

CASE REPORT



Clinical Outcome of an Impacted Maxillary Canine: From Exposition to Occlusion

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ABSTRACT

Aim: The aim is to report a case of impacted maxillary right canine successfully positioned into the occlusion line.

Background: Although the treatment of choice for an impacted canine is a combined surgical-orthodontic approach, there are differences in technique. The preorthodontic uncovering and autonomous eruption technique is a safe and predictable option for the treatment of palatally impacted maxillary canines in adolescents and adults as is the orthodontic creation of a space before minimal surgical exposure, the bonding of a small attachment (an eyelet), full-flap closure, and immediate traction. Although the mechanical management of impacted teeth is a routine task for most orthodontists, certain types of impaction can be frustrating.

Case description: An 18-year-old adult patient presented for clinical examination with a mobile maxillary right deciduous canine, the absence of a maxillary right permanent canine, Angle Class I malocclusion, an overjet of 2.0 mm, an overbite of 3.0 mm, and rotated canine and left maxillary central and lateral incisors. Cephalometric measurements revealed a skeletal Class I relationship as well as upright maxillary incisors (1. NA = 18°) and mandibular incisors (1. NB = 16°, IMPA = 80°). The facial profile was concave. Clinically, a constricted maxillary arch was observed, and the patient had a nail-biting habit.

Conclusion: The canine was aligned, leveled and positioned in the occlusion line. The aesthetic, functional and periodontal results remained stable in the retention phase.

Clinical significance: Various treatment strategies are available to treat impacted maxillary canines. The surgical,

periodontal, and orthodontic considerations in the management of impacted canines must be clearly explained to the patient.

Keywords: Impacted, Impaction, Maxillary canine, Orthodontics.

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BACKGROUND

The maxillary canines have the longest period of development and the longest and most tortuous course to travel from the point of formation, i.e., lateral to the piriform fossa, to their final destination in the full occlusion.^{1,2}

The maxillary permanent canines are occasionally displaced toward the palatal side of the dental arch and do not erupt correctly into the dental arch. The impaction of a maxillary canine requires comprehensive surgical-orthodontic treatment. Following the surgical exposure of the tooth, orthodontic forces are applied to bring the impacted canine into occlusion.^{3,4}

Radiographic techniques that are commonly used clinically to determine the position of an impacted canine include occlusal radiographs and Clark's method, which utilizes two periapical radiographs. These techniques are commonly used due to availability and ease of determining the prognosis of an impacted canine.⁵

The management of severely impacted canines often requires the combined expertise of numerous clinicians who communicate with each other to generate an optimal treatment plan. The surgical, periodontal, and orthodontic considerations in the management of impacted canines must be clearly explained to the patient.⁶

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Although the treatment of choice for an impacted canine is a combined surgical-orthodontic approach, there are differences in technique. The preorthodontic uncovering and autonomous eruption technique is a safe and predicoption for the treatment of palatally impacted maxillary canines in adolescents and adults⁷ as is the orthodontic creation of a space before minimal surgical exposure, the bonding of a small attachment (an eyelet), full-flap closure, and immediate traction.⁸

The purpose of this clinical report was to describe the successful clinical outcome of a patient with an impacted maxillary permanent canine.

CASE DESCRIPTION

An 18-year-old adult patient presented with the following chief complaint: "my canine is almost falling." Clinical examination revealed the presence of a mobile maxillary right deciduous canine, the absence of a maxillary right permanent canine, angle class I malocclusion, an overjet of 2.0 mm, an overbite of 3.0 mm, and rotated canine and left maxillary central and lateral incisors (Fig. 1).

Radiographic examination of the maxillary right canine revealed that it was palatally positioned between the roots of the central and lateral incisors (Fig. 1F). All of the third molars were present, with the exception of the left maxillary molar (Fig. 1G). Cephalometric measurements revealed a skeletal Class I relationship as well as upright maxillary incisors ($1. NA = 18^\circ$) and mandibular incisors ($1. NB = 16^\circ$, $IMPA = 80^\circ$) (Table 1). Clinically, a constricted maxillary arch (Fig. 1D) was observed, and the patient had a nail-biting habit.

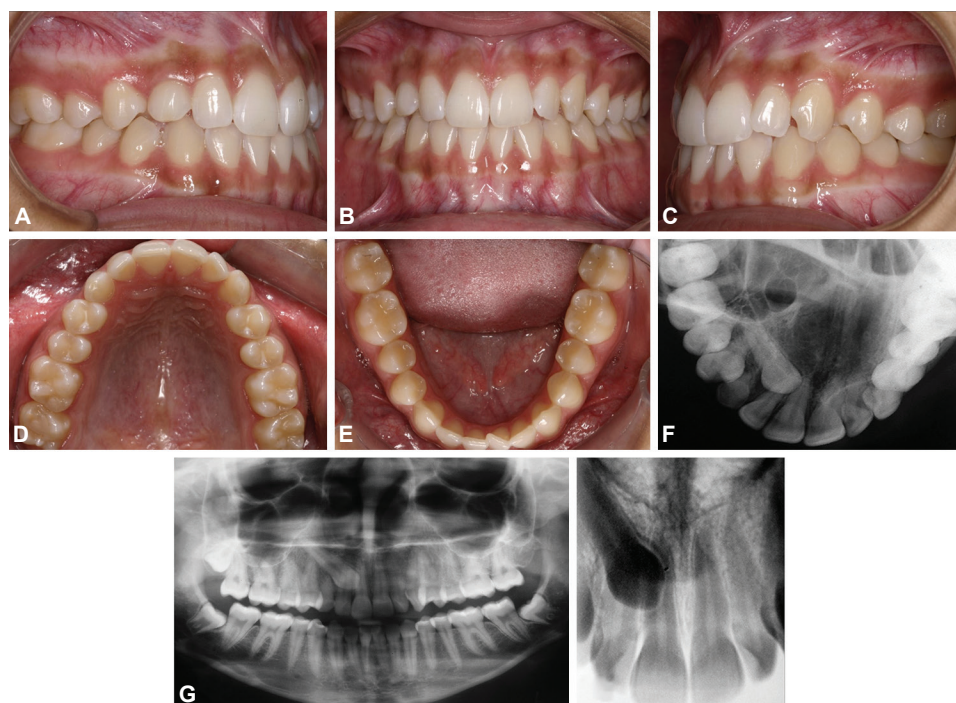
The treatment objective was to move the impacted maxillary right canine to the occlusion line while maintaining good posterior occlusion.

Rapid maxillary expansion (RME) was performed to expose the impacted canine, and movement of this tooth to the line of occlusion was attempted. The following treatment alternatives were considered: (a) canine extraction and replacement with a dental implant and prosthesis; (b) extraction of the canine and closure of the space by moving the posterior teeth with the support of a mini-implant; and (c) extraction of the canine, movement of the first premolar into the canine position, and placement of a dental implant and prosthesis between the first and second premolars.

Orthodontic treatment was initiated with RME with a modified Haas-type palatal expander (Fig. 2A) to expand the maxillary arch, increase the arch perimeter (Fig. 2B) to align the anterior teeth, increase the space required for subsequent alignment and level the right impacted maxillary canine.

The RME was successful, and after a 4-month retention period, a Roth prescription 0.022-in fixed appliance was bonded. A 0.018-in stainless steel archwire and an open coil spring were used to obtain a suitable space for the alignment and leveling of the canine. After space was opened, uncovering with a closed flap technique and bonding of an orthodontic mesh with a ligature wire were performed. (Fig. 3). The deciduous canine was extracted at the same time (Fig. 3F).

The initial orthodontic traction of the canine was accomplished with silk thread, elastic chains



Figs 1A to G: Pretreatment intraoral photographs, panoramic radiography

Table 1: Cephalometric measurements

skeletal pattern	SNA	82	Steiner	83 84
	SNB	80	Steiner	82 84
	ANB	2	Steiner	1 0
	Witts	$0 \pm 2\text{mm}$	Jacobson	-8 -5
		$1 \pm 2\text{mm}$		
	Convex	0	Downs	3 0
	Facial	87.8	Downs	90 93
	Eixo Y	59.9	Downs	58 56
	SN-GoGn	32	Steiner	33 31
	FMA	25	Tweed	26 24
dental pattern	IMPA	90	Tweed	80 85
	1-NA	22	Steiner	18 30
	1-NA	4	Steiner	3 5
	1-NB	25	Steiner	16 22
	1-NB	4	Steiner	3 2
	Pog-NB		Holdaway	1 1
	1-1	130	Downs	146 128
Profile	1-A-Po	1	Ricketts	0 1
	LS - S	0	Steiner	-1 -4
	LI - S	0	Steiner	-1 -3
ângulo Z	75	Merrifield	82 89	

and a ligature wire anchored in a rectangular 0.018 x 0.025-in archwire (Fig. 4). When the height of the canine clinical crown permitted the final alignment procedure, it was performed with “L”-shaped multi-loop arches and double helix loops of 0.016-in stainless steel (Fig. 4E) to concurrently align and move the tooth buccally.⁹ During the traction of the canine, panoramic radiography revealed a favorable evolution of the movement without any effects on the adjacent teeth as well as good periodontal health (Fig. 4C). A 0.019” x 0.025” stainless steel closing loops were applied to close the space between maxillary lateral incisors and canines (Fig. 4F).

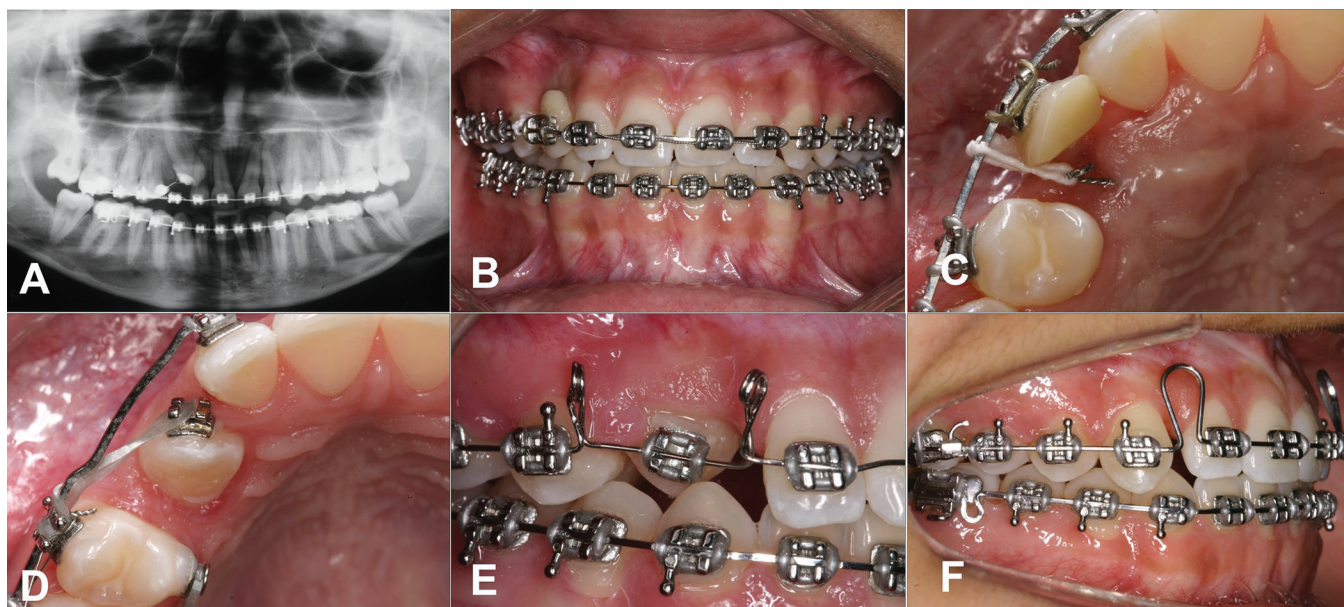
The proposed objectives of moving and positioning the maxillary right canine into the occlusion line were achieved with a correct overbite and overjet, and good posterior intercuspation was maintained excellent gingival and periodontal health (Fig. 5). The radiographic results revealed root apex normality (Fig. 5F). The duration of treatment was 38 months.



Figs 2A and B: Rapid maxillary expansion with a Haas-type palatal expander



Figs 3A to F: Biomechanics applied to move the canine to the buccal side without complications



Figs 4A to F: Preorthodontic uncovering of the right maxillary canine



Figs 5A to F: Posttreatment intraoral photographs, panoramic radiography

DISCUSSION

The diagnosis, treatment planning and positioning of the impacted right maxillary canine into the occlusion line were successfully performed and described.

The recognition of tooth disturbances in early mixed dentition that are genetically associated with canine impaction can aid clinicians in the early diagnosis of this clinical situation. If the canine displacement is detected early, the clinician should then focus on preventing potential impaction; however, it is more common for the orthodontist to first encounter the impaction after it has become problematic,⁵ as in the presented clinical case.

The current three-dimensional modalities allow for three-dimensional evaluations of impacted teeth and their spatial relationships with adjacent structures. The

impacted canine was exposed by bonding an attachment via the use of a closed flap technique. This process was followed by the orthodontic eruption, which produced a predictable and successful outcome with minimal complications, as previously recommended by Kokich, 2004, Knop, 2007, Mathews, 2013, Sajjani, 2014.^{7,10-12}

The frequency of root resorption among adjacent teeth to an impacted maxillary canine is low.¹⁰ Additional undesirable complications during orthodontic traction for the management of impacted canines include failure to erupt, bond failure and ankylosis. However, in cases of ankylosis or dilaceration, apicectomy can be performed, which involves the guided fracture of the apex of a canine root followed by the orthodontic traction of the canine. This is a conservative surgical alternative.¹³ None of these

complications occurred during the canine movement in the present clinical case, but the patient was advised regarding all of these possible complications.

The accurate localization of impacted canines and the determination of their relationships with the adjacent incisors and anatomical structures are part of the diagnostic process and are essential for successful treatment.¹⁴ Moreover, the treatment duration is significantly shorter (4 months) for patients who undergo CBCT compared with those who undergo conventional radiography.¹⁴ This shorter duration can be advantageous because treatment duration is generally longer in cases of impacted canines. Indeed, the treatment duration of the present clinical case was 38 months. CBCT must be introduced into the decision-making process at the outset.¹⁵

There are various potential auxiliary biomechanical features, including temporary anchorage devices.¹⁶ In contemporary orthodontics, the use of auxiliary features, such as elastic intermaxillary and extra-oral appliances, can limit the achievement of the treatment objective of positioning the canine into the dental arch; however, the results in this case and a previous case involving an impacted canine in an adult patient were aesthetically and functionally satisfactory,¹⁷ also in the present clinical case.

The use of RME in early mixed dentition appears to be an effective procedure for increasing the rate of eruption of palatally displaced maxillary canines¹⁸, even in adult patients; in the present clinical case, RME was a good adjunct treatment in the successful positioning of the canine.

Although the mechanical management of impacted teeth is a routine task for most orthodontists, certain types of impaction can be frustrating. However, in striving for excellence, there are correct and incorrect diagnoses as well as good and bad treatment plans and clinical outcomes. There are also revolutionary materials, but the professional must understand the related orthodontic knowledge and entirely master the techniques,¹⁹ and the esthetic outcome can be unpredictable.¹¹

Therefore, the treatment of severely and moderately impacted canines is complex and requires a multidisciplinary approach that involves communication across specialties to provide the patient with the best possible evidence-based dental treatment.

CONCLUSION

The canine was aligned, leveled and positioned in the occlusion line. The diagnosis was based only on panoramic, lateral headfilms and periapical radiographs. The aesthetic, functional and periodontal results remained stable in the retention phase. Even in adults, movement

can and should be, adapted to the individual patient's characteristics provided the patient is cooperative.

CLINICAL SIGNIFICANCE

Various treatment strategies are available to treat impacted maxillary canines. The surgical, periodontal, and orthodontic considerations in the management of impacted canines must be clearly explained to the patient.

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