

Surgical Exposure and Orthodontic Positioning of a Palatally Impacted Maxillary Canine

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ABSTRACT

The aim of the present report is to demonstrate the surgical and orthodontic positioning of a palatally impacted permanent maxillary canine in a patient aged 14 years. The surgical exposure and orthodontic traction were applied to reposition the canine with resultant proper functioning, excellent esthetics, and good periodontal health.

KEYWORDS: Impacted Canine, Surgical Exposure, Orthodontics, Interceptive, Esthetics

INTRODUCTION

Impaction refers to the failure of a tooth to emerge into the dental arch usually due to space deficiencies or the presence of any entity blocking its path of eruption.¹ After maxillary and mandibular third molars, the maxillary canines are the most commonly impacted teeth.² This is primarily attributed to its extended development period and the long, tortuous path of eruption before the canine emerges into full occlusion.^{2,4} Apart from this, other local predisposing factors like retained deciduous canine, congenitally missing lateral incisors, supernumerary teeth, odontomas, transposition of teeth and genetic causes have been found to be frequently associated with impacted canine.⁵

Impaction of maxillary canine has a reported prevalence of 1-2.5%^{6,7} with palatal impactions more commonly encountered as compared to labial impactions.^{8,9} Labial displacement of the maxillary canines is usually due to inadequate arch space and results in eruption in most cases.¹⁰ However, in cases of palatal impaction, canines seldom erupt spontaneously and often require complex surgical and orthodontic intervention as dictated by the dense palatal bone and mucosa, as well as a more horizontal position of the palatally displaced canine.⁵ Thus, labially impacted canines are mostly surgically removed, whereas the palatally impacted canines are indicated for orthodontic traction.¹⁰

The sequelae of impacted canines, includes resorption of the affected tooth and adjacent roots, dentigerous cyst formation which may result in ameloblastoma, infection and referred pain, which necessitates early treatment of these teeth.¹¹ It has been estimated that 0.71% children 10-13 years old have permanent incisors with root resorption caused by the ectopic eruption of maxillary canines.⁷ The resorption is predominantly seen in lateral incisors with a prevalence of 80%. The management of such cases, therefore, requires surgical access to the impacted tooth followed by biomechanical intervention to

align the tooth in the arch.⁵

The treatment modalities may vary from either surgical exposure alone allowing natural autonomous eruption, or surgical exposure with forced eruption under mechanical traction. When palatal impaction is severe, surgical reflection of palatal mucosa is done, followed by bone removal to gain access to the canine crown.¹² Care should be taken to remove only enough bone, needed to place an orthodontic attachment on the tooth. This case report describes one such closed surgical technique in conjunction with orthodontic traction for positioning a palatally impacted maxillary canine into the dental arch.

CASE REPORT

A 14-year-old girl reported to the Department of Pedodontics of Himachal Dental College, Sundernagar, Himachal Pradesh with a complaint of irregularly aligned teeth in the upper front region of the mouth. On clinical examination, it was found that, right and left cuspids were asymmetrical; 63 was over-retained and not mobile whereas 13 had normally erupted into the arch. There was proclination of 12 and 22 with rotation seen in 22, and both the central incisors were in retroclined position (Fig. 1, 2). The patient presented with Class II molar



Figure 1: Preoperative Photograph Of Dental Arches In Occlusion

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Figure 2: Occlusal View Of Maxillary Arch

relationship with a deep overbite and reduced overjet. Radiographic examination revealed impaction of the maxillary left permanent canine which was over lateral incisor palatally (Fig. 3). On clinical palpation, there was an absence of normal canine bulge, but there was palatal bulge indicating palatal positioning of the canine, which was confirmed radiographically using 'Buccal object rule.' The panoramic X-ray helped to identify the degree of impaction of the canine and its relationship with the lateral incisor of the same side and root resorption if any. The impacted canine was inclined vertically; its tip was situated at the middle third of the lateral incisor indicating a favorable position for orthodontic traction. According to Ericson and Kurol's¹³ classifications, medial displacement of the canine crown in relation to the lateral Incisor's long axis was grade II impaction for tooth #23.



Figure 3: Pre-Operative Radiograph Of Impacted Maxillary Canine

The possibilities for surgical exposure and orthodontic treatment and their risks and failures, were discussed with the patient and the guardians, and verbal consent was obtained. Before the surgical procedure, routine blood and urine examination was carried out, and the values were found to be within normal limits.

Anesthesia was obtained with 2% lidocaine (1: 100,000 epinephrine) using block and infiltration injection and tooth # 63 was extracted, after establishing a full thickness mucoperiosteal flap on left side of the palate. A palatal sulcular incision extending from the mesial aspect of the right central incisor to the mesial aspect of the first permanent molar was made. The flap was elevated and retracted with the help of a periosteal elevator for exposure of the impacted canine (Fig. 4). The bone overlying the crown of the canine was removed using a surgical bur and copious irrigation with normal saline was done. After sufficient exposure of the clinical crown, direct pressure was applied with sterile gauze and cotton pellets, to achieve hemostasis. The bone was removed adequately to attach an orthodontic bracket and not excessively removed.



Figure 4: Palatal Flap Raised To Expose The Impacted Canine

Once hemorrhage was controlled, the tooth surface was isolated, etched with 37% phosphoric acid, rinsed with water, and dried (Fig. 5). A Begg's bracket was bonded over the exposed tooth surface, and traction was given using an E-chain which was secured to the arch wire and flap repositioned and closed primarily with interrupted sutures (Fig. 6, 7, 8). Instructions were given to the patient and parent to maintain good oral hygiene and to have a soft and liquid diet for 24 hours.



Figure 5: Exposed Tooth Surface Etched With 37% Phosphoric Acid

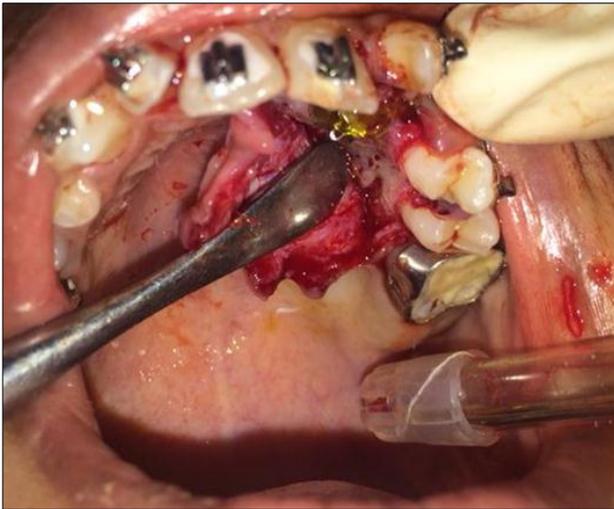


Figure 6: A Bracket Bonded On The Exposed Canine And E-Chain Attached

The sutures were removed 7 days post-surgically, with excellent wound healing. Movement of the canine was monitored radiographically and clinically (Fig. 9, 10). Within 6 months, the canine was clinically visible, and conventional orthodontic mechanics were used to extrude, and align the canine. The rotated lateral incisor in the maxillary arch was also corrected (Fig 11-13).



Figure 9: E- Chain Traction To The Impacted Canine



Figure 7: Flap Repositioned With E- Chain Exposed



Figure 10: Fixed Mechanotherapy To Align The Canine & Lateral Incisor



Figure 8: Radiograph Taken Following One Month



Figure 11: Post-Operative View

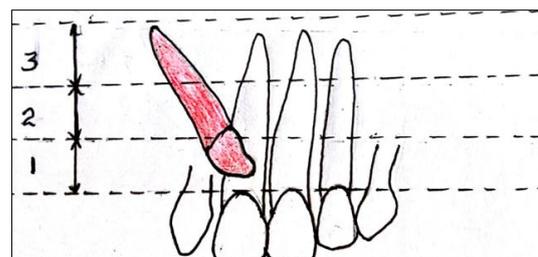


Figure 12: Vertical Height Of The Canine Crown: 1.At The Cervical Third; 2. At The Middle Third; 3. At The Apical Third

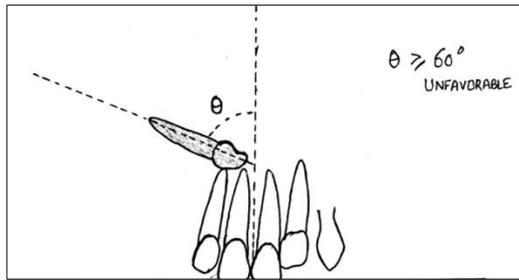


Figure 13: Canine Angulation To Midline

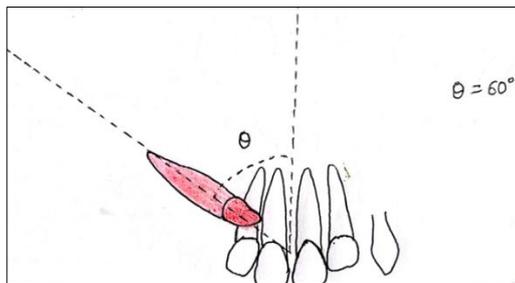


Figure 14: Canine Angulation To Midline

DISCUSSION

After lower third molars, maxillary canines are the most frequently impacted teeth with an incidence ranging from 1- 2.5 % and is twice as common in females as it is in males.^{2, 6, 7} The occurrence of impacted maxillary canine is more than twice that in the mandible.⁵ On reviewing the literature it was seen that, palatal canine impactions were about 85%, while 15% of the impactions occurred buccally.⁴ Dachi and Howell⁶ also showed that the majority of impactions of maxillary canines are unilateral at 92%, and only 8% are bilateral.

The etiology of buccally and palatally impacted canines is different. According to Jacoby (1983)¹⁰, 85% of impactions, which are palatally displaced had sufficient space to erupt, whereas, there is insufficient space for eruption of 83% of buccally impacted canines. Thus, inadequate arch space and a vertical developmental position are often associated with buccal canine impactions. Facial impactions have favorable vertical angulations, and palatal impactions are more inclined to have a horizontal angulation.¹⁰ Facial impacted canines have a potential to erupt without any surgical intervention and if they erupt they do so vertically, buccally and higher in the alveolus.² While palatal canine impactions may be due to the presence of extra space in the maxillary bone resulting in the lingual positioning and they do not erupt spontaneously and have to be surgically exposed followed by orthodontic intervention. The reasons for this extra space may be: (1) excessive growth in the base of the maxillary bone; (2) congenitally missing lateral incisors or peg-shaped lateral incisor; (3) stimulated eruption of the first premolar (4) hypoplastic enamel, infra- occluded primary molars and aplastic second bicuspsids.

Other factors frequently reported to contribute to canine impaction include: (1) the rate of root resorption of primary teeth (2) delayed exfoliation of the deciduous tooth; (3) trauma to the primary tooth bud; (4) disturbances in the sequence of tooth eruption; (5) displacement of crypt; (6) premature root closure; and (7) localized pathologic lesions, e.g. odontomes, cysts (8) presence of supernumeraries; (9) cleft lip & palate; (10) ankylosis; (11) syndromes, e.g. cleidocranial dysplasia.^{10, 14, 15}

The exact etiology of palatally impacted maxillary cuspids is unknown; however, there are two theories, namely, guidance theory and the genetic theory, which may explain the phenomenon. According to the "Guidance theory of palatal canine displacement", local predisposing factors including congenitally missing lateral incisors, supernumerary teeth, odontomas and transposition of teeth, interfere with the path of eruption of the canine.^{4, 16-18} Moreover, maxillary canines are among the last teeth to erupt as they develop high in the maxilla and have to travel a long path before they erupt into their position in the dental arch.⁷ Therefore, these are the factors responsible for displacement and impaction of maxillary canines.

The Genetic theory relates to the genetic etiology of impacted cuspids.^{17, 19, 20} Palatally impacted maxillary cuspids often present with other dental abnormalities, including tooth size, shape, number and structure, which Bacetti¹⁷ reported being linked genetically. As the canine has a long root and good bone support, it serves as an excellent abutment for fixed and removable prostheses, also, is useful in lateral excursions. Loss of canine can pose aesthetic and functional problems and should be avoided at all costs.¹²

In the present case, 23 was impacted palatally as was evident from palpation which was confirmed through SLOB technique. There was delayed eruption of the permanent canine (23) as well as prolonged retention of the deciduous canine (63) beyond 14 years of age. There was an absence of normal labial canine bulge and distal rotation of the lateral incisor (22) due to impaction of the canine which indicated for surgical exposure followed by orthodontic traction.

When the clinician first notices ectopically erupting canines, an early intervention is needed to prevent their impaction and potential sequelae. Williams suggested selective extraction of the deciduous canines as early as 8 or 9 years of age, as an interceptive approach to canine impaction in Class I un- crowded cases. This procedure usually allows the permanent canines to become upright and erupt properly into the dental arch, provided sufficient space is available to accommodate them. According to Ericson and Kuroi²¹, if the deciduous canines are removed before the age of 11 years, 91% of the ectopically erupting permanent canines will erupt in normal position, when canine crown is distal to the

midline of the lateral incisor. On the other hand, the success rate is only 64%, if the canine crown is beyond the midline of the lateral incisor.

Mc Sherry²² & Pitt et al²³, suggested the use of various factors to estimate treatment difficulty in a case of canine impaction:

- When the tip of the impacted canine lies at the apical third of the adjacent tooth, it is unfavorable; whereas when it is in the middle third, favorable; and when it is at the cervical third, it is the most favorable for orthodontic traction (Fig. 14).
- If the impacted canine lies at an angle more >60 to the midline, unfavorable; when it is at ≤ 30, most favorable; and when it is at 30–45, favorable.
- The combination of the above:

Apical third+ Horizontal = Surgical removal

Apical third + 30 angulation = Can be tried for orthodontic traction

Each patient detected with an impacted canine must be evaluated comprehensively first, and then various treatment options available can be considered, which includes the following:⁵

- No treatment should be performed for the unwilling patient and the clinician should periodically evaluate the impacted tooth for any pathologic changes.
- Auto-transplantation of the canine.
- Impacted canine extraction, followed by movement of the first premolar in its position.
- Extraction of the canine and posterior segmental osteotomy to move the buccal segment anteriorly to close the residual space.
- Prosthetic replacement of the canine.
- Surgical exposure of the impacted canine followed by orthodontic traction to bring the tooth into the line of occlusion.

The most common method used to bring palatally impacted canines into occlusion are surgically exposing the teeth and allowing them to erupt naturally during early or late mixed dentition, but the factors like, denser palatal bone, thicker palatal mucosa and a more horizontal position causes palatally displaced cuspids to get impacted and they rarely erupt without requiring complex biomechanical intervention. So, a closed flap technique can be employed in which the impacted tooth is surgically exposed, and a bonded attachment is placed, and orthodontic forces are used to move the tooth into the oral cavity.²⁴

In the present case, a closed flap technique was used which usually produces best gingival esthetics and increased ease of tooth movement, unlike, trap door open technique in which there are chances of loss of attached gingiva and damage to the attachment apparatus.²⁵⁻²⁷

SUMMARY

The purpose of this paper was to describe a technique for

the surgical exposure and orthodontic positioning of an impacted maxillary canine.

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