Review Article

# A multidisciplinary approach in the management of impacted maxillary canine

**ABSTRACT**

Impaction of maxillary canines is a commonly encountered clinical problem whose treatment requires a multidisciplinary approach. Thorough clinical and radiological evaluation is very important in appropriately planning the management of impacted maxillary canine. In the present article, an overview of diagnosing and managing the impacted maxillary canines has been discussed.

**Keywords:** Impacted maxillary canine, oral surgery, orthodontics, surgical exposure

## INTRODUCTION

Eruption of teeth represents a complex series of events, that leads to the movement of teeth from their developmental position within the jaws to their functional positions in the occlusal plane.[1,2] Teeth that cease to erupt before emergence in the oral cavity or fail to attain their anatomical position beyond the chronological eruption date are referred to as impacted teeth.[1,3]

After the third molar, the maxillary canine is the most frequently impacted teeth in the dental arch.[4,5] Although maxillary canine impaction occurs in approximately 2% of the population,[3,6] it is a common dental problem encountered in orthodontic practice,[5] with an incidence of up to about 20%.[4]

The permanent canines are the foundation of a balanced smile, functional occlusion, and provide a major support for the lip; therefore, the absence of the canine accentuates the appearance of a flattened upper lip.[4] Moreover, impacted canines increase the risk of cyst formation and compromise the long-term prognosis of adjacent incisors due to root resorption.[4,5,7]

The orthodontic treatment of impacted permanent maxillary canine remains a challenge to clinicians; hence, early diagnosis and intervention could save time, expense, and more complex treatment in the permanent dentition.[6] The ideal approach for the management of impacted canine entails allowing the tooth to erupt and be guided to an appropriate location in the dental arch through an interdisciplinary management approach by a team of an orthodontist, oral surgeon, pediatric dentist, and periodontologist.[3]

## MANAGEMENT

The management of the impacted maxillary canine involves:

- Diagnosis
  - Clinical evaluation of the suspected impacted canine
  - Radiological evaluation.
- Treatment planning.

## DIAGNOSIS

Accurate localization of the impacted tooth plays a crucial role in determining the feasibility, proper access for the surgical

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approach and direction for application of orthodontic force.[8] This based on both clinical and radiographic evaluation.

### Clinical evaluation

This will involve detailed history on the eruption of the teeth and the presence of systemic diseases which might impede teeth eruption. It must also include a proper physical examination of the dentition. Clinical signs must be correlated with chronological and dental age of the patient for proper diagnosis of maxillary canine impaction.[3] Ideally, patients should be examined by the age of 8–9 years to determine whether the canine is displaced from a normal position in the alveolus and assess the potential for impaction.[8] The clinical evaluation entails detecting:

- Delayed eruption of the permanent canine or prolonged retention of the deciduous canine beyond 14–15 years of age
- Rotation or inclination of the adjacent tooth (palatal inclination of either or both maxillary incisors indicate a palatal position of the impacted canine while labial inclination indicates a labial position)
- Lack of canine bulge in the buccal sulcus by the age of 10 years
- Asymmetry in the exfoliation and eruption of the right and left canine.

### Radiological evaluation

The radiographic evaluation includes orthopantomograph (OPG), lateral cephalogram, intraoral periapical (PA) X-rays with parallax technique (horizontal/vertical), and occlusal view (OV). Specialized views include computed tomography (CT) scan and cone-beam CT (CBCT).[8]

Extraoral radiographs such as cephalogram determine the relationship of the impacted teeth to the other facial structure and OPG may be used to localize impacted teeth in all three planes. Intraoral OV determines the position of the impacted teeth relative to the midline.[3,9] A single PA film provides a two-dimensional representation of the dentition thus, relates the canine to the neighboring teeth both mesiodistally and superoinferiorly. To evaluate the position of the canine buccolingually, a second PA film should be obtained by one of the following methods:[6]

- Tube-shift technique or Clark's rule or (SLOB) rule
  Two PA films are taken of the same area, with the horizontal angulation of the cone changed when the second film is taken. If the object in question moves in the same direction as the cone, it is lingually positioned. If the object moves in the opposite direction, it is situated closer to the source of radiation and is therefore buccally located.
- Buccal object rule
  If the vertical angulation of the cone is changed by approximately 20° in two successive PA films, the buccal object will move in the direction opposite to the source of radiation. On the other hand, the lingual object will move in the same direction as the source of radiation. The basic principle of this technique deals with the foreshortening and elongation of the images of the films.

CBCT can identify and locate the position of impacted canines accurately, and also can be used to assess any damage to the roots of adjacent teeth and the amount of bone surrounding each tooth.[6,7]

## TREATMENT PLANNING

The treatment plan of impacted maxillary canine depends on the findings from the clinical and radiological evaluation. Depending on the information obtained, the treatment plan falls under the following categories:[9]

### Interceptive treatment

Preventive modalities should be performed in cases that have a strong possibility of canine impaction. This entails the elimination of obstacles to the path of eruption and provision of sufficient room for eruption of underlying canines.[9] As such, extraction of the deciduous canine followed by space maintenance to allow the permanent canine to erupt naturally is advocated. In this treatment, the patient should be between 10 and 13 years, and there should be no over-crowding of teeth in arches. The success rate of this method is said to be 91% if the crown of impacted permanent canine were distal to the midline of the lateral incisor root; however, the success rate decreases to 64% if the crown is mesial to the midline of the lateral incisor root.[7] The radiographic follow-up to see if the tooth is erupting is very important. If radiographic examination reveals no improvement in the permanent canine's position 12 months after extraction of deciduous canine, consider alternative treatment.

### Combined Orthodontic and Surgical approach (surgical exposure and orthodontic alignment)

In here the patient should be willing to wear a fixed orthodontic appliance, should have good dental health (no surgical or orthodontic treatment should be carried out until periodontal condition is corrected by periodontologist). Furthermore, the degree of malposition of ectopic canine should not be too great to preclude orthodontic alignment.

The most common surgical methods are as follows:

- Excisional gingivectomy
- Closed eruption technique
- Apically positioned flap.

Gingivectomy is useful when the canine has a correct axial inclination and needs no upright correction during its eruption; the best time for performing this method is before the beginning of orthodontic treatment or during the late mixed dentition. This technique has minimal effects on the periodontium.[9]

Closed eruption technique requires uncovering of the labially impacted tooth. It involves elevating a flap, placing an attachment on the impacted tooth and returning the flap to its original location. If the tooth is displaced near the nasal spine; pedicle flap is reflected, orthodontic attachment is placed, and the flap is returned to its original position for complete closure. The orthodontic traction force is applied 1 week after creating a normal direction of tooth eruption.[8] Various methods have been described for applying traction to the impacted canine.[5,10] These include:

- Application of force in the form of elastic or wire traction
- Cantilever mechanics
- The ballista spring
- K-9 spring for alignment of impacted canines
- Kilroy spring for guiding the eruption of the impacted tooth.

Sharma *et al*.[5] described the successful treatment of ectopically erupted and impacted canines using Kilroy springs in three cases with treatment time ranging between 18 and 24 months. In another case report, Raghav *et al*.[11] managed the case of impacted maxillary canine in an 18-year-old patient by use of Ballista spring successfully within 12 months. Sukh *et al*.[12] on the other hand, had used cantilever to manage the case of impacted canine in a 16-year-old within a time frame of 22 months.

The open eruption technique involves wide resection of gingival and osseous covering the impacted canine. The mucoperiosteal flap is raised to expose the tooth and followed by bracket bonding. A chain or wire ligature connects the archwire to the tooth through the coronal part of the flap. The flap is sutured apically to the exposed crown.

Some authors[8,13] have proposed the following methods of orthodontic attachments:

- Polycarbonate or gold crowns cemented onto the exposed crown
- Wire lasso
- Drilling hole at canine tip and passing ligature through the hole then traction force is applied
- Orthodontic attachment of bondable mesh, bracket or lingual button with ligature chain or to the bonded attachment
- Multiple eyelet chain
- Magnets.

And for the application of traction, the following considerations have been recommended:[8]

- The use of light force to move impacted tooth; not more than 60 grams
- Availability or creation of sufficient space in the arch for impacted tooth
- Maintenance of the space either by continuous tying of the teeth or placement of a passive open coiled spring on the archwire
- Provision by the archwire of sufficient stiffness (e.g., 0.018 × 0.022) to resist deformation by the forces applied to it as the canine is extruded.

Due to the violation of the mucogingival tissue during surgical exposure and the presence of orthodontic mechanics at the site of exposure, the risk of periodontal disease is very high.[14] Therefore, the involvement of periodontologist in treating impacted maxillary canine is very important to have a successful outcome.

### Other management approaches

1. Surgical removal of the palatally ectopic/impacted permanent canine
   This treatment option should be considered if the patient declines active treatment and/or is happy with their dental appearance. The decision to extract an impacted canine should be made only when the tooth is ankylosed or when its position is unfavorable (horizontal or reverse) or if any attempt could harm the roots of the adjacent tooth. Because of the space which will be left behind after extraction, orthodontic treatment to close the space or by prosthetic rehabilitation is the option of closing the space. Therefore, combined approach involving surgeon, orthodontist, and prosthodontist is very important in this treatment option
   Some of the reasons that may necessitate extraction of the impacted canine include: Ankylosed tooth, external or internal root resorption of the tooth, and severely dilacerated root. Others include an acceptable occlusion with the first premolar in the position of canine, presence of pathological lesions (e.g., Cyst or infection) and if orthodontic movement of impacted the tooth will jeopardize the central and lateral incisors.[7-9]
2. Autotransplantation of canine
   This treatment option should be considered if the patient is unwilling to wear orthodontic appliances or the degree of malposition is too great for orthodontic alignment to be practical. The treatment is considered

when interceptive extraction of the deciduous canine has failed or is considered inappropriate. In order to be successful, there should be space available for the canine and sufficient alveolar bone to accept the transplanted tooth. Furthermore, the best results are archived if the impacted canine can be removed atraumatically.

3. No active treatment/leave and observe
   This approach may be considered if there is no evidence of root resorption of the adjacent teeth or pathology. Other considerations include: the deciduous canine should have good prognosis if it is present is in the position of the canine or when the 1st premolar is in the position of the canine and there is good contact between the lateral incisor and the first premolar. However, radiographic monitoring is recommended to check for cystic change or root resorption.

Regardless of the chosen techniques if adequate results are to be expected, the clinician has to abide to general surgical guidelines in approaching the impacted canine. These include:

a. Space regaining in the central arch for impacted canine. This space should be slightly larger than the width of the tooth. If adequate space cannot be gained by tooth arrangement, extraction of the 1st premolar is planned. This will be after confirmation by clinical or radiographic that the impacted canine has started to move and is not ankylosed
b. Control infection before and after surgery
c. Flap design (the flap design should preserve the attached gingival)
d. Bracket bonding
e. It is preferable to wait until tissue healing, and flap attachment occurs before applying force on tooth.

## CONCLUSION

Impacted canine is one of the common causes of seeking dental care. Its management requires a multidisciplinary approach for obtaining acceptable and adequate results. Several management options are available. It is role of the clinician to thoroughly investigate patients with impacted canines both clinically and radiologically, for appropriate management technique.

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### Conflicts of interest

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