# Decision Making Factors for Surgical Exposures Impacted Canines: A Review

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***Abstract:*** *This report describes the surgical and orthodontic management of a patient with a impacted canines, which is a frequently encountered clinical problem and the treatment usually requires an interdisciplinary approach. In the present article, an overview of the incidence and sequelae, as well as the surgical, periodontal, and orthodontic considerations in the management of impacted canines is presented.*
***Keywords****: Diagnosis, etiology, impacted canines, orthodontic techniques, surgical techniques.*

## I. Introduction

Impaction refers to a failure of a tooth to emerge into the dental arch, either due to space deficiencies or the presence of the entity blocking its path of eruption [1]. Permanent canines are the second most frequently impacted teeth after third molars[2]. The incidence of canine impaction is 1.7% according to Ericson and Kurol.[3]. Permanent canines (85%) have palatal impaction and remaining 15% have buccal impaction[4].

## II. Etiology

The exact etiology of tooth impaction is not known. However, two theories explain the mechanism i.e. guidance theory and genetic theory. According to the guidance theory of canine displacement, the impaction is due to local predisposing factors i.e. congenital missing teeth, odontomes, transposition of teeth and other factors which interfere the path of its eruption[5]. The second theory i.e. the genetic theory suggests that the impacted canines are often with other dental anomalies including the tooth size, shape number and structure[6].

## III. Factors Affecting The Surgical Exposure Of Impacted tooth

The decision regarding the surgical exposure of the impacted tooth depends upon the multiple factors that need to be assessed by clinical and radiographic evaluations.

A. **Clinical Assessment**:
1. Patient age: The most suitable age for tooth exposure and forced eruption is in childhood or adolescence because as the age increases, the impacted tooth develops ankylosis and the chances of orthodontic correction become difficult.
2. Esthetic and function of impacted tooth: A severely malformed or short rooted impacted tooth is likely to be unsightly and nonfunctional and is not worth saving.
3. Alignment of the adjacent teeth: The prognosis is good when there is spacing in the incisors while in cases of well aligned incisors the space has to be created to accommodate the impacted cuspid. The prognosis is usually worse where there is crowding of incisors.
4. Rotation of tooth. The orthodontic eruption of rotated impacted tooth is difficult.
5. Patient Cooperation: Factors such as missed appointments and poor oral hygiene influence the treatment duration and results.
6. Amount of Keratinized Tissue: Lack of keratinized tissue over the impacted tooth renders the treatment more difficult.
7. Length and the cost of the treatment: The length of the surgical and orthodontic treatment and treatment expenses are the other factors that should be considered. The length of the orthodontic treatment usually takes 1to3 years depending upon the patient age, bone density, amount of root formation and dilacerations, depth of the impaction, available arch space etc.

**B. Radiographic Evaluation:**

Orthopantogram (OPG), Periapical and Occlusal radiographs are taken and evaluated. Cone beam computed tomography (CBCT) have been better over the conventional radiographs in verifying the orientation and location of the canines and its relationship to the adjacent structures which is crucial for its treatment planing[7](Fig1) Radiographs are required to view the impacted canines in three dimensionsi.e., vertical, mesio-distal, buccopalatal. Radiographic measurements are carried out prior to treatment.(Table1)

Following measurements are taken;

**1. Canine angulation to midline (Fig2).**

A midline is constructed and a second line is drawn through the apex and the tip of the canine to the midline. The angle formed between two lines is measured.
   a. Grade 1: 0 to $15^o$ prognosis is good
   b. Grade2: 16 to $30^o$ prognosis is average.
   c. Grade 3 $31^o$ or more, the prognosis is poor

**2. Position of canine root apex in the horizontal plane(Fig.3)**
   a. Grade 1. Canine apex is located above the normal canine position. Prognosis is good.
   b. Grade 2. Canine apex is located above the first premolar region. Prognosis is average.
   c. Grade 3. Canine apex is located above the second premolar region. Prognosis is poor.

**3. Lateral incisior root overlap(Fig.4)**

The degree of overlap of the root of lateral incisior with the crown of the impacted canine is assessed and graded as:
   a. Grade 1. No horizontal overlap. Prognosis is good.
   b. Grade 2. Overlap less than half the root width. Prognosis is average.
   c. Grade 3. Overlap more than half, the root width, but less than the whole root width. Prognosis is average.
   d. Grade 4. Complete overlap of the root width or more. Prognosis is poor.

**4. Degree of vertical impaction.(Fig. 5)**
   a. Grade 1. Crown of the impacted canine is at the coronal segment of the lateral incisior root. Prognosis is good.
   b. Grade 2. Crown of the impacted canine is below the coronal segment of the lateral incisior root but above half the root. Prognosis is average.
   c. Grade 3. Crown of the impacted canine is below half the lateral incisior root but above apex. Prognosis is average.
   d. Grade 4. Crown of the impacted canine is below apex of the lateral incisior root. Prognosis is poor.

**5. Ratio of root formation.**

The canine root formation is graded from 1to3 depending upon the amount of root fomed:
   a. Grade 1. One third of root formed. Prognosis is good.
   b. Grade 2. Two third of root formed. Prognosis is average.
   c. Grade 3. Root is completely formed. Prognosis is poor.

The above criteria may aid decision making regarding the management of cases.

**Table1: Prognosis of impacted tooth for re-alignment depending upon the assessment of various factors**

| Category | Treatment difficulty level | | |
|---|---|---|---|
| | **Easy** | **Moderate** | **Difficult** |
| Age | Less than 15 years | 15-18 years | More than 15 years |
| Alignment of Upper Incisors | Incisors spaced | Incisors well aligned | Incisors crowded |
| Space between upper lateral incisors and upper first premolars | More than 7mm | 4-7mm | Less than 4mm |
| Angulation to midline | $0-15^0$ | $16-30^0$ | More than $31^0$ |
| Position of canine apex in horizontal plane | Canine root apex is located above the normal canine position | Canine root apex is located above the $1^{st}$ premolar region | Canine root apex is located above the $2^{nd}$ premolar region |
| Horizontal position (lateral incisor overlap) | No incisor root overlap | Overlap upto half the root width | Overlap more than half to complete the root width |

| Degree of Vertical Impaction | Canine crown at the coronal half of the root of the lateral incisor | Canine crown at the coronal half way of the root but below the apex of the lateral incisor | Canine crown is above the apical segment of the lateral incisor |
|---|---|---|---|
| Ratio of root formation | One third root is formed | Two third root is formed | Root is completely formed |

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List of Figures

**Figure 1a & b: Computed tomography showing location of impacted canine**



Fig 1 a          Fi. 1b
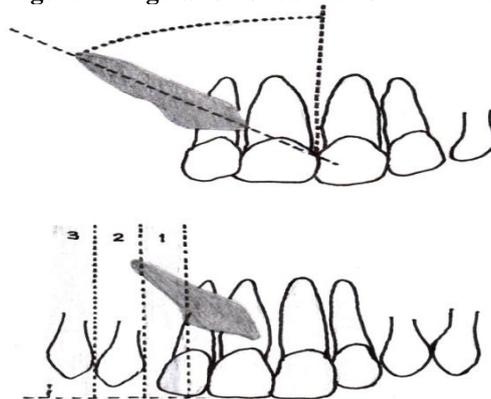
**Figure2: Angulation of canine to Mid –line**



**Figure 3: Position of canine root apex in the horizontal plane**
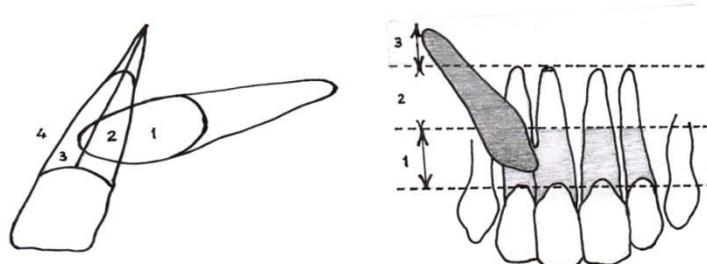


**Figure4: Lateral incisor root overlap          Figure 5:** *Degree of vertical impaction*