



Surgical Management of Various Types of Maxillary Canine Impaction: A Narrative Review

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ABSTRACT

With the exception of the third molar, maxillary canine impaction is considered to be the most common form of tooth impaction. The position of the permanent maxillary canine at the angle of the mouth is strategically important in preserving the harmony and symmetry of the dental arches. The incidence of maxillary canine impaction in the maxilla is more than twice higher compared to the mandible. Approximately one-thirds of the cases are labially located, and two-thirds are palatally located. Bilateral impaction has been reported in 8% of the patients with canine impaction. The treatment procedure is time-consuming and imposes a significant financial burden on the patient. Impacted maxillary canines could be erupted and guided to an appropriate location in the dental arch with early detection, timely interception, and proper surgical management in order to perform orthodontic treatment. Various surgical and orthodontic techniques could be used to guide impacted canines into the arch. Accurate selection of surgical and orthodontic techniques is essential to the successful alignment of impacted teeth. Management of impacted tooth often requires an interdisciplinary approach. In addition, proper cooperation of the orthodontist, oral surgeon, and periodontist seems crucial in this process. The present study aimed to review the clinical and practical aspects required for the management of maxillary canine impaction based on the location and age of the impaction.

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Introduction

Maxillary canine is mostly commonly exposed to tooth impaction, with the exception of the third molar (1). Approximately 2% of the population are affected by maxillary canine impaction, and the prevalence has been reported to be twice higher in women compared to men (2). The incidence of canine impaction in the mandible is less than half of the incidence in the maxilla (3). According to the literature, 8% of the patients with canine impaction also have bilateral impaction¹, one-thirds of which are labially located, and two-thirds are palatally located (4).

Treatment of impacted tooth often requires an interdisciplinary approach. Moreover, the surgical uncovering of the impacted canine and complex orthodontic procedures are considered essential to the alignment of the tooth into the arch. It is notable that the treatment procedure is time-consuming and imposes a significant financial burden on the patient. Therefore, attention should be paid to the early diagnosis and treatment of this condition.

The present study aimed to review the surgical considerations in the management and uncover-

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ing of impacted canines.

Literature Review

According to the literature, two different approaches are used for the management of maxillary canine impaction. The first method is focused on prevention, and the second method involves surgical uncovering. Both approaches are employed after confirming the presence of impaction.

Interceptive Management

The prevention of maxillary canine impaction is considered to be the most viable treatment approach, the success rate of which depends on the depth of impaction and age of the patients with impacted maxillary canines (5).

The effect of the extraction of the deciduous canine on the palatally erupted maxillary canine was first analyzed longitudinally by Ericson and Kuroi. Early extraction of the primary canine for mal-posed maxillary permanent canine correction has numerous benefits for children in terms of economic issues and comfort. Furthermore, periodontal damage to the ectopic canine treated by surgical uncovering and orthodontic procedures has been compared to control canines (4).

If the crown is distal to the midline of the lateral incisor root, the extraction of the deciduous canine before the age of 11 years may normalize the eruption path of the permanent canine in 91% of the cases. However, the success rate decreases to 64% in the cases where the impaction exceeds the mesial portion of the lateral incisor root (4). It has been clearly demonstrated that the timely extraction of the primary maxillary canine positively affects the correction of the palatal permanent canine impaction in most cases. Evidently, early diagnosis of eruption is essential to treatment success.

Surgical Methods

In case of unsuccessful preventive and interceptive treatments, clinicians should consider orthodontic procedures, followed by the surgical exposure of the canine to guide it into the arch. In such interdisciplinary cases, the cooperation of surgeons and orthodontists is crucial to effective surgical and orthodontic procedures.

Palatally Impacted Canines

An effective strategy is to initiate fixed orthodontic treatment on the maxillary arch so as to align the arch and provide sufficient space for the impacted canine. This treatment phase is followed by a surgical uncovering procedure, and traction is applied after within a few weeks (6).

The main advantages of this method are as follows:

Alveolar Defect: Through surgical exposure, the canine remains buried under the alveolar palatal bone. Applying a force on the canine causes the tooth to be pulled out of the crown against the bone, and the enamel faces the bone. Since the enamel cannot resorb the bone physiologically, pressure necrosis occurs, which is likely to lead to bone defect in the lateral incisor adjacent to the impacted canine, as well as the impacted canine (6-10).

Root Resorption: Due to the close contact between the canine and lateral incisor, the root resorption of the adjacent teeth is likely due to force application (11,12).

Ankylosed-like Behavior: When a tooth is buried beneath the alveolus for a long time, the root surrounding the tissue undergoes disuse atrophy, and the periodontal ligament remains non-functional in adults, even after surgery. As such, force application on these teeth results in slight or no movement, and it may be assumed that the canine is ankylosed. In fact, several months after the surgery, the ligament develops into a functional apparatus in adult patients (6).

The second strategy is to only uncover the palatally impacted canine prior to fixed orthodontic treatment, allowing the tooth to erupt into the palate; sufficient eruption often occurs within 6-9 months. Afterwards, the bracket is placed in order to continue the treatment (6,13-16). This technique has several advantages, such as the shorter time of wearing orthodontic appliances and root movement rather than crown movement (depositing the bone behind itself), which prevent defects. The other benefits of this method include the lower risk of adjacent root resorption due to autonomous canine eruption and higher possibility of functional periodontal ligament establishment (6).

Labially Impacted Canines

In the treatment of the patients with labial or mid-alveolar maxillary canine impaction, the orthodontist should consider four main criteria to decide the optimal surgical uncovering method. These criteria include the labiolingual and mesiodistal position of the impaction, vertical position relative to the mucogingival line, and amount of gingiva in the impaction site. Based on these factors, three types of intervention have been proposed for labially impacted canines in the current literature, as follows:

Window Technique: When the impaction is completely superficial and palpable above the level of the attached gingiva and is only covered by mobile, thin mucosa, an incision is made in the mucosa in order to induce the self-eruption of the canine. If there is no thick gingiva apical to the incision, the labial gingival attachment of the canine is not acceptable, and the procedure is not advisable in such cases (17).

Apically Repositioned Flap Technique: This procedure is only suitable for the impacted canines that are not displaced distally or mesially from their normal place in the arch. An apically displaced partial flap is raised from the gingival margin and sutured tightly to the gingival portion of the crown, leaving the coronal portion denude. Furthermore, vertical force application could be performed simultaneously via surgery or on the subsequent visit to the orthodontist (17-19).

Closed Technique: The indication of the cases requiring this procedure is completely opposite to the that of displaced flap. The closed technique is applicable where labially impacted teeth are displaced in the mesiodistal plane. This surgical technique is performed similar to displaced flap, and the only difference is that the attachment is bonded at the same time, and the flap is sutured at the same place with no displacement. In addition, a chain or twisted ligature wire is placed downward for extrusive force application (19,20). Figure 1 depicts the treatment chart in labial canine impaction.

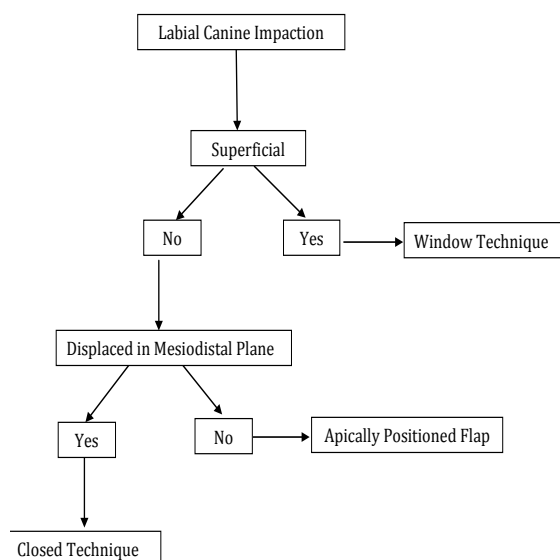


Figure 1. Treatment Flow Chart of Labial Canine Impaction.

Mid-alveolar Impacted Canine

This type of impaction is diagnosed mainly

based on labial impactions since surgical access is achieved on the labial plate of the alveolar process in both types of impactions.

In mid-alveolar impaction, an excisional approach (window technique) and an apically positioned flap are absolutely difficult to be achieved since a relatively large area of the bone must be removed from each surface of the crown.¹⁶ In such cases, a long, unaesthetic, clinical crown and reduced bone support on the labial alveolar bone plate could be detected. The tunnel technique is a great method to reduce the possible complications. On the other hand, the closed technique is used to pull down the canine through the empty socket of the extracted or exfoliated deciduous canine, leaving the labial ridge of the alveolar process unscathed (17,21).

Conclusion

Maxillary canine impaction is a common incidence, which requires a multidisciplinary approach for proper management. The management of impacted canine is important due to aesthetics and role of action. Adequate knowledge regarding the eruption patterns and etiology of impactions allows the early diagnosis and implementation of interceptive treatments in order to prevent impactions.

If tooth impaction occurs, practitioners should formulate the treatment plans based on the depth, localization, and attached gingiva of the impacted tooth. Furthermore, they must have adequate knowledge regarding the various types of treatment and make decisions about the type of the uncovering surgery. In this regard, orthodontists are advised to express their preferred de-impaction surgical uncovering to the surgeon, so that the best decision would be made for the patient in surgical and orthodontic aspects. Good cooperation between orthodontists and surgeons is considered critical in this regard.

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None.

Conflict of Interest

The authors declare no conflict of interest.

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