

Orthodontic treatment of a transmigrated mandibular canine: a case report

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Background: Intraosseous migration of a lower canine across the midline is a rare dental anomaly. The treatment options include: forced eruption of the unerupted tooth using orthodontic traction, autotransplantation, extraction followed by prosthetic replacement.

Aim: To report the management of a transmigrated lower right canine.

Method: The treatment involved surgical, orthodontic and cosmetic dental treatment. No permanent teeth were extracted.

Results: The transmigrated canine was placed between the left central and lateral incisors and the crown recontoured to simulate a lateral incisor. An acceptable aesthetic and functional outcome was gained.

Conclusion: Transmigration is a rare dental condition that can be treated successfully with a collaborative effort from several dental disciplines.

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Introduction

The failure of a tooth to emerge into the dental arch is usually due to crowding or the presence of an obstruction, such as another tooth, in the path of eruption.^{1,2} Occasionally, an unerupted tooth migrates to the opposite side of the arch. This is referred to as 'transmigration'.⁴

Transmigration usually involves a lower tooth, such as a lateral incisor, a second premolar or a canine, and on rare occasions the upper canines.^{3,5,6} Migrated canines typically remain impacted.^{7,8} Occasionally, they may erupt ectopically in the midline or on the opposite side of the arch.^{9–11} In some cases, canines have erupted next to the contralateral canine, in a mirror image fashion.¹² The first sign that a canine is transmigrating may be failure of a lower permanent canine to erupt, or retention of a lower primary canine.^{7,13} Absence of a developing permanent lower canine under a deciduous canine is associated with slow resorption of the root of the deciduous canine.¹⁴

Tooth migration in the mandible is unlikely to be detected during a routine clinical examination. It is rarely discovered on a routine periapical radiographic examination because the tooth is generally impacted under the apices of the permanent teeth, and lies adjacent to the mandibular border. Therefore, when a permanent tooth is 'missing' a panoramic radiograph should be taken. The female to male ratio of transmigrated teeth is 1.6:1.¹⁵

The treatment options for a transmigrated lower canine are: surgical removal of the impacted canine and retention of the deciduous canine for as long as possible; transplantation; surgical exposure, forced eruption and orthodontic alignment; and extraction followed by prosthetic replacement.¹⁶ Surgical extraction is the most favoured form of treatment, especially when the lower arch is crowded and space is needed to align the lower teeth.^{16,17} If the lower incisors are in a normal position and there is sufficient space in the arch for the transmigrated canine, transplantation may be undertaken.¹⁸ Surgical



(a) (b)

Figure 1. (a) Frontal view before orthodontic treatment. (b) Lower occlusal view before orthodontic treatment.

Table 1. Pre- and post-treatment cephalometric measurements.

Cephalometric variables	Before treatment	After treatment
U1/L1 (degrees)	144.0	126.0
U1/NA (degrees)	23.0	19.0
L1/NB (degrees)	35.0	29.0
SNA (degrees)	75.5	76.5
SNB (degrees)	70.5	72.5
ANB (degrees)	5.0	4.0
Maxillary depth (degrees)	86.0	87.0
GoMeSN (degrees)	35.0	31.0
Saddle angle (degrees)	136.0	137.0
FMA (degrees)	28.0	21.0
SN/OccP (degrees)	20.0	15.0
Jaraback (ratio)	65.7	72.0
ANSMc/NMc (ratio)	58.0	58.4

exposure, combined with orthodontic alignment, can be performed for labially impacted transmigrated canines. When the crown of a transmigrated canine has migrated past the contralateral incisors or if the apex of the transmigrated canine has migrated past the apex of the ipsilateral lateral incisor, it is usually impossible to move the unerupted tooth into its correct place in the arch.

The purpose of this article is to report multidisciplinary treatment of a transmigrated lower right canine. The tooth was positioned between the roots of the left central and lateral incisors and the crown recontoured to simulate a lateral incisor.

Case report

Pretreatment evaluation

An 11 year-old girl was referred to the Orthodontic Department at Yeditepe University with an impacted,

lower right canine and retained lower right deciduous canine. She was in good health and had no history of dental trauma. The intra-oral examination revealed Angle Class II molar and canine relationships, an overbite of 2 mm, an overjet of 5 mm, no upper or lower arch crowding and the lower left permanent canine was rotated mesio-lingually (Figure 1).

Analysis of the pretreatment lateral cephalometric radiograph revealed normal vertical values and a skeletal Class II relationship (Figure 2, Table 1). Radiographic examination also revealed that the lower right canine was positioned vertically with the tip of the crown labial to the roots of the lower left central and lateral incisors (Figure 2). There were carious lesions in the occlusal surfaces of upper right first molar and lower left first molar.

Treatment plan

The treatment plan called for extraction of the lower right deciduous canine and closure of the extraction space by moving the right lateral incisor and the both central incisors to the right side. Surgical exposure and forced eruption of the unerupted right canine were planned in order to place the transmigrated canine between the contralateral central and lateral incisors. A Jasper Jumper appliance was used to establish bilateral Class I molar relationships and to correct the overbite and overjet.

Treatment progress

Before active orthodontic treatment, the paedodontist responsible for the patient's dental care restored both carious teeth. The treatment objectives and alternatives were explained to the patient and her parents and informed consent was obtained.

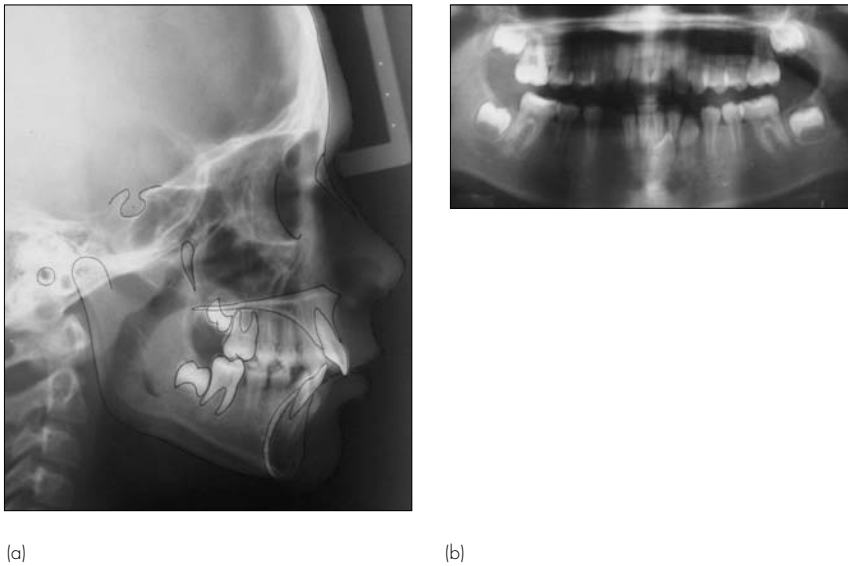


Figure 2. (a) Pretreatment lateral cephalometric radiograph. (b) Pretreatment panoramic radiograph.

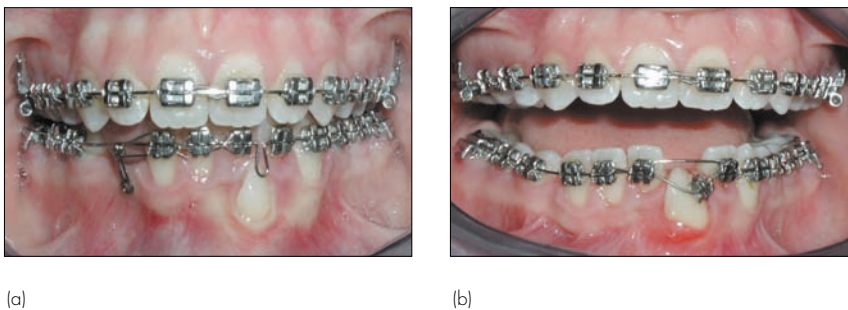


Figure 3. (a) The 0.016 x 0.016 inch stainless steel archwire used to correct the lower midline. (b) Forced eruption of the transmigrated canine with the sectional archwire.

Upper and lower 0.022 inch metal Roth brackets were bonded to the teeth in both arches (Victory Series, 3M Unitek, Monrovia, CA, USA) and the lower right deciduous canine was extracted. The upper arch was aligned and the lower arch levelled. The rotated left canine was corrected with a 0.016 inch and 0.016 x 0.016 inch NiTi archwires. A 0.016 x 0.016 inch stainless steel archwire was used to move the lower incisors towards the right side (Figure 3). Five months later, an open coil spring was used to create space between the left central and lateral incisors for the transmigrated canine.

After four months treatment, the transmigrated lower right canine was surgically exposed and a bracket bonded to the crown. At the next appointment traction was applied to the transmigrated canine with

a 0.016 inch NiTi segmental wire between the left central and lateral incisors. The main archwire was a 0.016 x 0.016 inch stainless steel wire with an offset between the left central and lateral incisors (Figure 3). After forced eruption of the transmigrated canine, which took 5 months, a Jasper Jumper fixed functional appliance and upper and lower 0.017 x 0.025 inch stainless steel archwires were used to correct the Class II malocclusion. The Jasper Jumper appliance was activated once a month for 4 months. Finishing archwires were used to torque teeth in both arches and were left in place for 4 months.

The fixed appliances were removed after 2 years and 5 months of active orthodontic treatment. The tip and labial surface of the transmigrated right canine were reshaped to simulate a lateral incisor. The lower



(a) (b)

Figure 4. (a) Frontal view after orthodontic treatment. (b) Lower occlusal view after orthodontic treatment.



(a) (b)

Figure 5. (a) Post-treatment lateral cephalometric radiograph. (b) Post-treatment panoramic radiograph.

arch was retained with a 0.0175 inch sectional wire bonded to the lingual surfaces of the lower incisors and canines.

Treatment results

During treatment, the upper (U1/NA) and lower incisors (L1/NB) were proclined 4 degrees and 6 degrees, respectively. As a result, the interincisal angle (U1/L1) decreased from 144 degrees to 126 degrees (Figure 4, Table I). The post-treatment panoramic radiograph revealed resorption of the distal root of the lower right first permanent molar, possibly due to the asymmetric Class I forces used to move the incisors to the right side (Figure 5). The lower right molar was root-filled by her paedodontist. Currently, the patient is recalled for retention checks.

Multidisciplinary treatment involving surgical exposure and orthodontic traction of the transmigrated canine, alignment and correction of the Class II malocclusion and cosmetic reshaping of the canine to simulate a lateral incisor, provided this patient with an acceptable aesthetic and functional result.

Discussion

Developing teeth move within the jaws before emerging into the mouth. It is not known why a tooth deviates from its normal path of eruption and erupts in an abnormal position. The lower canines are the most likely teeth to migrate to the opposite side.^{5,7,19} The angle between the long axis of an unerupted canine and the midsagittal plane indicates whether a canine is 'displaced' (between 25 and 30 degrees) or likely to migrate across the midline (30 and 95 degrees).¹⁸

According to Joshi, when the angle between the mid-sagittal plane and the dental axis exceeds 50 degrees, transmigration is predictable; if the angle falls between 30 and 50 degrees transmigration may develop, and if the angle is less than 30 degrees transmigration is unlikely to occur.¹⁴ In our patient the angle between the impacted canine and the mid-sagittal plane was about 80 degrees and the tooth had migrated across the mandibular midline.

If a migrating tooth can be diagnosed early, it may be possible to surgically expose the tooth and move it into the arch. We elected to treat our patient with a combination of surgery and orthodontic treatment. Alternative treatment options are to transplant the tooth to a space in the arch, extract the unerupted tooth and use the deciduous canine as a replacement for the permanent canine or leave the transmigrated canine in situ.^{16,18} Some clinicians prefer to transplant teeth with immature roots, so only a short period of time is available for the tooth to be detected and transplanted. Furthermore, it may be difficult to remove the impacted tooth intact and avoid damage to the root and/or adjacent teeth: situations that reduce the likelihood of a successful long-term outcome. In our case, the root of the lower canine was completely formed and the tooth was accessible. Our patient had a deep overbite, upright incisors and minimal crowding and did not require the extraction of any permanent teeth. The second and most common option would have been to extract the transmigrated canine. This option is generally favoured when the arch is crowded and a tooth needs to be extracted as part of the orthodontic treatment.^{16,17} Wertz noted that surgical repositioning of an impacted tooth can be attempted before the tooth is extracted.²⁰ A third option would be to leave the transmigrated canine in situ, but this approach can lead to long-term complications. Impacted teeth have the potential to become ankylosed, making future surgical removal difficult, and they can continue to erupt, leading to resorption of overlying roots and, if they erupt, crowding. The deciduous canine could have been left in position and the appearance of the crown enhanced with composite resin. In our case the transmigrated canine could have been extracted, the extraction space closed and the occlusion adjusted with the aid of temporary anchorage devices. We rejected the latter treatment plan because treatment would have taken longer and required an additional surgical procedure.

There were some disadvantages to our treatment. Firstly, the incisors were proclined between 4 and 6 degrees, due to the Jasper Jumper appliance. Secondly, we detected a slight colour difference in the lower left canine after the cosmetic reshaping procedures and, thirdly, the transmigrated canine had a slightly longer clinical crown than the adjacent lateral incisor. The latter was not considered a great aesthetic disadvantage. Finally, there was no contact between the right lower lateral incisor and upper right canine during lateral excursions of the mandible. This was not considered to be a problem.

Summary

Transmigration of a mandibular canine is a rare event. Early diagnosis of an impacted tooth likely to migrate across the midline allows the orthodontist to present multiple treatment options to the patient and his/her family. Surgical exposure and forced eruption of the transmigrated canine, combined with non-extraction orthodontic treatment and good patient cooperation can give an acceptable orthodontic result.

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