Positioning of Impacted Canine Teeth by Auto-transplantation After Unsuccessful Orthodontic Traction: Case Report

Başarısız Ortodontik Sürdürme Sonrası Gömülü Kanin Dişlerinin Ototransplantasyon ile Pozisyonlandırılması: Olgu Sunumu

Alper SİNDEL[1], Alper KUŞTARCI[2], Mükerrem HATİPOĞLU[3], Nelli YILDIRIMYAN[1]

[1]Akdeniz University Faculty of Dentistry, Department of Oral and Maxillofacial Surgery, Antalya, Turkey
[2]Akdeniz University Faculty of Dentistry, Department of Endodontics, Antalya, Turkey
[3]Akdeniz University Faculty of Dentistry, Department of Periodontology, Antalya, Turkey

Correspondence Address
Yazışma Adresi

Alper SİNDEL
Akdeniz Üniversitesi
Diş Hekimliği Fakültesi,
Ağız, Diş ve Çene Cerrahisi,
Antalya, Turkey

E-mail: dtalpersindel@gmail.com

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ABSTRACT

Canine teeth have important roles in both functional occlusion and facial aesthetics. Management of impacted maxillary canine teeth may be considered as one of the most complex cases in dentistry. Orthodontic traction or surgical extraction may be considered as two main treatment options and this decision requires careful evaluation for each patient. This report aims to present the treatment course of a 29-year-old female patient who had previously undergone unsuccessful orthodontic traction therapy for five years to position her impacted maxillary canine teeth on both sides. After considering all alternative treatment options and evaluating the teeth and their prognoses, the maxillary canines were corrected by surgical extraction followed by intraoperative root canal therapy and auto-transplantation to the surgically created recipient sites. Patient is within the third year of follow-up with no complications.

Key Words: Tooth transplantation, Autotransplantation, Impacted tooth, Maxillary canine

ÖZ

Dental arkta maksiller kanin dişler, hem fonksiyonel oklüzyon hem de yüz estetiği yönünden önemli role sahiptir. Gömülü konumdaki maksiller kaninler ise tedavi açısından diş hekimliğindeki en kompleks olgular arasında değerlendirilmektedir. Bu olgulardaki ana tedavi seçenekleri ortodontik sürdürme veya cerrahi çekim olmakla beraber bu hastaların kapsamlı bir şekilde değerlendirilmesi gereklidir. Çalışmada bilateral gömülü maksiller kanin dişlerinin ortodontik sürdürülmesi için beş yıllık bir tedavi geçmişi bulunan 29 yaşındaki kadın hastanın sonuç elde edilememesi nedeniyle fakültemize başvurusunu takiben gerçekleştirilen tedavisi rapor edilmiştir. Diğer alternatif tedavi seçenekleri, dişlerin durumu ve prognozu değerlendirilmiş ve gömülü kanin dişlerinin cerrahi çekim ile birlikte intraoperatif endodontik tedavisine ve cerrahi olarak hazırlanan alıcı sahalara ototransplantasyonuna karar verilmiştir. Takibinin üçüncü yılında olan hastada başarı sağlanmış olup, süreci etkileyecek bir komplikasyon gelişmemiştir.

Anahtar Sözcükler: Diş transplantasyonu, Ototransplantasyon, Gömülü diş, Maksiller kanin

INTRODUCTION

Each tooth has a specific time range for eruption and it is considered to be impacted if it fails to erupt within this expected time (1). Over-retained deciduous canines, supernumerary tooth or odontomas and abnormal eruption pattern of first premolars are local obstructive factors of impaction for maxillary canines (2-4). Pathological factors may include chronic periapical granulomas or radicular cysts of deciduous teeth, follicular cysts of impacted teeth, facial trauma or dilaceration of the roots (5-7). Systemic conditions such as endocrine disorders or nutritional deficiencies may also be responsible (8). A possible genetic factor is suggested but similar rates of impaction between monozygous and dizygous groups advocate a rather non-genetic etiology (9).

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From near the orbital floor to its final destination, a long eruption path is also blamed for maxillary canine impaction because of a high possibility of discrepancies along this track (10). Additionally, maxillary canines are prone to impaction since they have the longest development period until occlusion (11).

The majority of impacted upper canines stay asymptomatic but may cause malpositioning or root resorption of adjacent teeth, or present with cystic lesions. Either orthodontic or surgical treatment is advised when any signs of resorption are detected (12, 13). Swelling and eruption into the nasal cavity are some of the other complications (14). Clinically, crowding, decreased arch length or diastema are the red flags of impaction (15). Partial-impactions may result in infection or pain (16, 17).

Both maxillary canines are required to fulfill aesthetic and functional needs (18). Recently more patients are being treated by tooth auto-transplantations to replace their missing teeth in the alveolus (19). Autotransplantation may offer a reasonable and predictable treatment method to replace missing teeth as a result of traumatic injuries, aplasia or developmental disturbances such as clefting as well as impacted or misaligned teeth (19, 20). The major advantages of auto-transplantation is the use of an autologous tissue, preservation of the periodontal ligament, and the favourable aesthetic outcomes (19). Tooth auto-transplantation may also be considered as a good option for patients who do not wish to endure the rigors of extended orthodontic care (20). Therefore, this report aims to present a case of unsuccessful orthodontic traction of bilateral impacted maxillary canines corrected via auto-transplantation to surgically created tooth-sockets.

CASE REPORT

A 29-year-old woman was seen at the University's Clinic of Oral and Maxillofacial Surgery on January 2014. She had previously received orthodontic extrusion therapy at an outside center but her treatment was considered unsuccessful after five years of futile effort. She was referred to the university clinic for further evaluation. Intraoral examination revealed edentulous areas corresponding to upper canines. Orthopantomography confirmed impaction and traction appliances bilaterally (Figure 1).

The patient was presented two treatment options: 1) Surgical extraction and implant restoration, and 2) Auto-transplantation following surgical extraction and intraoperative endodontic treatment. The patient selected the latter due to financial reasons and provided written consent.

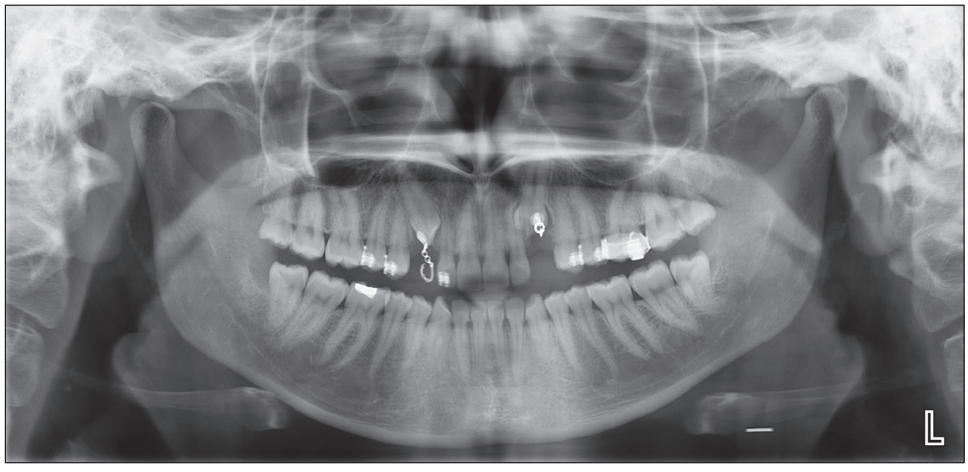

Figure 1: Pre-operative orthopantomograpic (OPTG) image of the patient.

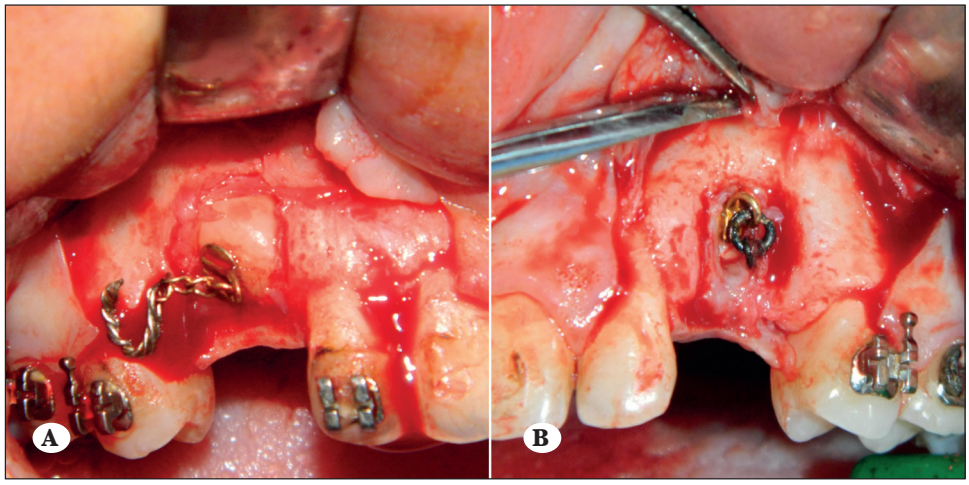

Figure 2A,B: Intraoperative view after flap elevation
A) right maxillary canine,
B) left maxillary canine.

Infiltrative anaesthesia was obtained (Fullcain, Onfarma, Samsun, Turkey.) and a full-thickness flap was raised following mid-crestal and vertical incisions at the edentulous areas to reveal impacted teeth (Figure 2A,B). Both teeth were extracted under extreme caution to prevent fractures. Extraorally, root canal obturation was completed with gutta percha (ACEONE-Endo, ACEONEDENT, Gyeonggi-do, Korea.) and epoxy-amine resin (AH Plus, Dentsply Turkey, Istanbul, Turkey.). The access cavity was closed with nano-hybrid composite filling (Filtek Z550 Nano Hybrid, 3M ESPE, Istanbul, Turkey.) (Figure 3). Recipient sites were prepared using implant drills (Straumann Pilot and Twist Drills, Straumann USA LLC, MA, USA.) of corresponding diameter. Endodontically-treated teeth were placed into these sockets carefully. Any remaining gaps and previous extraction socket were filled with bone allograft (MinerOss, Biohorizons, AL, USA.) (Figure 4). The teeth were positioned to obtain a symmetrical view and stabilized using a semi-rigid splint by stainless steel wire of 0.4 mm diameter via resin-curing. Occlusal contacts were removed and the flap was positioned with 3/0 silk non-resorbable sutures (Dogsan, Trabzon, Turkey.). Post-operative medication included amoxicillin/clavulanic acid (875mg/125mg), etodolac (500mg) and chlorhexidine (0.12%) mouth rinse. A soft diet was advised. After a week, the sutures were removed and the teeth displayed slight gingival edema with no signs of infection or pain (Figure 5). The splint was removed three months post-operatively and periodontal scaling was performed one month after splint-removal. Follow-up periapical radiographs were obtained at the post-operative second, fourth, and twelfth months, and yearly onwards. No sign of clinical or radiographic pathology was observed at the three-year follow-up visit (Figure 6A-C, 7A-C).

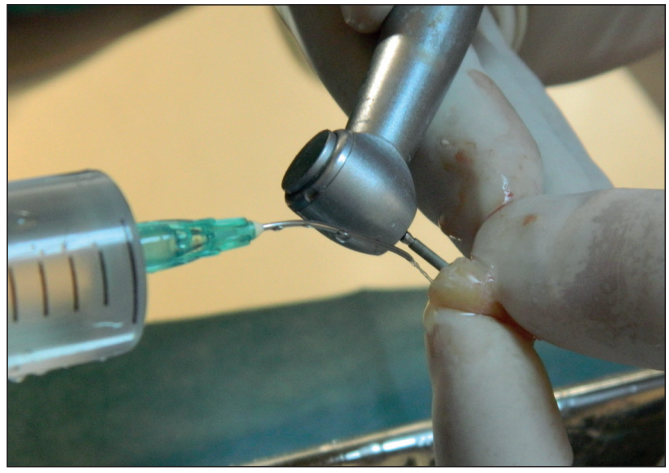

Figure 3: Intraoperative image showing the preparation of access cavity.

Figure 4: Intraoperative image of right maxillary canine teeth, reimplanted and gaps filled with bone graft.

Figure 5: Intraoral image of the patient after suture removal, post-operative 1 week.

DISCUSSION

Canine impaction is more common in the maxilla than in the mandible with an incidence of 2.5% and 0.10% respectively (21, 22). Upper canines are "the cornerstones of the mouth" because they provide a transition between the incisors and posterior teeth. They function in tearing and piercing in a masticatory sense, support the facial muscles, and are required for good aesthetics and phonetics (23).

A symmetrical smile is achieved if both canines are correctly aligned (24). Gingival margins and incisal edges of upper centrals should be below that of canines for an attractive smile (25). Besides aesthetic importance, canines provide functional occlusion by guiding the mandible in a centric relation (16, 26). Sajnani stated that absence of canine guidance may have negative consequences on the temporomandibular joint (27). Moreover, canines are reliable abutments for prosthetics and are perfect for load uptake because they have an ideal crown-to-root relation and the longest root, and are positioned at the intersection of sagittal and transverse forces (26).

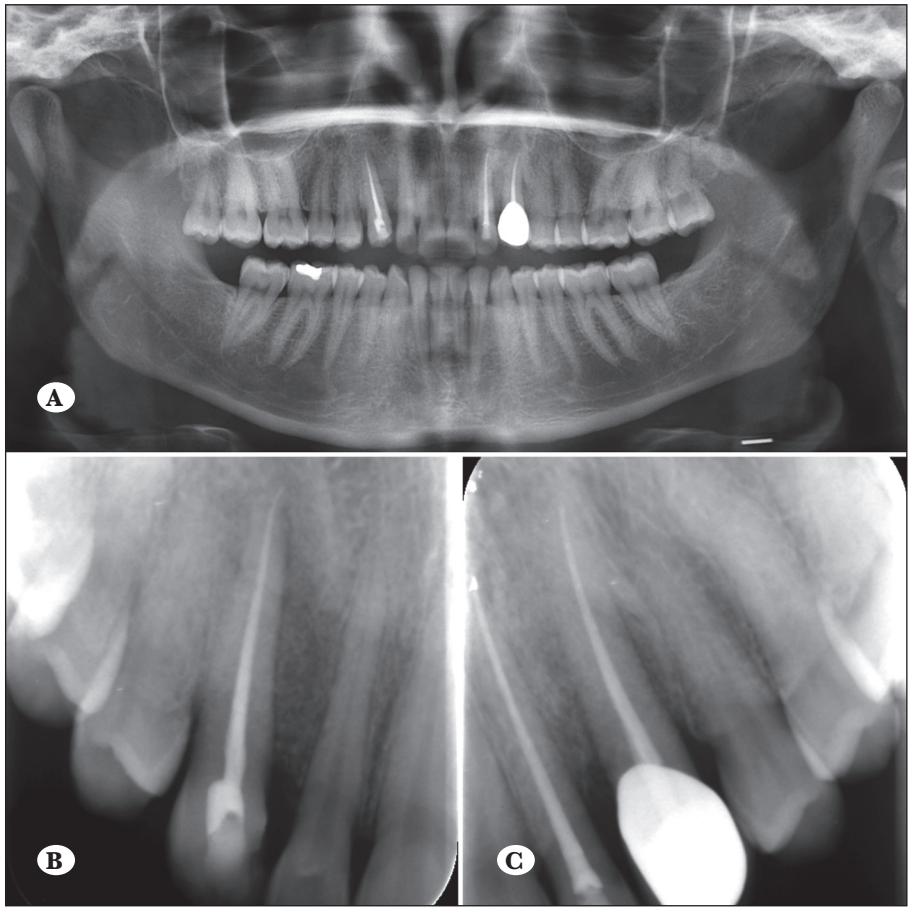

Figure 6A-C: **A)** OPTG image, **B)** periapical radiography of right canine, **C)** periapical radiography of left canine, post-operative three years.

Figure 7A-C: Intraoral image of the **A)** maxillary arch, **B)** right canine and **C)** left canine, post-operative three years.

Treatment options for canine impaction are surgical extraction, orthodontic traction after surgical exposure, and auto-transplantation (27). Symptom-free patients rejecting these options are advised to be periodically monitored both clinically and radiographically to detect any changes (28, 29).

Ru and Bai grounded successful auto-transplantation on timing, endodontic treatment, supplementary graft materials, splinting and occlusal loading (30). Stability should be ensured through suturing or via arch bars, orthodontic wires and composite resin. Several reports reported a negative prognosis with rigid fixation and a semi-rigid splint was therefore used in this case (31, 32).

Successful auto-transplantations are evaluated through pulpal and periodontal monitoring (33). Periapical radiolucency, inflammatory root resorption, replacement resorption (ankylosis) or, in cases without endodontic treatment, a negative response to electrometric sensitivity tests are indicators of failure (34). Radiographically, a physiological space equivalent to periodontal ligament fibers (PDL) is expected whereas clinically physiological mobility and no bleeding on probing are required to consider periodontal healing successful (35). In the present study, tooth sockets were surgically prepared and PDL on the socket walls were therefore absent (35). However several reports claim vital PDL on the surface of the root may have greater importance regarding the prognosis (36).

Other criteria for success may be listed as the adequacy of alveolar bone in all dimensions as well as sufficient attached keratinized tissue. The recipient site should also be free of any infection or inflammation (37). Donor tooth position is also an important factor, especially when an impacted tooth is planned as the donor. Positions, which allow extractions that are as atraumatic as possible, have lower risk of tooth damage, and thus have more predictable results (38). Therefore the vertical impaction of this present case may have contributed to the success of auto-transplantation.

Several patient-based factors that contribute to the success of auto-transplantation are overall good health and acceptable oral hygiene. It is also important for patients to follow post-operative instructions and attend their periodic follow-up visits (38).

Implant rehabilitation is a highly-preferred and reliable choice to replace missing teeth. However patients with incomplete jaw growth are contraindicated for implant treatment. Instead, auto-transplantation of permanent teeth has no age-related contraindication. Auto-transplantation has the advantage of rehabilitation with natural teeth rather than prosthetics (34). Success rates as high as 98% have been reported by Andreasen et al. but there is still controversy on whether to consider progressive root resorption as failure (33, 35). Arikan et al. mentioned that resorbed root sites which are replaced by bone help keep a sufficient bucco-palatal width for future dental implant substitution and failed treatment may therefore actually result in successful alveolar ridge augmentation (35). However it is not possible to foresee the pattern of clinical bone defects that may occur. Considering other reports with rather lower success rates of 57.5% for canine teeth auto-transplantation, the patients should be informed about implant treatment before deciding on auto-transplantation in order to avoid secondary augmentation procedures for implant surgery (39).

Physicians may consider tooth auto-transplantation as a valid choice of treatment to rehabilitate edentulous areas if implant treatment cannot be afforded by the patients, prosthetic bridges involving preparation of healthy adjacent teeth are to be avoided, or if there are other contraindications to implant surgery. Auto-transplanted teeth should be closely monitored, frequently followed up and supported with routine periodontal therapy to detect any signs of complications.

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