

Long-term follow-up of autogenous canine transplants with application of guided bone regeneration

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Abstract. The aim of this study was to evaluate the aesthetics and outcome of autotransplantation of impacted canines unsuitable for orthodontic realignment using a combination of surgery with guided bone regeneration and orthodontic treatment. Ten severely impacted canines in nine consecutive patients (mean age 14.8 years) were included. The recipient mesiodistal space was created orthodontically and the recipient socket prepared using dental implant drills. Following transplantation, bone defects were grafted using guided bone regeneration, teeth were aligned and occlusions adjusted orthodontically. Patients were followed-up every 6 months for an average of 7.1 years (range 2–11 years). The mean pink aesthetic score was 13.33 ± 0.87 . Pocket depths were less than 3 mm. Radiographic examination showed an uninterrupted periodontal space and lamina dura in seven cases, unclear periodontal space in two, and replacement resorption in one case. The analysis showed that canine transplantation combined with guided bone regeneration and orthodontic treatment gives acceptable and predictable aesthetic results.

Key words: transplantation; cuspid; impacted tooth; aesthetics; guided bone regeneration.

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Impacted teeth are those with a delayed eruption time or that are not expected to erupt completely based on clinical and radiographic assessment. Studies have reported that the incidence of tooth impaction varies from 5.6% to 18.8% of the population.¹ The maxillary canine is an important tooth within the dentition, having a role in aesthetics, lip support, and masticatory efficiency.² The permanent maxillary canine is the second most frequently

impacted tooth in the dental arch after the third molar, and the prevalence of its impaction is 1–2% in the general population. Eighty-five percent of impacted maxillary permanent canines are palatal, and 15% are labial impactions. The incidence of impacted mandibular canines is 0.35%.¹

Treatment options for impacted teeth include: (1) surgical exposure with orthodontic alignment; (2) extraction of the impacted tooth with simultaneous

orthodontic alignment in circumstances where arches are crowded; (3) extraction of the impacted tooth, followed by later implant placement when the jaw bone is fully grown, usually after 18 years of age. In cases where an impacted tooth is severely displaced or the impacted position is too deep, orthodontic alignment is impossible, and autotransplantation can be considered as a treatment option.³ Compared with an implant, transplanted teeth can erupt in

harmony with the adjacent teeth when the jaw bone is not fully grown. The healing of transplants is rapid and they have acceptable function almost immediately. Moreover, transplants have good aesthetic results, as their natural emergence profile and the natural appearance of enamel and the crown form are maintained. The total cost of transplantation is also much lower than implant treatment.⁴

The frequent occurrence of bone defects in the original position of the impacted canine after its extraction is an issue, and complications that are associated with the surgical removal of impacted teeth include periodontally compromised adjacent teeth and osseous defects.⁵ When donor teeth are placed into the recipient site with poor buccolingual spacing, roots can protrude through a bone dehiscence. Graft materials should therefore be placed over the exposed root in order to create space for bone regeneration.⁴ Penarrocha et al.⁶ suggested that after removing the ectopically positioned canines, implants could be placed and anchored bicortically in the sockets and floor of the nasal fossae and maxillary sinus, and the bone defects remaining around the implants could be filled with collected allograft shavings. In the treatment of bone defects around an implant, Simion et al.⁷ used polylactic acid/polyglycolic acid membranes in association with autogenous bone chips as a space-maker and stabilized with fixation screws or nails. Bone substitutes and guided bone regeneration (GBR) have also been used extensively in areas of deficient bone volume as spacers under membranes.⁸ However, very few clinical studies have investigated the application of GBR in canine autotransplantation when osseous defects are present after the removal of impacted teeth.

The purpose of this study was to investigate the indications for canine transplantation with a combination of GBR techniques and orthodontic treatment. The indications for this treatment option and surgical techniques that affect the prognosis were investigated over a long follow-up period. Graft survival and functional success rates were assessed in addition to aesthetic outcomes.

Materials and methods

The institutional ethics committee approved the research protocol.

Clinical records

Over a 9-year period, from 2001 to 2009, nine consecutive patients (five female,

four male; 10 transplanted teeth) were referred for dental autotransplantation. Two of the teeth were labial impacted maxillary canines, three were palatal impactions, three were mandibular impacted teeth, and two were labial impacted canines where orthodontic traction had failed. The average age of the patients at the time of transplantation was 14.8 years (range 13–17 years).

Preoperative orthodontic treatment

The mesiodistal space of the recipient site, equivalent to the mesiodistal diameter of the contralateral canine, was created with preoperative orthodontic treatment. Malocclusion, especially where the opposing teeth were overgrown, was corrected to prevent the vertical position of the transplant being affected and the profile of the transplant being badly impaired by occlusal adjustment and occlusal trauma (Figs 1 and 2).

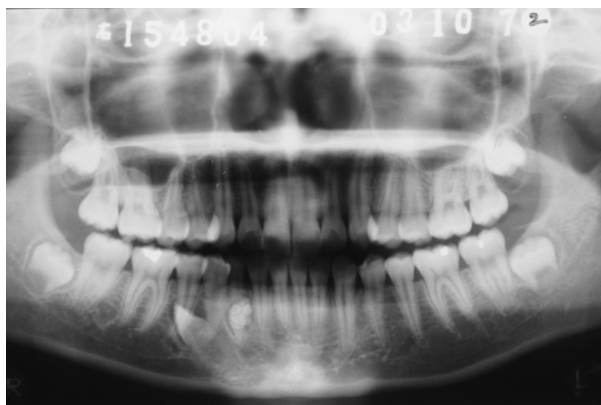


Fig. 1. Panoramic radiograph at the initial examination reveals an ectopically erupted mandibular canine.

Surgical procedure

Preparation of the donated tooth

Local anaesthetic (lidocaine 2% with epinephrine 1:100,000) was administered to the patient. An incision was made and a full-thickness flap reflection was performed in order to fully expose the surgical site. An osteotomy was performed to remove the donated tooth atraumatically, and care was taken to preserve as much periodontal ligament (PDL) on the root as possible. After the diameter and length of the root were measured, the donated tooth was replaced in the extraction socket for preservation (Fig. 3). The extraoral transplantation time should be less than 30 min.

Surgical treatment of the recipient area

The recipient bed was prepared a little larger than the donor using dental implant drills (NobelReplace Dental Implant, Nobel Biocare AB, Sweden) of increasing



Fig. 2. The mesiodistal space of the recipient site was created with preoperative orthodontic treatment.

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