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Orthodontic Considerations for Management of Bilateral Impacted Maxillary Canine. Case Series and Review of Literature

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ABSTRACT

Maxillary canines are one of the most common teeth that are impacted among patients seeking orthodontic treatment. Depending on the position of these impacted teeth, various surgical techniques have been employed for their exposure. The primary goal of surgical phase is to provide the means for correct position of orthodontic anchorage. Additionally, the technique used must ensure favorable tissue anatomy that will permit long-term maintenance of periodontal health. In the present case series, bilateral maxillary canines were orthodontically brought into occlusion. Adittionally review of literature in management of bilateral maxillary canines is briefed.

Keywords: Impacted Maxillary Canines; Orthodontic correction; Mucogingival Interceptive Surgery

INTRODUCTION

Maxillary canine is second only to the maxillary first permanent molar in terms of importance for occlusion, primarily because of the "cuspid protection" it provides to the adjacent teeth. Maintaining a space between the canines that is both comfortable and aesthetically pleasing is also essential. When the canine takes much longer to erupt than the opposing canine or the premolars, it is considered impacted. When the canine is in an ectopic or eruption-obstacled position, it could pose problems. The maxillary canine's path of eruption is more complex and challenging than that of any other tooth, contributing to the increased likelihood of impaction. The process begins in the maxilla at around age 3–4, and the resulting tooth has a crown that is angled mesially and slightly lingually.

Gradually rising to a vertical position, it reaches the occlusal plane and seems to make contact with the distal side of the root of the lateral incisor, following which it appears to be redirected to a more upright orientation[1]. Diagnosis and identifying impacted maxillary canines as soon as possible is crucial. Resorption of neighboring incisor roots occurs in roughly 50% of cases of impacted maxillary canines. On average, resorption begins between the ages of 11 and 12 [2]. The possibility of impacted maxillary canines should be taken into account by the treating dentist or general practitioner when an ectopic eruption of the first permanent molar in the upper jaw is diagnosed, which typically occurs between the ages of six and seven. The extraction of primary canines in cases of palatally displaced canines without suspicion of root resorption of the incisors has been the subject of a number of investigations [3]. Most of these investigations demonstrated effective orthodontic treatment, which was amplified with the addition of cervical traction, a transpalatal arch, or, if necessary, rapid maxillary expansion. Which surgical exposure method (open or closed) is best depending on position of canine. It has been found that the treatment of impacted canines has minimal effects on periodontal health, and the long-term stability prognosis is good. However, few other studies have advocated extraction of impacted canine owing to different reasons[4]. In this article we present cases of bilateral impacted maxillary canines treated at our center and review the litereature for management of the same.

Objective of the study

To present case series for management and to analyse the methods for managing bilateral impacted maxillary canine.

Hypothesis

What are the criteria to opt for orthodontic management of impacted maxillary canine over surgical extraction of the tooth and what is the timing and duration of the treatment for a successful outcome.

MATERIALS AND METHOD

Data sources

Data extraction for the review was carried out from databases such as Pubmed, Web of Science, Scopus, Medline, and Embase from the year 2000 to 2023, for studies with keywords ‘impacted canine’ ‘orthodontics’ ‘maxillary canine.’

After an initial selection phase of the records identified from the databases, the potentially eligible articles were qualitatively evaluated before including them in the review.

A manual search of orthodontic journals including American Journal of Orthodontics and Dentofacial Orthopedics, European Journal of Orthodontics, Angle Orthodontist, Journal of Orthodontics and World Journal of Orthodontics was also performed.

Case series

Two patients were treated at our institution who had impacted maxillary canines removed.

Case 1: Description

A 17-years-old female presented to the dental department of our institution with an impaction maxillary canines, proclined upper incisors, mild maxillary and mandibular crowding. Her medical history was insignificant. Clinical examination revealed a straight profile, competent lips, protruded lower lip. The patient had impaction maxillary canines, proclined, protruded upper & lower incisors, mild maxillary crowding (-2mm) and mandibular crowding (-2 mm). The overbite was (3.5 mm), over-jet was increased (4 mm). Upper midline coincided with facial midline and the lower midline was deviated to right by (1.5 mm) in relation to upper midline. (Figure 1)

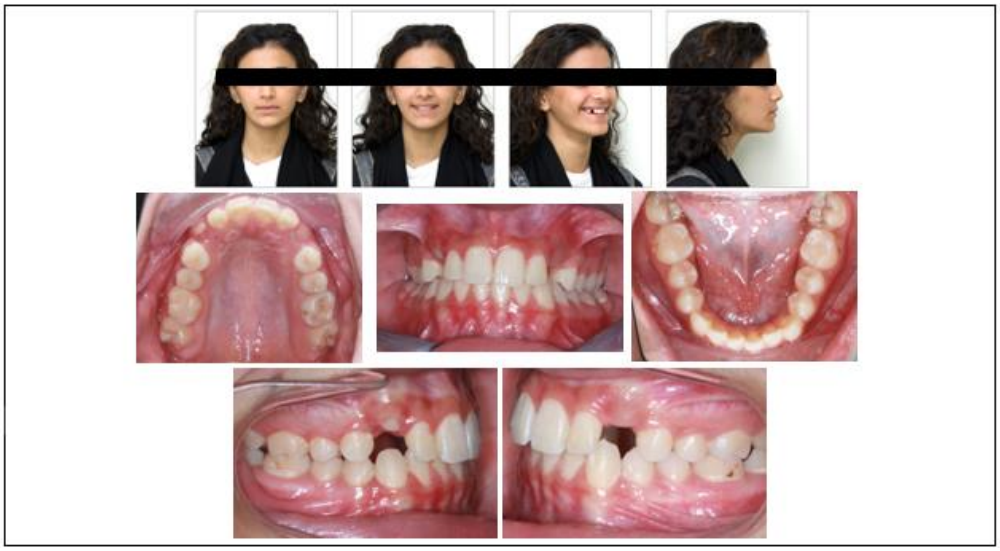


Figure 1:

Panoramic radiography showed all third molars in their developing stage, multiple restored teeth, impacted maxillary canines with retained primary canines (Figure 2).

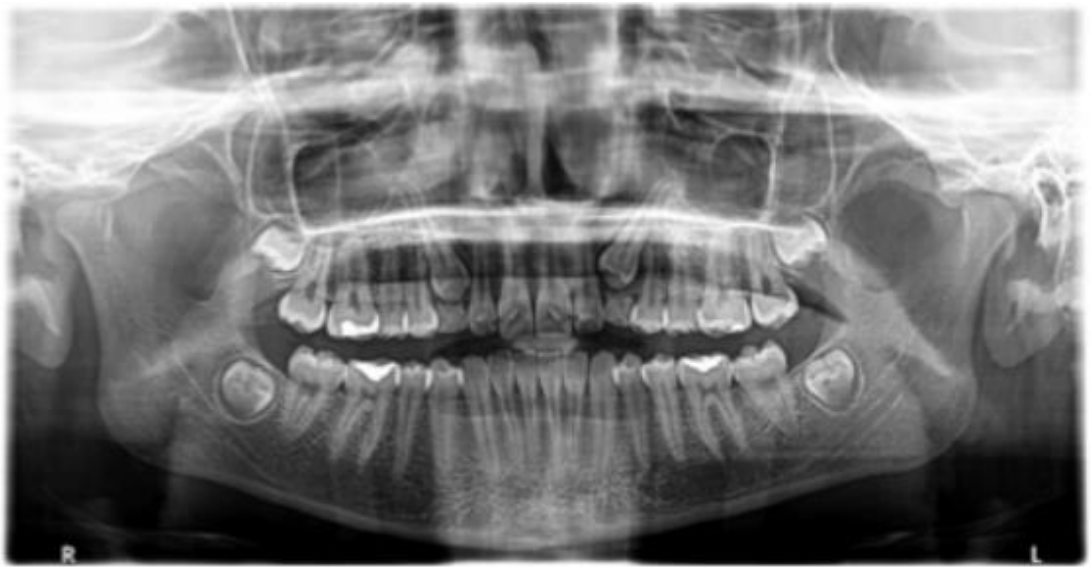


Figure 2

Cephalometric analysis revealed a skeletal Class I relationship.Dento- alveolar analysis showed proclined maxillary incisors, increased over bite, lower midline shifted to the right by (1.5 mm), impacted maxillary canines, mild maxillary crowding (-2 mm) and mandibular crowding (-2 mm) with multiple rotations. Soft tissue analysis showed a straight profile, competent lips, protruded lower lip. The patient was diagnosed with a class II malocclusion subdivision right on class I skeletal base complicated by impacted maxillary canines. Treatment Objectives The treatment objectives were to correct maxillary incisors inclination, normalize the overbite, correct lower midline, canine exposure & traction ,relieve upper & lower crowding, improve facial aesthetics, and obtain normal lip position. Treatment Option Comprehensive, non-surgical treatment, non-extraction fixed Orthodontic appliances

Treatment Progress

The orthodontic plan was to treat the patient without extractions and to use the closed surgical exposure method followed by orthodontic traction to erupt the impacted canines. Treatment was initiated with a 0.022 0.028-inch slot standard edge-wise appliance. The orthodontic mechanics involved leveling and alignment of upper and lower teeth using 0.014, 0.016, and 0.016 0.022-inch nickel titanium (NiTi) arch wires. 0.016 0.022-inch stainless steel arch wires were introduced in both arches. Then the dentition was aligned on 0.017 × 0.025-in stainless steel arch wires and spaces were developed for the impacted canines and with the help of minor oral surgery and orthodontics, impacted canines were exposed and moved into the proper position using a NiTi wire overlay on a rigid main arch wire. The remaining spaces were closed reciprocally with a power chain. Right class II correction was accomplished using class II 3/16" 4oz medium inter arch elastics, while the left was maintained with a triangular elastic. All of the finishing touches were made. We completed de-bonding and kept meticulous documents. After debonding, a modified Hawley retainer and a lingual fixed retainer were placed in the upper and lower arches, respectively. The patient underwent treatment for 30 months

Treatment Results

Significant improvement of facial appearance was noticed on extra-oral photographs (Figure 3). A well-balanced profile with lip competence at rest and an aesthetic smile with adequate maxillary incisor were apparent on smiling. Intra-oral photographs and dental casts showed satisfactory overbite, adequate over-jet, Class I canines relationship, correction of dental midline deviation.Periodontal health was satisfactory.

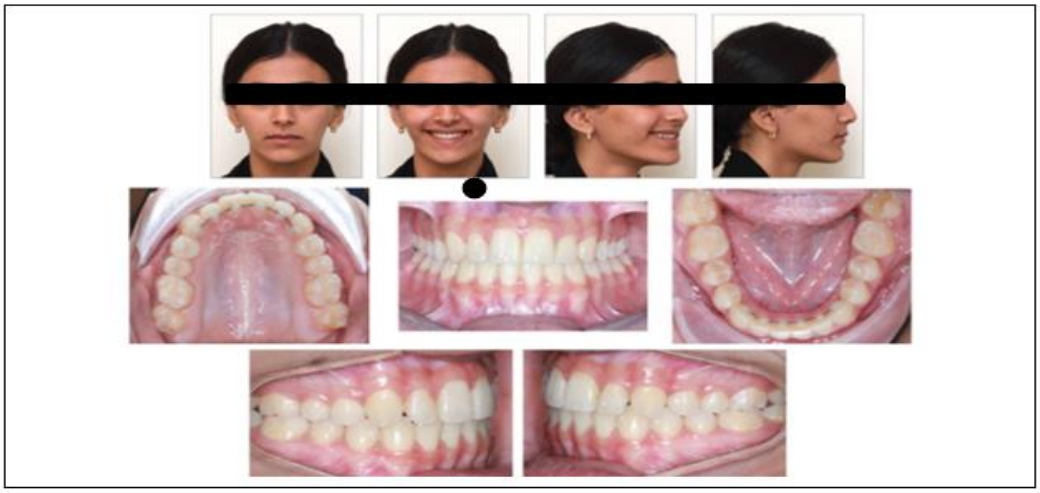
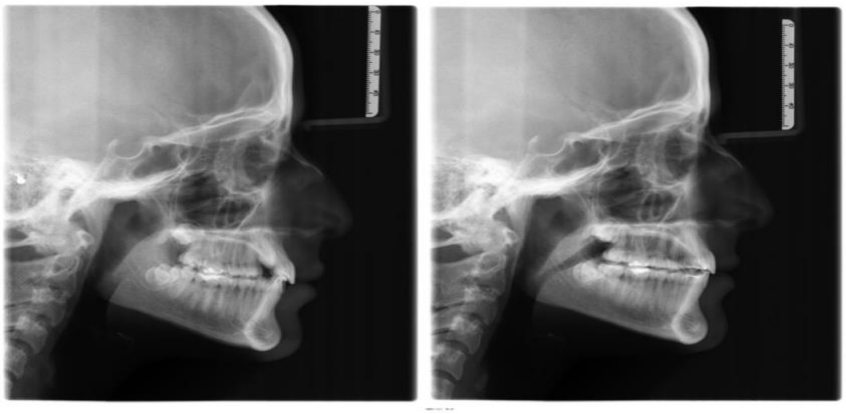


Figure 3

Maintaining the normal skeletal relationship was observed at the end of treatment. Dento-alveolar changes included a greater degree of lingual retro-clination of the maxillary and with slight intrusion of the upper incisors, as well as protraction and slight extrusion of the lower first molars. In terms of soft tissue changes, there was an improvement in the position of the upper and lower lips.

The following were noticed on superimposition of the lateral cephalometric radiographs Figure 4:

-Superimposition at the cranial base registration revealed that the upper and lower lips moved backward. -Maxillary regional superimposition confirmed cephalometric changes, including upper incisors retroclined with stable maxillary molars. -Mandibular regional superimposition corroborated with the results, and improvement of lower incisors position and inclination was observed. The 2-years post-treatment follow-up visits showed stability of orthodontic treatment and maintenance of the Class I canine relationship.



Variables	Norms	Pre-treatment	Post-treatment
SNA (°)	81° ± 2°	82°	82°
SNB (°)	78° ± 2°	79.8°	79.8°
ANB (°)	2° ± 2°	2.2°	2.2°
SNPog (°)	81° ± 2°	82°	82°
Wits(mm)	-1 ± 2	1.5mm	1 mm
Man.SN (°)	32° ± 4°	30°	31°
Max.SN (°)	8° ± 2°	8°	8°
Max.-Man(°)	27° ± 4°	25°	26°
Me-tgo-Ar(°)	126° ± 5°	125°	125°
UI-LI(°)	131° ± 10°	130°	133°
UI-Max.(°)	110° ± 6°	118°	110°
UI-NA(mm)	4 ± 2.7	5.9mm	4mm
LI-Man. (°)	93°±6°	93°	92
NB-LI(mm)	4 ± 2	3.7mm	3.6mm
UL-EL(mm)	-2 ± 2	-3 mm	-3.6 mm
LL-EL(mm)	-0 ± 2	-3 mm	-2 mm
NLA (°)	90° – 110°	105°	106°

Figure 4

Case 2 Description

A 19-year-old female presented to the dental department of our institution with impacted maxillary canines, proclined, protruded upper and lower incisors, mild maxillary crowding (-3 mm), and mandibular crowding (-1mm). Clinical examination revealed a slight convex profile, competent lips, protruding upper and lower lips, and increased lower anterior facial height. Ovebite was shallow (1 mm), and overjet was reduced (1mm) with multiple rotations. The upper midline coincided with the facial midline, and the lower midline was shifted to the right by 2 mm in relation to the upper midline. Figure 5

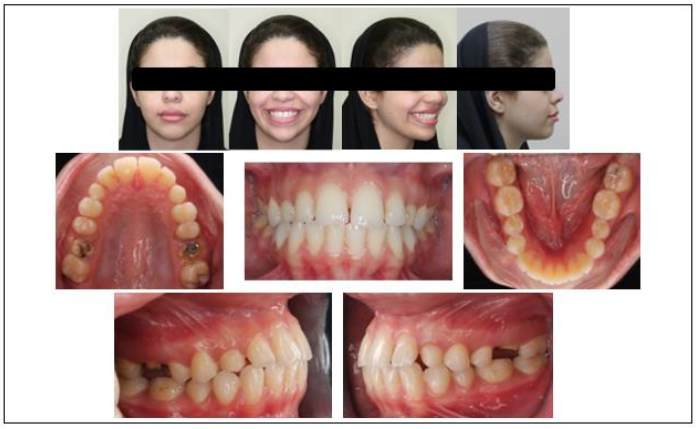


Figure 5

Panoramic radiograph showed all third molars in their developing stage. Multiple restored teeth,and endodontically treated right and left first molars an impacted maxillary canines with retained primary canines. Figure 6

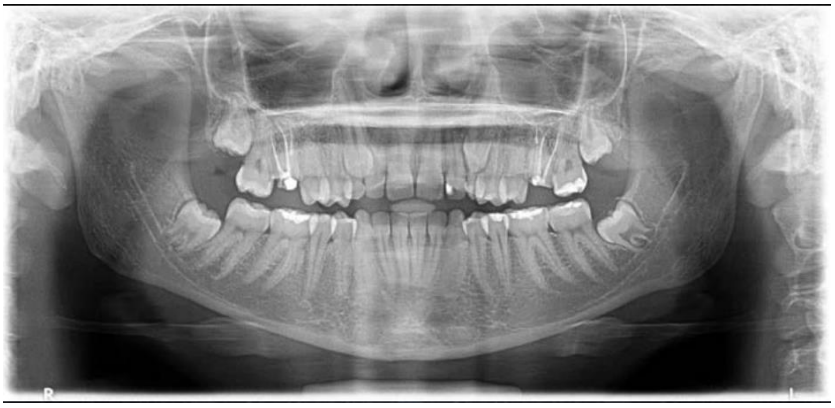


Figure 6

Cephalometric analysis revealed skeletal class I relationship and increased lower anterior facial height. Dento alveolar analysis showed protruded and proclined maxillary and mandibular incisors, decreased overbite, diastema, lower midline shifted to the right by (2 mm), impacted maxillary canines, mild maxillary crowding(-3 mm) and

mandibular crowding (-1mm) with multiple rotations. Soft tissue analysis showed a slide convex profile, competent lips, protruded upper and lower lips.

The patient was diagnosed with Class I skeletal base, increased lower facial height, impacted maxillary canines with competent and protruded lips.

Treatment objectives

The treatment objectives were to correct maxillary and mandibular incisors position and inclination, normalize the overbite, close anterior diastema, correct lower midline, canine exposure and traction, relieve upper and lower crowding, correct the rotated teeth, improve facial aesthetics and obtain normal lip position.

Treatment Options

1) Comprehensive non surgical treatment, extraction of upper and lower first premolars, fixed orthodontic appliances.
2) Comprehensive non surgical treatment, extraction of upper and lower first molars, fixed orthodontic appliances.
3) Comprehensive non surgical treatment, extraction of upper first molars and lower first premolars, fixed orthodontic appliances.

Treatment progress

Initially, temporary anchorage devices were inserted in the paramedian in the hard palate at the level of the upper molar. Remove the nurse for absolute anchorage, and to support temporary context, stop orthodontic bands on the upper second molar. Impressions were taken, and the pontics were fabricated on a plaster cast. The crowns were fixed to the modified trance with a little arch. The upper canines were surgically exposed, a closed surgical approach in which a surgical exposure is made to access the crown and facilitate bonding with immediate closure afterwards. Followed by the cementation of the modified appliance and the activation of the orthodontic traction, which will guide and align the teeth in the arch. Then, the maxillary first molars and mandibular first premolars were removed, and treatment was initiated with an inch-slot standard edge-wise appliance. The orthodontic mechanisms In Word, leveling and alignment of upper and lower teeth are done using inch-thick nickel titanium arch wires. Inch stainless steel arch wires were introduced in both arches, and the anterior teeth were retracted using active tiebacks to improve the position and inclination of the incisors overjet and achieve canines as shown in the Figure 7. After debonding, lingual fixed retainers were placed in the upper and lower arches, respectively. The patient underwent treatment for 34 months.

Treatment results

Significant improvement in facial appearance was noticed on extra oral photographs (Figure 8). A well-balanced profile with lip competence at rest and an aesthetic smile with adequate maxillary incisors were apparent when smiling. Intraoral photographs and dental casts showed satisfactory overbite, adequate overjet, Class I canine relationship, and correction of dental midline deviation. Periodontal health was satisfactory.

Reduction in lower anterior facial height, maintenance of a normal saggital relationship, and decreased vertical discrepancies were among the skeletal changes observed at the end of the treatment. Dentoalveolar changes included a greater degree of lingual retro inclination of the maxillary and mandibular incisors, with a slight intrusion of the lower second molars. In terms of soft tissue changes, there was a decrease in the lower anterior facial height and an improvement in the position of the upper and lower lips.

Following was noticed on the superimposition of the lateral cephalometric radiographs Figure 9

Superimposition at the cranial base registration revealed that the upper and lower lips moved backward with a counterclockwise rotation of the mandible.

Maxillary regional superimposition caused cephalometric changes, including upper incisors retroclined with a stable maxillary second molar.

Mandibular regional superimposition was corroborated by the results, and an improvement in lower incisor position and inclination was observed. The 3-year post-treatment follow-up visits showed stability of orthodontic treatment and maintenance of the Class I canine relationship.

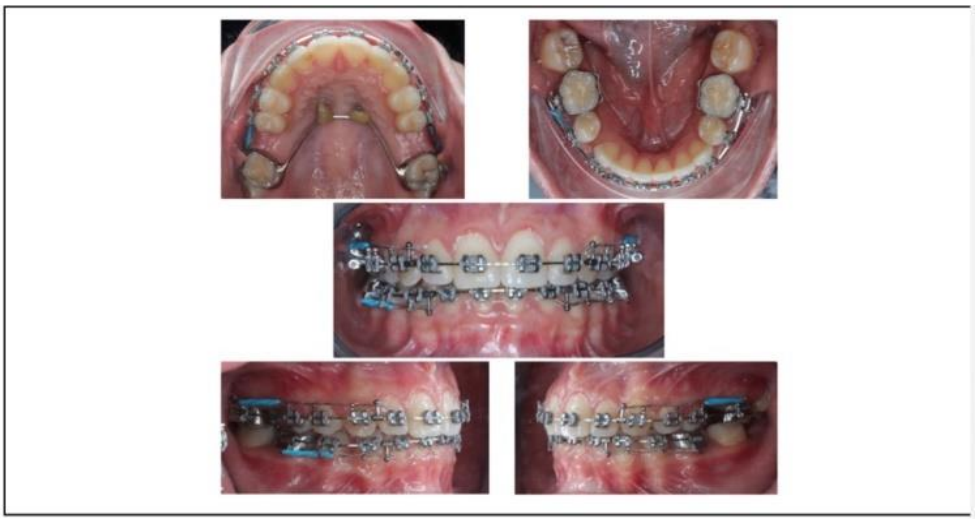


Figure 7

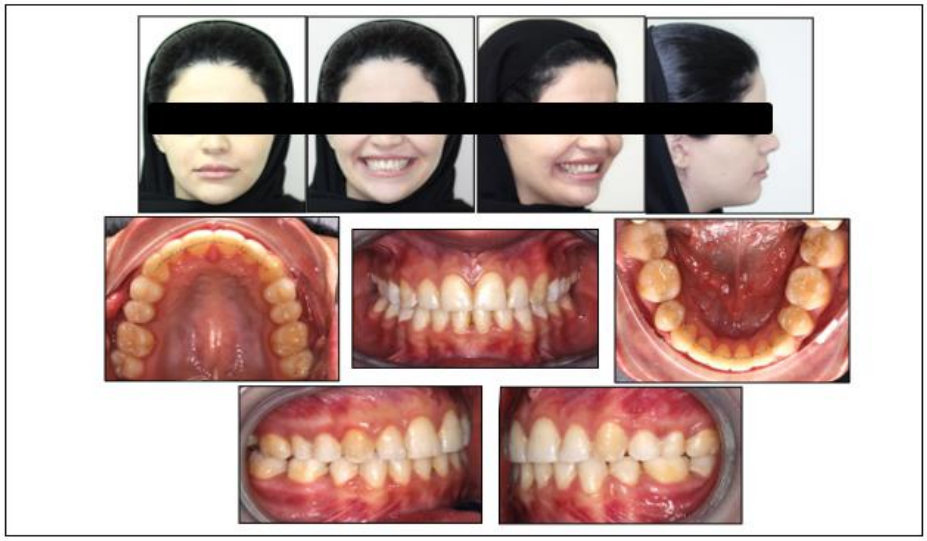
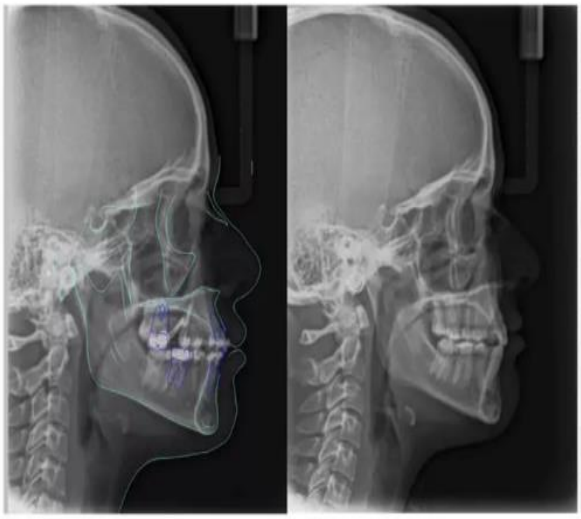


Figure 8



Variables	Norms	Pre-treatment	Post-treatment
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SNB (°)	78° ± 2°	81.3°	79.9°
ANB (°)	2° ± 2°	1.4°	2°
SNPog (°)	81° ± 2°	81.1°	81.1°
Wits(mm)	-1 ± 2	-1mm	-1.2 mm
Man.SN (°)	32° ± 4°	31.4°	31.4°
Max.SN (°)	8° ± 2°	3.4°	3.4°
Max.-Man(°)	27° ± 4°	27.6°	24.4°
Me-Igo-Ar(°)	126° ± 5°	125°	125°
UI-LI(°)	131° ± 10°	113.8°	135.7°
UI-Max.(°)	110° ± 6°	117°	106.2°
UI-NA(mm)	4 ± 2.7	8mm	3.5mm
LI-Man. (°)	93°±6°	102.7°	93.7
NB-LI(mm)	4 ± 2	8mm	3.9mm
UL-EL(mm)	-2 ± 2	-1.1 mm	-2.6 mm
LL-EL(mm)	-0 ± 2	3.4 mm	0.2 mm
NLA (°)	90° – 110°	99.4°	94.6°

Figure 9

DISCUSSION

Orthodontists have historically been responsible for the management of ectopic and unerupted teeth, allowing for the consideration of a variety of options such as space recreation, autotransplantation, interceptive approaches, and orthodontic mechanical eruption.

Canines are the second most frequently impacted among all teeth, following third molar impactions. In general, they have an estimated prevalence that spans from 1 to 4%. Two percent of the population has impacted upper canines, and it's twice as frequent in women as in men. Canine impaction occurs more frequently in the maxilla than

in the mandible[5]. Early identification and management during the mixed dentition phase can shorten treatment time, decrease expenses and prevent more complicated therapies.

Management options

Extraction of the deciduous canine

Whenever early indicators of a canine ectopic eruption are discovered by orthodontists, an endeavor should be taken to prevent impaction and associated sequelae. For children between the ages of 10 and 13, palatal impaction of canine is the most common cause for early extraction[6]. The success rate of self-correction drops to roughly 64% when the tip of the impacted canine cusp crosses the long axis of the lateral incisor, and extraction of the main canine may not help at all. After the extraction of the preexisting canine, there is a 91 percent likelihood that the replacement canine will emerge naturally provided that the tip of the canine cusp does not cross the long axis of the lateral incisor[7].

Impacted canine extraction

In cases where the prognosis is poor, such as when the impaction is very deep, when the canine root is completely formed, when there is a marked angulation (root laceration), when there is too little space in the arch, or when the canine position is very unfavorable (between the lateral and central incisor roots, for example), extraction of the impacted canine followed by implant placement or orthodontic closure of the space is indicated. The risks associated with orthodontic displacement, such as the inability to obtain adequate bone and gingival levels and the possibility of root resorption of adjacent teeth during this movement, can be avoided in the aforementioned cases by extracting the impacted tooth and replacing it with an implant or the first premolar . Internal or external resorption of the impacted tooth, acceptable and reasonably functional occlusion after first premolars replacement, and whenever a pathology is associated with the crown of the impacted tooth (cyst or infectious process) are all additional indications for impacted canine extraction[8].

Assisted Interception with Other Devices

It has been reported that the success rate of primary canine extraction increases dramatically when it is combined with space creational methods like face masks, cervical or straight pull headgears, rapid maxillary expansion, or the removal of multiple deciduous teeth in a sequential or alternating fashion.Treatment using a cervical pull headpiece at night, in addition to extraction, has been shown to increase the rate of successful eruption to 87.5%. In a study conducted by Baccetti et al., it was shown that the upper first molars of the patients who did not wear headgears shifted significantly mesially[9]. Headgears' primary function, then, is to halt the mesial migration of the upper arch's posterior segments, clearing a path for the impacted tooth's eventual emergence. Canine teeth may erupt more easily after undergoing a maxillary expansion therapy due to an enhanced intraosseous location of the impacted teeth.2 Armi et al. in a randomized clinical study chose to exclude extraction of primary canines from the treatment alternatives[10]. They divided their subjects into three groups: those who received cervical pull headgear, those who received fast maxillary expansion/headgear, and those who received neither treatment. They discovered that the

success rate of permanent canine eruption can be increased by as much as three times without primary canine extraction when orthodontic therapy is coupled with fast maxillary expansion and/or cervical pull headgear. Armi et al.'s research suggests that removing the deciduous teeth that are mechanically impeding the upper arch is just as crucial as preserving the upper arch's perimeters, in particular the anterior maxillary dimension. Recently, Hadler-Olsen et al. undertook a randomized experiment to investigate the link between the arch size disparity and the effectivity of headgears in class II patients[11]. Interestingly, they discovered aside from the impact that headgears have on eruption course, they are greatly helping patients by broadening the arch. According to them, the maxilla grew more in narrow dental arches than in broad ones due to the headgear therapy. Furthermore, they hypothesized that the "lip bumper effect" was given by the inner headgear bow as a relief effect against the pressure of the lip musculature, leading to a notable increase in inter-canine distance. Because of this, the researchers concluded that the front of the maxilla had the most impact on the canine's vertical eruption.

Surgical Approach

In the event that preventative measures fail, a combination of surgical and orthodontic procedures to realign the impacted teeth is the next best option. Surgical exposure of the canine is followed by orthodontic movement of the tooth into the dental arch, especially in situations of palatal displacements. Following surgical uncovering, the desired outcome might be either active eruption by orthodontic pressures or passive eruption by the patient themselves.

Surgical strategy is best determined by the location and degree of bone displacement. According to Huang et al., the quantity of keratinized tissue around the impacted tooth, the vertical location of the impaction in relation to the mucogingival junction (MGJ), and the mesiodistal position of the canine crown are the most important considerations in reaching a final choice[12]. If there is not enough gingiva, the breadth of the keratinized tissue can be increased with more predictability by using an apically positioned flap. Patients with a severely affected canine whose crown tips are adequately aligned mesiodistally may be candidates for a closed eruption procedure. If a maxillary canine is severely affected, with the crown projecting labially or the cusp tip being moved mesially, a two-stage procedure may be necessary, with exposure occurring first and mucogingival surgery occurring afterward. When the canine is resting on the gum line, open exposures reveal the tooth's crown for precise bonding. If there is enough keratinized gingiva from the crown to the MGJ, a simple excision surgery should be sufficient. The window technique, the complete flap open procedure, and the apically moved flap technique are three further variations of this method that can be used in various contexts.

Method using a window

The quickest and easiest way to reveal an impacted canine, which is often located superficially, may be felt above the level of the associated gingiva, and is hidden only by a thin, movable layer of oral mucosa. In cases with buccal canines that are visible and palpable above the level of the connected gingiva, a semilunar window can be used to get access to the tooth. But in palatally impacted canines, due of thick mucosa, bone, and follicle, they are 5 to 7 mm

beneath the surface which requires a deeper and more complicated surgical removal of a circular region with riskier bonding process of attachments. Surgical dressings like Coe-Pak or a healing plate can be used to stop the formation of granulated tissue and reduce discomfort. In rare cases, a modest luxation performed for the sake of "loosening it up" or "to check if it is ankylosed" might aid in deeper impactions by inducing a spontaneous eruption or altering the trajectory of the eruption. However, this procedure may lead to resorption of the cervical root or ankylosis.

Flap surgery

Full flap surgeries are an option for treating palatal impactions. It is done by maximal exposure of the tooth and suturing the flap back to its old location, while a circular part of the associated mucosa is removed. The apically relocated flap is a variant used to treat labial canines. If the canine is located above the level of the MGJ and is not displaced mesial or distal to the typical location in arch,this technique is recommended. This method can save the keratinized tissue, however it can't be used on severely impacted teeth. Crown instability and re-intrusion of the tooth following orthodontic treatment may result from strains in the relocated gingiva due to tooth movement if the impacted tooth's placement is above the MGJ. Incision-free surgery. By raising a mucoperiosteal flap, cutting enough bone to expose the crown and allow tooth movement, bonding a chain, resuturing the flap, and leaving the chain exiting through the gingiva, a less invasive technique is achieved. When a tooth is deeply impacted, or when a buccal impaction is displaced mesially or distally from its usual location, closed operations are the recommended treatment option.Since the closed eruption method produces less gingival scarring, the outcomes are more aesthetically pleasing and there is less vertical relapse. However, since the tooth is no longer visible, the orthodontic force applied during traction cannot be regulated.According to Becker and Chaushu, exposure may be done minimally by opening the follicle only sufficient for bonding an attachment, and leaving the remainder of the follicular tissue intact. In a more extreme method, the tooth might be exposed by completely removing the follicle surrounding it.

Method of creating a tunnel

Crescini et al. first proposed it for patients with midalveolar impacted teeth. To avoid an erupting tooth with a lengthy, unsightly crown and diminished bone support on the labial side, this variation of closed surgery is used[13]. The impacted tooth is removed by tractioning it down into the empty canine socket. Exposure facilitated via corticotomy. Fischer studied this method for use in the planning of therapy for impacted dogs. In a clinical experiment, he compared the outcomes of bilateral palatal impactions treated by corticotomy to those treated with traditional techniques of palatal exposure. Overall, he achieved quicker tooth movement across the board with no discernible impact on periodontal health.Recent research by Ferguson et al. on 151 palatally impacted teeth indicated that using this approach around the impacted teeth increased the pace of tooth movement by a factor of 2–4 [14]. Leaving roughly 1.5 mm of bone interproximally, an ostectomy is performed between the surrounding teeth to

create a passage for the impacted canine crown to the ultimate arch wire location. Furthermore, it should be followed by penetrations over the root prominence of the affected tooth toward movement direction.

Comparing open and closed surgery outcomes

After treatment, Parkin et al. found no difference in periodontal health between canines that had been palatally impacted using either of these two methods [15]. Sampaziotis et al.'s systematic review corroborated their finding [16]. They also found that the postoperative discomfort from both procedures was comparable, with closed surgical techniques resulting in a little shorter recovery time for palatal impactions. When compared to palatal impactions, the recovery period for buccal impactions is greater after either a closed or open exposure. In a meta-analysis, Cassina et al. revealed that the open surgical method gives a superior result than the closed procedure in terms of reduced initial alignment length and lower risk of ankylosis [17]. Buccal impactions which are surgically exposed using the open approach will likely lose roughly 1 mm of keratinized tissue, as compared with typical physiological eruption. However, there is a paucity of appropriate research, therefore open and closed exposures for buccally impacted canines have not yet been directly explored. However, from an aesthetic standpoint, it is widely agreed that there is no discernible difference between open and closed exposures.

Impacted Teeth Extraction Surgery and Subsequent Mechanical Traction

Growing individuals without substantial arch space shortages are more likely to benefit from orthodontic traction of the affected canine. Sajnani states that there are three steps necessary for the orthodontic alignment of an impacted canine in the maxillary arch. Since the canine is probably not at its optimal angulation, and the crown will consequently require greater space, the first step is to create sufficient space, and even slightly more. If the space needs to be created by removing a premolar, that decision should be made only after the affected canine's mobility has been verified, since removing an ankylosed impacted tooth would be counterproductive. The direction of motion toward the arch is the focus of the second stage. The crown should be moved buccally and occlusally to its ideal position in the dental arch.In contrast, a buccally directed force may cause harm if the canine is close to the incisor roots, and no movement would be obtained owing to the root obstruction. Therefore, it must first be moved in a posterior and occlusal orientation, and then buccally into place. The final step involves adjusting the inclination, the orientation, and the rotation. To avoid damaging neighboring roots, a buccally positioned canine may necessitate extensive distal and occlusal adjustments. A clinically appropriate angulation can be achieved by distally relocating the apex. In terms of angulations and tipping, if the apex is in the line of the arch in the buccolingual plane and in the mesiodistal plane, then the crown of the tooth will just need to be tilted into its position in the arch, a rather easy biomechanical exercise. Conventional golden chains and strong rectangular arch-wires aren't the only mechanisms at play while yanking an affected canine into place. The incisor apex is closer to the resorptive follicle of the impacted canine in the traditional alignment, which might place the surrounding laterals at risk of resorption from the expressed torque from the wire. Additionally, TADs provide supplemental anchoring for ankylosed impacted teeth. Temporary anchoring devices provide a practical and dependable skeletal support for impacted teeth, allowing for more controlled movement of the tooth prior to disimpaction. The primary advantage of this approach is that the

maxillary arch may not be bracketed until canine is disimpacted, and ankylosis may be ruled out. Soft tissue irritation, plaque buildup, and gingival inflammation are some of the unintended consequences. Ballista springs are commonly made with a round Australian wire that is 0.014 inches in diameter, making them another modern technology. Compared to previous approaches, this one has the extra benefit of being usable both before and after the leveling and alignment process.When combined with a surgical exposure, the cantilever on the segmented arch approach provides a means of traction that is both effective and safe. The segmented arch procedure, developed by dentist Charles Burstone in 1962, entails dividing the dental arch so that the teeth may be consolidated into active parts and a passive unit (anchor). The cantilever, a device for dental traction produced from titanium and molybdenum alloy wire, is amenable to this treatment. Because its mechanics are statically established, the approach has been claimed to be effective and predictable in a case report by Nakandakari et al [18]. In 2008, Schubert treated 103 patients using the Easy Way-Coil® system, and the entire process, from initial surgical exposure to fixed appliance removal, took an average of 17.8 months [19]. Although this method was safe, effective, straightforward, and cost-effective, it will not be recommended for ankylosed impactions. However, it has only recently been shown to be useful in cases of simultaneous and numerous maxillary canine and premolar impactions.67 Finally, additional ways such as K-9 springs and double-arch-wire mechanism also have been observed to be beneficial in pulling out in impacted canine.

Transplantation

It's the process of moving one or more teeth from one location in an individual's dental arch to another. Although not frequently, autotransplanting can be a beneficial treatment in circumstances of failure or impracticality of previously stated treatments or patient refusal to undertake orthodontic treatment. When the canine is positioned too high or at an angle of more than 45 degrees with respect to the occlusal plane, this treatment option may be preferable to extraction. When compared to implant-supported restoration, tooth transplants have benefits such functional adaptability and alveolar ridge preservation, and the transplanted tooth may regain proprioceptive function and normal periodontal support. After surgical relocation, many techniques of fixing have been recorded. Suturing, orthodontic wire, a plastic vacuform splint, and a metal cap splint are all mentioned as viable treatment options, with the fixation lasting anywhere from two weeks to six months. Endodontic treatment of autotransplanted canines may be required depending on the size of the apical foramen and whether or not it has closed (root formation more than 75%14). Due to the young tooth's potential to revascularize, a monitoring and management method is recognized in situations of open apices. The success rate of open apex teeth, however, has been observed to be greater than that of closed apex teeth.

CONCLUSION

Canine impaction is a treatable condition that is particularly sensitive to when and where the tooth is displaced. Orthodontists will have the upper hand if they are able to spot the problem early on and intervene, either by preventing it by extracting deciduous canines or by intercepting it using assistance devices to provide greater space. Expertise from several fields is needed for a late diagnosis of impaction. Bonding an attachment may need either an

open or closed surgical procedure, depending on the specifics of the case. However, in the majority of outcome evaluations, there was no discernible clinical difference between the two methods. Orthodontic techniques for extracting an impacted canine need the use of a sufficient amount of force applied in the right direction. Autotransplantation or surgical removal of the affected canine may be necessary in extremely unusual cases because to the severity of the issue.

REFERENCES

1) Becker A, Chaushu G, Chaushu S. Analysis of failure in the treatment of impacted maxillary canines. American Journal of Orthodontics and Dentofacial Orthopedics 2010;137(6):743-754.
2) Counihan K, Al-Awadhi EA, Butler J. Guidelines for the assessment of the impacted maxillary canine. Dental update. 2013;40(9):770-777.
3) Ngan P, Hornbrook R, Weaver B. Early timely management of ectopically erupting maxillary canines. InSeminars in Orthodontics 2005;11(3)152-163.
4) Alqahtani H. Management of maxillary impacted canines: A prospective study of orthodontists' preferences. Saudi Pharmaceutical Journal. 2021;29(5):384-390.
5) Kalyani P, Kumar MS. Prevalence Of Impacted Canines Among Dental Patients-A Retrospective Study. Int J Dentistry Oral Sci. 2021;8(8):4059-4064.
6) Alejos-Montante K, Martínez-Zumarán A, Torre-Delgadillo G, Rosales-Berber MÁ, Garrocho-Rangel A, Pozos-Guillén A. Early identification of permanent maxillary canine impaction: A radiographic comparative study in a Mexican population. Journal of clinical and experimental dentistry. 2019;11(3):e282.
7) Littlewood SJ, Mitchell L. An introduction to orthodontics. Oxford university press; 2019.
8) Pua Oa, Silva Júnior Jp, Martins Jh, Cavalcante Bm, Almeida Pp, et al. Surgery traction canine of impacted in the maxillary: a case report. RGO-Revista Gaúcha de Odontologia 2023;71:e20230052.
9) Baccetti T, Leonardi M, Giuntini V. Distally displaced premolars: a dental anomaly associated with palatally displaced canines. American journal of orthodontics and dentofacial orthopedics. 2010;1;138(3):318-322.
10) Baccetti T, Leonardi M, Armi P. A randomized clinical study of two interceptive approaches to palatally displaced canines. The European Journal of Orthodontics. 2008;30(4):381-385.
11) Hadler-Olsen S, Pirttiniemi P, Kerosuo H, Sjögren A, Pesonen P, Julku J, Lähdesmaki R. Does headgear treatment in young children affect the maxillary canine eruption path?. European Journal of Orthodontics. 2018;30;40(6):583-591.
12) Huang HM, Ou KL, Wang WN, Chiu WT, Lin CT, Lee SY. Dynamic finite element analysis of the human maxillary incisor under impact loading in various directions. Journal of Endodontics. 2005;1;31(10):723-727.

13) Crescini A, Nieri M, Buti J, Baccetti T, Pini Prato GP. Orthodontic and periodontal outcomes of treated impacted maxillary canines: An appraisal of prognostic factors. The Angle Orthodontist. 2007:1;77(4):571-577.
14) Ferguson DJ, Rossais DA, Wilcko MT, Makki L, Stapelberg R. Forced-eruption time for palatally impacted canines treated with and without ostectomy-decortication technique. The Angle Orthodontist. 2019:1;89(5):697-704.
15) Parkin NA, Milner RS, Deery C, Tinsley D, Smith AM, Germain P, et al. Periodontal health of palatally displaced canines treated with open or closed surgical technique: a multicenter, randomized controlled trial. American Journal of Orthodontics and Dentofacial Orthopedics. 2013;144(2):176-184.
16) Sampaziotis D, Tsolakis IA, Bitsanis E, Tsolakis AI. Open versus closed surgical exposure of palatally impacted maxillary canines: comparison of the different treatment outcomes—a systematic review. European journal of orthodontics. 2018:23;40(1):11-22.
17) Cassina C, Papageorgiou SN, Eliades T. Open versus closed surgical exposure for permanent impacted canines: a systematic review and meta-analyses. European Journal of Orthodontics 2018:23;40(1):1-0.
18) Nakandakari C, Gonçalves JR, Cassano DS, Raveli TB, Bianchi J, Raveli DB. Orthodontic traction of impacted canine using cantilever. Case reports in dentistry. 2016:9;2016.
19) Schubert M, Baumert U. Alignment of impacted maxillary canines: critical analysis of eruption path and treatment time. Journal of Orofacial Orthopedics/Fortschritte der Kieferorthopadie. 2009:1;70(3).