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**Review Article**

# Impacted Canine: An Arduous Task

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ABSTRACT

An impacted tooth can be defined as a tooth which has failed to erupt completely or partially to its correct position in the dental arch and has lost its eruption potential. Canine normally erupts when half to three quarter of the root have developed. It may be considered as impacted if the root development is complete but tooth has not erupted in the oral cavity. Early detection and timely interception results in successful management.

## INTRODUCTION

Impaction is a pathological condition defined by the lack of eruption of a tooth in the oral cavity within the time and physiological limits of the normal eruption process.1 After the third molar, the most frequently impacted tooth is the maxillary canine. The prevalence of impacted maxillary canines ranges from a minimum of 0.92% to a maximum of 4.3%.2 The ectopic eruption and impaction of maxillary permanent canines is a frequently encountered clinical problem. Of all the permanent maxillary canine impactions, palatal impactions occur two to three times more often than buccal impactions.3

**Epidemiology:** The knowledge of prevalence of impacted teeth is important for practitioner for early recognition and interceptive treatment of impacted teeth. Etiology: Bishara SE (1998) suggested that the ectopic eruption and impaction of maxillary permanent canines is a frequently encountered clinical problem.8 The diagnosis and treatment of this problem usually requires the expertise approach and cooperation of the general practitioner, oral surgeon, periodontist and the orthodontist. Bishara summarized the etiology of impacted teeth as follows:

1. Primary or Localized - combination of the following factors or any one of them

a. Tooth size-arch length discrepancies.

b. Altered rate of root resorption of deciduous teeth resulting in prolonged retention or early loss of the deciduous canine.

c. Abnormal position or rotation of tooth buds.

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| AUTHOR | YEAR | POPULATION | INFERENCE |
|---|---|---|---|
| **Dachi SF and Howell FV**[4] | 1961 | American (3043) | 0.92% incidence of canine impaction. M:F 1:2.3 |
| **Becker A et al**[5] | 1981 | Israeli (88) | Prevelance of palataly displaced canine M: F 1:2.5 |
| **Oliver RG et al**[6] | 1989 | Hong kong Asians (50) | 28% palatal 72% labial |
| **Yavuz MS et al**[7] | 2007 | Turkish (5022) | Mandibular canine 1.29% prevelance |

d. Presence of an alveolar or palatal cleft and canine eruption into the cleft area.

e. Ankylosis.

f. Cystic or neoplastic formation.

g. Trauma to the deciduous tooth bud resulting in dilaceration of the root.

h. Disturbances in tooth eruption sequence.

i. Iatrogenic origin.

j. Idiopathic condition with no apparent cause.

2. Secondary or Generalized

a. Abnormal muscle pressure.

b. Febrile diseases.

c. Endocrine disturbances

d. Vitamin D deficiency

**Classification of impacted canine**: Lindauer's (1992) located the unerupted canine cusp tip relative to the lateral incisor root in one of four sectors using a modified method of Ericson and Kurol's.9 He evaluated the panoramic radiographs taken during late mixed dentition period and classified it into 4 sectors as shown in Figure 1.

Sector I: The area distal to a line tangent to the distal heights of contour of the lateral incisor crown and root.

Sector II: The area mesial to sector I, but distal to a line bisecting the mesiodistal dimension of the lateral incisor along the long axis of the tooth.

Sector III: The area mesial to sector II, but distal to a line tangent to the mesial heights of contour of the lateral incisor crown and root.

Sector IV: All areas mesial to sector III

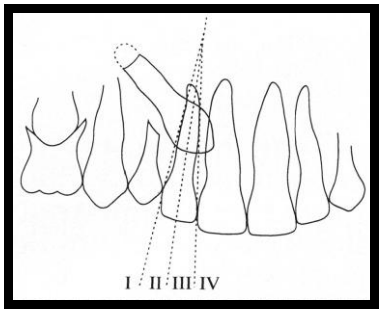


Figure 1: Lindauer's classification[9]

**Localization of impacted canine:** The term localization means "determination of the site." There are basically three methods used for the localization of an impacted maxillary canine; visual inspection, palpation, and radiography. The orthodontic guidance of an impacted canines requires correct identification of the position and the inclination which is difficult with conventional radiographic methods, where a three dimensional (3D) image can be formed only in the orthodontist's mind. A tube shift method is commonly employed in clinical settings (horizontal & vertical tube shift) to locate correct position of an impacted canine.10 However, newer techniques like CT/CBCT & rapid prototyping are more promising and accurate. CT scanning is a method in which clear serial radiographs may be taken at graduated depth in any part of the human body.11 Due to more radiation dosage of CT, CBCT came into play with decreased radiation dose, high resolution and excellent tissue contrast.12 Rapid prototyping is a technology that can automatically construct physical models from CAD data. This helps in reducing time and increasing precision, decreasing morbidity for maxillofacial surgery, thus resulting in less suffering to patient thereby reducing costs and length of hospitalization and

improving quality of life.13

**Management Options:**

After the comprehensive assessment of malocclusion to localize the canine, decision on its prognosis for alignment should be made. Factors affecting prognosis include patient co-operation, age, general oral health, position of the canine in three planes of space, angulation of the canine to midline, distance from midline and relation of canine to adjacent lateral incisors.

The treatment alternatives include:

1. Interceptive removal of primary canine.
2. Surgical exposure with orthodontic alignment.
3. Surgical removal of impacted canine.

**Interceptive removal of deciduous canine**:

Extraction of primary canine is recommended in spaced or well aligned arches if age of the patient lies between 10-13 years.14 Palatally erupting canine's eruption path normalize within 12 months after extraction of deciduous canine in 78% of cases but extraction of the primary canine does not guarantee correction everytime. If no radiographic improvement is seen in one year with interceptive treatment, surgical exposure with orthodontic traction is indicated. The success of early interceptive treatment for impacted maxillary canine is influenced by the degree of impaction and age at diagnosis. If the maxillary canine crown is distal to the midline of the lateral incisor root, the success rate is proposed to be 91% where as the success rate decreases to 64% if the crown is mesial to the midline of the lateral incisor root.

**Surgical exposure with orthodontic alignment:**

Adequate surgical exposure is the first step in management of an impacted cuspid.15 Various surgical procedures have been suggested in literature. Use of electrocautery or lasers is contraindicated, since they cause soft tissue damage. There are three basic methods to surgically expose and align impacted canine.

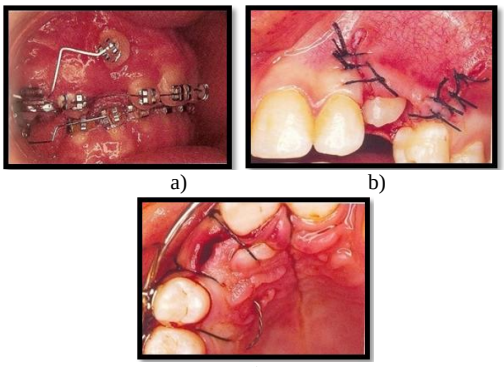


Figure 2: (a) Circular incision[15]
(b) Apically positioned flap[16]
(c) Closed eruption technique[17]

1. Open surgical exposure and spontaneous eruption.
2. Open surgical exposure and packing with subsequent bonding of an auxiliary.
3. Closed surgical exposure and bonding of attachment intra-operatively.

If the canine has correct axial inclination then open surgical exposure is done to allow spontaneous eruption. Excision of the gingiva over the canine with bone removal is sufficient to allow eruption of canine. If the canine is impacted labially or in the middle of the alveolus, three techniques can be employed to uncover the tooth. The three techniques employed are shown in Figure 2. (a) Circular incision (b) Apically positioned flap16 (c) Closed eruption technique. The vertical location of the tooth and the amount of the gingiva will determine the appropriate technique. If the tip of the labially impacted canine is coronal to the CEJ of adjacent lateral incisor and has a wide zone of gingiva, then gingivectomy is the treatment of choice. If the tip of the canine is apical to CEJ of adjacent lateral

incisor and there is lack of adequate amount of attached gingival around the canine, then apically positioned flap should be performed. If the canine is impacted in the middle of the alveolus or high in the vestibule near the nasal spine, closed eruption technique will be the treatment of choice. Appropriate surgical technique should be chosen so that it exposes the canine within a zone of keratinized mucosa and without the exposure of CEJ.

**Application of orthodontic traction:**

Different devices can be applied to the crown of an impacted canine including a wire, pins, crown formers and orthodontic brackets. For many years, lasso wires were a popular technique to secure a tooth but such wires injured the root of the tooth. Securing threaded pins into the tip of the canine damaged the crown of impacted tooth. The crown forms cemented over the crown of an impacted tooth act as a foreign body causing erosion of overlying tissue with ultimate exposure of the impacted tooth. Orthodontic bracket is device of choice. Once the orthodontic attachment has been placed on impacted canine, orthodontic traction is applied to move the canine into proper alignment.

Various methods have been described for applying traction as shown in Figure 3. The maintenance of adequate space in the canine area is essential prior to application of traction. Application of force can be in the form of elastic or wire traction. "The ballista spring" system for impacted teeth has been described by Harry Jacoby.18 It employs a wire loop constructed using a 0.014", 0.016" or 0.018" round wire. A labial auxiliary wire introduced by Kornhauser made up of 0.014" or 0.016" stainless steel round wire can also be used for traction. Auxiliary consists of vertical loop with a small helix sited at its extremity which is located opposite to

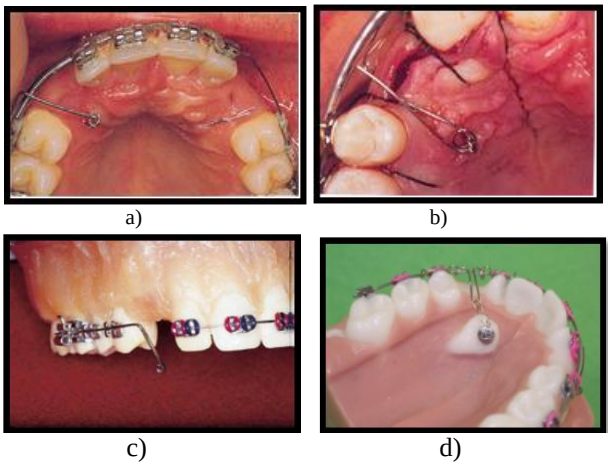


Figure 3: (a) Ballista spring18
(b) Labial auxiliary wire[19]
(c) K-9 spring[20]
(d) Kilroy spring[21]

prepared canine space in the arch and pointing downward and at right angle to plane of occlusion.19 K-9 spring for alignment of impacted canines was described by Varun Kalra, it comprises of a spring made of 0.017 x 0.025 inch TMA wire.20 Bowman and Carano designed monkey hook as well as kilroy spring for guiding the eruption of impacted tooth. They described two types of kilroy springs. Kilroy I applies lateral and vertically directed forces to direct the impacted tooth. Kilroy II spring was designed to produce more vertical eruptive forces for eruption of buccally impacted tooth.21 Magnetic forces have also been advocated by some authors to align impacted tooth. Regardless of the method for traction, the direction of force applied should initially move the impacted tooth away from roots of the neighbouring teeth. Bishara recommends the use of light forces < 60gm to move the impacted tooth.

**Surgical removal and prosthetic replacement:**

Surgical removal of impacted canines is indicated when there is poor patient cooperation or inadequate position for orthodontic alignment. The removal of ectopic canines is recommended if the degree of malposition is

too great (canine is oblique or horizontal); any evidence of early resorption of adjacent teeth; patient is too old for interception; good contact between lateral incisor and first premolar & if it is ankylosed and cannot be transplanted. Later the canine can be replaced by a prosthetic restoration.22 First premolar can be used as an adequate replacement for the canine by mesiopalatal rotation and introduction of buccal root torque along with grinding of the first premolar palatal cusp.

**CONCLUSION**:

Impaction of permanent maxillary canine is frequently encountered clinical problem. It plays vital role in facial appearance, dental aesthetics, arch development and functional occlusion. 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.

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