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Review Article

**SYSTEMIC REVIEW: CANINE IMPACTION: PREVALENCE, CAUSES,
CLASSIFICATIONS, COMPLICATIONS, AND MANAGEMENT.****Dr. Atheer Ali Almasoud¹, Dr. Norah Fahad Aljuhaimi²**¹BDS degree, College of Dentistry, King Saud bin Abdulaziz University for Health Sciences,
Riyadh, Saudi Arabia²BDS degree, College of Dentistry, King Saud bin Abdulaziz University for Health Sciences,
Riyadh, Saudi Arabia**Abstract:**

The aim of this present article is to systemically review the topic of canine impaction and its components: prevalence, causes, classifications, complications, and management. The materials and methods used for this review is to search in the PubMed database using the advanced features. Keywords like canine impaction, causes, prevalence, classifications, management were used to search the database. The search aimed to identify all relevant studies written in English language. A total of 17 papers were reviewed and included in the final systemic review according to the specific keywords. Exclusion criteria were applied to exclude studies that were not PubMed indexed. With maxillary canine being the second most commonly impacted tooth after third molars, it is important to understand the causes in order to prevent it or manage it early. Therefore, further studies should be conducted as the causes are still unclear and not definitive. Moreover, the need of internationally accepted classification of canine impactions is advisable for canine impaction assessment as well as for planning for surgical operation. As for the complications, the worst complication is maxillary incisors root resorption. However, further researches using high technology (CBCT) are needed to determine a more precise percentage of root resorption cases related to maxillary canine impaction.

Keywords: canine impaction, causes, prevalence, classifications, management

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INTRODUCTION:

One of the most common dental anomalies is impaction of teeth. Tooth impaction is defined as the infraosseous position of the tooth after the expected time of eruption¹. Maxillary canine is considered the second most commonly impacted tooth after third molar¹. The prevalence of maxillary canine impaction is approximately 1% to 2.5%²⁻³. It is found to be twice more often in females compared to males and the incidence in the maxilla is more than twice that in the mandible. Canine impaction can be labial or palatal. There are several etiological factors that can cause canine impaction. It can be localized, systemic, or genetic factors³. Arch length-tooth size discrepancy is most common localized factor for labially impacted canine. However, the exact cause of palatally impacted canine is unknown⁴. The maxillary canines are crucial for both esthetic and functional occlusion. Therefore, the appropriate diagnosis and initiation of surgical and orthodontic treatment are extremely helpful for an eruption and guidance of the tooth to its proper position and to avoid the possible complications in the future. This paper reviews the literature of maxillary canine impaction and its components: prevalence, causes, classifications, complications, and management.

Prevalence of canine impaction

Different incidence of canine impaction has been reported in different studies. Cook J et al. [2] stated that maxillary canine is the second most commonly impacted tooth after the maxillary third molar with an incidence from 1% to 2.5%. Regarding the gender differences, he found that maxillary canines' impaction is more common in female patients than in male patients. Moreover, Alhammedi M et al. [5] reported that canine impaction is in 1.9% of population. The result also showed bilateral canine impaction in 22.3% of the patient with impacted canines. Ninety two percent had impacted maxillary canines only whereas 7.5% had impacted maxillary canines with other impacted teeth. Furthermore, Alzoubi H et al. [6] with his retrospective radiograph study using orthopantograms found that impacted canine represented the highest proportion of all impacted maxillary teeth followed by the second premolars and the central incisors. Regarding the classification, he found that type II of canine impaction comprised the highest proportion (51%) while type IV (0.5%) comprised the lowest frequency using Yamamoto et al. classification. He concluded that the maxillary canine is the most

frequently impacted tooth followed by mandibular canines. Another study by Sajjani A et al. [7] stated that the overall prevalence of impacted maxillary canines is 2.1%. Regarding the localization of impacted canine, he found that buccally impacted canines demonstrated a slightly higher incidence (49.8%) compared to palatally impacted canines (43.9%).

Causes of canine impaction

Several etiologic factors of canine impactions have been proposed in several studies. Arch-length deficiency has been long related to the most of the canines impactions. However, Jacoby⁸ reported in his study that 85 percent of the palatally impacted canines have sufficient space for eruption, while only 17 percent of labially impacted canines had sufficient space. Consequently, arch length discrepancy is considered to be a primary etiologic factor for labially impacted canine. However, the exact cause of palatally impacted canine is remain unknown. Moreover, Baccetti T⁹ stated that palatally impacted canines are genetically reciprocally associated with anomalies such as enamel hypoplasia, aplasia of second premolars, infraocclusion of primary molars and small maxillary lateral incisors. Furthermore, Becker A et al.[10] found that there is an increase of incidence about 2.4 times of palatally impacted canines adjacent to the sites of missing lateral incisors compared with palatally impacted canines in the general population. However, Mossey P et al.[11] reported in his retrospective study of a west of Scotland population that there was weak support for the association between palatal canines and absence of the adjacent lateral incisor. Also, he found that there is a weak association between palatally displaced maxillary canines and lateral incisors of smaller than average crown width.

Classification of impacted canine

There is no standard classification of canine impactions used in the literature and Yamamoto et al. and Ghoneima A et al. classifications are the most common ones

Yamamoto et al. classification in 2003 divided maxillary canine impactions into seven types according to their long-axis angles and the occlusal plane [12].

Type I: canine embedded between lateral incisor and first premolar

Type II: crown is mesially tipped

Type III: crown distally tipped

Type IV/V: canine long axis is orientated horizontally

Type VI: canine crown is directed up toward orbital fossae

Type VII: canine long axis in horizontal direction with its crown placed buccally or interchanging with adjacent teeth

As for Ghoneima A et al. (2014) classification, which is the most recent, they categorized maxillary canine impactions into ten different groups (Types A to J) according to their positions and locations. [13]

Type A: canine is in a mesioangular position behind the central incisor root

Type B: canine is in vertical position behind the lateral incisor

Types C and D: canine is in vertical position either between the lateral incisor and 1st premolar or between the 1st and 2nd premolars

Types F and H: canine is in horizontal position either near to the inferior wall of maxillary sinus with the crown positioned distally or between the lateral incisor and 1st premolar

Type E: canines were in mesioangular direction lying between the anterior-inferior wall of the maxillary sinus and the basilar part of the nasal cavity

Type G: canines were impacted vertically with their roots inside the maxillary sinus

Type J: canine is palatally positioned

Type I: canine is impacted completely inside the maxillary sinus

To conclude, the two classifications are only examples of many in literature, and the need of standardization of a defined classification is essential for proper diagnostic and therapeutic considerations

Complications of canine impaction

Migration and displacement of teeth, loss of arch length, dentigerous cyst formation, infections and root resorption of lateral incisors and to lesser extent central incisors are the common complications of palatally impacted canines with the root resorption being the most severe complication [2]. A study done by Ericson and Kurol [14] analyzing the extent and prevalence of root resorption of maxillary incisors related to maxillary canine displacement using computerized tomogram (CT) in addition to the basic clinical and intraoral radiographic investigation. The study included 107 children, (mean 12.5 years), with 156 ectopically and 58 normally erupting maxillary canines and concluded that with ectopically erupting maxillary canines, 48% had resorbed

maxillary incisors. However, another study by Liu et al., [15] using CBCT images in 210 impacted maxillary canines found root resorption to be only in 27.2% of lateral and 23.4% of central incisors which is lower percentage -by almost half - than Ericson and Kurol study. This suggest that there is lack of precise data until now of how much damage of maxillary incisors can be done by the canine impaction or displacement.

Management of canine impaction

It is been agreed in the literature that the most desirable approach to manage palatally impacted maxillary canines is to do orthodontic treatment to create adequate space in the dental arch followed by surgical exposure of the canine and then apply mechanical force to bring it into occlusion^[2,16]. Different techniques have been suggested such as, the use of stainless-steel arch wires auxiliary by Becker et al 1995 [17], nickel titanium closed coil springs by Loring L ross 1999 [18], and temporary anchorage devices by Park 2004 [19]. As for the labially impacted maxillary canines, three approaches were described by Kokich [16] depending on the mucogingival junction (MGJ) and its position to the canine cusp. The three approaches are

1. Gingivectomy: if the canine cusp is coronal to MGJ
2. Creating an apically positioned flap: if the canine is apical to MGJ
3. Using closed eruption techniques: if the canine is significantly apical to MGJ

Alternative management approaches of maxillary canine impaction include [2]:

1. Auto transplantation of the canine
2. Extraction of the impacted canine and movement of a first premolar in its position
3. No treatment or prosthetic replacement of the canine

CONCLUSION:

With maxillary canine being the second most commonly impacted tooth after third molars, it is important to understand the causes in order to prevent it or manage it early. Therefore, further studies should be conducted as the causes are still unclear and not definitive. Moreover, the need of internationally accepted classification of canine impactions is advisable for canine impaction assessment as well as for planning for surgical operation. As for the complications, the worst complication is maxillary incisors root resorption. However, further researches using high technology

(CBCT) are needed to determine a more precise percentage of root resorption cases related to maxillary canine impaction. In addition, the management approaches of canine impactions either buccally or palatally are diverse, and each orthodontist develops his own technique and approach case by case depending on his skills and the patient's unique treatment plan as seen in literature.

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