forces. The use of a periosteal elevator, powered periosteal elevator or even a scalpel can facilitate tooth extraction with little or no trauma to the root surface and periodontal ligament and reduce the occurrence of root fractures.⁹

Consideration should be given to the size of the recipient area. Mesiodistal assessment is easily executed, but it is typically difficult to determine the labiopalatal width of a donor root and whether it can fit well within the alveolar walls. For such assessments, occlusal radiographs are sometimes recommended.⁶ In the present case, the alveolar receptor has sufficient height and width to protect the permanent canine. Our primary concern in the selection of a recipient site was periodontal integrity. In this regard, a suitable site must have sufficient alveolar support in all dimensions; it should be covered with adequate attached, keratinized tissue to allow proper coverage or approximation to the transplant. It should also be free of chronic inflammation, and, as we discuss below, there should be minimal manipulation of the transplant.

At the present case, the patient was 18-year-old, which means that the root apex of the permanent canine has completely closed. Since the main objective is to obtain the maximum root length of the transplant, timing is critical for several reasons. On the other hand, the likelihood of a successful prognosis is reduced as the root apex reaches closure. The fact that revascularization must take place should always be taken into consideration.⁶ The ideal stage of a tooth to be transplanted is when the root has reached three quarters of its development and the apex is more than 1 mm exposed.⁷ While Fong and Agnew noted a reestablishment of blood supply within a closed apex, this is more easily achieved at an earlier stage. Surgical manipulation of a tooth in the bud stage of development is a traumatic event, and further development from that point onward may not be normal. Postoperative root formation is often inhibited or may take on morphologic abnormalities. The maintenance of deciduous teeth in these areas becomes very important. If replacement is planned, these teeth should be kept free from pathologic processes, and it is desirable to delay extraction until the time of transplantation, as the extraction site provides the basis of a crypt for placement.⁶

The prognosis for transplantation is good if the patient is healthy, obedient, and able to maintain good oral hygiene.¹⁴ Good oral hygiene, self-motivation, and a medical history not contraindicating transplantation are

prerequisites to initiating this treatment step.⁶ Transplantation is more advantageous in children and adolescents, due to the continuous induction of alveolar bone, and therefore allows for physiological growth.¹⁴ Regardless of the surgical technique undertaken, a careful atraumatic surgical procedure is essential to preserving the intact periodontal ligament (PDL) to the greatest degree possible. In some situations, autotransplantation may not be possible as a one-stage procedure. Two-stage transplantation is reported in cases of ectopic canine, where the canine is removed initially and stored in the buccal pouch until the recipient site is orthodontically prepared.⁶

After the donor tooth has been transplanted, it is usually held in place to promote periodontal healing and avoid inflammatory root resorption due to occlusal trauma. However, rigid long-term fixation of transplanted teeth may have adverse effects on periodontal and pulpal healing and cause ankylosis.⁶ In this case, a splinting procedure was performed with an interdental wire. Splinting is one of the most important things in transplant treatment, to stabilize and immobilize the tooth for the time necessary to ensure that no additional injury occurs and to protect the attachment to assist the periodontal fibers to regenerate. Proper positioning after transplantation should provide minimum pressure between the root surface and alveolar bone to assist reorientation of functional periodontal membrane fibers.⁶

Most studies advise flexible splinting for 7–10 days, as this allows for some functional movement of the transplant. This movement has been suggested to stimulate PDL cellular activity and bone repair. In some cases, a suture crossing the occlusal surface can be used for stabilization of the transplanted tooth; on the other hand, when stability is doubted in traumatic situations, wire splint may be used for fixation for 3–4 weeks when premolars are transplanted into the incisor region.⁶

Autotransplantation can have complications such as loss of pulp vitality, poor periodontal healing, and root resorption, which can be minimized if mature transplants are root filled within 4 weeks of transplantation.⁶ Some studies considered endodontic treatment only if necessary during follow-up;^{5,13,15} others performed it in all the teeth with complete roots and/or closed apices.^{5,6} A study by Lagerström and Kristerson revealed a success rate of 87% for teeth with immature roots and 67% for teeth with mature roots when they are not root-filled. Similarly, an evaluation of transplants to the maxillary incisor region showed a 96% survival rate with immature roots, while teeth with mature roots had an 82% survival rate. Although most studies suggested a greater success rate for teeth with immature roots, these teeth showed less post-transplant root growth than transplanted teeth with more mature apices.^{6,13}

A survival analysis for clinical outcomes in autotransplantation of teeth with complete root formation showed that the cumulative tooth survival rate was 68.2% at 12 years after the tooth autotransplantation. Tooth survival, inflammatory root resorption (IRR), ankylosis, and related prognostic factors were assessed based on clinical and radiographic examination. According to the analysis, patient age, donor position, and extraoral time were significantly associated with tooth survival. Donor extraction type was significantly associated with IRR, and transplantation timing and initial stability were significantly associated with ankylosis. If the condition of the patient is less than 45 years of age, maxillary donor teeth, and an extraoral time of less than 15 minutes were associated with significantly higher tooth survival; surgical extraction of the donor tooth was associated with a significantly higher incidence of IRR; and immediate transplantation after the extraction of the recipient site's tooth and low initial stability were associated with a significantly lower incidence of ankylosis.¹⁶ The limitation of this case report is that panoramic photo was not taken during the follow-up to assess the condition of bone healing around the transplanted tooth.

CONCLUSION

Transplantation of an ectopic canine into its jaw alignment is a simple and fast treatment option for patients with ectopic teeth, especially to those who often reject the idea of wearing an appliance to align an ectopic tooth. The treatment can be carried out in one visit, with an atraumatic extraction of the ectopic tooth, donor site preparation, insertion of the tooth into its new position, and being fixated with interdental wiring for 3 months. A gradual evaluation is carried out to see the success of the post-transplant tooth.

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