

Asymmetric Extraction for Managing a Severely Crowded Malocclusion: A Case Report

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Abstract

The mandibular premolar impactions account for nearly 24% of all the dental impactions including the third molars. The literature regarding the impactions of mandibular premolars is very limited although they are considered as the third most common impactions after all the third molars and maxillary canines. This case report describes the treatment of a Class I malocclusion having severe crowding in both the upper and lower arches, buccally placed maxillary canines and impacted mandibular right second premolar with an asymmetric treatment approach in a young growing patient.

Key words: Asymmetric extraction, Buccally placed canine, Impacted mandibular premolar, Severe crowding.

INTRODUCTION

The highly placed maxillary canines are one of the most commonly encountered conditions in orthodontic practice. Studies showed their prevalence to be 1–2% in the general population. The etiology for such malocclusion varies from systemic to local factors.^[1,2]

Impaction refers to failure of a tooth to erupt into the dental arch.^[1] After the third molars and the maxillary permanent canines, the mandibular second premolar impactions rank third in frequency of impaction with prevalence rate of 0.2–0.3%.^[3,4]

In the sequence of eruption, the mandibular premolars erupt after the eruption of mandibular first molar and mandibular canine. In this process, the chances of eruption of the second premolars become less as the room for its eruption becomes inadequate.^[5]

Apart from systemic and genetic factors, the other etiological factors for premolar impactions are arch-length deficiency, ankylosed primary molar, ectopic position of

tooth germ, lack of space, presence of supernumerary teeth, or odontomas.^[6,7] Various treatment methods have been suggested such as observation, intervention, relocation, and extraction depending on its relationship with the adjacent teeth.^[8]

The objective of this article is to present the treatment of buccally placed maxillary canines along with impacted mandibular second premolar in a severely crowded Class I malocclusion by an asymmetric extraction protocol.

Diagnosis and Etiology

A 10-year boy reported with the chief complaint of an unesthetic smile due to irregularly placed upper and lower front teeth [Figure 1]. He had no medical history or dental trauma and was physically healthy. During the initial examination, he did not show any signs or symptoms of temporomandibular joint dysfunction.

The extraoral and intraoral examination [Figure 1] showed a convex profile with average nasolabial angle, no gross asymmetries with Angle's Class I malocclusion, and Class I incisor relationship with buccally erupted maxillary right and left canines. The maxillary arch showed severe crowding with space shortage of 14 mm with a midline shift of 3 mm toward the left. It was also observed that maxillary left second premolar had a Class II amalgam restoration. The mandibular left canine was buccally placed and the right second premolar was impacted with the mandibular arch showing crowding of 12 mm. There were average overbite and overjet of 3 mm.

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Figure 1: Pre-treatment extraoral and intraoral photographs



Figure 2: Pre-treatment lateral cephalogram and orthopantomograph

Cephalometrically [Figure 2], the patient had a Class II skeletal relationship (A-Nasion-Point B [ANB] angle: 6°) with orthognathic maxilla, retrognathic mandible (sella-nasion-point A [SNA]: 82° and sella-nasion-point B [SNB]: 76°), and an average growth pattern (Max-Man plane angle: 27°). Maxillary incisors showed average inclination of 117° to the maxillary plane and mandibular incisors showed average inclination 95° to the mandibular plane with average interincisal angle [Table 1]. The panoramic radiograph [Figure 2] showed

Table 1: Pre- and post-treatment cephalometric values

Variable	Pre-treatment	Post-treatment	Change
SNA	82°	83°	1°
SNB	76°	78°	2°
ANB	6°	5°	-1°
SN to maxillary plane	7°	8°	1°
Wits appraisal	3 mm	3 mm	0 mm
Upper incisor to maxillary plane angle	117°	112°	-5°
Lower incisor to mandibular plane angle	95°	98°	3°
Interincisal angle	124°	137°	13°
MM angle	27°	29°	2°
Upper anterior face height	45 mm	50 mm	5 mm
Lower anterior face height	58 mm	64 mm	6 mm
Face height ratio	56%	56%	0%
Nasolabial angle	110	110	0
Edge centroid relationship	2 mm	4 mm	2 mm
Lower incisor to APog line	1 mm	3 mm	2 mm
Lower lip to Rickett's E plane	1 mm	1 mm	0 mm

SNA: Sella-nasion-point A, SNB: Sella-nasion-point B, ANB: A-nasion-point B

all permanent teeth with impacted lower right second premolar, unerupted second and third molars in all the four quadrants.

The Treatment Objectives

The treatment objective was to disimpact the mandibular right second premolar and align the buccally placed maxillary canines. Our treatment objective also included accepting mild Class II skeletal relationship, maintaining the Class I molar relationship on both the sides and correction of midline discrepancy. Also, achieve a Class I canine relationship and to improve the smile arc.

Treatment Alternatives

Three treatment alternatives were presented to the patient.

1. Extraction of maxillary and mandibular first premolars.
2. Extraction of the maxillary and mandibular second premolars.
3. An asymmetric extraction of maxillary right first premolar and maxillary left second premolar due to its guarded long-term prognosis along with extraction of mandibular right and left first premolars.

Seeing the advantages and disadvantages of all the three treatment plans, the third treatment option was adopted because it would optimize facial and smile esthetics. This would also create sufficient space to bring the buccally placed maxillary right and left canines into alignment and occlusion. The arch-length deficiency in mandibular arch would be resolved, thereby bringing the impacted right mandibular second premolar into alignment and occlusion. This would enhance both the profile and the smile esthetics by achieving ideal incisal and canine relationship. Cooperation and stability issues were discussed with the patient.

Treatment Progress

The pre-operative orthodontic preparation was performed with conventional 0.022-inch MBT appliances and transpalatal arch placed in the maxillary arch. The initial alignment and leveling was achieved with 0.014" NiTi archwire in maxillary arch and 0.012" NiTi archwire was placed in mandibular arch. The upper archwire was

followed by 0.018" SS with power chain extending between right canine and molar on the same side. Open coil springs between maxillary left lateral incisor and first premolar. The maxillary archwire was replaced with 0.017" \times 0.025" NiTi, 0.019" \times 0.025" NiTi followed by 0.019" \times 0.025" SS. In the mandibular arch, after the initial wire of 0.012" NiTi, 0.016" NiTi, 0.016" \times 0.022" NiTi, 0.017" \times 0.025" NiTi, and 0.019" \times 0.025" NiTi was placed. A button was bonded on mandibular right second premolar and GLC bite blocks were given on both the mandibular first molars. The lower archwire was replaced by 0.019" \times 0.025" SS with traction placed on the button bonded to lower right second premolar with power chain to the archwire. After the mandibular second premolar came into occlusion, the bracket was bonded on it and brought it into alignment using 0.016" NiTi, 0.016" \times 0.022" NiTi, 0.017" \times 0.025" NiTi, 0.019" \times 0.025" NiTi, and 0.019" \times 0.025" SS [Figure 3]. The appliance was debonded following the standard finishing archwire sequence and retention was provided by Hawley's retainers in both upper and lower arches.

Treatment Results

The facial esthetic was improved with better lip support, consonant smile arc, ideal overjet and overbite, Class I incisor, Class I canine, and Class I molar relationship [Figure 4]. The maxillary and mandibular midlines coincided with each other and to the facial midline [Figure 4].

The prefinishing panoramic radiograph and lateral cephalogram [Figure 5] showed good overall root parallelism, lack of root resorption, satisfactory improvement in ANB angle, and improvement in the mandibular position, thereby correcting its retrognathism [Figure 6 and Table 1]. The maxillary incisors were upright by 5° while the mandibular incisors were proclined by 3° [Figure 6 and Table 1]. The arch-length discrepancies in both upper and lower arches were resolved.



Figure 3: Mid-treatment intraoral photographs



Figure 4: Post-treatment extraoral and intraoral photographs

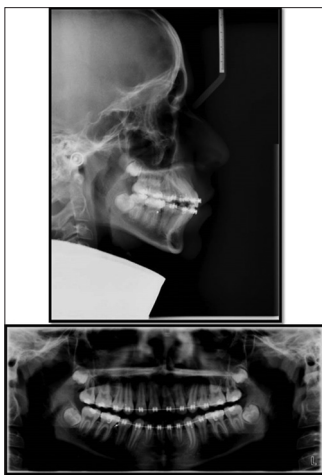


Figure 5: Near end-stage lateral cephalogram and orthopantomograph

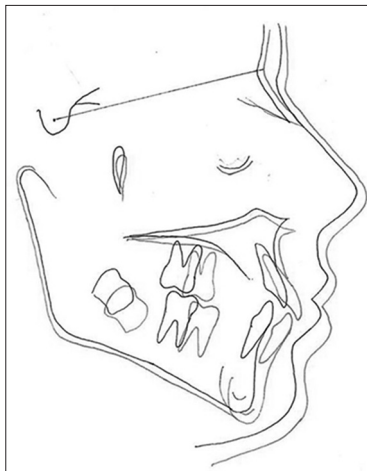


Figure 6: Pre-treatment and near end-stage lateral cephalogram superimposition

DISCUSSION

The premature loss of deciduous predecessor is considered to be the most common etiological factor for impaction of mandibular second premolar.^[9,10] Impaction of the mandibular second premolar has also been related to the initial angulation of the tooth and the early loss of the first permanent molar.^[11] Over-retained or infraocclusion and ankylosed primary molars are other causes leading to same.^[12] Various treatment options are available to manage this problem. First, the extraction of impacted mandibular second premolar could have been considered, but we did not choose to do this, as from the periodontal point of view extraction of unerupted mandibular second premolar would have left a marked bony defect in the area, even after the adjacent teeth have been fully uprighted. The next option was extracting the mandibular first premolar and bringing the impacted mandibular second premolar into occlusion with orthodontic therapy which we opted to do since the eruptive movement of impacted mandibular second premolar was considered to be more faster toward the site with least resistance.^[13]

The present generation is more conscious about their facial appearance due to which there is increase in demand for anterior teeth alignment and smile arc.^[2] The most common causes of Class I malocclusions are crowding and highly placed maxillary canines.^[1,14] In this case, there was severe crowding in both the arches with buccally placed maxillary canines. The tooth size arch-length discrepancy was another important factor influencing the decision of extraction in our case. Considering the amount of space needed for correction

of the crowding in both the upper and lower arch, we decided to go with extraction treatment plan in both the arches. Our patient presented with a heavy Class 2 amalgam restoration on his maxillary left second premolar. Its long-term prognosis was questionable. Hence, we chose to extract maxillary right first premolar, maxillary left second premolar, and mandibular first premolars on both the sides.

Among the patients undergoing orthodontic treatment, one-third of them show Class II skeletal pattern which could be due to maxillary prognathism, mandibular retrognathism, or combination of both.^[15,16] The mandibular retrognathism is most common characteristics of this malocclusion according to McNamara.^[17] The treatment of skeletal Class II malocclusion depends on various factors such as age of the patient and tooth material arch-length discrepancy. In actively growing patients, the correction of skeletal Class II malocclusion due to mandibular retrognathism can be done using orthopedic appliances which help in jumping the bite. In our case, the patient presented with mandibular retrognathism, but there was severe crowding in the upper and lower arch with overjet of 3 mm. Our patient presented with pleasing profile, and hence, choosing to maintain skeletal Class II relationship was acceptable. The facial convexity was mild and he showed Class I dental relationship which was another added benefit in maintaining skeletal Class II relationship.

CONCLUSION

A pleasing esthetic with a desirable occlusion was achieved. The asymmetric extraction pattern was instrumental in reestablishing the majority of components that were needed for a balanced smile since his main concern was an unesthetic smile. A sound diagnosis and treatment plan is needed for successful and stable orthodontic results. Extraction of erupted tooth overlying the impacted tooth could be advantageous since the eruptive movement of

the impacted tooth gets faster toward the site with least resistance.

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