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Combining Extractions with Fixed Functional Appliances in Treatment of Class II Malocclusion: Two Case Reports

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Case Report

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Abstract: This article presents compilation of two cases treated by combining two treatment approaches, extraction of teeth to correct dentoalveolar parameters and the fixed functional device forsus for correction of the skeletal parameters. The result is well aligned teeth and stable occlusion along with positive changes in the facial profile due to the skeletal effects of the fixed functional device.
Keywords: dentoalveolar parameters, extraction, teeth

INTRODUCTION

Class II malocclusion is the most common type of malocclusion with which patients report for treatment[1]. Class II malocclusion may be dental or skeletal or their combination. The skeletal class II malocclusion may be due to prognathic maxilla, retrognathic mandible or a combination of both[2]. Class II malocclusion resulting from mandibular retrusion is generally treated with functional appliances that create orthopedic forces directed at the mandibular structures [3]. Non-compliant correction of class II malocclusion using fixed functional appliances (FFA) at the deceleration stage of growth has gained tremendous popularity in the recent times.

However many skeletal class II malocclusion patients especially in the later stages of growth present along with dental compensation in the form of proclined mandibular incisors thus presenting a contraindication to application of fixed functional appliances which are known to increase incisor proclamation. The orthodontist is in a dilemma as he wants to take advantage of whatever little growth is remaining in such situations while preventing worsening of and in many cases wanting to reduce incisor proclamation.

The following case reports presents treatment of two such cases where we successfully combined two treatment modalities to take advantage of the skeletal effects of the fixed functional appliances while simultaneously preventing worsening of and correcting the dental parameters.

CASE1

A 13 year old female reported to the department of orthodontics and dentofacial orthopaedics with chief complaint of forwardly placed upper front teeth. On extra oral examination, it was observed that the patient had a symmetrical leptoprosopic face, convex profile, incompetent lips, everted lower lip, and deep mentolabial sulcus. Intraoral examination revealed that the patient had Angle's Class II div 1 malocclusion with overjet of 9mm and overbite of 33 %(figure1).

Cephalometric findings revealed an average growth pattern, skeletal Class II malocclusion with slightly protruded maxilla (SNA 83°) and retruded mandible (SNB 75°). Upper and lower incisors were proclined and protruded (upper 1 to SN-110.5° IMPA 107°). Orthopantomogram findings showed developing third molars (figure2).

Treatment objectives: The treatment objectives were to reduce the convexity of the facial profile, achieve Class I canine and molar relation, ideal overjet & overbite and normal incisor inclination and lip competence.

Treatment options

To take advantage of the little remaining growth we thought to go in for functional appliance treatment. However this would have worsened the

lower mandibular inclination during the treatment and moreover because of the bidental protrusion present the appearance of the patient worsened.

The second alternative would have been to correct the dental protrusion by fixed orthodontic treatment involving extraction of all four first premolars to be followed by mandibular advancement surgery but the patient did not agree for surgery. Hence we decided to first partially reduce the protrusion by extraction of all first premolars and then go in for fixed functional appliance.

Treatment progress

All four 1st premolars were extracted. Maxillary and mandibular dentitions were bonded using MBT 022 slot brackets (Di-MIM Mini Twin, Ortho Organisers, Aston Avenue, Carisbad). Initial alignment wires progressed from 016 NiTi to 019 × 025 NiTi wires. Finally, 019 × 025 stainless steel wires were continued for 1 month after which retraction was done using tie backs & sliding mechanics. Forsus fatigue resistant device (FRD, 3M Unitek Monrovia Calif) for mandibular advancement was then placed for 6 months. (Figure 3) Final finishing and detailing was then done using settling elastics. Total treatment time was 22 months.

Treatment results

The facial profile of the patient was significantly improved. Ideal overjet and overbite were achieved with highly improved smile esthetics. A Class I canine and molar relationship was achieved. Optimum lip competence was achieved. (figure4) Cephalometric comparison showed improvement in anteroposterior jaw relationship and basal dentoalveolar relationship.(figure5,6) (table 1,2,3)

CASE 2

A 12 year old male patient reported to the department of Orthodontics and Dentofacial Orthopaedics with the chief complaint of irregularly placed upper front teeth. On extraoral examination, it was observed that the patient had symmetrical mesoprosopic face, convex facial profile, competent lips, and deep mentolabial sulcus. On intraoral examination, patient had an Angle's Class II div 2 malocclusion with crowding in maxillary and mandibular arches. The patient had an overjet of 4mm, overbite of 70% and dental midlines coinciding with each other and facial midline. (figure 7)

Pre-treatment cephalogram confirms horizontal growth pattern (FMA 23°), skeletal Class II malocclusion on account of slightly prognathic maxilla (SNA 86°), retrognathic mandible (SNB 77°) with small mandibular body length. (Figure 8) Upper incisors were retroclined (upper 1 to SN 88°) and crowded, lower incisors were proclined (IMPA 104°). Orthopantomogram findings showed developing third molars (figure 8). Treatment objectives were to improve convex facial profile, achieve Class I canine and molar relation, ideal overjet and overbite and normal incisor inclination.

Treatment options

The space discrepancy due to crowding and lower incisor inclination necessitated extraction whereas to treat retruded mandible functional appliance was needed. So first option was extraction of upper 2nd premolars & lower 1st premolars for alignment and leveling followed by space closure with group C anchorage in maxillary arch and group a anchorage in mandibular arch and finally placement of fixed functional appliance for retruded mandible.

The other option would have been extraction of all 1st premolars to correct crowding and other dental parameters followed by mandibular advancement surgery. But as the patient was well within growth period we decided to go in for the first option.

Treatment Progress

Maxillary 2nd premlolars and mandibular first premolars were extracted. Maxillary and Mandibular arches were bonded using MBT 022 slot brackets (Di-MIM Mini Twin, Ortho Organisers, Aston Avenue, Carisbad). Initial alignment wires were progressed from 0.012 Niti, 0.014 NiTi, 0.016 Niti, 0.017 x 0.025" NiTi, 0.019 x 0.025" NiTi to finally 0.019 x 0.025" SS wire. 0.019 x 0.025" SS wire was left for 1 month followed by closure of remaining spaces using tie backs and sliding mechanics. Forsus fatigue resistant device (FRD, 3M Unitek Monrovia Calif) for mandibular advancement was then placed for 6 months. Final finishing and detailing was then done using settling elastics. Total treatment time was 20 months (figure 9).

Treatment results: The facial profile of the patient was significantly improved. Ideal overjet and overbite were achieved with highly improved smile esthetics. A Class I canine and molar relationship was achieved. (Figure 10) Cephalometric comparison showed improvement in anteroposterior jaw relationship and basal dentoalveolar relationship. (Figure 11, 12) (Table 1,2,3)

Table−1: Skeletal changes

	CASE 1			CASE 2		
	Pre (T0)	Prefunctional (after space closure) (T1)	Post (T2)	Pre (T0)	Prefunctional (after space closure) (T1)	Post (T2)
SNA	83°	82°	80°	86°	85°	84°
SNB	75°	75.5°	78°	77°	77°	82°
ANB	8°	6.5°	4°	9°	8°	2°
Wits	7mm	5mm	2mm	9mm	8mm	1.5mm
Mandibular Length (Go-Pog)	62mm	62mm	67mm	61mm	62mm	66mm
FMA	31°	31°	31°	23°	23°	24°
SN-MP	29°	29°	29°	26°	26°	27°

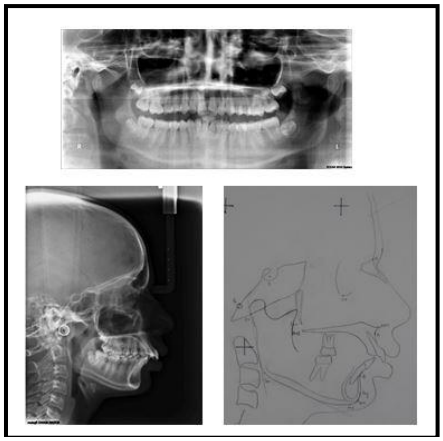
Table–2: Dental Changes

	CASE 1			CASE 2		
	Pre (T0)	Prefunctional (after space closure) (T1)	Post (T2)	Pre (T0)	Prefunctional (after space closure) (T1)	Post (T2)
U1-NA	6mm	3mm	2mm	1.5mm	4mm	4mm
U1-NA	28.5°	20°	21°	3°	28°	26°
U1-SN	110.5°	102°	100°	88°	110°	107°
L1-NB	9mm	3mm	3mm	5mm	4mm	4mm
L1-NB	37.5°	17°	26°	29°	23°	25°
L1-IMPA	107°	89°	93°	104°	95°	96°

Table–3: Soft tissue changes

		CASE 1			CASE 2		
		Pre (T0)	Prefunctional (after space closure) (T1)	Post (T2)	Pre (T0)	Prefunctional (after space closure) (T1)	Post (T2)
E Line	Upper lip	+3mm	-1mm	-3mm	-2mm	-2mm	-4mm
	Lower lip	+4mm	+0mm	-1.5mm	-3mm	-4mm	-2mm
Nasolabial angle		97°	105°	109°	95°	100°	107°

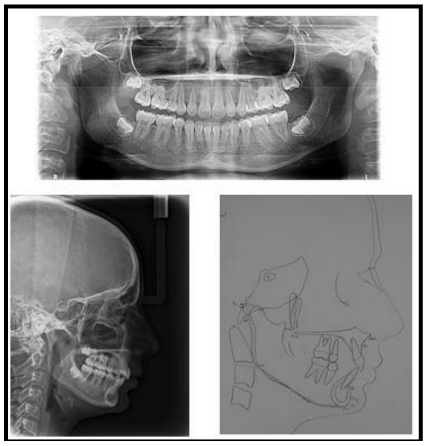
Fig–1: CASE 1 pretreatment extraoral and intraoral photograph



Fig−2: CASE 1 Pretreatment OPG and Lateral cephalogram

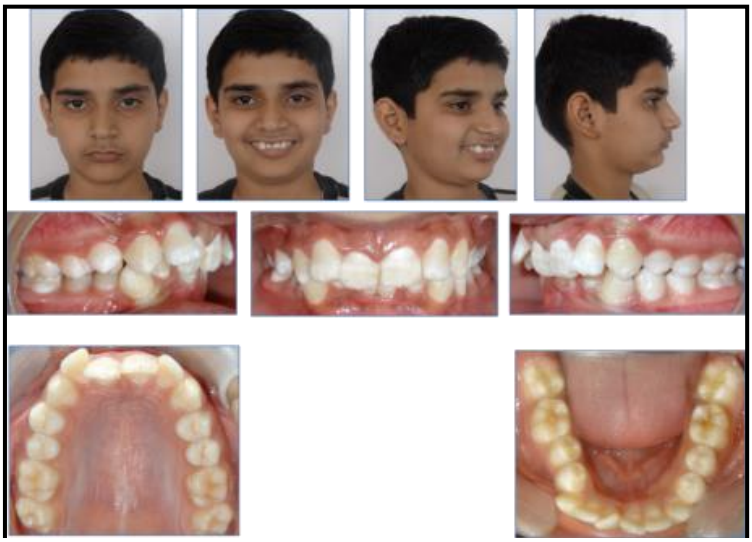
Fig−3: CASE 1 Forsus placement after space closure

Fig−: CASE1 Posttreatment extraoral and intraoral photographs

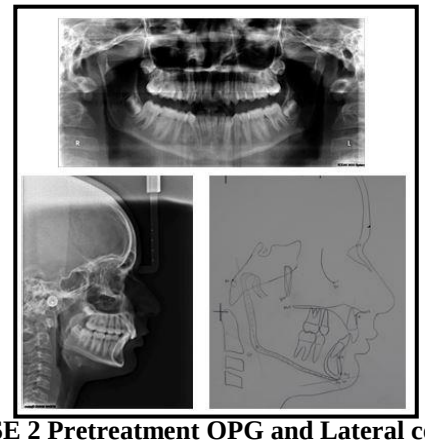


Fig−5: CASE 1 Posttreatment OPG and lateral cephalogram

Fig–6: CASE 1 Superimposition

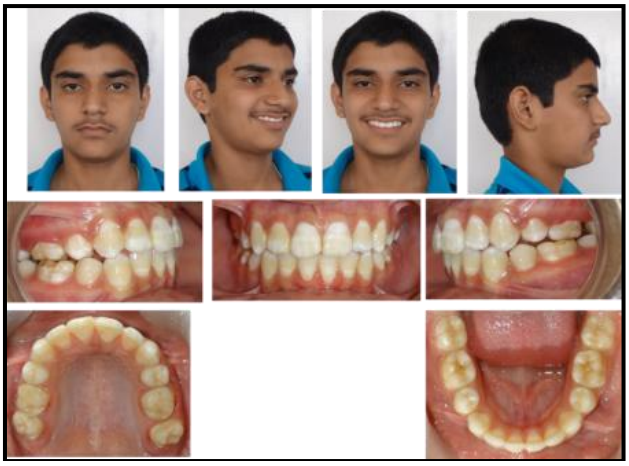


Fig–7: CASE 2 Pretreatment extraoral and intraoral photographs

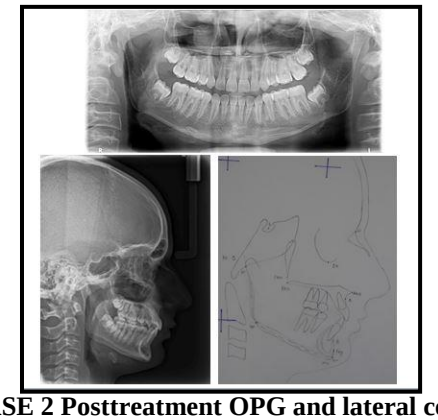


Fig–8: CASE 2 Pretreatment OPG and Lateral cephalogram

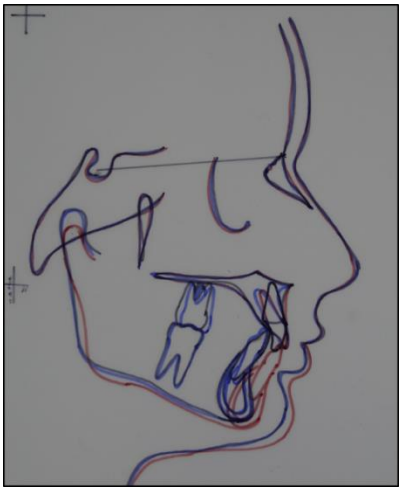
Fig–9: CASE 2 Forsus placement after space closure



Fig–10: CASE 2 Posttreatment extraoral and intraoral photographs



Fig–11: CASE 2 Posttreatment OPG and lateral cephalogram



Fig–12: CASE 2 Superimposition

Fig−13: CASE1 One year follow up

Fig−14: CASE 2 One year follow up

DISCUSSION

Treatment planning for Class II malocclusion requires consideration of esthetics, skeletal discrepancy, dent alveolar protrusion, lip competency, facial convexity and stability of final occlusion. Correction of dent alveolar protrusion or crowding requires extraction of teeth and a retruded mandible requires treatment with some sort of functional appliance in growing patients or surgical advancement in case of adults. Skeletal effects can be achieved even during deceleration phase of growth by using certain fixed functional appliances [4].

In the two cases presented above arch length discrepancy along with retruded mandible was present. In the first case due to the concomitant presence of dent alveolar protrusion application of FFD would have worsened the lower incisor inclination as FFD have been shown to increase the lower incisor proclamation [5]. On the other hand correction of the dent alveolar protrusion by extractions and fixed appliances would have resulted in losing the opportunity to take advantage of whatever little growth was remaining and a compromised esthetics as the patient was not ready for surgery. Combining the two treatment modalities resulted in very encouraging and esthetic results. In second case the extreme crowding in lower arch required mandatory extractions and retruded mandible along with convex facial profile required functional appliance placement.

The results show that favourable skeletal effects have been achieved in both the cases. Skeletal effects of forsus FFA are evident with 3° and 5° increase in SNB in Case1 and Case2 respectively, restraining effect on maxilla shown by 3° and 2° decrease in SNA in Case1 and Case2 respectively (table 1).

Extractions prior to application of forsus appliance show favourable dental changes. The significant improvement in lower incisor inclination (IMPA decreased by 14° in Case1 and 8°in Case2) is evident which improve the long term stability and periodontal health. Improved incisor inclination has also allowed achieving full forward posturing with FFA otherwise the proclaimed mandibular incisors would

have interfered with desired mandibular forward position (table 2).

In both the cases overall significant improvement in facial appearance and soft tissue profile was obtained along with stable dent alveolar and occlusal relationship. (Table 3) Combining the two treatment modalities resulted in very encouraging and esthetic results. Extractions prior to functional appliance decompensated dental compensations of malocclusion and provided stable dent alveolar relationships even partially negating the dent alveolar side effects of fixed functional appliances which are shown to increase lower incisor proclamation. Initial extractions and retraction of anteriors especially in maxillary arch further increased the motivation of the patient in the first case.

CONCLUSION

Class II malocclusion requires efficient diagnosis and treatment planning. Proper treatment planning and its execution in these cases gave good and stable results.

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