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Clinical Protocol in Developing Class 3 Malocclusion; Justified Approach?

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Abstract The purpose of the current report was to investigate orthopedic effects of a maxillary protraction headgear along with maxillary expansion on facial morphology in developing Class 3 patient before and during the pubertal period. The treatment resulted in Class 1 molar occlusion bilaterally; an ideal overjet, overbite, incisor angulations, and overcorrection may be needed during the treatment with continuous monitoring for the long term stability of the treatment.

Keywords: *class 3 malocclusion, early correction, post treatment changes, protraction headgear, treatment changes*

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1. Introduction

A class 3 incisor relationship is one of the most difficult malocclusions to correct orthodontically, mainly because of uncertainty of a satisfactory and stable outcome after growth. It has been a common practice to intervene early with orthodontic and orthopedic treatment modalities. Although orthopedic forces that attempt to control or alter the skeletal framework in skeletal Class 3 patients appear to be remarkably effective in the initial stages. The results are rarely maintained long term. [1,2] It is recommended that extra oral traction should start early in the primary dentition stage. Cozzani [3] reported that when a child is treated at the age of 4 years, the direction of growth of the maxilla may coincide with the direction of the protraction, creating a stable result. In 1981, Turpin[4] developed some guidelines by which one could decide when to intercept a Class III malocclusion [Table 1]. If the patient falls into the positive line, then early treatment ought to be considered; but if some of the patient's characteristics fall in the negative column, delaying treatment until condyle growth has ceased may be a better alternative.

Table 1. Turpin's Guideline

Positive Factors	Negative Factors
Convergent facial type	Divergent Facial Type
Anteroposterior Functional Shift	No anterior-posterior shift
Symmetrical Condylar Growth	No asymmetrical condyle growth
Young With Growth Remaining	Growth completed
Mild Skeletal ANB < -2	ANB > -2
Good co-operation expected	Poor co-operation
No Familial Prognathism	Familial Pattern
Good Facial Esthetics	Poor Facial Esthetics

2. Case Report

Figure 1. Pre-treatment facial profile

Figure 2. Intraoral Pre-treatment photographs

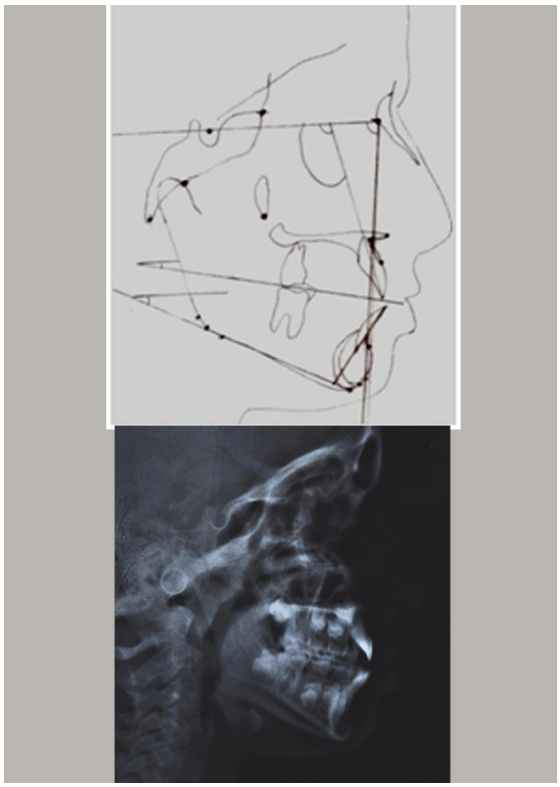

Figure 3. Pre-treatment cephalogram

Table 2. Pre-cephalometric measurements

ANGULAR MESUREMENTS		LINEAR MEASURMENTS	
SNA	71	N-S	66mm
SNB	73	S-BA	42mm
ANB	-2	N-ANS	46mm
GONIAL ANGLE	132	ANS-ME	56mm
MANDIBULAR PLANE ANGLE	37	N-ME	102mm
OCCLUSAL PLANE TO SN	22	ANS/ME \N-ANS	1.27
UPPER INCISOR TO SN	98	GN-CD	110.5
OCCLUSAL PLANE TO SN	22	POG-GO	61
LOWER INCISOR TO ME/GO	98	CD-GO	62
		WITS	-2

The case presented here is of a healthy 8.5 -year-old girl with improper bite, who had no craniofacial deformity or facial asymmetry (Figure 1 Functional shift in the mandible on CR- CO evaluation was without any abnormality (Figure 2). According to CVM analysis, her growth peak may come after a year as she was in cervical stage 2. Orthodontic treatment objectives included maxillary protraction of the upper incisors to obtain a positive overjet, overbite and complete alignment of the teeth. The pre treatment values of cephalometric analysis describe a developing class 3 malocclusion. [Table 2] (Figure 3).

3. Treatment Alternatives

Class 3 patients treated early with chin-cup alone have latent catch-up of mandibular displacement in a forward and downward direction. A second option was to wait until growth had ceased and then use dental camouflage or orthognathic surgery. Most parents hope to begin their child's treatment early to avoid negative psychological effects. The third treatment option could be maxillary protraction combined with rapid palatal expansion to correct (or overcorrect) the anterior cross bite, followed by fixed appliance treatment and was accepted by the parents as they wish to correct the developing malocclusion as early as possible.

4. Treatment Progress

4.1. PHASE 1

A banded (both first molars and first decidious molar) jackscrew rapid palatal expansion appliance in maxilla was activated 90° twice a day for 2 weeks. Transverse dimensional growth in the palate was achieved, (lingual cusps of upper posterior teeth approximating buccal cusps of lower posterior teeth. After rapid palatal expansion, a transpalatal arch further consolidated the correction, facemask was used for 12 hours a day, with a force of 500 g on each side directed 30° downward and forward. Six months later, the Antero -Posterior crossbite was corrected. Lingual arch in the lower dentition preserved the leeway space (Figure 4).

Figure 4. Mid treatment photographs showing Facemask and Lingual arch

4.2. PHASE 2

Teeth were bonded with a 0.022-in pre adjusted edgewise appliance. The archwires used were, 0.016-in nickel-titanium, 0.017 x 0.025-in nickel-titanium, and 0.018 x 0.025-in stainless steel. After 6 months' of observation, appliances were removed. Complete alignment and finishing with acceptable overjet and overbite was completed in 30 months (Figure 5).

Figure 5. Post-treatment photographs

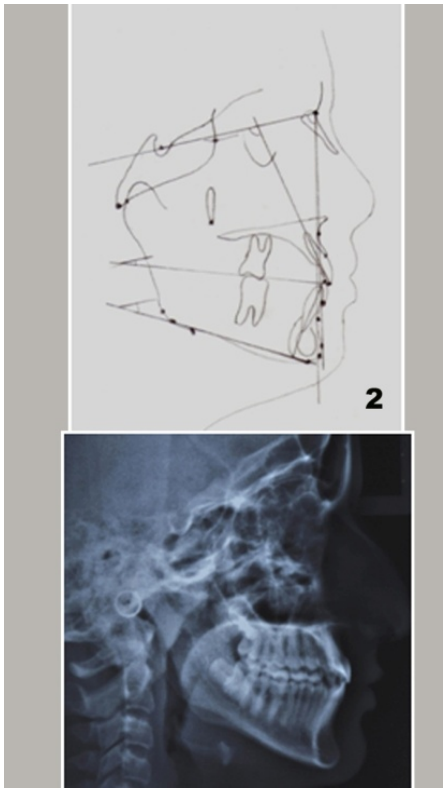

Figure 6. Post treatment cephalogram

In properly selected cases, dentoalveolar camouflage for class 3 malocclusion by growth modification with protraction headgear can be useful modality of treatment. This case demonstrates significant improvement in esthetics and occlusion with long term stability (Figure 6). As said by Wolff's law, "the structure and shape of a bone becomes progressively adapted to all the changing mechanical forces exerted on the bone; as a whole bone represents function and responds to stress placed on it. The post treatment orthodontic measurements showed Wits correction from initial -2 to + 0.5 (Figure 7) [Table 3]. The case is being followed till now with continuous wearing of chin cup in night because of coming growth spurts till the completion of adolescence. Even with proper overbite often with sudden spurt can still make the mandible move forward.

Table 3. Post-cephalometric measurements

Angular Measurments		Linear Measurments	
S-N-BA	125	N-S	67.5mm
SNA	75	S-BA	45mm
SNB	72	N-ANS	44mm
ANB	+3	ANS-ME	61mm
GONIAL ANGLE	120	N-ME	104mm
MANDIBULAR PLANE ANGLE	23	ANS/ME \N-ANS	1.4
OCCLUSAL PLANE TO SN	15	GN-CD	11I.5
UPPER INCISOR TO SN	85.5	POG-GO	65
LOWER INCISOR TO ME/GO	95	CD-GO	66
		WITS	+0.5

Figure 7. Serial pictures showing improvement in facial profile

5. Discussion

Maxillary growth enhanced by facemask is through two phenomena, enbloc displacement of maxilla and superficial bony apposition. Treatment of Class 3 malocclusion with bonded maxillary expander and facemask in early mixed dentition results in more favorable craniofacial changes than treatment in late mixed dentition. In our case significant forward displacement of maxillary structure was achieved, as an outcome of early treatment. Postero anterior orthopedic traction induced significant forward displacement of pterygomaxillary suture, this finding supports from a clinical prospective, the observation of Melsen and Melsen [5] on dry skull and autopsy material. According to this investigation disarticulation of palatal bone from pterygoid process was possible on skull of infantile and juvenile. The amount of maxillary advancement in the early treatment group with banded maxillary expander and facemask were according to the measurement seen by Ngan et al [6]. However the mandible showed smaller annualized increments, the favorable change in total mandibular length in the early treatment was with smaller increments in inclination of condyle axis. Such a skeletal change can be interpreted as more upward and forward direction of condylar growth in patients treated early. According to Lavergne and Gasson [7] this mechanism namely anterior morphogenetic rotation of the mandible is a biologic process that can dissipate excessive mandibular growth relative to maxilla, as it has been reported earlier as functional treatment of class 3 malocclusion. The favorable aspect was limited extrusion of maxillary dentition, this was because of presence of occlusal splints of banded maxillary retainer and it did not effect mandibular position in the vertical plane. In this case maxillary expansion was applied before protraction forces to operate an activation of maxillary suture system, presumably facilitating the action of face mask. Previous investigations have showed certain relapse tendency after application of active force in experimental animals. However the latest studies [8] say that moving the maxilla forward with external force is possible before adolescence .The amount of skeletal change with this therapy often extends to midface but there are variations in mandible and maxillary response, and it is still not possible to accurately predict the outcome. The growth modification basically depend a pun better biomarkers or genetic identification of patient types to indicate likely treatment response.

6. Conclusion

In this clinical case we highlight treatment effects produced by orthopedic face mask combined with bonded maxillary expander .The major findings were

1. Treatment of Class 3 malocclusion with maxillary expansion and face mask in early mixed dentition induced more favorable changes in craniofacial skeleton .There effective forward displacement of maxillary structures was achieved as effective outcome of early treatment.
2. There was reduction in mandible protrusion significantly in smaller increments in total mandible length associated with more upward and forward direction of condylar growth .
3. There were significant changes in maxillary and mandible modifications in overall treatment effects of maxillary expansion by facemask therapy.

Conflict of Interest

NONE.

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