

Orthodontic Guidance of an Impacted Maxillary Canine: A Review

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Abstract

Canine normally erupts when half to three quarter of the root have developed. It may be considered as impacted if the root development is completed, but unaided eruption is not expected to occur. Treatment of an impacted canine needs to be integrated into the overall orthodontic treatment planning. Present article discuss the orthodontic guidance of an impacted maxillary canine, choice of surgical technique, orthodontic & periodontal considerations and potential complications.

Keywords: Impaction, Open eruption, Closed eruption.

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INTRODUCTION

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. Third molars are the most commonly impacted permanent teeth, followed by maxillary canines (1). The need to retain or remove the impacted canine is based on thorough clinical and radiological evaluation. And while a general consensus exists regarding removal of the impacted third molar, an impacted canine needs to be addressed in a different manner. Management of an impacted canine can be a challenge and the esthetic outcome can be unpredictable if it is not planned properly. Canine tooth has a strategic position at the angle of the arch and is responsible for maintenance of harmonious & symmetry of occlusal relationship (2). Lack of canine guidance has negative consequences on TMJ (3) and on adjoining teeth. Due to its vital importance in dentition; preservation of the tooth is the best alternative to maintain functional and esthetic integrity of the dental arch (4, 5). The present article discusses the different techniques of orthodontic guidance of an impacted maxillary canine, choice of

surgical technique, orthodontic & periodontal considerations and potential complications.

INCIDENCE OF CANINE IMPACTION:

The incidences of maxillary canine impaction are 1- 2.5% (6). 85% of the canine impactions are palatal and only 15% are labial (7). The incidence of bilateral maxillary canine impactions is 8% of all the canine impactions. The incidences are about 1.17% in females as compared to 0.51% in males (8). The incidence of palatal impaction of maxillary canine in females is 2 times more common than in males and is 5 times common in Caucasians than in Asian population (8, 9).

Radiographic localization of impacted canine:

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 the correct position of an impacted canine (10, 11); however

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newer techniques like CT/CBCT & rapid prototyping are more promising and accurate. Although the production of a prototype by using CT might provide state-of-art analysis of canine position, conventional radiographs are still necessary as a part of orthodontic records. The use of rapid prototyping models seems to facilitate the surgical procedure and the communication with the colleagues and patients. Surgery duration is reduced in 17% to 60% of the patients with fewer traumas, a more comfortable post-operative recovery and fewer complications (12).

CHOICE OF SURGICAL TECHNIQUE

The stages involved in orthodontic guidance of impacted canine include: Pre-surgical orthodontics – placement of fixed orthodontic appliance, preparation of anchorage, alignment of adjoining teeth/root and creation of space for the erupting canine. Surgical stage – exposure of the impacted canine and bonding an attachment on the exposed surface. Post-surgical orthodontics – application of light traction & guiding impacted canine into occlusion.

The techniques for surgical exposure of impacted canine includes: Open eruption technique (excisional uncovering), apically positioned flap and closed eruption technique. The choice of surgical exposure technique depends upon three dimensional position of the impacted canine i.e. labio-palatal position, vertical position (depth), mesio-distal position and gingival attached at the level of impaction. In open eruption technique, the impacted canine is surgically uncovered and an attachment is bonded on the exposed surface. The wound is allowed to heal through secondary healing and orthodontic traction is applied to guide the canine to desired position. In closed eruption technique a full thickness muco-periosteal flap is raised, attachment is bonded on the exposed surface of the canine with an auxiliary to guide the canine and flap is sutured back in place. The auxiliary attached is used

to apply light traction force to erupt and guide the canine into the occlusion. The mechanics of guiding the impacted canine is basically the same regardless of whether the eruption is open or closed.

MANAGEMENT OF LABIAL IMPACTION

Once the position of the impacted canine is confirmed, the choice of technique for surgical exposure will vary according to the different combinations in the clinical situation. The various clinical combinations possible includes: (a) impacted canine positioned labially (superficial), in this situations any of the surgical technique for impacted tooth exposure can be planned as there is little or no bone covering the impacted canine (b) Impacted canine positioned in center of the alveolus, in this situation a closed eruption technique is preferred as the amount of bone covering the canine is more & will require extensive bone cutting (c) vertically deep placed impacted canine (apical to mucogingival junction), closed eruption technique is recommended as adequate gingival attachment is not possible with open eruption technique or with apical positioned flap (d) impacted canine positioned superficial vertically (coronal to mucogingival junction), any of the surgical exposure can be employed in these clinical situations (e) adequate attached gingiva present over impacted canine, any of the surgical technique can be used (f) inadequate width of attached gingival tissue is present over the impacted canine, the only technique recommended is apical positioned flap (g) impacted canine positioned mesially and over the root of the lateral incisor, apical positioned flap is preferred method for surgical exposure.

PALATAL IMPACTION

Palatal impacted canine requires a good surgical exposure to guide it in occlusion. Once a palatal impaction is confirmed and arch is prepared for the eruption of the impacted canine,

a full-thickness muco-periosteal flap is elevated in the area of the impacted canine and the bone over the crown is removed. The flap is repositioned, and a ligature wire is passed through the gingival flap to apply light traction. Gingival tissue on the erupted canine is generally adequate (13).

ORTHODONTIC CONSIDERATIONS

The mechanics to guide an impacted canine should mimic the normal eruptive process. Before initiating orthodontic guidance, adequate space should be made available in the arch to accommodate the erupting canine. Orthodontic mechanics should be applied to guide the canine through the center of the alveolus. Orthodontic force to guide the canine should be light and continuous (<60gm). Heavy forces can result in root resorption. Initially the direction of the applied force should be aimed to correct the angulation of the impacted canine and to protect root approximation to adjacent teeth. Various auxiliaries are designed to applying traction to the bonded attachment: Monkey hook (14), Kilroy spring (15), Balista spring (16) or MPA (17). A low profile attachment (eyelet) should be bonded on exposed surface of the impacted canine to avoid break down of overlying tissue, dehiscence or 'buttonholing' (18). This is especially required in cases with labial impacted canine with little or no labial bone and stretched mucogingival tissue.

Retention for impacted canine should be a part of treatment planning. It has been observed that there are increased incidence of rotations and spacing following orthodontic guidance of an impacted canine (19). Permanent bonded retention is advocated for guided canine, to avoid any rotational relapse.

PERIODONTAL CONSIDERATIONS

Orthodontic mechanics that guide a labially impacted canine in labial direction should be avoided to prevent bony dehiscence and poor gingival

attachment. Closed eruption technique should be preferred in labially impacted canine over other to guide it into final position with a good periodontal health. Apically positioned flap is preferred for impacted canine which is mesially inclined and is positioned close to root of incisors. Several aesthetic and periodontal drawbacks have been reported with apically repositioned flap (20), lengthening of clinical crown, unesthetic gingival margin, some degree of attachment loss and bone loss on the labial surface. Different surgical exposure techniques have been compared for the post treatment results. No significant differences were found in gingival index, plaque index, pocket depth and periodontal bone level when apically positioned technique was compared with closed eruption technique. However, esthetic outcome of two techniques were different: the crown length of canine guided through closed surgical technique were similar to contralateral canine whereas with apical positioned technique the guided canine has longer crown length due to apical position of the flap. Orthodontic relapse (61%) because of apical pull by the bands of gingival scarring has been observed in patients with deep vertically impacted canines managed using apical positioned flap (20).

COMPLICATIONS

The orthodontic guidance of impacted canine may not be successful in all the cases; there may be failures, non-alignment of impacted canine in the desired position. The prognosis is worst in cases where canine is impacted horizontally and apically deep in palatal process (21). The other factors known for failure include ankylosis of impacted canine, malformations of

root, external resorption. Root resorption is reported to be more frequently in palatally impacted canine (22). An unexplained pain can be because of collision of crown of impacted canine with roots of adjacent teeth. If the impacted canine does not respond to the applied orthodontic force for 3 months, supplementary treatment plan should be made.

CONCLUSION

Multidisciplinary approach for guiding the impacted canine gives predictable results. 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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