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## A Case Report on Clinical Management of Impacted Maxillary Cuspid and Bicuspids through Surgical Exposure and Orthodontic Alignment

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**Abstract**

The term impacted tooth refers to any tooth, which fails to erupt in the oral cavity. Impacted canines are usually examined in the oral cavity by an orthodontist during day to day practice and it can be corrected through an interdisciplinary approach. It is advisable to do the early diagnosis and treatment plan for impacted teeth in order to acquire descent post-treatment results. It is quite challenging for an orthodontist to do the treatment of impacted teeth and acquire stable results. This case report addresses the orthodontic management of a 14 year old female patient with unilateral palatally impacted maxillary canine and buccally impacted first premolar impaction. The treatment protocol involved two phases of which one was surgical orthodontic intervention and the other was orthodontic intervention. In phase I, exposure of impacted canine by raising periodontal flap was carried out and the Nance palatal appliance was used to guide the eruption of canine. In phase II, fixed orthodontic appliance was used. The total time required for active treatment was 24 months. The purpose of this case study was to address the early diagnosis of impacted teeth and also to achieve proper alignment, occlusion and esthetics by an interdisciplinary approach by utilizing various mechanical tactics.



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## Introduction

Any tooth, which aborts to erupt in the dental arch within a definite time, is referred to as impacted tooth [1]. Teeth, which are commonly impacted include: third molars, maxillary canines, maxillary premolars and central incisors. Disturbances in the eruption of teeth are diversification of normal eruption of the tooth, which includes accelerated, deferred, failed or deviated direction of the regular tooth eruption [2]. In contemporary orthodontics, the treatment of impacted tooth remains a challenge to the orthodontist. Treatment procedure of such cases includes surgical exposure, guided orthodontic and traction to align the impacted tooth in the dental arch. Most common complications of such cases are a gingival recession, root resorption and bone loss [3]. The rate of incidence of impacted maxillary canine and maxillary premolar is approximately 2% and 0.5%, respectively, in the general population [4, 5]. Usually, the impacted teeth are responsible for some problems such as aesthetic dissonance, decreased masticatory ability and difficulty in maintaining oral hygiene. In addition to these, when impacted in the extreme proximity of antral and nasal cavities maxillary premolar is expected to cause complications, which may lead to surgical intervention. Moreover, the dentigerous cyst is also seen in association with impacted teeth [6]. Many etiologic factors are suspected for impacted canines and premolars, but the arch length discrepancy is supposed to be the most common and primary etiologic factor [7].

This case report describes the successful treatment of a patient with impacted maxillary canine and premolar and was corrected by utilizing orthodontic treatment. The treatment was done to correct orthodontic alignment of all the teeth in the dental arch to achieve the proper occlusion and improve the esthetics and masticatory function of the patient.

## Case presentation

A 14-year-old female patient visited our orthodontic department of the stomatological hospital in Jiangsu province with the chief complaint of the unerupted tooth in the upper front tooth region. Upon doing an intraoral examination, all permanent teeth erupted except the maxillary and mandibular third molars left maxillary canine and first premolar. Further, a retained deciduous left maxillary canine was found. Mild crowding in

relation to mandibular anterior teeth, overjet of 3 mm and overbite of 3.5 mm was recorded when in occlusion and the mandibular first molars were in class I relationship. The dental midline of maxillary dentition was deviated towards the right by 1 mm and midline of mandibular dentition was concordant with a face. Extraoral examination revealed that she had roughly symmetric, slightly dolichocephalic, leptoprosopic face with 3 mm of interlabial gap with lip incompetence. There was no past medical or orthodontic treatment history.

## Treatment objectives

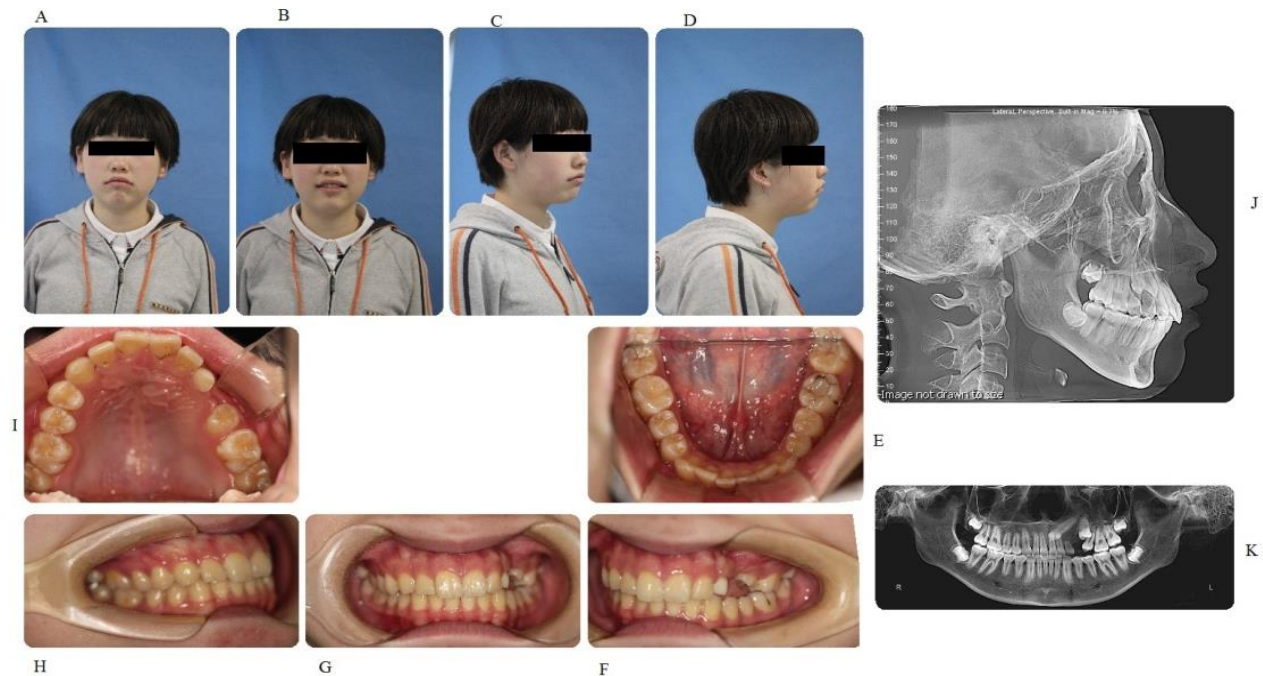
The primary objective of orthodontic treatment for this patient was to guide the eruption of palatally impacted maxillary canine and labially impacted maxillary first premolar, to level and align both the arches, reduce the overjet and overbite to normal, and achieve Class I canine relation bilaterally. Considering the patient's age and soft tissue profile, the use of Nance palatal appliance was determined and also not to extract any teeth. The treatment plan was to expose the canine surgically followed by bonding the attachment and to bond the buccally erupted the first premolar so that desired position could be obtained for both the teeth. Almost after the desired position is obtained for both canine and premolar, Nance palatal retainer would be removed and upper and lower arch would be bonded and the finishing of inter-arch would be achieved.

## Treatments used

After clinical and radiological examination, the custom-made Nance palatal appliance was prepared for the particular patient.

### Phase I-surgical orthodontic intervention

The mucoperiosteal flap was raised in order to expose the canine for bonding the attachment and then the flap was surgically repositioned (Fig. 1). Nance palatal appliance also called as repositioning Nance appliance (RNA) is a fixed functional appliance that consists of bands on upper first molars, which are joined along with stainless steel wire of 0.036 inches and is bent around the anterior region of the hard palate near the rugae area lingually to the upper incisors. There is an acrylic Nance button attached to the wire. Both the canine and maxillary first premolar was bonded to the attachment so that the desired position of both the teeth could be achieved. Between 2.5 to 3 months of time period, the canine was clinically visible (Fig. 2).



**Fig. 1** Pretreatment photographs. (A) Facial front; (B) facial front smiling; (C) facial ¾ right; (D) facial profile; (E) intra oral (mandibular); (F) intra oral left; (G) intra oral front; (H) intra oral right; (I) intra oral maxillary; (J) lateral cephalogram; (K) orthopantomogram.

### Phase II-post surgical orthodontic intervention

At the end of 6 months, the labial surface of maxillary canine was completely exposed and clinically visible and space was created for it (Fig. 3). At this stage, the maxillary and mandibular arches were bonded with 0.022 MBT metallic edgewise brackets. Niti (Nickel-Titanium) 0.014" round archwire was applied to both maxillary and mandibular arch. At 12 months, Niti spring was applied from maxillary right lateral incisor to maxillary right first premolar to maintain the space for alignment of the maxillary canine to its proper position in the maxillary arch (Fig. 3). At 18 months, the canine and maxillary premolars were



**Fig. 2** Nance palatal appliance to guide the eruption of impacted maxillary canine.

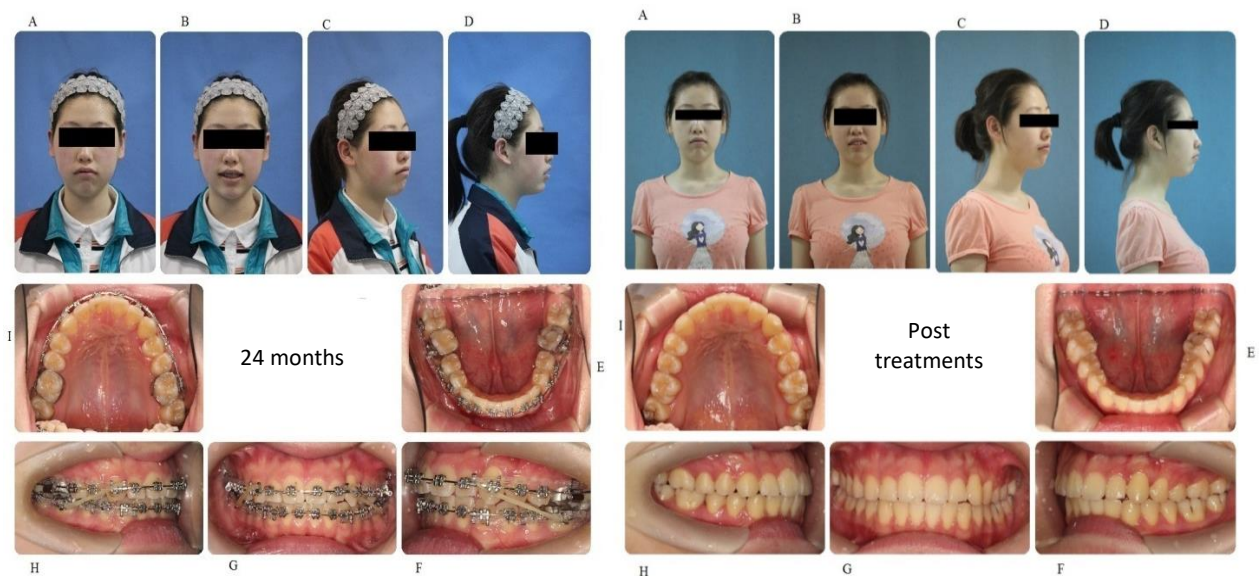
aligned to their respective positions and the occlusal was maintained with the use of class II elastics. Archwire was changed every 2 months for maxillary arches starting from 0.014 inch round Niti archwire and later replaced by 0.018×0.022 rectangular Niti archwire (Fig. 4). For mandibular arch, every month from 0.014 inches round Niti archwire and later replaced by 0.017×0.25 inch Niti rectangular archwire. After appropriate alignment, leveling, detailing and finishing were done. The occlusion was allocated to settle down and class I molar relationship was achieved bilaterally and then the brackets were deboned. The lingual bonded retainer was used for retention in the maxillary and mandibular arch. Total time for active treatment was 24 months. Pretreatment and post-treatment comparison of the cephalometric measurements is given in Table 1.

### Discussion

Maxillary canines and premolars are essential for an aesthetic smile and functional efficiency. Owing to this reason, extraction of these teeth is contraindicated. Impaction of these teeth may lead to alteration in occlusion, aesthetics, functioning and maintenance of oral hygiene. Sometimes, the impacted tooth is also responsible for the underlying pathology such as odontogenic cyst and there are also reports of Adenomatous odontogenic



**Fig. 3** Treatment progress at 12 months and 18 months. (A) Facial front; (B) facial front smiling; (C) facial ¾ right; (D) facial profile; (E) intra oral (mandibular); (F) intra oral left; (G) intra oral front; (H) intra oral right; (I) intra oral maxillary.



**Fig. 4** Treatment progress at 24 months and post-treatment. (A) Facial front; (B) facial front smiling; (C) facial ¾ right; (D) facial profile; (E) intra oral (mandibular); (F) intra oral left; (G) intra oral front; (H) intra oral right; (I) intra oral maxillary.

tumors. In addition to these factors, these teeth are mostly found on the palatal aspect because of this the diagnosis is further delayed as patient complains only after experiencing pain [8, 9]. Etiologic factors commonly associated with impacted canines and premolars are either systemic or local, which includes: arch length discrepancy, early loss of deciduous molars causing the mesial drift and underlying pathological lesions such as dentigerous cyst etc. [10]. According to previous studies, many approaches have been used to align

the impacted canine and premolars [11, 12]. But in the contemporary case report, the palatally impacted maxillary canine was aligned by utilizing Nance palatal appliance also called as repositioning Nance appliance (RNA). The RNA, which is fixed a functional appliance, if utilized appropriately according to the requirement of the case, best results can be obtained for both the patient and practitioner [13]. In this case, firstly to move the canine away from the roots of lateral incisor was a necessity in order to minimize the damage to its

**Table 1** Pretreatment and post-treatment comparison of the cephalometric measurements.

Measured values	Pre-treatment	Post-treatment	Normal
SNB(°)	86.5	84.1	82.5
SNB (°)	79.7	81.2	80.9
ANB (°)	6.9	3.5	1.6
FH-NPo (°)	85.5	81.5	80.6
FMA (°)	30.8	26.5	25.0
SN-GoGn (°)	38.2	35.0	32.9
Y-Axis (°)	66.0	61.0	60.0
LAFH (°)	53.0	56.6	55.0
U1-L1(°)	133.8	128.0	130.8
U1-NA (°)	14.6	22.3	22.8
U1-NA (linear)(mm)	4.6	5.6	6.0
L1-NB (°)	28.7	25.3	22.0
L1-NB (linear)(mm)	8.7	6.0	4.0
L1 to A-Po line (mm)	4.8	2.9	2.7
S-Line (mm)	4.5	3.0	2.0
G-Sn-Po (°)	22.8	15.0	12.0

roots. About 11 months of time was needed for complete traction of the impacted canine and the total time for active treatment was about 24 months in this case. But according to various reports the duration of time for complete traction and alignment of canines varies because of gender, age, the severity of impaction, unilateral and bilateral impaction and molar relation. The challenging tooth movements can be carried out by properly understanding the application of biomechanics and biologic principles. It was clinically challenging to guide the eruption of impacted maxillary canine and to align the maxillary first premolar. By utilizing RNA and progressive traction of the impacted tooth with gentle orthodontic forces were successful tactics to acquire the proper occlusion.

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### Conflict of interest

The authors have no conflict of interest

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