Interdisciplinary Approach in the Treatment of Impacted Canines – Review

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The management of impacted canines is important in terms of esthetics and function. Clinicians must formulate treatment plans that are in the best interest of the patient and they must be knowledgeable about the variety of treatment options. When patients are evaluated and treated properly, clinicians can reduce the frequency of ectopic eruption and subsequent impaction of the maxillary canine. The simplest interceptive procedure that can be used to prevent impaction of permanent canines is the timely extraction of the primary canines. 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. In the present article, an overview of the incidence and sequelae, as well as the surgical, periodontal, and orthodontic considerations in the management of impacted canines is presented.

Keywords: Diagnosis, etiology, impacted canines, orthodontic techniques, prevention, surgical techniques

INTRODUCTION

Impaction is a pathological condition defined by the lack of eruption of a tooth in to the oral cavity within the time and physiological limits of the normal eruption process.¹ Impacted teeth are those with a delayed eruption time or that are not expected to erupt completely based on clinical and radiographic assessment. Permanent maxillary canines are the second most frequently impacted teeth; the prevalence of their impaction is 1-2% in the general population.¹ ² This is most likely due to an extended development period and the long, tortuous path of eruption before the canine emerges into full occlusion. Methods of diagnosis that may allow for early detection and prevention should include a family history, visual and tactile clinical examinations by the age of 9-10 years and a thorough radiographic assessment. Because there is a high probability that palatally impacted maxillary canines may occur with other dental anomalies, the clinician should be alert to this possibility. When the condition is identified early, extraction of the maxillary deciduous
canines may, in some cases, allow the impacted canines to correct their paths of eruption and erupt into the mouth in relatively good alignment. This interceptive treatment may further reduce complications associated with palatally impacted canines including root resorption of the lateral incisors and the need for more complex surgical and orthodontic intervention.\textsuperscript{1,2,4,5} (Fig. 01)

![Fig. 01: Root resorptions of adjacent teeth](image1)

Clinicians have various definitions of “impaction.” Canine impaction can be defined as an unerupted tooth after its root development is complete; or a tooth still unerupted when the corresponding tooth on the other side of the arch has been erupted for at least 6 months and has a complete root formation; or a condition in which a tooth is embedded in the alveolus and is locked in by bone, adjacent teeth, or other obstacles and cannot properly erupt into the oral cavity. This includes teeth in which eruption is significantly delayed and there is no clinical or radiographic evidence that further eruption is likely to happen.\textsuperscript{1,3,4,6,7}

Maxillary canine has the longest period of development and the most devious eruption path. Its final position in the occlusion is essential to complete the arch form, a functional occlusion and symmetry and harmony of the dentition. The maxillary canine is the most frequently impacted tooth except from third molars. The reported incidence of canine impaction varies from 0.8 to 5.2 percent in normal populations. Bilateral impaction is seen in 17 to 45 percent of the cases, and impacted canines are more common in females than males. The reported percentages of palatally impacted canines, varies between 41 percent and 93 percent among studies. Most of the palatally impacted canines (85 percent), have sufficient space for eruption into the dental arch.\textsuperscript{4,5,7,8} (Fig. 02a-c)
Two common theories may explain the phenomenon of the palatally impacted canine, but the exact etiology of impacted maxillary canines is not yet known. The guidance theory of palatal canine displacement suggests that palatal displacement is a result of local factors such as lack of guidance along the root of the lateral incisor due to congenitally missing lateral incisors, supernumerary teeth, odontomas, transposition of teeth, or other mechanical destining factors that influence the eruption path of the canine. The second theory for canine impaction is known as the genetic theory. In this theory palatal impaction of canines has been found to be related to congenital absence of teeth, and is suggested to be of the same genetic origin. In addition, there are some factors that are thought to cause canine impaction such as obstacles, abnormal position of tooth bud, dental crowding, long and complicated path of eruption, late eruption date, early loss of deciduous canine, prolonged retention of the deciduous teeth, and systemic disease. Palatally impacted maxillary canines are often present along with other dental abnormalities including tooth size, shape, number, and structure; hypoplastic enamel, infra-occluded primary molars and aplastic second bicuspid. 

In general, the causes for retarded eruption of teeth may be either generalized or localized. Generalized causes include endocrine deficiencies, febrile diseases, and irradiation. The most common causes for canine impactions are usually localized and are the result of any one, or combination of the following factors:

(a) tooth size-arch length discrepancies,
(b) prolonged retention or early loss of the deciduous canine,
(c) abnormal position of the tooth bud,
(d) the presence of an alveolarcleft,
(e) ankylosis,
(f) cystic or neoplastic formation,
(g) dilaceration of the root,
(h) iatrogenic origin (discussed earlier), and
(i)idiopathic condition with no apparent cause. (Fig. 03a, b)
If orthodontic treatment is not provided for impacted canine, complications such as root resorption of the neighbouring lateral incisor and first premolar, and development of cyst may occur.\textsuperscript{7,8,9} (Fig. 04a, b).

A genetic predisposition was shown in some studies; the relatives of patients with palatal canines are likely to exhibit palatally displaced canines and anomalous lateral incisors. Peck et al concluded that palatally displaced canines appear to be a product of polygenic multifactorial inheritance.\textsuperscript{10} Also Prinin et al found that palatally impacted canines are genetic and related to incisor premolar hypodontia and peg shaped lateral incisors.\textsuperscript{11}

This article discusses the etiology, diagnosis, and clinical management of impacted maxillary canine teeth.

**Prevalence and Etiology**

Eighty-five per cent of impacted maxillary permanent cuspids are palatal impactions, and 15% are labial impactions. Inadequate arch space and a vertical developmental position are often associated with
buccal canine impactions. If buccally impacted cuspids erupt they do so vertically, buccally and higher in the alveolus. Due to denser palatal bone and thicker palatal mucosa, as well as a more horizontal position, palatally displaced cuspids rarely erupt without requiring complex orthodontic treatment. Palatally erupting or impacted maxillary canines occur twice as often in females than males, have a high family association and are 5 times more common in Caucasians than Asians. It is not unusual for maxillary canine impaction to occur bilaterally, although unilateral ectopic eruptions are more frequent.\(^5\)

Although Impacted canines can be seen intooth size arch length discrepancy, early loss of deciduous teeth, craniofacial syndromes like Crouzon syndrome, cleidocranial dysostosis etc, The exact etiology of palatally impacted maxillary cuspids is unknown; however, two common theories may explain the phenomenon: the guidance theory and the genetic theory.\(^6,7\)

The “guidance theory of palatal canine displacement” proposes that this anomaly is a result of local predisposing causes including congenitally missing lateral incisors, supernumerary teeth, odontomas, transposition of teeth and other mechanical determinants that all interfere with the path of eruption of the canine. Maxillary canines develop high in the maxilla, are among the last teeth to develop and travel a long path before they erupt into the dental arch. These factors increase the potential for mechanical disturbances resulting in displacement and, thus, impaction. The second theory focuses on a genetic cause for impacted cuspids.\(^7,12\)

Palatally impacted maxillary cuspids often present with other dental abnormalities, including tooth size, shape, number and structure, which Baccetti reported to be linked genetically. Several abnormalities are believed to have a common hereditary link, manifested as a developmental disturbance during embryonic growth. Research demonstrates that up to 33% of patients with palatally impacted cuspids also have congenitally missing teeth, a frequency that is 4-9 times that of the general population.\(^12\)

Studies also show that up to 47.7% of patients with palatally impacted cuspids have small, peg-shaped or missing lateral incisors.\(^12\)

In patients with congenitally absent maxillary lateral incisors, the co-occurrence of palatally impacted canines is 2.4 times that of the general population. Palatally impacted maxillary canines are also associated with such anomalies as hypoplastic enamel, infra-occluded primary molars and aplastic second
bicuspids.\textsuperscript{12} However, it remains uncertain whether the anomalous lateral incisor is a local causal factor for palatally displaced canines or an associated genetic developmental influence. Diagnosis and Early detection of impacted maxillary canines may reduce treatment time, complexity, complications and cost. Ideally, patients should be examined by the age of 8 or 9 years to determine whether the canine is displaced from a normal position in the alveolus and assess the potential for impaction. The clinician can investigate the presence and position of the cuspid using 3 simple methods: visual inspection, palpation and radiography.\textsuperscript{5,6,7,12}

**DIAGNOSIS**

When dealing with impacted maxillary canines, an accurate diagnosis is critical for the success of the proposed treatment. Unlike impacted mandibular third molars, unerupted permanent maxillary canines cause patients relatively few problems. A retained primary canine may have a relatively poor appearance compared with a properly aligned permanent canine, but many patients are often unaware of the presence of and do not seek treatment for a retained primary canine. Consequently, the discovery of an impacted canine is frequently made at the time of a routine radiographic examination.\textsuperscript{4,5,6,7} Jacobs gave the four reasons why it is important to localize an impacted maxillary canine. Firstly, it is a sound principle not to extract a well-placed tooth in order to make space for a poorly positioned one. If a well-placed tooth is preserved, the treatment time may be shortened considerably, and the result is predictable. The converse is also true. If a poorly placed canine is kept and a well-aligned tooth extracted, then the treatment time will be prolonged and the result is unpredictable.\textsuperscript{13} Secondly, an error in the localization process can result in a surgical flap being raised in the wrong area. Thirdly, the clinician must be estimate the degree of difficulty involved in uncovering a displaced canine. Uncovering a malpositioned canine may be more hazardous to the adjacent teeth than extracting the canine\textsuperscript{14,15}. And, fourthly, if suitable clinical conditions exist, a palatally impacted maxillary canine may be induced to spontaneously erupt into the line of the arch, simply by extraction of the primary canine. As extraction of the primary canine is often successful in allowing the palatally impacted canine to erupt spontaneously, the necessity for surgery and orthodontics with all their associated discomforts, hazards, and costs are avoided. This procedure may also reduce the incidence of resorption of the roots of an adjacent incisor by an impacted canine.\textsuperscript{[14,15,16]}
Clinical signs that may indicate ectopic or impacted succedaneous cuspids include lack of a canine bulge in the buccal sulcus by the age of 10 years, overretained primary cuspids, delayed eruption of their permanent successor and asymmetry in the exfoliation and eruption of the right and left canines. Primary cuspids that are retained beyond the age of 13 years and have no significant mobility strongly indicate displacement and impaction of permanent canines. Although Power and Short assert that the maxillary canine is late in its eruption sequence if it has not emerged by the age of 12.3 years in females and 13.1 years in males, correlation between chronological and dental ages is poor and overall dental development must be considered when investigating delayed canine eruption.\(^{17}\)

Although distal crown tip on the maxillary lateral incisors is common in the mixed dentition stage before eruption of the maxillary canines, an exaggerated distally tipped incisor should increase suspicion of a mesially deflected and palatally impacted canine.\(^{18}\)

In these cases, the lateral incisor crown may be tipped distally because the impacted cusp is exerting force on the distal aspect of the lateral incisor root. Such palatal impactions can cause the lateral incisor to rotate as well. Retroclined lateral incisors can also occur when buccally directed forces cause the root to tip labially and the crown to tip palatally.\(^{19}\)

In severe cases, the central incisor may also be affected, and its crown may become malpositioned.\(^{17,18,19}\)

Palpation of the buccal and lingual mucosa, using the index fingers of both hands simultaneously, is recommended to assess the position of the erupting maxillary canines. Eruption time of a maxillary canine varies from 9.3 to 13.1 years. Because canines are palpable from 1 to 1.5 years before they emerge, the absence of the canine bulge after the age of 10 years is a good indication that the tooth is displaced from its normal position, and ectopic eruption or impaction of the maxillary cuspids is possible. Asymmetries in the alveolar process are not considered significant in children younger than 10 years, and differences in bilateral palpation could be due to vertical differences in eruption rates at young ages. However, in patients older than 10 years, an obvious palpable bilateral asymmetry could indicate that one of the permanent cuspids is impacted or erupting ectopically.\(^{20,21,22}\)

In contrast, examination of intrabony movement of the canines between the dental age of 8 to 10 years was advised by Williams. If permanent canine bulges are not palpable, he offered to examine lateral
and frontal radiographs specifically for Class I malocclusions, even with minimal arch length loss. He suggested removing the deciduous canine when a position apparently lingual to the anterior teeth on the lateral radiograph and a medial tilt of the long axis of the canine in relation to the lateral wall of the nasal cavity on the frontal radiograph are observed.  

Radiographs are indicated when canine bulges are not present; right and left canine development and eruption is asymmetrical occlusal development is advanced and there are no palpable bulges indicating the presence of the cuspids in the alveolar process; and the lateral incisor is delayed in eruption, malpositioned, or has a pronounced labial or palatal inclination in relation to the adjacent central incisor. Accurate radiographs are critical for determining the position of impacted canines and their relation to adjacent teeth, assessing the health of the neighbouring roots and determining the prognosis and best mode of treatment.  

A panoramic radiograph taken in conjunction with 2 periapical views obtained using Clarke’s Rule (Buccal Object Rule) or a 60% maxillary occlusal film allows the impacted teeth to be located either palatally or buccally relative to adjacent teeth. Ericson and Kurol found that periapical radiographs allowed accurate location of the teeth in 92% of the cases they evaluated.  

Although conventional dental radiographs provide satisfactory diagnostic images, they lack the accuracy necessary for assessing palatal or buccal root resorption of the lateral incisor especially with mild

Fig. 05 : radiographic Diagnosis, parallax method

Fig. 06 maxillary occlusal film

Although periapical films are diagnostic for transverse position, occlusal radiographs are more accurate for determining the positions of the canines relative to the midline. Lateral cephalometric radiographs are also helpful in assessing the anterior–posterior position of the displaced tooth, as well as its inclination and vertical location in the alveolus. 

Although conventional dental radiographs provide satisfactory diagnostic images, they lack the accuracy necessary for assessing palatal or buccal root resorption of the lateral incisor especially with mild
or early resorption. Computed tomography (CT) is more accurate in terms of locating the impacted cusp in 3 dimensions and for diagnosing associated lesions such as root resorption of adjacent teeth. However, although CT is an asset in cases where root resorption is suspected, cost, time and increased radiation exposure restrict its routine use. More recently cone beam CT has been recommended for visualizing impacted teeth, as the radiation dose is less and it gives 3D picture of impacted tooth, path to be followed for orthodontic movement.  

Fig. 07 (Fig 07) 

Fig. 07: cephalogram can be used to discern the position of the impaction

As may be seen in OPG, it is not clear whether canines and premolars are labial or palatal and mesial or distal. When we look at the pictures developed from CBCT scan, it is clear that the canines are erupting labially whereas the premolars are palatally erupting.  

Medical computerized tomography (CT) was an improvement which overcomes the limitations of conventional two-dimensional (2D) imaging however, radiation exposure of CT scans limits its clinical utility.  

The advent of 3D cone beam computed tomography (CBCT) has reduced the radiation dose, making it an advantageous tool in dentistry. CBCT images have been proven to be useful for the accurate diagnosis of the impacted canines, treatment planning and the identification of associated complications, such as root resorption in adjacent incisors. In addition it was found that CBCT reduces the treatment duration and increases the success of treatment in difficult cases to a similar level of simpler cases. Small volume CBCT may be indicated as a supplement to a routine panoramic X-ray in the following cases if:  

- canine inclination in the panoramic X-ray exceeds 30°  
- root resorption of adjacent teeth is suspected  
- the canine apex is not clearly discernible in the panoramic X-ray, implying dilaceration of the canine root.

The association of palatally impacted maxillary cuspids with other dental anomalies regardless of whether there is a true genetic relation is clinically significant for the general practitioner. When an associated abnormality is suspected or diagnosed, further clinical and radiographic examinations are indicated to investigate
the possibility of maxillary canine displacement. If palatally displaced canines are identified early during mixed dentition, interceptive treatment may prevent future complications and more extensive orthodontic treatment. 4,8,21,28,29

**Management of Impacted Canines**

Before surgical intervention, it is necessary to consider the need to create adequate space to facilitate movement of the impacted tooth. For management of the impacted maxillary canine, all of the teeth in the maxillary arch should be bracketed to allow for proper positioning of the canine and to avoid canting of the occlusal plane. 33 Bracketing of all the teeth provides adequate anchorage for extrusion of the impacted canine. The other option is to use a mini-implant or micromini-implant as anchorage to move the impacted canine. Pre-surgical orthodontic treatment should be performed until adequate space is made for the canine. This usually takes between 2 and 4 months 33.

In principle, there are five treatment options for impacted maxillary canines:4,21 (i) no active treatment except monitoring, (ii) interceptive removal of the primary canine, (iii) surgical removal of the impacted canine, (iv) surgical exposure with orthodontic traction and alignment, and; (v) auto-transplantation of the impacted canine.

When the permanent maxillary canine is impacted or erupting buccally or palatally to the arch, the preventive treatment of choice is extraction of the primary canine; when the patient is 10-13 years old. 13,14,26 However, if any root resorption is evident before this age and there is suspicion of impaction, the primary canine should be extracted and appropriate treatment implemented, such as monitoring of the eruption path or orthodontic alignment. When a canine is impacted buccally, the retained primary canine should be extracted to create a pathway and space for the permanent canine to erupt into the arch. This is especially important if both the permanent and primary canines are simultaneously visible in the arch. 9

In Class I noncrowded situations where the permanent maxillary canine is impacted or erupting buccally or palatally, preventive treatment of choice is extraction of the primary cuspids when the patient is 10-13 years old. However, if any root resorption is visible before this age and there is suspicion of impaction, the primary cuspids should be extracted and appropriate treatment implemented, i.e., monitoring the eruption path or orthodontic alignment. When canines are impacted buccally, overretained
primary cuspids should be extracted to create a path and space for the permanent cuspids to erupt into the arch. This is especially important if both the permanent and primary cuspids are visible in the arch at the same time.\(^5\)

Power and Short showed that interceptive extraction of the primary canine completely resolves permanent canine impaction in 62% of cases; another 17% show some improvement in terms of more favourable canine positioning.\(^6\) Ericson and Kurol found that, in 78% of palatally erupting cuspids, the eruption paths normalize within 12 months. However, extraction of the primary cuspid does not guarantee correction or elimination of the problem. If there is no radiographic evidence of improvement one year after treatment, more aggressive treatment, such as surgical exposure and orthodontic eruption, is indicated.\(^{24, 25}\) The success of early interceptive treatment for impacted maxillary cuspids is influenced by the degree of impaction and age at diagnosis. As a general rule, when the degree of overlap between the permanent maxillary cuspid and the neighbouring lateral incisor exceeds half the width of the incisor root, the chances for complete recovery are poor.\(^{24, 25, 26}\)

The surgical removal of impacted canines although seldom considered might be a viable option in the following situations: patient declines active treatment and/or is happy with appearance:\(^4\)
- there is evidence of early resorption of adjacent teeth.
- the patient is too old for interception.
- there is a good contact for lateral incisor and first premolar or the patient is willing to undergo orthodontic treatment to substitute first premolar for the canine
- if the impacted canine is ankylosed and cannot be transplanted
- if the root of impacted canine is severely dilacerated
- if the impaction is severe and the degree of malocclusion is too great for surgical repositioning/transplantation.

Especially extraction of the labially erupting and crowded canine is contraindicated. Such an extraction might temporarily improve the aesthetics however may complicate and compromise the orthodontic treatment results. The success rate drops to 64% if the cuspid crown is positioned mesial to the midline of the lateral incisor before interceptive treatment. Other factors influencing prognosis include canine angulation and crowding. The chance of successful eruption of an impacted canine following extraction of the primary canine is less than favourable as the angle from the vertical increases. Power and Short found that an angle exceeding 31% from the vertical significantly reduces the chance of
normal eruption following an extraction. However, the degree of horizontal overlap with the adjacent lateral incisor has been found to have more influence on prognosis than angulation.7, 8 (Fig 08a-c)

Fig. 08a-c: As an example, the pendulum can be used for space gain

Ericson and Kurol found that more mesially positioned canine cusp tips are associated with greater resorption of lateral incisor roots. Arch crowding can also have a significant influence; moderate to severe crowding indicates the need for complex orthodontic treatment to resolve the impaction and the malocclusion. Sequelae from Maxillary Canine Impactions The permanent canines are the foundation of an esthetic smile and functional occlusion, and any factors that interfere with their development and eruption can have serious consequences. Although extraction of primary cuspids can be beneficial in specific cases, inappropriate extraction of primary maxillary cuspids must be avoided, due to the increased potential for arch collapse and arch crowding, which could lead to a buccal impaction. Abnormal eruption paths within the dentoalveolar process may result in impactions and serious clinical ramifications. Unerupted or partly erupted cuspids may increase the risk of infection and cystic follicular lesions and compromise the lifespan of neighbouring lateral incisors due to root resorption.8,9,10,21,28,20 Clinical studies have determined that 12% of lateral incisors that are adjacent to ectopically erupted canines have some degree of external root resorption, while the prevalence of lateral incisor root resorption in 10-13 year olds is 0.7%. A mesial-horizontal eruption path has also been shown to be more devastating to the adjacent lateral incisor, as is advanced root formation of the palatally displaced maxillary canine.4,21,29

Corrective Treatment
Corrective treatment is performed in
situations where orthodontists cannot render preventive or interceptive treatment for some reason, or patients present beyond the point of prevention. There should be an attempt to bring impacted maxillary canines down to occlusion if possible, because permanent canines are important for both functional and aesthetic reasons. There are numerous surgical methods for exposing the impacted canine and bringing it to the line of occlusion. Two of the most commonly used methods are (I) surgical exposure, allowing natural eruption and surgical exposure with placement of an auxiliary attachment.  

Orthodontic forces are subsequently applied to the attachment to move the impacted tooth. (Fig 09a-g).

Fig. 9a, b: Formation of a Mucoperiosteal flap and expose the crown of an impacted canine with substantial protection of the bone.

Fig. 9c: titanium chain by Watted (DENTAURUM).

Fig. 9d Fixation of the attachment by means of light curing resin after etching technique.

Figure 9e: repositioned and stitched cloth (closed elongation).
Three techniques have been proposed by Kokich for uncovering a labially unerupted maxillary canine (gingivectomy, apically positioned flap, and closed eruption technique). He also suggested that orthodontists should evaluate 4 criteria to determine the correct method for uncovering the tooth so the outcome achieves the optimum periodontal health.  

These criteria include:
1. The distance between the canine cusp and the mucogingival junction;
2. The labiолingual position;
3. The mesiodistal position;
4. The amount of gingiva in the area of the impacted canine.

In palatally impacted canines, the concern about the lack of keratinized gingiva disappears because palatal tissue is a dense connective tissue.

Bishara suggested 2 surgical methods for exposing the impacted canines: surgical exposure followed by allowing spontaneous eruption; and surgical exposure with auxiliary attachment for further orthodontic treatment.  

The first method is useful when the canine has a correct axial inclination and needs no upright correction during its eruption, but this method may increase treatment time and be unable to control the path of eruption.

Kokich suggested performing this method before the beginning of orthodontic treatment or during the late mixed dentition because the tooth will erupt in a more favorable location, which will facilitate orthodontic movement without dragging the crown through the palatal gingival.

Schmidt and Kokich also reported that this technique had minimal effects on the periodontium and that the overall effects on the impacted canine appeared better than those from the closed exposure and early traction techniques.

The second method is used when there is no eruption force left or the tooth does not lie in a favorable direction and orthodontic force is required to move the impacted tooth away from the roots of the adjacent teeth and bring it to the proper
position. After sufficient space has been created, surgical exposure is performed and the attachment is placed. Light orthodontic force (not to exceed 60 g, or 2 oz) is then applied to move the tooth to the desired position by various orthodontic techniques.36 (Fig. 10a-k)

Fig.10 a: a 16-year-old patient before the treatment. The OPG shows the displacement and retention of tooth 13 and 23 with persistence of the tooth 53 and 63.

Fig. 10b-e: Clinical situation in occlusion and in the supervision of the upper dental arch.

Fig. 10 f: Status after initial mobilization of the canine.

Fig. 10 g: OPG at the end of treatment.
Fig. 10 h-k: Clinical situation after the treatment

Surgical exposure

The individually selected surgical procedure for each of the canine position in which the exposure the first step is to secure periodontally and aesthetically pleasing result. It is now generally recommended, again to cover the palatal displaced canines after adhesion of the attachment with the mucoperiosteal flap previously formed, to perform a closed elongation. The Attachment with the best chance of success, the titanium head with titanium necklace is by Watted.mit the best chance of success is the titanium head with titanium chain by Watted.36,37,38

Exposure of palatal displaced canines

In the surgical exposure of impacted palatal canines the cut is marginal (Fig. 9a) or para marginal (Fig. 9f). Because of better wound healing after adaptation of the mucosa to mucosa the para marginal incision is preferred. If the displacement permits this, incision around the Incisive foramen in an asymmetric (unilaterally extended to canine) or symmetrical formed (bilaterally extended to canine).39 After careful mobilization of the mucoperiosteal flap, only so much cortical bone is removed until the crown portion of the retained tooth is exposed enough to secure fixation of attachments. Extensive milling leads to a larger post-therapeutic bone loss. To limit the bone loss after cessation of the canine to a minimum, the cemento-enamel border must not be exceeded. The dental follicle is carefully debrided in the immediate circumference of the exposed crown area since often it emanates from
the highly vascularized tissue and frequently bleeds, which makes the attachment difficult to be fixated (Fig. 09b). 36, 37

In general, the most reliable bonding technique is the acid etching technology without the usual pre-treatment of the enamel with rubber cups and polishing paste, since the post-eruptive enamel maturation has not been yet taken place and pre-eruptive enamel porosities increase the composite adhesion. In addition, the use of rotary instruments would easily cause bleeding and thus the Attachment fixation is difficult. A sufficient flushing of the surface is necessary to avoid gingival necrosis or permanent fixation of the attachment that is endangered by remaining etchant. 21,28,33

After careful hemostasis - often all it takes is a short compression by means of a swab soaked with H2O2 - the exposed tooth surface is blown dry and slightly etched for 30 seconds with phosphoric acid. Following a copious lavage with isotonic NaCl solution, the surface must be carefully dried. An adequate flushing of the surface is necessary to avoid the result of gingival necrosis or permanent fixation of the attachment that is endangered by remaining etchant. The attachments with fine clinical prospects are for example the Eyelet and Pressing with the gold chain. 21,36,37 The new attachment with the best Chance of success in terms of stability and biocompatibility is the titanium head with titanium chain by Dr. Watted (titanium head with chain DENTAURUM) (Fig 09c). The knobs base was treated with the laser, that significantly increases detention accuracy. The attachment with the best resistance to the liability of knobs or eyelet is substantially larger than that of a brackets. 38,39,40 Due to the bracket size and base, it is not suitable to be glued on the palatal surface (Fig. 09d). The fixation of gold or titanium chains to the attachment ensures secure transmission of orthodontic forces in one to three days after the applied surgical exposure for the first time. 40 After hardening the composite, the operation field is finally rinsed with ISO toner NaCl solution. The repositioned mucoperiosteal flap is fixed by sutures and covering the entire surgical field (Fig. 9e and g). After the exposure of palatally impacted tooth, if the exposed area is open or is it only covered by a surgical dressing, according to Becker et al. the following complications can occur: soft tissue overgrowth and plaque accumulation which lead as soon as the adjustment has been completed in association with the secondary healing to a chronic infection and to compromise- afflicted periodontal conditions21,29. The fixed knobs of titanium chain project at the desired breakdown location at the alveolar ridge level several millimeters above the seam.
area. The passage point must be necessarily determined in consultation with the orthodontist, since otherwise the soft tissue may undergo unnecessary trauma during orthodontic setting. If necessary, a maxillary association board can be incorporated. Several days after the surgical exposure of the impacted tooth, it was moved by the action of suitable orthodontic appliances with the mucous membrane in the desired position. In palatal displaced canines, the closed elongation is carried out in the rule. If the canine is moved directly under the palatal mucosa, a fenestration is possible and sufficient 40.

CONCLUSION

The prevalence of maxillary canine impaction is significant and the frequency increases with other genetically associated dental anomalies.

Multidisciplinary approach for guiding the impacted canine gives predictable results. Careful diagnosis is critical and it is crucial that every patient should be managed with tailor-made treatment plan with sound scientific backing as there is no ‘cook book’ approach for all cases. The development of treatment and mechanical plans must be based on the careful analysis of the clinical situation and identification of the correct force system is necessary to obtain the desired tooth movement.

The management of an impacted canine is a complex procedure requiring a multidisciplinary approach. The clinicians should communicate with each other to provide the patient with an optimal treatment plan based on a scientific rationale.

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