

Combination of surgical exposure and fixed orthodontic appliance in bilateral impacted canine

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Abstract

Objective: This case report is to describe the management of bilateral impacted canine due to the persistence of deciduous teeth with surgical procedures and retraction with orthodontic tools.

Methods: Orthodontic treatment used a Straight Wire system with a 0.22 bracket slot. It began with the use of Niti 0.14 for the correction of anterior teeth crowding. Teeth 53 and 63 extraction were performed and continued with Niti 0.18 wire to correct crowding and obtain sufficient eruption spaces for teeth 13 and 23. The surgery used an open window procedure with a full-thickness triangular flap to open the canine crown, bracket placement, and canine retraction using an elastomeric chain.

Results: Within five months, the crowding was corrected, and enough space was obtained for the canine eruption, and within three months, the canine had reached the occlusal plane perfectly.

Conclusion: Bilateral impacted canines can be treated with a combination of surgical procedure and retraction with orthodontic treatment to achieve optimum occlusion and aesthetic function.

Keywords: Impacted Canine, Open window, Orthodontic

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Introduction

An impacted tooth can be defined as a tooth that has failed to erupt, cannot reach its anatomical position, and has passed its chronological eruption time even though the root formation is complete.¹The upper canines teeth have the second-highest risk of being impacted after the third molars, which go through a long and winding eruption pathway from formation to eruption into the oral cavity.² Based on the research by Melha et al.³ among 2157 panoramic radiographs analyzed, it was found that canine impaction in 79 patients (3.65% of the total sample), seventy-three cases had maxillary canine impaction (3.37% of the total population), and of eight patients with impacted mandibular canines.³ The prevalence of upper canine impaction in adults varied from 0.92 to 1.7%, which was higher in women (1.17%) than in men (0.51%), as published by Dachi and Howell. Thilander and Myrberg reported a 2.2% higher incidence in children aged 7-13 years.⁴ In general, the estimated prevalence of impaction

ranged from 1 to 4%. Impacted upper canines affected about 2% of the population and were twice as common in women as in men. The incidence of impacted canines was two times higher in the maxilla than in the mandible, and of all patients with impacted upper canines, 8% occurred bilaterally. Also, two-thirds of the impacted upper canine was on the palatal aspect, while only one-third involved the buccal plate.⁵

The most common etiologic factors leading to impactions are arch length discrepancy, the persistence of primary teeth, abnormal position of tooth seeds, alveolar fissure, ankylosis, cyst or neoplastic formation, root laceration, iatrogenesis and idiopathic conditions such as multifactorial sources.⁶ Some authors have separated the etiological factors of canine impacted into three groups: local, systemic, and genetic factors. Among the local etiological factors, the ectopic position of the tooth seed can be considered the most important, apart from the discrepancy of arch length caused by lack of space and absence of eruptive guides, which is very common in cases of lateral incisor agenesis. However, the problem of impacted canine appears to be related to the long pathway through which the canine seed must travel to reach the last eruption position. More specifically, related to the lack of space, it appears to be a more general etiological factor associated with the labial position of the impacted upper canine. Not coincidentally, one study showed that 85% of impacted upper palatal canines had sufficient space in the arch for eruption, while only 17% of labial impacted upper canines had sufficient eruption space.⁵

Patients with impacted canine need to be diagnosed earlier to reduce the overall duration of orthodontic treatment and even reduce future complications.⁷ The diagnosis of maxillary impacted canines begins with clinical examination. Canine impaction may occur if it has not erupted past its chronological age or if the canine is not palpable in the buccal sulcus by 10 to 11 years of age. Clinical examination is complemented by radiographic evaluation for accurate diagnosis and to determine the prognosis of treatment. Newer diagnostic tools such as cone beam computed tomography can be used for three-dimensional localization of impacted teeth.⁴

Treatment of canine impactions is almost always a clinical challenge and is essential because it can cause aesthetic and functional problems. The impacted canine can also cause root resorption of adjacent teeth, especially the lateral incisors. Several studies have reported that incisor root resorption was more common in female than male patients.⁸ The ideal approach to the management of canine impactions is interdisciplinary management, consisting of a team of orthodontists, oral surgeons, and periodontists. In early intervention (10-13 years) with the extraction of primary canines, spontaneous eruption of permanent canines increased by 75% of cases, and severity of impact was reduced by 94%. Removing physical barriers, such as supernumerary teeth, odontoma, fibrous sheets, and dental sacs, helps tooth eruption. Providing adequate space with maxillary expansion and molar distalization improves the prognosis of the impacted canine.¹ One of the goals of orthodontic treatment in impacted canine cases is the extraction of persistent deciduous canine in the arch, retracting impacted canines, maintaining dental arch coordination, and rebuilding adequate function and aesthetics for the patient.⁶ There are several different approaches, described in the literature for dealing with the impacted canine problem; Extraction of the deciduous canine, which allows the spontaneous eruption of the impacted permanent tooth, removal of the impacted canine followed by placement of the implant in the space or orthodontic closure of the space, orthodontic traction of impacted canines, with or without the need for prior surgical exposure, auto-transplantation of impacted canines.⁵

Surgical with orthodontic traction of the impacted canine is required when the diagnosis of the impaction has been established, and the spontaneous eruption is unlikely. It can be done after complete root apex formation. Two different methods of the surgical exposure of the impacted canine have been developed, namely open eruption technique and the other method called the closed eruption technique. The open eruption technique is usually used for palatal

impacted canines, whereas closed eruption technique is commonly employed to treat labially impacted canines.¹ This current case report describes the orthodontic traction of impacted bilateral labial canines with surgical exposure using the closed eruption technique.

Case Report

The 18 years old patient came to the orthodontic clinic complaining of the crowding of the lower anterior teeth so that the calculus formed quickly, and the upper anterior teeth were felt to be protruded. The clinical examination results showed the persistence of deciduous teeth (53 and 63). The permanent canines had not yet erupted. The midline of the mandible to the upper jaw shifted 1.5 mm to the right. Class I right and left molar relationship, overjet, and overbite were normal [figure 1](#). The OPG X-ray results showed that the right and left upper canines were impacted and in an inclination that was unfavorable for spontaneous eruption, even if the deciduous canine teeth were extracted. Insufficient space was seen for a permanent upper canine eruption [figure 2](#).



Figure 1. Intraoral photograph before treatment

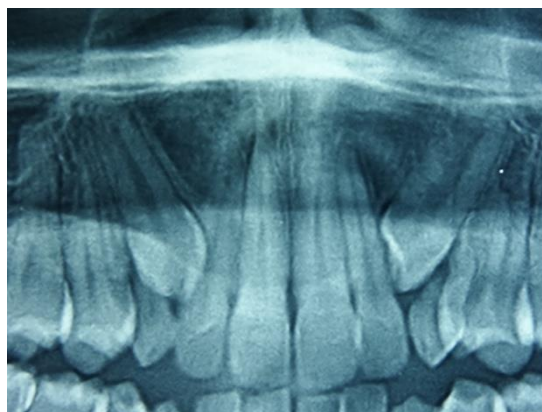


Figure 2. Pretreatment Orthopantomogram (OPG)

The treatment objectives for the patient, in this case, were to correct the position of the impacted upper permanent canine due to deciduous persistence so that they were in a good dental arch and optimal occlusion and aesthetic function were achieved. The patient's chief

complaint was actually anterior crowding and protrusion. Based on the results of the arch length discrepancy analysis, if the protruded anterior teeth were to be pushed back, it would require the extraction of the first four premolar teeth. However, due to bilateral canine impactions, the first stage of treatment was crowding correction and preparing the space for the impacted canine eruption.

The treatment began with teeth extraction (53 and 63), followed by orthodontic treatment using a fixed appliance of Straight Wire System, with a bracket slot 0.22. Leveling and aligning utilized Niti 0.14 wire, followed by Niti 0.18. After three months, the crowding was corrected, it continued by adding space for the extraction of teeth 53 and 63 using open coil spring between the teeth 14-12 and 22-24 to obtain sufficient space for impacted upper canine 13 and 23 eruptions [figure 3A](#).

After sufficient eruption space was obtained, a surgical exposure was performed, which was an open window procedure to open the impacted upper canine with the full thickness triangular flap to the limit of the cemento-enamel junction. The removal of a small amount of alveolar bone to open the canine crown was done carefully not to open the cemento-enamel junction and not to disturb the periodontal tissue [figure 3B](#). In this case, the surface of the canine crown that could be opened was large enough so that the right and left upper canine brackets were immediately attached to the elastomeric chain [figure 3C](#). The mucosa was then sutured back with the flap repositioned apically and the elastomeric chain extending into the oral cavity through the wound margin or the flap incision area [figure 4A](#). The immediate traction of impacted canine was carried out with light force, starting with a Niti 0.12 wire inserted into the elastomeric chain hole. Ligation of the upper incisors, right, and left upper posterior teeth was done to prevent the inclination of the occlusal plane (occlusal canting). Wire Niti was continued with a diameter of 0.14 and 0.18.

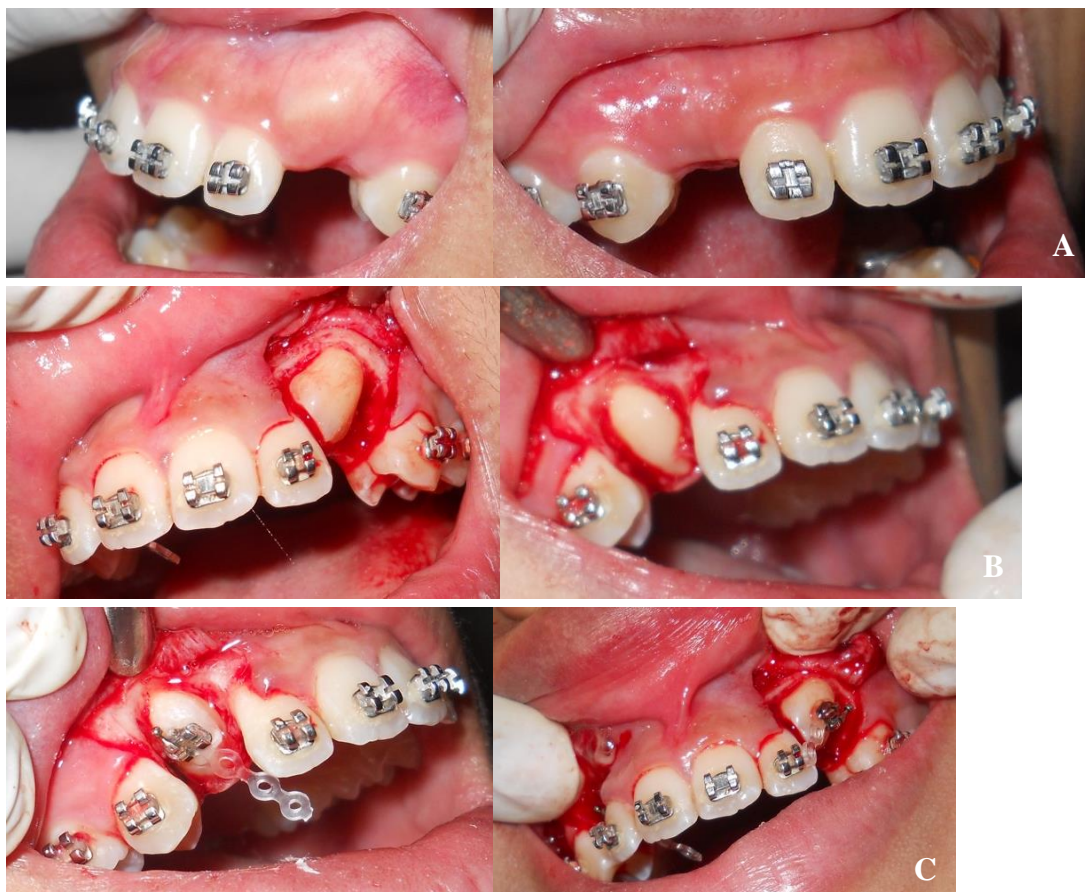


Figure 3. A. Intraoral photograph before surgical exposure, B. Surgical exposure, C. Canine bracket attachment

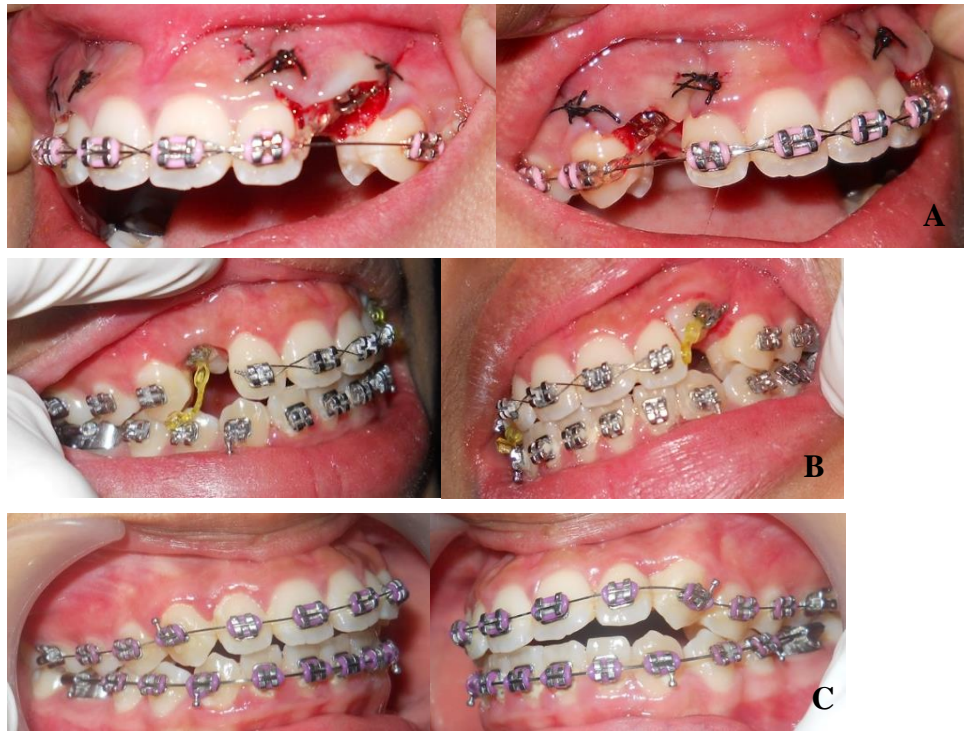


Figure 4. A. Closing flap, B. A month after surgery, C. Intraoral photograph three month after surgery

The bilateral upper impacted canine had a complete eruption, reaching the occlusal plane within three months [figure 4B](#). The wire replacement was continued until rectangular wire with a diameter of 0.16 x 0.22. Even though all teeth were already in a good arch, the patient was still unsatisfied with her protrusive anterior teeth to be retracted so that the treatment was continued with the extraction of the first four premolars teeth and anterior teeth [figure 4C](#). In this case, the premolar extraction was carried out without hesitation because the impacted canine was already appropriately handled. The entire treatment could be completed within two years with satisfactory results, where class 1 molar and canine relations, normal overjet and overbite, midline inline, excellent interdigitation were achieved so that the treatment goals were achieved, namely optimal aesthetic function and occlusion [figure 5](#).



Figure 5. Intraoral photograph after treatment

Discussion

The handling of impacted canines is very necessary. For the extraction of impacted canines, if possible, it would be better to avoid extractions because permanent maxillary canines have an essential role in aesthetics to get an attractive smile and important for a functional occlusion.^{9,10} Untreated impacted canines can cause arch length discrepancies, loss of vitality of adjacent teeth, follicular cysts, canine ankylosis, infections, and pain.^{11,12} Besides, if orthodontic treatment is not provided for impacted canine, complications such as root resorption of the neighboring lateral incisor and first premolar and the development of cyst may occur.¹³ Therefore, in this case, even though the patient's chief complaint was a protruded upper anterior teeth, the main concern was to overcome the bilateral impacted canine. In this case, surgical exposure of the canine with open flap by full-thickness triangular flap and followed by orthodontic treatment to bring a canine into the line of occlusion is the most appropriate approach.

The treatment choice of this case was bracket placement to improve the alignment of the teeth and prepare the canine eruption space, followed by surgical opening with a closed eruption method and orthodontic traction, with the consideration that if only the deciduous canine were extracted, it was unlikely that the permanent canine may erupt spontaneously due to mesial inclination of the crown. Besides, the space from the extraction of the canines is insufficient for the permanent canine eruption. The extraction of the first premolar to correct a protrusive anterior tooth was also not performed until it confirmed that the impacted canine had reached the correct position.

Before performing surgery, it is necessary to consider efforts to get adequate space to facilitate the movement of impacted teeth. For the management of impacted maxillary canine, all teeth in the maxillary arch must be bracketed to get the proper position of the canine and to avoid canting from the occlusal plane. Mounting brackets to all teeth provide adequate anchorage for impacted canines extrusion. Orthodontic treatment before surgery should be carried out until space for canines is adequate and usually takes 2-4 months.¹³ The surgical procedure performed in this case was an open window procedure with full-thickness triangular flap and a closed eruption, considering the position of the impacted canine in the labial.

Surgical exposure with the closed eruption method is preferred by many oral surgeons and orthodontists.¹⁴ This technique usually involves lifting a large full-thickness flap with a minimum bone removal rate to remove the area covering the ectopic canine. Attempts are made not to open the cemento-enamel junction or not to interfere with the periodontal ligament. An attachment or bracket is with twisted wire ligature or a gold chain connected by a bracket/attachment to the crown that is exposed during surgery. The mucosa is then sutured back into place with the end of a wire or gold chain extending into the oral cavity either through the wound margin or an incision in the flap. Orthodontic traction usually begins immediately after the surgical procedure. This technique is widely used for labially canine impaction.¹

The treatment results of this case were very satisfying. The bilateral impacted upper canines could occupy the correct position with the class I canine relationship in healthy gingival tissue. When considering the periodontal implications of surgical exposure, apically positioned flaps or closed eruptions through keratinized gingival tissue are recommended for labial ectopic canines. The soft tissue in the maxillary buccal aspect consists of keratinized attached gingiva at the alveolar margin and changeable non-keratinized tissue in the sulcus. There is conclusive evidence that an open-eruption approach through non-keratinized gingiva should be avoided. Long-term periodontal health is better when more resilient keratinized gingival tissue is retained on the labial aspect of the canine.¹ Goodsell recommends that any tooth that has been surgically exposed and through orthodontic force traction should be controlled periodically to check for excessive mobility or bleeding of the gingiva around the tooth. Care must be taken to ensure that the periodontal attachment follows the tooth as it is guided into the arch.¹⁵ The impacted canine retraction, in this case, was carried out with a very light force, starting with Niti wire 0.12. The elastomeric chain was not changed until the brackets on the canines were visible and allowed replacement. The gradual replacement of the wire from the smallest to the larger diameter and regular check-ups provided controlled orthodontic force so that at the end of this treatment, the canine teeth were in a good position and healthy periodontal tissue condition.

Conclusion

Bilateral impacted canines should be treated optimally to reach an ideal position because canine has an essential role in occlusion and aesthetic functions. Treatment using a combination of surgical exposure and orthodontic traction with light, controlled forces are very useful and yields satisfactory results.

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Conflict of Interest

The authors report no conflict of interest.

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