



Management of severely impacted mandibular canines and congenitally missing mandibular premolars with protraction of autotransplanted maxillary premolar

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Transmigrated mandibular canines increase the treatment complexity in terms of both anchorage and biomechanical planning. Additionally, a Class II malocclusion with a deep overbite and associated dental anomalies such as hypodontia can further increase the treatment complexity and the overall treatment time. This case report describes the successful interdisciplinary treatment of a patient, aged 12.5 years, with transmigrated and severely impacted mandibular canines and congenitally missing mandibular second premolars. The transmigrated mandibular right canine was extracted, and a maxillary second premolar was autotransplanted to the missing mandibular right second premolar site with the aid of a stereolithographic donor tooth replica fabricated with 3-dimensional cone-beam computed tomography and a rapid prototyping technique. Furthermore, the autotransplanted tooth was protracted by 4 to 5 mm to close the space caused by the extraction of the mandibular right canine. The impacted mandibular left canine was orthodontically guided into its normal position in the arch. Good esthetic outcome and functional occlusion were achieved. (*Am J Orthod Dentofacial Orthop* 2016;150:339-51)

Transmigration is the term used by some authors to define an unerupted mandibular canine crossing the midline.¹ The reported incidence of transmigrated mandibular canines ranges from 0.05% to 0.4%.² The etiology of impacted mandibular canines is largely unknown or is multifactorial. Tumors, cysts, odontomas, premature loss of deciduous teeth, prolonged retention of deciduous canines, crowding, spacing, abnormally increased eruption force of the

canines, and a genetic origin associated with hypodontia are some factors that have been suggested to play a role in the transmigration of mandibular canines.¹

The management of transmigrated mandibular canines is complicated and may preclude an ideal treatment outcome. Surgical extraction, transplantation, or autotransplantation and surgical exposure followed by orthodontic alignment are common approaches for the management of transmigrated canines.¹ The deciding factor for selecting the most appropriate treatment plan depends on the position of the transmigrated canines.² Additionally, the treatment complexity is further increased when transmigration is associated with congenitally missing teeth, especially in a Class II malocclusion. In these circumstances, it may be necessary to promote the eruption of the canines into the arch and replace the missing mandibular premolars with endosseous implants, close the edentulous space, or resort to autotransplantation.

Autotransplantation of a tooth is a highly sensitive procedure that involves the preparation of the recipient site with a trial-and-error method using a donor tooth as a template. This leads to increased extra-alveolar time and, more importantly, may damage the periodontal ligament cells of the donor tooth³ and cause pulpal necrosis.⁴

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Fig 1. Pretreatment photographs.

However, with the introduction of cone-beam computed tomography (CBCT) imaging and 3-dimensional (3D) printing of stereolithographic models with rapid prototyping technologies, these concerns can be addressed. It is now possible with 3D imaging to visualize the recipient site and the donor tooth. Additionally, the adaptability of the donor tooth to the recipient site in the buccolingual dimension can be evaluated on the CBCT images. Subsequently, this information can be exported into a software program for virtual planning and eventual printing of the donor tooth template with rapid prototyping techniques. The stereolithographic donor tooth template can aid in the recipient socket preparation and may reduce the manipulation of the donor tooth and the extra-alveolar time during the autotransplantation of the tooth.⁵

This case report illustrates the treatment of a patient with a Class II malocclusion, congenitally missing mandibular second premolars, and severely impacted

mandibular canines. An ipsilateral maxillary premolar was autotransplanted to the missing mandibular right second premolar site using 3D CBCT-based rapid prototyping techniques for stereolithographic donor tooth fabrication. Additionally, the autotransplanted tooth had to be significantly protracted after extraction of the transmigrated mandibular canine. The severely impacted mandibular left canine was erupted using direct and indirect anchorage from a miniscrew placed in the mandibular buccal ridge.

ETIOLOGY AND DIAGNOSIS

An adolescent Hispanic girl, aged 12.5 years, reported to the orthodontic clinic at the University of Connecticut with the primary complaint that her canines were compressed in her jaw. Her extraoral examination showed a convex soft tissue profile with competent lips and an obtuse nasolabial angle (Fig 1). Intraorally, the patient

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