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Orthodontic Management of Unilateral Impacted Mandibular Canine - A Case Report

Dr. Shubhangi Mani[1], Ret. Col. Dr. Ravindra Manerikar[2], Dr. Deeksha Devadiga[3], Dr. Shweta Nair[4], Dr. Ragini Ogale[5]

[1,2,3,4,5]Department of Orthodontics, Rural Dental College, Pravara Institute of Medical Sciences, Loni, India.

Corresponding Author: Dr. Ragini Ogale

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ABSTRACT

While the prevalence of impacted maxillary canines is 0.9–2.2%, but mandibular canine impaction occurs less frequently. Failing to monitor and promptly address impacted canines may lead to various complications, including the displacement of nearby teeth, loss of vitality in neighboring teeth, dental arch shortening, follicular cysts, canine ankylosis, recurring infections, recurring pain, internal resorption of the canine and adjacent teeth, external resorption of the canine and adjacent teeth, or a combination of these issues. To prevent such undesirable effects, it is crucial to make a timely and accurate diagnosis, conduct precise predictive analysis, and intervene early. The present case report discusses the diagnosis and treatment plan of a 16-year-old female presenting with an impacted canine on her mandibular right side.

Keywords: canine impaction, unilateral, lower arch, surgical exposure, closed eruption technique

INTRODUCTION

Dental crowding is a misalignment caused by a difference in the size of the jaw and teeth[1]. It is evident when there is a larger gap between the teeth and the jaws. Proximal caries in the primary dentition is the most frequent cause of crowding. It causes the posterior teeth to shift mesially, which reduces the size of the jaw. Genetics, bad habits, inadequate dental care, and cleft lip and palate are some additional factors that contribute to crowding[2]

Depending on how much overlap there is, three categories of crowding - mild, moderate, and severe - are created[3]. In order to provide space, treatment methods include extraction, interproximal stripping, expansion, molar distalization, derotation, and straightening teeth. The degree of congestion determines how much space needs to be created. One or more teeth must be extracted in cases of severe crowding; interproximal stripping or the extraction of a single incisor are used to treat moderate crowding; and stripping is used to address mild crowding.

Impaction is the term used to describe when a tooth is unable to erupt into the dental arch. This is typically caused by either insufficient space or the existence of something that prevents the tooth from erupting.[4] Even though heredity has long been thought to be a factor, the exact cause has frequently been unidentified.[5] In dentistry, impacted teeth are frequently observed, and they present a risk to the preservation and continuation of dental health.

Local causes may have an impact on a tooth's failure to emerge. Some of these factors could be mechanical obstruction (from an extra tooth, cyst, or tumor); inadequate space in the dental arch as a result of skeletal irregularities (micrognathia); early loss of deciduous teeth; or an imbalance in the size of the tooth arches. Tooth eruption failure is also linked to systemic causes, including endocrine abnormalities, hereditary diseases, and prior jaw radiation. Many teeth are typically affected when there is a systemic illness. Generally speaking, though, the precise reason for an eruption's failure is still a mystery. While any tooth can get affected, the most commonly affected teeth are the maxillary central incisors, maxillary canines, maxillary and mandibular premolars, and third molars. The prevalence of impacted maxillary canines is 0.9–2.2%, but mandibular canine impaction occurs less frequently.[6]

When asymptomatic, many fully impacted teeth may be kept in place. Nonetheless, the following consequences of canine impaction were proposed by Bishara et al.:[7,8]

- Malposition of the impacted tooth labially or lingually
- Loss of arch length and migration of nearby teeth
- External root resorption of the impacted tooth and neighbouring teeth
- Infection, especially when partial eruption causes discomfort and trismus
- Referred pain

The treatment alternatives for the management of mandibular canines are as follows:

1. No treatment: The deciduous canine could be aesthetically pleasing and have a good root length. Alternatively, the deciduous canine may have exfoliated sooner and the canine space closed spontaneously, resulting in a good premolar-to-incisor contact. But it's important to keep an eye on the canine to make sure that neighbouring teeth don't resorb. It is generally preferable to remove the affected canine in order to avoid resorption.
2. Space closure and mandibular canine tooth extraction. The amount of remaining space and the inclination of the neighbouring teeth could make this an orthodontic procedure that is challenging.
3. Transplantation: Although the operation is somewhat rapid, the long-term prognosis is unknown.
4. Prosthetic or restorative therapy.
5. Surgical exposure, followed by orthodontic treatment and forced eruption.[9]

Several techniques have been described for eruption of the unerupted permanent teeth. Azaz et al.[10] proposes that these can be classified into three categories:

1. The impacted teeth's crowns are surgically exposed in the initial surgery to allow for eruption. To maintain a patent channel around the crown and a normal eruptive path into the oral cavity, all soft and hard tissues surrounding the crown of the unerupted canine must be removed.
2. The alternative approach includes applying attachment to the partially exposed crown. An orthodontist can use active directional traction in this case.
3. The final method entails surgically moving a significantly malpositioned or impacted tooth from its initial location to the optimal location for eruption. In order to achieve this, the unerupted crown is surgically exposed, and enough bone is removed to form a suitable channel through which the tooth can be softly luxated and rotated into the correct position. An impacted tooth's crown can be exposed and an orthodontic attachment placed using either an open or closed surgical technique.

The purpose of this paper was to describe the diagnosis and orthodontic treatment planning of the non-extraction case of a moderate crowding while managing an

impacted mandibular canine by surgical exposure and orthodontic positioning of it.

CASE REPORT

- **Diagnosis and Etiology:**

A 16-year-old girl reported with a chief complaint of irregularly placed upper and lower front teeth and wanted to get the treatment done for the same. She had no past medical or dental trauma, and her physical health was good. During the initial evaluation, no temporomandibular joint dysfunction symptoms or indicators were observed. The extraoral clinical examination (Fig. 1) showed a straight profile with acute nasolabial angle. There were no gross asymmetries.

The intraoral examination (Fig. 2) showed an Angle's Class I malocclusion and Class I incisor relationship. Maxillary canines were buccally placed bilaterally due to over-retained deciduous predecessors. The mandibular right canine was impacted with the deciduous canine present in the arch. There was also an over-retained canine and first molar present in the third quadrant. The maxillary and mandibular arches showed moderate crowding. There was increased overbite of 4mm and overjet of 2mm.

Cephalometrically (Fig. 3), the patient had a Class III skeletal relationship (ANB angle: 1°). A horizontal growth pattern was seen. Maxillary incisors were slightly proclined with the upper incisor at 5mm and 30° to NA. The lower incisors were upright, with an IMPA of 91° and the lower incisor at 20° and 2.5mm to NB. The panoramic radiograph showed all permanent teeth, including the maxillary unerupted third molars. However, the tooth buds of the unerupted mandibular thirds molars were not seen. The mandibular right canine was impacted (Fig. 3). The labial position of the impacted mandibular canine was confirmed with the help of mandibular occlusal radiograph. The favorability of the impacted canine to erupt into the arch was analyzed and it was found to be good. (Table. 1)

- **Treatment objectives**

1. Correction of palatally placed 13,23
2. Correction of impacted 43 and bringing it to alignment
3. Extraction of over-retained deciduous teeth
4. Maintaining Class I molar relation
5. Unravelling of the crowding in the upper and lower arches
6. Improving the smile

- **Treatment alternatives**

Three alternatives were presented to the patient:

1. Non-extraction treatment: This approach would require gaining space from the extraction of the over-retained deciduous teeth as well as through some amount of arch widening. The surgical exposure and repositioning of the impacted canine would address the correction of the canine relationship bilaterally. However, the facial and smile esthetics would be optimized.
2. Extraction of all first premolars: The two main advantages of this treatment option were the efficiency to bring the impacted mandibular left canine into alignment in the arch with space created by extraction of premolars. Nevertheless, first premolars extraction treatment would not resolve the arch length discrepancy but would end up in excess space.
3. Extraction of mandibular right lateral incisor. This would create sufficient space to bring the impacted mandibular left canine into alignment and occlusion. The arch-length deficiency in mandibular arch would be resolved. While this treatment option wouldn't hamper the facial profile or aesthetics, dental stability would be questionable due to the incorrect canine relation achieved on the right side.

The first treatment option was adopted because it would optimize facial and smile aesthetics. Co-operation and stability issues were discussed with the patient.

- **Treatment progress**

Both the aesthetic concerns and the patient's desires called for a challenging solution for an unusual impacted mandibular canine treatment to align into its ideal position in the arch. The over-retained deciduous teeth present in the arches were extracted before the start of orthodontic treatment.

The orthodontics was performed with conventional 0.022" slot MBT appliances. The initial alignment and levelling of the upper arch was achieved with 0.012" and 0.016" NiTi archwires followed by rectangular 17x25 NiTi and 19x25 SS archwire. In order to bring the palatal placed maxillary canines in the arch, an overlay ("Piggy Back") wire of 0.014 NiTi was placed over the 0.019 X 0.025 stainless steel main archwire. Simultaneously, a posterior bite plane was cemented in the lower arch temporarily, so as to achieve proper disocclusion needed for the alignment of these palatally placed canines (Fig. 4)

The impacted mandibular canine was surgically exposed and bonded with the bracket during the 0.018' AJ Wilcock archwire stage (Fig. 5). An 0.014" NiTi archwire was passed from the bonded attachment on the canine. Surgical exposure was carried out under local anaesthesia. The window approach closely simulated the closed eruption technique. The alignment and levelling were completed with round NiTi wires followed by 0.019 X 0.025-in stainless steel rectangular archwires. After the mandibular left canine was brought into the arch, settling was done with 0.014" Stainless steel archwire. This entire orthodontic procedure took 18 months.

RESULT

The facial aesthetic was improved with better lip support and improved nasolabial angle (Fig. 6-7). The smile was enhanced and the consonant smile arc was achieved. Intraorally, ideal overjet and overbite was achieved with Class I molar and canine relationship. The panoramic radiograph taken just before debonding (Fig. 8) showed good overall root parallelism and lack of root resorption. Pre-debonding lateral cephalogram (Fig. 8) showed satisfactory improvement in ANB angle by 1º and improvement in mandibular position (SNB: 79°). The position of upper and lower incisors was improved, upper incisor at 22° and 4mm to NA and the lower incisor at 26° and 6mm to NB with an IMPA of 101°. A favourable profile change in facial profile contoural angle was seen.

FIGURE 1: PRE-TREATMENT EXTRA-ORAL PHOTOS

FIGURE 2: PRE-TREATMENT INTRA-ORAL PHOTOS

FIGURE 3: PRE-TREATMENT CEPHALOGRAM AND OPG

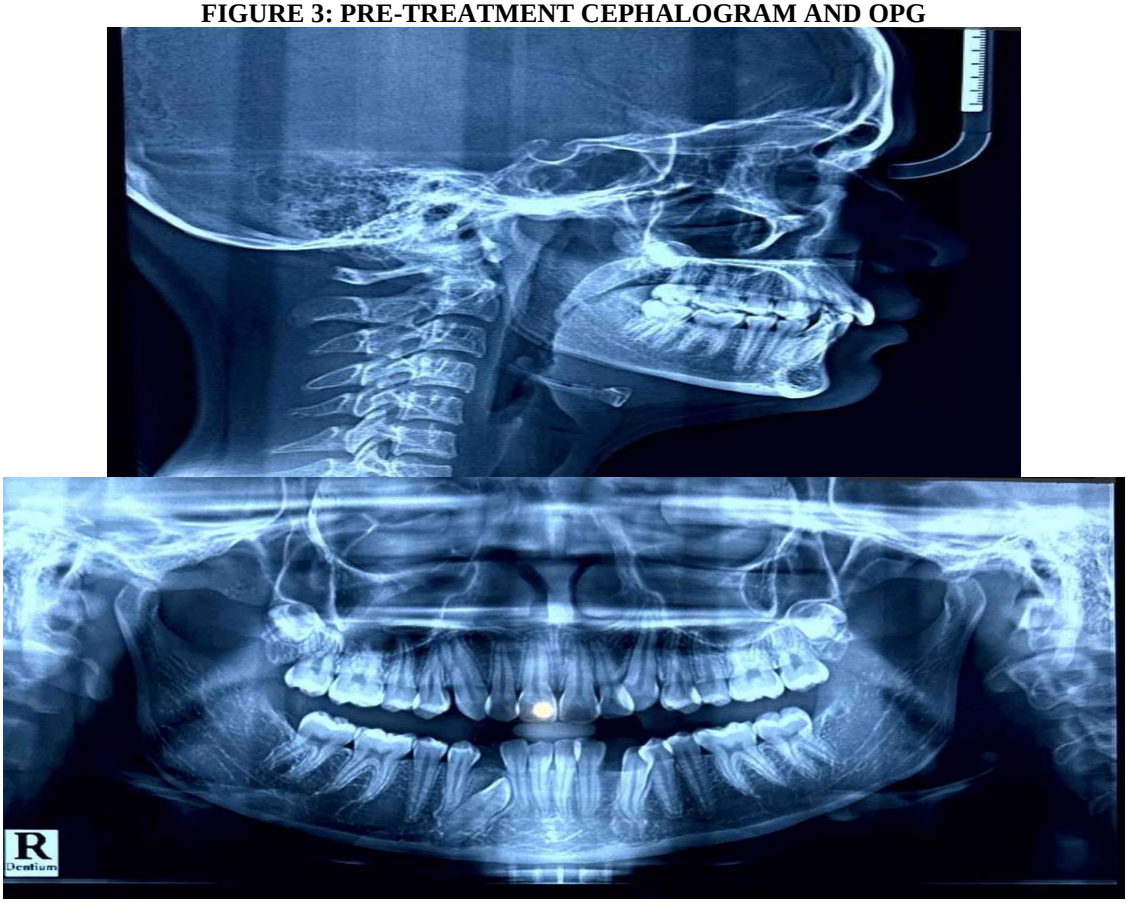

FIGURE 4: UPPER CANINE ALIGNMENT

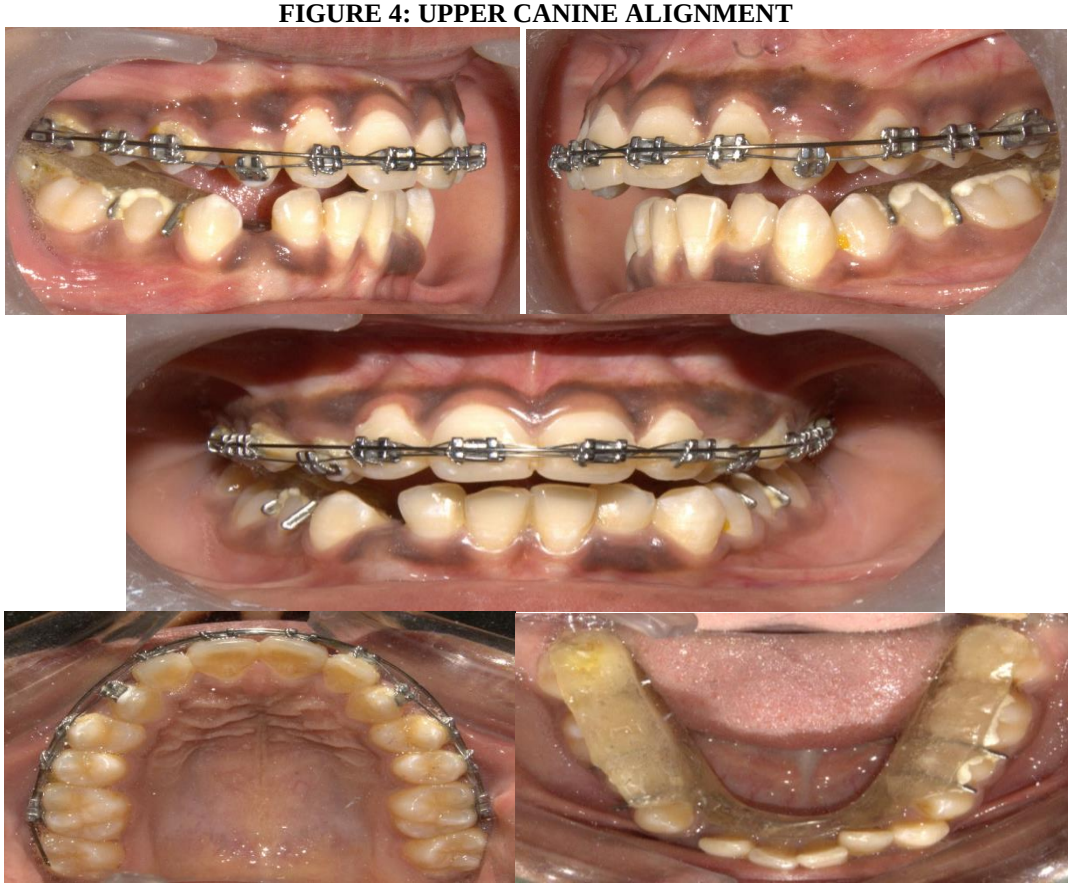

FIGURE 5: CORRECTION OF THE MANDIBULAR IMPACTED CANINE

FIGURE 6: POST-TREATMENT EXTRA-ORAL PHOTOS

FIGURE 7: POST-TREATMENT INTRA-ORAL PHOTOS

FIGURE 8: POST-TREATMENT RADIOGRAPHS

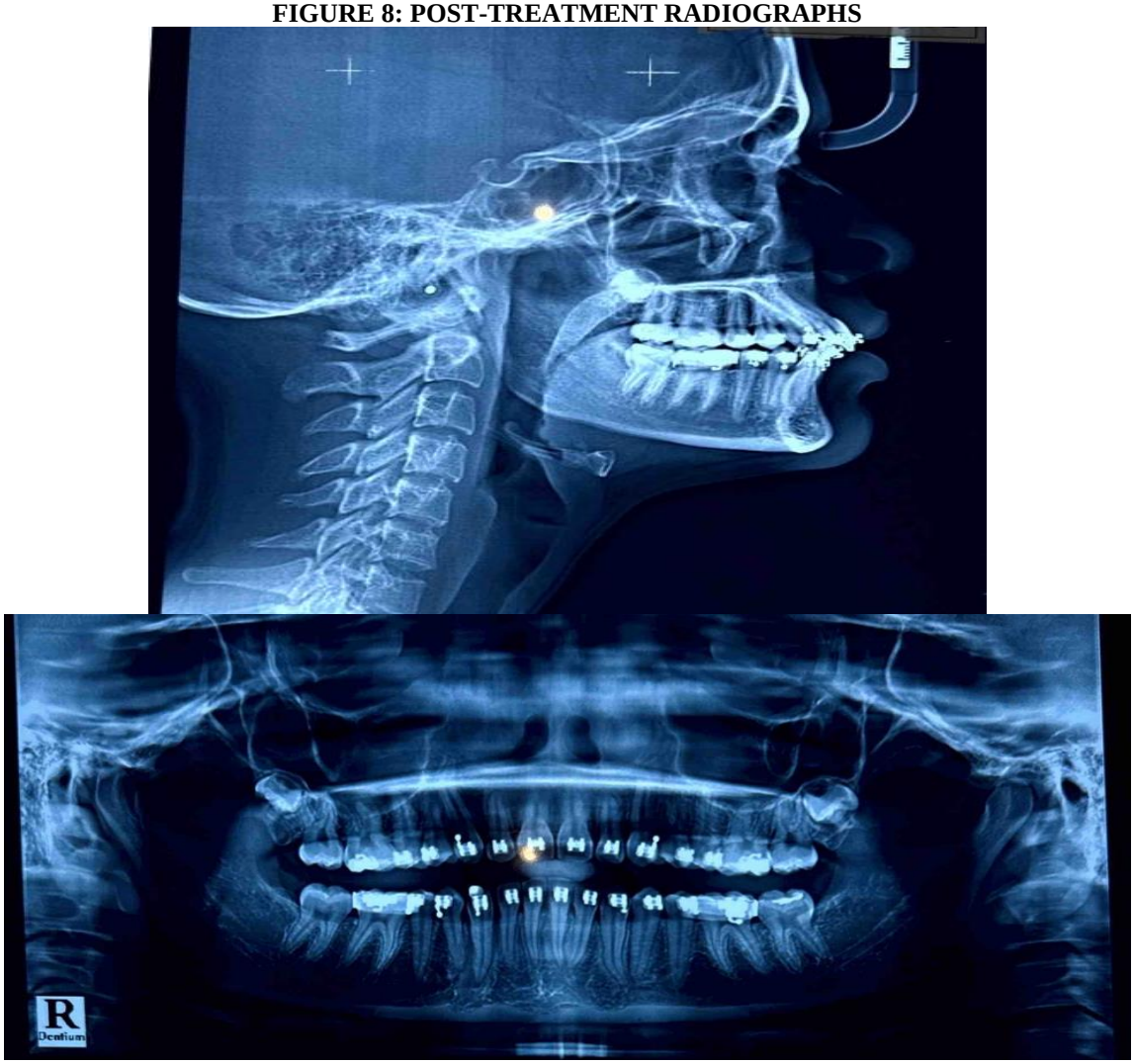

Table No.1: Cephalometric Assessment

PARAMETER	PRE-TREATMENT	POST-TREATMENT
Sagittal Skeletal Relationship		
SNA	88°	88°
SNB	87°	87°
ANB	1°	1°
Wits Appraisal	BO coincides with AO	BO coincides with AO
Dental Base Relationship		
U1-NA	30°, 5mm	27°, 4mm
L1-NB	20°, 2.5mm	23°, 3mm
U1-Pal	60°	62°
IMPA	91°	93°
Dental Relationship		
Interincisal angle	128°	130°
Overjet	4mm	2mm
Overbite	4mm	2 mm
Vertical Skeletal Relationship		
FMA	20°	21°
Mandibular plane angle	20°	25°
Jarabak ratio	77.5%	81.4%
Soft Tissues		
Lower lip to Ricketts E-line	0mm	-0.5mm
Nasolabial angle	70°	80°

DISCUSSION

The origin of impacted mandibular canines has been the subject of conjecture by numerous writers[10]. These include insufficient space, an excess of teeth, early loss of the deciduous dentition, keeping the deciduous canine, an excessively long crown, genetic causes, endocrine gland dysfunction, tumors, cysts, and trauma. The most frequent issue preventing teeth from erupting normally in general was insufficient space[10]. Impaction of the lower second premolars in the jaw was caused by minor crowding in the buccal segments, which was often exacerbated by impaction of the lower third molars.

The identification and localization of impacted teeth is the most crucial stage in their care. It is unusual for the mandibular canine eruption to fail.[11] Mandibular canine impactions are considered a significantly rarer condition, and the frequency of occurrence has only been reported in a few numbers of investigations.[12]

Ankylosis, external apical root resorption, and pulp necrosis can all result from delayed tooth eruption. It is challenging to forecast the onset of resorption. Therefore, it is important to consider that all impacted teeth carry a high risk of either external apical root resorption or harm to the neighboring tooth. Therefore, radiographic exams ought to be used to keep an eye on these hazards. Orthopantomographs are used often.[13,14]

Surgical extraction, as opposed to a valiant attempt to restore the tooth to its natural position, seems to be the preferred course of treatment for impacted and migrating mandibular canines.[15] Since the canine in our instance was in a good position and is regarded as a significant cornerstone of the dental arch, we made the orthodontic decision to move it into the proper alignment.

The patient comprehended and agreed to all the benefits and drawbacks of both surgical and orthodontic repositioning, as well as the risks (such as the possibility of not achieving the intended results) and the requirement for good cooperation.

CONCLUSION

According to our findings, the ANB angle improved satisfactorily, and the exterior soft tissue profile was pleasant. The dental and skeletal correlations were ideal. For this patient, whose primary worry was his unattractive smile, the combined effect of surgically exposing the impacted mandibular canine and orthodontically correcting its positing was crucial in reestablishing the major components of a balanced smile.

Declaration by Authors

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