

Case Report

Management of impacted maxillary canines during orthodontic treatment: Report of two cases with 1-year follow-ups

ABSTRACT

The prevalence of impacted maxillary canines is 2%–3%. The position of the canine germ should be evaluated between 9 and 11 years of age group. In addition to the clinical examination, radiographic evaluation of the canine site will aid in gathering additional data such as the position of the canine, its relationship with the adjacent teeth, and any oral pathology associated with the site. It becomes imperative to have an early diagnosis of the ectopically positioned canine. Orthodontic considerations which include orthodontic traction for the malpositioned canine tooth along with surgical exposure assume significance, if the permanent canine is deviating from its normal eruption pathway trajectory within its specified timeline of erupting into the dental arch. The objective of reporting the following two cases is to analyze a successful 1-year follow-up outcome of an interdisciplinary, evidence-based approach in managing impacted canines in two female patients in their second decades of life.

Keywords: Impacted canines, multidisciplinary approach, orthodontic treatment

INTRODUCTION

Maxillary canine displacement can be defined as the developmental dislocation often resulting in tooth impaction requiring surgical and orthodontic treatment.^[1] An impacted canine is defined as, “a tooth retained in the maxillary or mandibular arch beyond the date of eruption, surrounded by its pericoronal sac and has no contact with the oral cavity.”^[2] The frequency of maxillary canine impaction is between 0.2% and 2.8%. The prevalence rate ratio of females to males varies between 1.3:1 and 3.2:1.^[3] The maxillary canine tends to move palatally between the age group of 5 to 9 years, later with substantial movement in the buccal direction between the age group of 10 and 12 years.^[4]

Early management

In the early stage of its development, it is challenging to differentiate palatally displaced canines from buccally displaced ones. Therefore, the early diagnosis of the displaced

maxillary canine is of paramount importance between the age group of 9 and 11 years. Clinical examination which involves locating the canine tooth germ, identifying the canine bulge in the dental arch in the late stage of diagnosis is the first step in the approach of management of this situation. Radiographic examination is a supplemental aid to clinical examination which gives additional information to arrive at a sequential treatment plan.

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Late management

Late management encompasses 13 to 14 years of age of the patient to be managed for the impacted canines. When the extraction of the primary canines or a combination of extraction and cervical headgear, rapid maxillary expansion or a transpalatal bar has failed, or the canine is impacted buccally, the next step is surgical exposure of the canine and fixed orthodontic appliances. The right time to start with exposure depends on the dental development and the risk of resorption of the incisor roots. It is important to know if there are root resorptions involving the neighboring incisors. Especially in extraction cases, it is not a high-quality treatment to extract premolars and leave severely resorbed incisors. The radiographic examination is very important, as without cone-beam computed tomography (CBCT) examinations, there is a high risk of leaving severely resorbed incisors and removing healthy premolars.^[5] Our two case reports in the present article are categorized under the late treatment phase management.

CASE REPORTS

Case one (gingival excisional procedure)

A 13-year-old female teenage patient was under an orthodontist's care for her dental malocclusion. This patient was referred by the orthodontist for a maxillary right canine exposure to position the tooth in the dental arch by orthodontic mechanics.

During the initial clinical examination [Figure 1], the four-point evaluation criteria were applied.

A prominent labial bulge over the maxillary right canine region was noticed indicating preliminary that the canine was labially positioned. The vertical apicocoronal positioning of the tooth showed that it was positioned coronal to the mucogingival junction [Figure 1d].

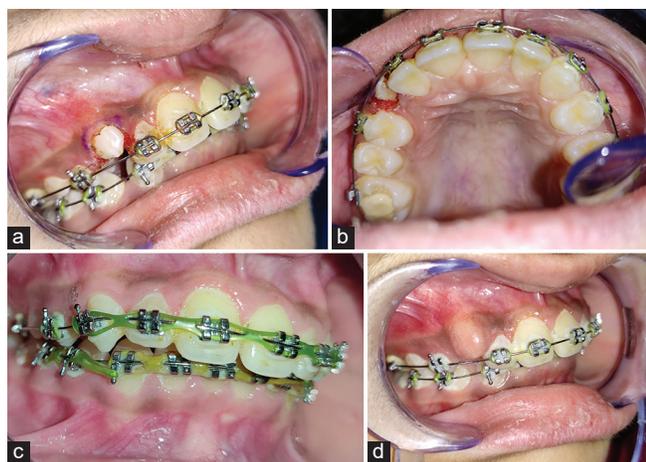


Figure 1: (a) Case 1 Post op lateral view (b) Case 1 Post -op Occlusal view (c) Case 1 One year follow up (d) Case 1 Pre -op

Adequate amount of gingiva was present over the unerupted canine and the final criteria being that the crown of the tooth was slightly mesially positioned with respect to its adjacent lateral incisor.

The treatment decision was undertaken on the above criteria and an excisional approach to uncover the canine was decided upon keeping adequate band of attached gingiva over the unerupted tooth. The excisional procedure to uncover the tooth was decided to be undertaken with the help of a diode laser unit (NV Microlaser soft-tissue diode laser; Denmat holdings; CA, USA) with a wavelength of 808 nm and power setting of 2W and under continuous mode, with a 400 μ fiber tip, under local infiltrative anesthesia (lidocaine 2% with 1:100000 epinephrine) for a quick bloodless procedure so that the crown of the tooth could be exposed to help the orthodontist initiate the orthodontic treatment mechanics to position the tooth properly in the dental arch.

Figure 1a and b shows the clinical situation immediately postprocedure. A sterile surgical pen was used to mark the incision keeping sufficient keratinized gingiva apical to the incision both labially (following the surgical marking) and palatally to expose the coronal portion of the unerupted canine. Figure 1c shows a 12-month follow-up of the exposed maxillary canine within the dental arch in the phase of active orthodontic care.

Case two (closed flap approach)

A 13-year-old female teenage patient was under an orthodontist's care with respect to her dental malocclusion. She had a retained maxillary left deciduous canine in the dentition [Figure 2–Baseline X-ray]. Orthodontic treatment was initiated by the orthodontist, and the maxillary left deciduous canine was extracted before referring this patient for the unerupted canine exposure procedure, to initiate further orthodontic treatment to align the canine in the dental arch.

Figure 2b shows the initial preoperative intraoral clinical picture. It shows the canine space at the maxillary left canine region in the arch and absence of any impacted canine bulge in the vestibular space of the retained canine. The orthodontic wire was removed with the brackets bonded to the teeth in place in the maxilla. This was to facilitate the canine exposure procedure with access to the bony cavity of the impacted permanent canine without any hindrance. A decision was taken to treatment plan the procedure based on CBCT. It showed a radioluscent dental follicle with respect to the unerupted canine covering its entire crown-like a sac with no apparent radiographic signs of root resorption of the adjacent lateral incisor. The unerupted canine showed a



Figure 2: (a) Case 2 Baseline CBCT (b) Case 2 Base line Pre -op (c) Case 2 Reflection of a full thickness mucoperiosteal flap (d) Case 2 Exposure of canine and bonding of button to support the chain for traction (e) Case 2 Part of chain for traction exposed after primary closure of the flap (f) Case 2 Clinical 4 months follow up (g) Case 2 Xray 4 months follow up (h) case 2 clinical frontal view 6 months follow up (i) Case 2 clinical lateral view 6 months follow up (j) Case 2 Clinical frontal view 1 year 4 months follow up (k) Case 2 smile view showing canine tooth crown during 1 year 4 months follow up

mesial crown tilt with angle of about 50° with the long axis of the erupted incisor. Lower one third of the unerupted crown showed buccal superimposition over the apical part of the lateral incisor root [Figure 2a, panoramic, three-dimensional volume tomographic and cross section CBCT views].

Based on the above radiographic views and the clinical evaluation, decision was taken to opine the patient and her family to undergo a closed flap procedure with bonding of an orthodontic button and attachment of an orthodontic traction chain to the wire ligation to surgically expose the canine and mechanically guide it into its normal position in the dental arch.

After a preoperative hematological assessment of the patient, she was appointed for the procedure. Infiltration anesthesia was achieved locally at the site using lignocaine (1:100000 adrenaline).

A full-thickness periosteal flap was reflected with vertical releasing incisions to access the bony cavity site of the impacted canine. The incisions and reflection of the flap were planned two teeth mesial and two teeth distal of the maxillary canine area [Figure 2c] and reflection beyond the mucogingival area in the apical direction to have a very good visualization of the site and mitigate any tension or pull from the flap to avoid any tearing of the soft tissue which would in any way be detrimental to the vascularity of the area and compromise further healing. Immediately after reflecting the surgical flap, a bony window with the crown of the impacted canine beneath is observed [Figure 2c]. To avoid any damage to the crown of the unerupted tooth, the thin cortical bone is removed with the help of surgical curettes

avoiding any craze lines and damage to the unerupted canine crown from the curette tips. The bony window is enlarged further to access the area for the orthodontist to bond the button on the canine crown which would support the chain for the traction of the tooth [Figure 2d] during its pathway guidance into the dental arch. Once the chain is attached to the orthodontic button, the flap is coronally positioned and sutured with a part of the traction chain exposed out of the flap [Figure 2e] so that it may be attached to the ligation wire in the maxillary arch.

Postoperative instructions were given to the patient and postoperative anti-inflammatory analgesic with betadine gargling (1:1 ratio) were instructed. Oral hygiene maintenance emphasis was laid down to the patient and her family for uneventful healing of the site and eruption of the impacted canine.

The patient was recalled after 10 days for suture removal and local irrigation with betadine (1:1) in saline was carried out. Uneventful healing was observed and the subsequent follow-ups were done by the orthodontist at 4 months; clinical [Figure 2f] and X-ray [Figure 2g] 6 month follow-up clinical [Figure 2h frontal and 2i lateral view] showed marginal gingival inflammation over the maxillary left canine tooth. Generalized gingivitis was noted with other areas, and the orthodontist noted very poor oral hygiene at this follow-up visit.

The subsequent follow-ups became challenging with this patient post 9 months as the patient with her family shifted to their home town after the lockdown conditions were partially relaxed in the country because of the SARS Cov2 pandemic

which gripped the entire world. One year 4 months follow-up clinical pictures were sent by the patient [Figure 2j retracted frontal view and Figure 2k lateral face view with smile] showed healthy gingiva at the maxillary left canine site with marginal tissue inflammation and the canine almost erupting in the dental space between the mandibular left lateral incisor and the canine. The patient's family are opined to see an orthodontist in their home town where they currently are based because of the ongoing pandemic conditions.

Orthodontic considerations

Before the initiation of the orthodontic traction, it is important to know the resorption process of adjacent teeth. The decision-making should involve whether to preserve the resorbed adjacent teeth or extract them. The canine should move from the incisor if it is showing signs of resorption before the initiation of traction in the alveolar bone. After the impacted canine is moved away, the resorption can be halted and the tooth is not prone to further damage after which the comprehensive orthodontic treatment can be initiated. An important criteria in buccally impacted canines are to carefully select the orthodontic mechanics technique to avoid or minimize the gingival recession. A maxillary canine that has been exposed apical to the mucogingival junction and brought down to its normal position in the dental arch may exhibit an unfavorable esthetic result.^[6]

Surgical considerations

The decision on the type of impacted canine exposure will form the basis of mitigating future soft-tissue challenges namely, gingival recession, loss of attachment of the erupted tooth, any mucogingival issues which may be encountered at a future date either during or after completion of the entire orthodontic treatment. In both our cases reported, no soft-tissue defects are noted at 1-year follow-ups around the erupted maxillary canines.

DISCUSSION

After the third molars, the maxillary canines are the most commonly impacted permanent teeth.^[7] About one-third of impacted maxillary canines are positioned labially or within the alveolus and two thirds are located palatally.^[8] In most situations, the appropriate timing and surgical procedure for uncovering an impacted canine are determined by specific criteria.

Labial impaction of maxillary canines

Labial impaction of a maxillary canine is either due to ectopic migration of the canine crown over the root of the lateral incisor or shifting of the maxillary dental midline, causing insufficient space for the canine to erupt. Williams^[9]

Box 1: Possible etiologic factors – associated with impacted canines^[10]

Localized factors

- Tooth size–arch length discrepancies
- Failure of the primary canine root to resorb
- Prolonged retention or early loss of the primary canine
- Ankylosis of the permanent canine
- Cyst or neoplasm
- Dilaceration of the root
- Absence of the maxillary lateral incisor
- Variation in root size of the lateral incisor (peg-shaped lateral incisor)
- Variation in timing of lateral incisor root formation
- Iatrogenic factors
- Idiopathic factors

Systemic factors

- Endocrine deficiencies
- Febrile diseases
- Irradiation

Genetic factors

- Heredity
- Malposed tooth germ
- Presence of an alveolar cleft

suggested that extraction of the maxillary deciduous canine as early as 8 or 9 years of age will enhance the eruption and self-correction of a labial or intra-alveolar maxillary canine impaction. Olive^[11] suggested that opening space for the canine crown with routine orthodontic mechanics might allow for spontaneous eruption of an impacted canine. However, in some situations, even these techniques do not work, and the orthodontist must refer the patient to have the labial impaction uncovered surgically. There are three techniques for uncovering a labially impacted maxillary canine: Excisional uncovering (Case 1), apically positioned flap,^[12] and closed eruption techniques^[13] (Case 2).

Further, a four-point criteria^[14] is taken into consideration to determine the correct method of uncovering the impacted canines.

Criterion 1

Assess the labiolingual position of the impacted canine crown. If the tooth is impacted labially, then any of the three techniques could be used, because generally there is little if any bone covering the crown of the impacted canine. However, if the tooth is impacted in the center of the alveolus, an excisional approach and an apically positioned flap are generally more difficult to perform, because extensive bone might need to be removed from the labial surface of the crown.

Criterion 2

Evaluate the vertical position of the tooth relative to the mucogingival junction. If most of the canine crown is positioned coronal to the mucogingival junction (Case 1), any of the three techniques can be used to uncover the tooth. However, if the canine crowns were positioned apical to the mucogingival junction, an excisional technique would be inappropriate,

because it would not result in any gingiva over the labial surface of the tooth after it had erupted. In addition, if the crown were positioned significantly apical to the muco-gingival junction, an apically positioned flap would also be inappropriate, because it would result in instability of the crown and possible reintrusion of the tooth after orthodontic treatment.^[15] In the latter situation, a closed eruption technique will provide adequate gingiva over the crown and does not result in reintrusion of the tooth in the long term.^[16]

Criterion 3

Evaluate the amount of gingiva in the area of the impacted canine. If there were insufficient gingiva in the area of the canine, the only technique that predictably would produce more gingiva is an apically positioned flap. However, if there were sufficient gingiva to provide at least 2–3 mm of attached gingiva over the canine crown after it had been erupted, any of the three techniques could be used.

Criterion 4

The final criterion is to evaluate is the mesiodistal position of the canine crown. If the crowns were positioned mesially and over the root of the lateral incisor, it could be difficult to move the tooth through the alveolus unless it was completely exposed.

Reporting of such case reports adds up to already published scientific articles in this subject. Two different methods are discussed in uncovering labially impacted canines which can be taken into consideration during the planning phase. One-year follow-up shows the follow-up results of canines uncovered with different approaches. Furthermore, attempts to publish such cases add value to the philosophy of retaining natural teeth as far as possible and emphasize their functional and esthetic value.

CONCLUSIONS

Early detection of unerupted maxillary canines is important. For achieving long-term results, interdisciplinary planning of such cases is vital along with the proper criteria to use as guidelines to augment the surgical decision-making in uncovering the impacted tooth.

Limitation of this study

This is a case report series of two cases done with different techniques and followed up till 1 year for results. A large multi-center study involving a large sample size with a long-term follow-up is highly recommended. Furthermore, both the cases reported in this publication, the age group of the patients is in the second decade of their life. We need reporting of varying age groups of such cases attempted with adult orthodontics and interdisciplinary involvement to learn any challenges involved or limitation in treating them.

Recommendations

1. Interdisciplinary treatment planning and execution of challenging orthodontic cases yield long-term successful results
2. Impacted canines can be a challenging entity during orthodontic treatment but if the right criteria of diagnosis and treatment guidelines are followed, it can be very satisfying not only from a clinician's perspective but also from the patient's point of view whose natural dentition is preserved for function and esthetics.

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Conflicts of interest

There are no conflicts of interest.

REFERENCES

1. Peck S, Peck L, Kataja M. Site-specificity of tooth agenesis in subjects with maxillary canine malpositions. *Angle Orthod* 1996;66:473-6.
2. Brezulier D, Sorel O. Impacted canines – Literature review. *J Dentofacial Anom Orthod* 2017;20:208.
3. Peck S, Peck L, Kataja M. The palatally displaced canine as a dental anomaly of genetic origin. *Angle Orthod* 1994;64:249-56.
4. McSherry P, Richardson A. Ectopic eruption of the maxillary canine quantified in three dimensions on cephalometric radiographs between the ages of 5 and 15 years. *Eur J Orthod* 1999;21:41-8.
5. Ericson S, Kuroi PJ. Resorption of incisors after ectopic eruption of maxillary canines: A CT study. *Angle Orthod* 2000;70:415-23.
6. Bjerklin K. Orthodontic management of impacted maxillary canines. *APOS trends Orthod* 2020;10:64-71.
7. Bass T. Observation on the misplaced upper canine tooth. *Dent Pract Dent Rec* 1967;18:25-33.
8. Johnston WD. Treatment of palatally impacted canine teeth. *Am J Orthod* 1969;56:589-96.
9. Williams BH. Diagnosis and prevention of maxillary cuspid impaction. *Angle Orthod* 1981;51:30-40.
10. Manne R, Gandikota C, Juvvadi SR, Rama HR, Anche S. Impacted canines: Etiology, diagnosis, and orthodontic management. *J Pharm Bioallied Sci* 2012;4:S234-8.
11. Olive RJ. Orthodontic treatment of palatally impacted maxillary canines. *Aust Orthod J* 2002;18:64-70.
12. Vanarsdall RL, Corn H. Soft-tissue management of labially positioned unerupted teeth. *Am J Orthod* 1977;72:53-64.
13. Vanarsdall R, Corn H. Soft tissue management of labially positioned unerupted teeth. *Am J Orthod* 1977;72:53-64.
14. Kokich VG. Surgical and orthodontic management of impacted maxillary canines. *Am J Orthod Dentofac Orthop* 2004;126:278-83.
15. Vermette M, Kokich V, Kennedy D. Uncovering labially impacted teeth: Closed eruption and apically positioned flap techniques. *Angle Orthod* 1995;65:23-32.
16. Becker A, Brin I, Ben-Bassat Y, Zilberman Y, Chaushu S. Closed-eruption surgical technique for impacted maxillary incisors: A postorthodontic periodontal evaluation. *Am J Orthod Dentofacial Orthop* 2002;122:9-14.