



## Substitution Of Missing Maxillary Canine With Maxillary first Premolar: An Alternative To Traditional Orthodontic Treatment

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### Abstract

A 15 year old girl reported with the chief complaint of an unesthetic dental appearance. Her maxillary anteriors were proclined with class II skeletal base and maxillary permanent left canine was missing. Treatment included class II camouflage treatment with upper premolar extraction and substitution of the missing upper canine with premolar. After 26 months of active treatment, the patient had a Class II molar relationship and ideal overbite and overjet. Her profile was improved, lips were competent, and gingival levels were acceptable. Cephalometric evaluation showed acceptable maxillary and mandibular incisor inclinations. Intraoral pictures taken at the end of treatment demonstrated that substitution of canine with first premolars can be a valid alternative to traditional orthodontic treatment.

**Keywords:** missing canine, class II camouflage, unilateral premolar extraction

### Introduction

Congenitally missing teeth (CMT) are among one of the commonly known dental anomalies [1]; which can be defined as developmental absence of teeth, except the third molars, either in primary or permanent dentition [2]. It has also been termed as teeth aplasia, teeth agenesis, and lack of teeth [3].

Congenital absence of permanent canines has been reported as a rare occurrence [4]. Different studies have reported greater frequency of occurrence of agenesis in the maxillary region along with higher female predilection and more chances of unilateral agenesis. [5,6]

Multifactorial etiology of CMT, which combines genetic, epigenetic and environmental factors, is noted [2,4]. The genetic factor has been more significant than environmental factor. Some of the associated regulatory homeobox genes include MAX1, PAX9, EDA and AXIN2 etc [7].

Environmental factors like tooth bud infection, trauma, nutritional disturbances during pregnancy or infancy, smoking during pregnancy, maternal medications, irradiation and somatic diseases (syphilis, scarlet fever and rickets) are also associated [2,4]. The association of tooth agenesis with other syndromes (Oral and facial clefts, Rieger syndrome, Down syndrome, hemifacial microsomia etc) as well as other dental anomalies (microdontia, taurodontism, tooth transposition and rotation, ectopic eruption, retained primary teeth and alveolar bone hypoplasia) have also been reported in the literature [2,4].

In absence of maxillary canine facial and smile esthetics are compromised since they are positioned at the corners of the dental arch, forming the canine eminence for support of the alar base and the upper lip. As they support the dentition, contributing to

disarticulation during lateral movements in certain persons, preservation or proper substitution of canine is essential.

In cases of missing maxillary canine premolar substitution has been a viable treatment option which includes (a) recontouring of the premolar by grinding with diamond instruments (b) making a composite resin mesial “corner,” (c) and providing its crown with proper maxillary canine axial inclination (torque) [8,9].

Class II malocclusions can be treated by several means, according to the characteristics associated with the problem, such as anteroposterior discrepancy, age, and patient compliance [10]. Methods include (a) Growth modification, (b) Camouflage (c) surgical approach.

Orthodontic camouflage is a method of correcting malocclusion by making the skeletal problem less apparent. Camouflage usually involves the planned extraction of upper first and lower second premolars [11]. When the mandibular dental arch is treated without extraction; removal of two maxillary premolars are done accepting a Class II molar relationship. Typically, the first premolars are

extracted to resolve anterior malalignment and increased overjet [12].

In this case report, a 15-year-old girl with congenitally absent upper left canine and bearing class II malocclusion was treated with combination of premolar extraction and premolar substitution for canine.

### Case Report

A 15-year-old girl reported with the chief complaint of an unesthetic dental appearance [Figure 1]. The facial analysis showed incompetent lips with lip strain and protrusive dentition. The intraoral examination showed a healthy periodontium, mild maxillary transverse constriction, and severely proclined maxillary anteriors and mildly proclined mandibular anteriors with class II molar relationship present on both sides. All teeth were present except for the upper permanent left maxillary canine where a retained deciduous tooth was present [Figure 2] but got exfoliated before commencement of treatment.

The cephalometric analysis showed a class II skeletal base with average growth pattern [Table 1]. No familial history of missing maxillary canines was present. Pretreatment photos are present.

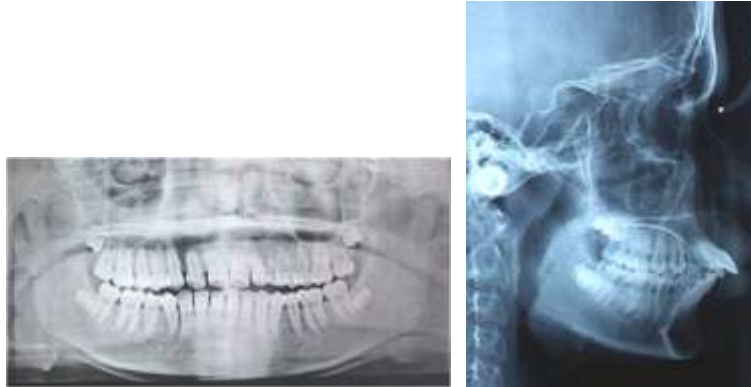
**Figure 1. Pretreatment photos**



### Treatment Objectives and treatment plan

The treatment objectives were to reinforce anchorage with transpalatal arch in upper arch, extract right maxillary first premolar and interproximal slicing in the lower arch to align maxillary and mandibular dentition, to reduce dentoalveolar protrusion, improve lip competence, and to establish a stable class II molar relation. At the end of the treatment upper left first premolar would be in the place of missing upper left canine.

**Figure 2. Pretreatment radiographs**



### Treatment alternatives

Non extraction and extraction plans were considered. An alternative to current treatment plan was to prosthodontically replacing missing canine without any extraction but it would have its inherent problem of loss of sound tooth structures (FPD) or hazards of invasive procedure (Implant). Apart from that no improvement in the facial profile would be achieved and the overjet would remain large.

Another option was to move maxillary molars distally in order to achieve class I molar relation. Several techniques were available such as extraoral traction, distal jet appliance, pendulum appliance or with bone screws[13]. However, these techniques often were accompanied by unwanted side effects of flaring or mesial movement of the anterior teeth and were time consuming. Modern implants although a good alternative but had the disadvantage of being an invasive procedure. Moreover maxillary molar distalisation would require prosthetic replacement for the missing canine.

Regarding orthodontic camouflage treatment by extraction of upper first and lower second premolar

the molar relation would have been corrected but the facial profile might deteriorate.

The procedure selected was to extract only the maxillary right first premolar and to utilise the space of missing upper left canine for retraction accepting the class II molar relation at the end of the treatment.

### Treatment Progress:

After extraction of the maxillary right first premolar, preadjusted fixed appliances were placed, and alignment in the maxillary and mandibular dental arches was achieved by a 0.016 inch nickel-titanium wire. Then, levelling was obtained in both arches with 0.019 X 0.025 inch nickel-titanium wires. Maxillary and mandibular 0.019 X 0.025 inch stainless steel rectangular archwires and power chain were used to close the extraction spaces [Figure 3]. The finishing stage of treatment was started, and a progress panoramic radiograph was taken to check for root parallelism and topography of the extraction site. At the end of the treatment composite recontouring of the premolar buccal surface was done.



**Figure 3. Mid-Treatment photographs**



**Result:**

After 26 months of active treatment, the patient had a Class II molar relationship and ideal overbite and overjet. The profile was improved, the lips were competent, and the cephalometric evaluation showed acceptable maxillary and mandibular incisor inclinations [Figure 4].

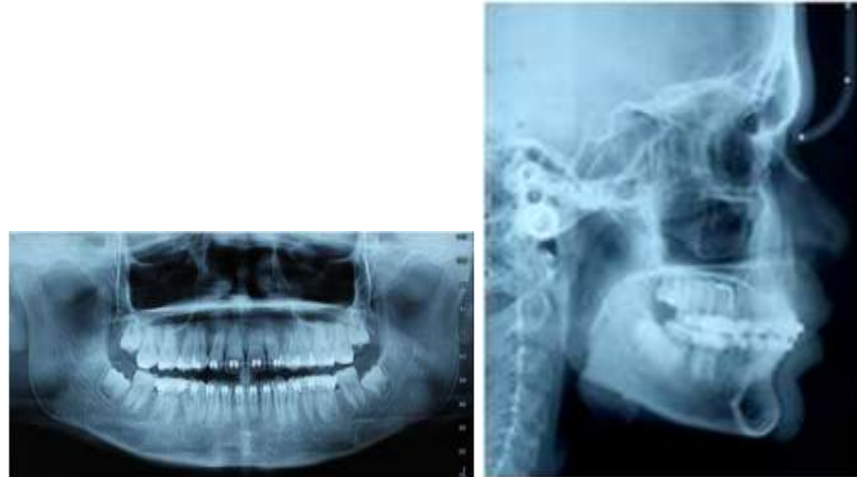
The final panoramic radiograph showed that good root parallelism was achieved in the anterior regions as well as across the extraction site [Figure 5]. All results were confirmed by superimposition of pre and post treatment cephalogram tracings [Figure 6].

The gingival levels were acceptable, but a slightly higher position of the maxillary left first premolar and gingival margin with respect to the maxillary lateral incisors should have been achieved. No occlusal interference was observed during different mandibular functional movements. Maxillary and mandibular bonded retainers were given. No temporomandibular joint or muscle problems developed during the retention and postretention periods. The temporomandibular joints showed no clicking on opening and closing. No mandibular shift was assessed upon closing, nor are premature contacts evident.

**Figure 4: Post Treatment photographs**

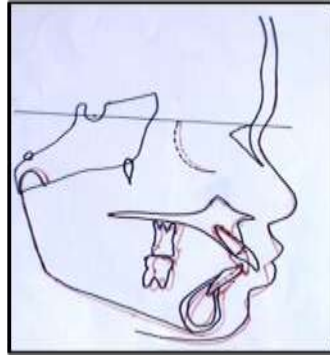


**Figure 5:Post Treatment radiographs**



**Table 1: Cephalometric analysis**

Parameters	Pre treatment	Post treatment
<b>Skeletal(horizontal)</b>		
SNA (°)	90	88.5
SNB(°)	87	87
ANB(°)	3	1.5
Wits appraisal(mm)	5	2
Na perp- Pt A (mm)	1	1
<b>Skeletal(vertical)</b>		
FMA(°)	22	22
Y axis(°)	57	58
Jarabak's ratio(%)	74	72.72
<b>Dental</b>		
U1 to NA(mm)&(°)	11.5 & 45	5 & 25
U1 to SN(°)	140	111
L1 to NB(mm)&(°)	6 & 33	4 & 25
IMPA(°)	104	92
U1 to L1(°)	88	129
<b>Soft tissue</b>		
Nasolabial angle(°)	79	98.5
Z angle(°)	74	74.5

**Fig 6: Superimposed tracings****Discussion:**

It was previously reported that single canine agenesis is more predominant than multiple canine agenesis and mostly occurs with other types of dental anomalies such as congenital absence of other teeth, microdontia, delayed tooth formation, supernumerary teeth, taurodontism etc[14]. In our case there was neither congenital absence of other permanent teeth nor other dental anomalies associated with canine agenesis. If the permanent canine could not be palpated in the buccal sulcus by eleven years of age, impaction, ectopic eruption or transmigration of the teeth must be considered[15,16]. Early detection of impacted or missing maxillary canines by radiographic investigation may enable interceptive treatment and reduce the treatment time, complexity, and complications.

Treatment of class II patient requires careful diagnosis and a treatment plan involving esthetic, occlusal, and functional considerations. In the present case, it was decided to camouflage the skeletal discrepancy by extracting the maxillary right first premolar and retracting the anterior teeth utilising the extraction space and missing canine space to improve facial profile, leaving the molars in a class II relationship. This treatment plan was basically similar to extraction of two maxillary first premolar.

With space closure, part of the treatment involves the substitution of the first premolars into the site of the maxillary canines. This change in tooth arrangements naturally has an impact on the functional occlusion. Some clinicians have expressed concerns that the forces generated through lateral excursive movements placed on the smaller and thinner roots of the first premolars will induce bone loss and

periodontal problems[17]. However, such claims are not supported by any evidence. Long term periodontal and occlusal studies[18] have shown that space closure with premolar substitution for canines may lead to an acceptable functional relationship, with modified group function on the working side.

Even in excellently treated cases, the marginal gingival contours of the six maxillary anterior teeth will, as a rule, deviate from the optimal “high-low-high” situation because of the short premolar and long canine clinical crowns. This may constitute an esthetic problem in patients who show a considerable amount of maxillary gingiva when smiling. The esthetic problem may be more pronounced in unilateral than in bilateral agenesis cases. The different crown lengths between premolars and canines may be handled by using one of four options: 1. Accept the differences. 2. Make a local labial gingivectomy on the first premolar(s) 3. Do surgical crown lengthening on the premolar(s) 4. extrude the first premolars during the orthodontic treatment, restore the premolars with a hybrid composite incisal build-up at the end of treatment[19]. Here although crown surface recontouring was done, gingival level difference was present and surgical crown lengthening was planned. But the patient denied any further procedure.

Achieving proper interdigtation is one of the key factors for long-term stability of the corrections brought by treatment. There was no disharmony in the occlusion even if mandibular canine in occluding with the maxillary first premolar. The patient was pleased with the treatment outcome in spite of some crown and gingival height mismatch related to maxillary left first premolar.

**Conclusion**

Canine substitution by first premolars could be a valid alternative to traditional orthodontic treatment in bimaxillary dentoalveolar protrusion cases when maxillary premolar extraction is a treatment option.

Good functional and esthetic results can be achieved, if an accurate and detailed anterior tooth position is managed during orthodontic finishing. There is not much available scientific or clinical evidence that substituting maxillary first premolars for canines should imply any notable compromise with regard to the esthetic outcome or to the long-term periodontal condition, or that such substitution should result in an inferior function compared with other treatment alternatives.

Planned extraction of indicated teeth to bring about dental compensation and camouflage the skeletal discrepancy gives an overall improvement in facial esthetics, occlusion and also satisfaction to the patient.

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