

## An Orthodontic Guided Closed Eruption Surgical Technique of Bilaterally Impacted Mandibular Canines in an Adult

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### Abstract

**Objectives:** An impacted tooth is defined as partially or completely unerupted tooth which lies against adjacent tooth, overlying soft tissues or bone so that its further eruption is unlikely. Orthodontic treatment is planned on an individual basis after thoroughly considering the patient's overall facial and dentoskeletal characteristics; the duration, risks, and costs of treatment; patient preferences; and the orthodontist's experience. This article reports an orthodontic treatment of a 21-year-old female, with an impacted mandibular both canines in the permanent dentition that was successfully managed using 0.014" nickel-titanium auxiliary archwire on a 17" × 25" stainless steel base archwire. In this case, the reason for impaction of the canines was an overlying retained primary canines in that area. The over retained primary canine was extracted followed by surgical exposure of canines. Closed eruption technique, with a standard edgewise bracket bonded on the labial surface of the impacted canines, was followed as it facilitates the preservation of attached gingiva around the newly erupted tooth. This case report demonstrates a simple way to treat an orthodontic guided eruption and repositioning of an impacted permanent mandibular canines using a ligature tie and a standard edgewise bracket.

**Key words:** Closed flap technique, Impaction, Orthodontic extrusion, Surgical exposure.

### Introduction

An impacted tooth is defined as partially or completely unerupted tooth which lies against adjacent tooth, overlying soft tissues or bone so that its further eruption is unlikely. Impaction refers to failure of a tooth to emerge into the dental arch. The etiology of impaction is multifactorial. Some of the causes are: genetic predisposition, developmental anomalies, syndromes, inadequate arch space.<sup>1</sup> The overall prevalence of tooth impaction is approximately 20%.<sup>2</sup> The frequency of mandibular canines impaction is significantly lower than that of maxillary canines.<sup>3</sup> The prevalence of impacted mandibular canines varies from 0.05% to 0.4%, which is less frequent than impaction of maxillary canines, ranging from 0.9% to 2.2%.<sup>4,5</sup> The incidence of impacted canines in patients over 20 years of age has been documented as 0.9%.<sup>6</sup> Surgical exposure can be performed in 3 accepted ways: (1) circular excision of the oral mucosa immediately overlying the impacted tooth, (2) apically repositioning the raised flap that incorporates attached gingiva overlying the impacted tooth, and (3) the closed-eruption technique in which the raised flap that incorporates attached gingiva is fully replaced in its former position, after an attachment has been bonded to the impacted tooth.<sup>7</sup> Vermette et al compared the apically positioned flap with the closed eruption technique and found much superior results in terms of gingival, periodontal, and pulp status with the closed-eruption

technique. An irregular gingival contour characterized one third of the treated incisors. In contrast, none of the incisors in the study of Vermette et al that had been treated by the closed-eruption technique displayed gingival irregularity.<sup>8</sup> Nevertheless, adverse changes in attached gingiva and bone level were found, regardless of surgical procedure.<sup>9</sup> The diagnosis and the treatment of such problem require the expertise and cooperation of the general dentist, pedodontist, oral surgeon, periodontist and above all the orthodontist.<sup>10</sup>

### Diagnosis and Etiology

The ectopic eruption and impaction of teeth are frequently encountered clinical problems. One of the rare or infrequent tooth that is seen impacted in the oral cavity is the mandibular canine. A 21-year-old female came to Dhaka Dental College and Hospital, referred by a general dental practitioner for orthodontic treatment with the chief complaint of impaired facial esthetics due to spacing on both upper and lower anterior segment.



Figure 1: Pretreatment extroral photographs



Figure 2. Pretreatment panoramic radiograph and CBCT

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She had a symmetric face, mesochoycephalic, mesoyprosopic face with a prominent nose and competent lips (Figure-1). Intraoral examination (Figure- 3) showed a spaced both upper and lower arch with retained mandibular deciduous canines and unerupted (Fig: 2) mandibular canines. In occlusion, she had a 2.5mm overjet and 2mm overbite. The molar relationship was class I and no mandibular shift was detected on closure. The maxillary right second premolar was in mesio-buccal rotation and was in scissor bite and retain root of maxillary right deciduous second molar. Teeth 16, 35, 36, 37, 45 and 47 were filled and 46 was prosthesis. There were no signs or symptoms suggesting temporomandibular joint disorders, and the maximum incisal opening and jaw movements were in the normal range. There was no relevant history of any medical problem. Radiographic (Figure-2) examination showed that all teeth, including the third molars, were present. Both mandibular canines had well developed roots, were impacted at the level of the alveolar bone height. A horizontal tube shift technique with periapical radiographs confirmed that both impacted mandibular canines were in the labial position.



Figure 3. Pretreatment intraoral photographs

The reason for impaction of mandibular canines can be an unresorbed deciduous predecessor or any obstruction, e.g. odontome or supernumerary tooth or relative shortage of space in the immediate area due to arch length tooth material discrepancies. Trauma to the mandible at the specific area of erupting canine, can also lead to its impaction. In this case etiology of impaction was retain deciduous canine.

#### Treatment Objectives

The treatment objectives included the eruption of the impacted mandibular canines into the space created by extraction of deciduous canines between the lateral incisors and the first premolars, closer of moderate spacing in the upper and lower anterior teeth, maintaining proper overjet and overbite. Based on the patient's overall analysis and soft tissue profile, it was determined that a close- eruption orthodontic treatment plan would be the best approach. In the interdisciplinary treatment plan it was decided to expose the canines surgically and bond attachments to aid their eruption with light forces. Toward the achievement of best result both the upper arch and the lower arch would be bonded and interarch finishing achieved.

#### Treatment alternatives

Various techniques have been applied to treat impacted mandibular canines. The impacted canine can be surgically exposed and bracket or button bonded to its labial surface. Traction may initiated with 3/ 16, 3.5 oz elastics attached with ligature wire. Traction may directly done by NiTi arch wire with ligaturewire. A wire ligature pigtail tied to the bonded attachment at the time of surgery and rolled downwards which attached ligature wire. There is another option using lingual arch with a stainless steel spring (19 x 25 ss) attached to the impacted mandibular canine with a ligature tied to a bracket bonded on the impacted tooth.

#### Case report

A 21 -year-old female patient with the chief complaint of spacing on lower front teeth was referred from the private dental chamber to the department of orthodontics and dentofacial orthopedics in Dhaka Dental College and Hospital. The patient had a slight convex profile, competent lips, average nasolabial angle and with a pleasant soft tissue profile. On intra oral examination (Fig:3), she had Angle's Class I molar relationship on both right and left side with Class I incisors relationship. The overbite and overjet were 2 mm and 2.5 mm respectively. Cast analysis revealed arch-length discrepancies of-4 mm and -6 mm in the upper and lower arch, respectively. The buccal position of the impacted canine was confirmed by the tube shift cone technique.<sup>11</sup> In this technique two periapical views of the each impacted tooth were taken with the X-ray tube directed at right angles to a tangent to the line of the arch at an appropriate angle to the horizontal plane. One periapical view was taken by placing the tube slightly distally to the first one and the position of the impacted tooth was compared in the two views. It was observed that the impacted canines moved away from the adjacent teeth in the periapical view on the distal movement of the tube, thus proving that they were buccally placed.



Figure 4. After surgery extraoral and intraoral photographs

#### Treatment progress

Correction of the established malocclusion was carried out using comprehensive fixed machanotherapy with standard edgewise appliance (0.018-in slot). As the impacted canines was in favourable position for eruption, it was decided to bring it into the oral cavity. Closed eruption technique was chosen as it facilitates the preservation of attached gingiva around the newly erupted tooth.



Figure 5. Treatment in progress intraoral photographs

The deciduous canine was extracted and the labially impacted mandibular canines were surgically exposed with the help of an envelope flap and brackets were bonded on the labial surface to them and stainless steel ligature wires were braided from these brackets. The lower arch was stabilized using 17" x 25" stainless steel archwire, and a piggyback 0.014" NiTi auxiliary archwire was inserted. The braided ligature strands from the mandibular canines were lightly tied with a continuous 0.014" NiTi archwire. The maximum force level of the traction on the mandibular canines was kept below 2 oz. After every 4 weeks, the piggyback NiTi archwire was activated by about 1 mm, and the canine repositioned in about 1 year. After repeated activation with light forces, periapical radiographs were taken to monitor progress. Finally, 0.017 x 0.025-inch stainless steel wires were applied to coordinate both arches, whereas 0.018-inch round archwires were used for the finishing procedures. After active orthodontic treatment, the brackets were removed. A maxillary and a mandibular canine to-canine bonded retainer were used for retention



Figure 6. Finishing stage for settling intraoral photographs

### Treatment results

The occlusion (Figure-9) showed a well-aligned dentition with proper intercuspation of both anterior and posterior teeth with the Class I molar and canine relationships was. The treatment took about 12 months to complete with the canine fully erupted in the oral cavity. The post treatment evaluation of the periodontal status of the orthodontically erupted both right and left mandibular canine of an adequate width of attached gingiva in relation to it. The probing sulcus depth was also within normal clinical range with no evidence of clinical attachment loss. The patient however, was guided to maintain good oral hygiene with periodic follow up visits.



Figure 7: Posttreatment extraoral photographs.

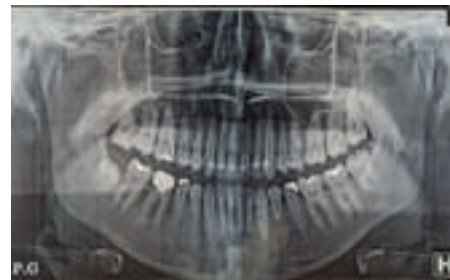


Figure 8. Posttreatment panoramic radiographs

The patient had a consonant smile arch (Figure-7), interdигitation of the teeth was good, the initial mild spacing was corrected, and normal overjet and overbite were achieved. Oral hygiene was good and the patient was motivated and cooperative throughout the treatment. Both the patient and her parents were pleased with the outcome.



Figure 9. Pretreatment intraoral photographs

### Discussion

Impacted canines might cause no untoward effects but there may be migration of the neighboring teeth and loss of arch length; internal resorption; dentigerous cyst formation; external root resorption of the impacted canines and the neighboring



teeth; infection, particularly with partial eruption; and referred pain. The risk of root resorption of the permanent lateral incisors is also an important indication for orthodontically erupting impacted mandibular canines.<sup>12</sup> Extraction of the labially impacted canine is generally contraindicated because it can complicate and compromise the orthodontic result and limit the possibility of providing the patient with a functional occlusion.<sup>13</sup> If a superelastic NiTi archwire is inserted directly into the canine bracket, the wire must be deflected and the arch form can be distorted. This can result in tipping or intrusion of the adjacent teeth, canting of the occlusal plane, and a consequent lateral or anterior open bite. So, requires stiff main archwires to avoid side effects on the adjacent teeth. Furthermore, the stiff primary archwire prevents the flexible NiTi archwire from sliding freely through the brackets. If the movement of an impacted canine is delayed, subsequent bleeding and scarring of the surrounding tissues may prevent further eruption and may also require additional surgery.<sup>14</sup> The use of sectional arches are also commonly seen but they lead to taxing of the anchorage as the forces of the erupting canine are dissipated upon a limited number of teeth as compared to the entire lower arch

The established malocclusion was corrected using comprehensive fixed mechanotherapy with a standard edgewise appliance. The post treatment evaluation of the periodontal status of the orthodontically erupted mandibular canines an adequate width of attached gingiva in relation to it. A closed eruption technique (Figure-4) in the present case preserved attached gingiva around the newly erupted tooth. Orthodontic treatment of impacted teeth requires meticulous personal and professional plaque control measures to preserve periodontal health.<sup>15</sup> Care was taken to minimize the side effects as much as possible during the course of treatment.

### Conclusion

Closed eruption technique with a standard edgewise bracket bonded on the labial surface of the impacted canine facilitated preservation of the attached gingiva around the newly erupted tooth. The quality of treatment outcome is good and long-term esthetic results can be achieved by treating impacted mandibular incisors with a closed-eruption orthodontic surgical technique. Light forces and extra care are required to prevent possible damage to the teeth and supporting structures.

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