 DOI: 10.18231/2455-6785.2017.0034

A case of ortho-surgical management of palatal canine impaction using K-9 Spring

Aditi Gaur[1,*], Sandhya Maheshwari[2], Mohd. Tariq[3], Sanjeev Kumar Verma[4]

[1]Senior Resident, [2,4]Professor, [3]Professor & HOD, Dept. of Orthodontist, Dr. Z.A. Dental College, Aligarh Muslim University, Aligarh, Uttar Pradesh

***Corresponding Author:**
Email: aditigaur2289@gmail.com

Abstract

The present article describes a case report of a palatal canine impaction in a 14 year old male patient. The case was treated by surgical exposure of the impacted tooth followed by orthodontic traction. Sufficient space was created prior to the application of traction forces. The total treatment time was 22 months. The treatment duration in such cases depends on the age of the patient and the position of the impacted tooth with respect to the occlusal plane and mesiodistal position of the tooth.

Keywords: Impaction, Palatal, Canine, Impacted.

Introduction

Impaction is referred to a condition of unerupted tooth when its root formation is complete or when its contralateral tooth has been erupted for at least 6 months.(1) The ectopic eruption and impaction of maxillary permanent canines is a frequently encountered clinical problem. The prevalence of maxillary canine impaction ranges from 0.8 to 5.2%.(2,3) Approximately one-third of impacted maxillary canines are located labially and two-thirds are located palatally.(4) It has been reported found that palatal impactions account for 85% and labial impactions 15%.(5,6) Management of impacted canines involves either a guided eruption of the impacted tooth or eruption by orthodontic traction. Highly positioned palatally impacted canines are often difficult to manage because of the presence of thick palatal bone. The present article describes the case of a palatal canine impaction which was managed by surgical exposure followed by orthodontic treatment.

Case Report

A 14 year old male patient had reported to the department of Orthodontics with the chief complaint of irregularly positioned teeth. On extra oral examination it was observed that the patient had symmetrical, mesoprosopic face with convex profile and competent lips. The smile analysis revealed a reduced incisor display with a non consonant smile and reduced lateral negative space.(Fig. 1)

On intra oral examination it was observed that the patient had Angle's Class I molar relation bilaterally, missing canine and retained C in the first quadrant, crowding in mandibular anteriors, an overjet of 4mm with a deep bite. The maxillary arch was asymmetrical and symmetric mandibular arch with lingual blocked lateral incisors.(Fig. 1)

Fig. 1

Cephalometric findings suggested that the patient had a Class II skeletal base and a hypodivergent growth pattern.(Fig. 2)

Fig. 2

Orthopantomogram was recorded which showed an impacted maxillary canine. An occlusal radiograph of the patient was also recorded which showed a palatal canine impaction causing retroclination of maxillary

incisors due to impingement on the roots of the incisors.(Fig. 3)

Fig. 3

A volumetric CT was recorded to further evaluate the position of the canine with respect to the dentition. (Fig. 4)

Fig. 4

Treatment Objectives

- Align and level the maxillary and mandibular dental arches
- Surgical exposure of 13 followed by orthodontic traction
- Obtain normal overjet and overbite
- Achieve bilateral Class I canine occlusion
- Maintain class I molar occlusion
- Maintain optimum soft tissue relationship

Treatment progress: On considering the diagnostic criteria a treatment plan was formulated for the patient involving surgical uncovering of the impacted maxillary canine followed by traction. The treatment was initiated using an MBT 022 slot pre-adjusted edgewise appliance.

Progressive archwire sequence of 016,018, 016 x 022 and 019 x 025 NiTi wires was used. Finally 019 x 025 SS wire was ligated. Surgical exposure of the canine was performed by a periodontist with an open flap technique.(Fig. 5) The deciduous canine was removed during the surgical procedure. A lingual button attachment with a pigtail ligature wire was bonded to the canine during the procedure. The ligature wire was tied to the main archwire. An open coil spring was placed across the wire to maintain the space for the canine.(Fig. 6) Once the canine was close to the occlusal plane a bracket was bonded to the canine to achieve final occlusion.(Fig. 7)

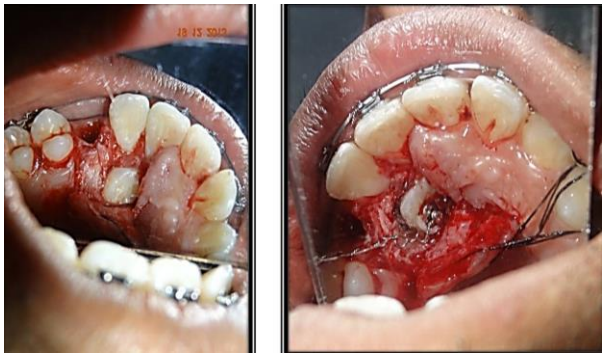

Fig. 5

Fig. 6

Fig. 7

Treatment results: A functionally stable and esthetic occlusion was achieved during a period of 22 months. (Fig. 8, 9, 10)(Table 1)

Fig. 8

Table 1: Cephalometric findings

Cephalometric parameters	Pre	Stage
SNA(82)	84˚	82
SNB(80)	80˚	79
ANB (3.12°±1.8°)	4˚	4^0
Wits (-0.01mm)	7mm	5mm
APP- BPP (5mm)	7mm	6mm
MM bisector (-5mm)	-1mm	0.5mm
SN length: 72mm	70mm	70mm
Maxillary length(pns-A⊥): 49mm	50mm	50mm
Mandibular length(Go-Pg): 77mm	75mm	75mm
N⊥ to A point -4.46mm	- 1mm	-1mm
N⊥to B point -11.03mm	-8mm	-8mm
N⊥ to Pog -10.5mm	- 7mm	-7mm
Maxillo-mandibular difference: 30mm	25mm	25mm
FMA (23.83±2°)	19˚	19
SN-MP (32-35°)	26˚	26
Y Axis (59.62°±3)	58˚	58
Bjork's sum (394°)	382˚	382
J ratio (62-65%)	73%	73%
Gonial angle (123±7°)	114˚	114
Upper anterior facial height (45%)	46%	46%
Lower anterior facial height (55%)	54%	54%
Mx 1 to A-Pg: 6.74±1.3mm	7.5mm	8mm
Mx 1 to NA: 4.92±2.05mm	4mm	5mm
Mx 1 to NA: 24.02±5.82°	22˚	30
Mx 1 to Palatal Plane (71°)	68˚	76
Md 1 to A-Pg (-2mm to 2mm)	1mm	3mm
Md 1 to NB (6±1.7mm)	3.5mm	3mm
Md 1 to NB (27±4.3 °)	23˚	24
IMPA (99°)	100˚	103
Inter-incisor Angle (123°)	130˚	120

Fig. 9

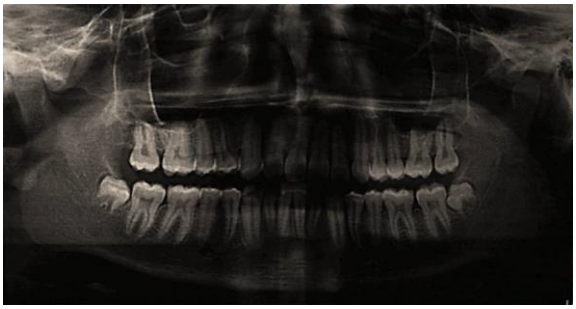

Fig. 10

Discussion

Management of highly positioned canines which are palatally displaced is often a challenging situation for an orthodontist. The distance between canine tip and occlusal plane, long axis inclination of the lateral incisor, and mesiodistal location are strongly correlated with the treatment duration.

The location and diagnosis of an impacted canine can be made using clinical examination and radiographic techniques. Periapical radiographs often supplemented with an occlusal radiograph can be useful as a diagnostic aid for impactions.

Several treatment options can be considered such as: radiographic follow-up of the impacted tooth should be performed as any pathological change may result; canine auto-transplantation; extraction of impacted canine and movement of premolar towards the space

left; extraction of canine and osteotomy for moving posterior segment in order to close the residual space; reestablishment of occlusion with prosthesis, and finally, the most recommended option, surgical exposure with orthodontic treatment for moving the tooth to occlusal line.[7]

Two common methods that have been considered for impacted canines are the closed- eruption technique and the open- eruption technique. The position of canine in the present case was high as compared to the occlusal plane and closer to the midline, thus a closed eruption technique was planned. Palatally displaced canines often require immediate post surgical exposure traction in patients. In our case traction was applied once the post surgical swelling had subsided. The possibility of palatal traction depends on the position of the retained tooth in relation to adjacent teeth, angulation of its long axis, height of alveolar ridge, presence of ankylosis or dilaceration, presence of enough space arch, and correlation between chronological age and dental eruption sequence.[8]

Sufficient space should be created prior to application of traction forces to the canine. A rigid stainless steel working wire is required before the traction is applied to prevent undesirable effects on the neighbouring dentition.

Palatally impacted canines need to follow a buccal trajectory to obtain adequate positioning in the dental arch. Application of traction force promotes, consequently, an intrusive force on and anterior inclination of the posterior segment, thus keeping the system in equilibrium. On the transverse plane, canine tends to erupt palatally, with posterior teeth shifting buccally. After eruption, the tooth should be orthodontically moved in the buccal direction so that it becomes aligned with other teeth in the arch. K-9 spring was used in the present case for alignment of the impacted canine. The spring provides a downward effect on the palatally impacted canine without causing adverse effect on the molars.[9]

The treatment difficulty and probability of complications, which interfere with duration of the traction, are related to age, occlusal movement, apical movement, angulation and mesiodistal location of the impacted canine's crown, complex relationship between canine's crown and midline, close contact between canine's incisal facet and adjacent lateral incisor, and presence of transposed lateral incisor or first premolar.[10]

Conclusion

The impacted canine must be localized prior to the treatment for better access during the surgical exposure. Ortho surgical traction is the most effective means of correcting a malocclusion involving an impacted canine.

References

1. Lindauer S, Rubenstein L, Hang W, Andersen W, Isaacson R. Canine impaction identifi ed early with panoramic radiographs. J Am Dent Assoc 1992;123:91-2, 95-7.
2. Chu FC, Li TK, Lui VK, Newsome PR, Chow RL, Cheung LK. Prevalence of impacted teeth and associated pathologies-a radiographic study of the Hong Kong Chinese population. Hong Kong Med J. 2003;9:158–63.
3. Thilander B, Jakobsson SO. Local factors in impaction of maxillary canines. Acta Odontol Scand. 1968;26:145–68.
4. Mitchell L, editor. An Introduction to Orthodontics. 3rd ed. New York: Oxford University Press; 2007. p. 147-56.
5. Hitchen AD: The impacted maxillary canine. Br Dent J 1001-14, 1956.
6. Rayne J: The unerupted maxillary canine. Dent Pract 19194-204, 1969.
7. Bishara SE. Impacted maxillary canines: a review. Am J Orthod Dentofacial Orthop. 1992;101:159-71.
8. Bishara SE. Clinical management impacted of maxillary canines. Semin Orthod. 1998;4:87-98.
9. Kalra V. The K-9 spring for alignment of impacted canines. J Clin Orthod. 2000 Oct;34(10):606-10.
10. Cati G, Ghobadlu J, Nieri M, Clauser C. Factors associated with the duration of forced eruption of impacted maxillary canines: a retrospective study. Am J Orthod Dentofacial Orthop. 2006;130:349-56.