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"An indigenous design of headgear to correct vertical maxillary excess: A case report"

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I. Introduction

Maxillary Prognathism as defined as overextended maxillary bone in sagittal plane is a very common complaint encountered in the everyday orthodontic office. They can be addressed either by retraction of the maxillary dentition or orthopaedic movement of the basal bone or by the combination of both the methods. The problem becomes complex when prognathism gets accompanied by vertical maxillary excess (VME). Vertical malocclusion results from interplay of many etiological factors during growth period. These growth factors include growth of maxilla and mandible, variations in rate of growth in both the maxillary suture and mandibular condyles and dentoalveolar development with the eruption of the teeth. The potential etiological factors other than unfavourable growth patterns are digit sucking habits, lymphatic tissue, tongue and orofacial muscle activity, heredity, orofacial functional matrices, jaw posture, head position. The correction of vertical dysplasia is more difficult and more challenging than the correction of anterior- posterior, transverse malocclusions, hence there is need for proper diagnosis and treatment plan. Parker &Johnson (1993) believed that interceptive treatment should be carried out for the cases that do not self correct. One of such interceptive measure and the mostly used appliance is a high pull headgear. This is an appliance used to treat hyper divergent open bite, by effectively holding maxillary sutural growth and vertical dentoalveolar development. Caldwell used acrylic splint With headgear (high pull) showed that, this approach produce a superior and distal displacement of maxilla, reduction in SNA angle, clockwise rotation of palatal plane and relative intrusion of upper molar with increased lower molar eruption, decreased mandibular growth and increased SNB angle.[1] The headgear assembly has 3 components, a)force delivery unit or facebow, b) force generating unit or elastics c) anchorage unit(figure 1).The headgear assembly is costly and the question about affordability arises for most of the rural Indian population, thus a cheaper modification of the appliance has been long awaited.

II. Presenting The Case

A female patient named Gayathri aged 11 years came to the dental department of MGM medical college with a chief complaint of forwardly placed upper front teeth. The patient belonged to the lowest socioeconomic strata of our society and failed to comply with the regular protocols and costs of our department (figure 2).We have performed a thorough clinical examination and found she had a typically convex profile with acute nasolabial angle (figure 3). The other factors seemed normal although when she smiled we could see a full crown display with 2 mm of gingival show(figure 4).When we have captured her smile photograph from a 3/4th view we have noticed her premaxilla visibility is far more than normal (figure 8). we have performed intraoral examination and found upper and lower anterior teeth have crowding and proclination(figure 5).We have obtained the lateral cephalogram of the patient as a secondary diagnostic aid(figure 6) and done a cephalometric study(table 1 & 2) and came to a conclusion that It is a case of skeletal class II pattern with Angles class-II div-I malocclusion with anteinclined maxilla, average growth pattern with proclined upper and lower anterior, mildly retrusive chin, increased lower anterior face height, strained upper lip and acute naso labial angle. The case demanded immediate attention and we have formulated a treatment plan according to the demands of the case. We have decided for Redirection of maxillary growth via a high pull headgear and allow the mandible to grow using the growth left in the patient.

III. Treatment

Treating the case demanded a headgear which couldn't be acquired due to the financial status of the patient so we have decided to design an appliance which is cheaper yet deliver the same force with precision so that we can obtain desired result. We have taken a long holding strap of a bag made of cotton with a width of 1 inch and thickness of 4 mm, cut it around the exact length of the circumference of patient's head and stitched it (figure 1).Later we have attached a few hooks to it, thus created a headgear assembly which is firm yet much cheaper and affordable. Later we have delivered a splint to the patient and attached the headgear to it via elastics (figure 7).The elastics has to be changed every 4th day till the treatment tenure gets over. The force produced by

the headgear is 350-400 grams wore by the patient 12-14 hours a day preferably in the evening every day a month for 9 months.

IV. Result

The patient reported to us every month once to check if the force degradation level is correct and the direction of the force produced is precise. The patient and her parents were very much motivated and compliance has been excellent. Total treatment period of 9 months were over and we have removed the intra oral splint and dislodged the headgear assembly. We have checked the patient intra orally and cephalometric values obtained from lateral cephalogram. Intra oral clinical evaluation reveals the teeth exposure of the patient at rest, have dramatically reduced from 5mm to 0 mm(figure 10).The smile line at rest lies on the lower border of the maxillary anterior teeth and there is no gingiva seen(figure 11). The 3/4th smile picture which earlier gave an impression of premaxilla jetted out looks normal now (figure 12) and in harmony. The mandible looks more in harmony with the maxillary component. The profile view from a complex outline came up to a straight outline(figure 13).The crowding and proclination of maxillary and mandibular anterior teeth have been addressed and corrected to normal values(figure 14).Cephalometric study reveals,(figure 9)the acute angle of the nasolabial curvature has reduced to obtuse, the lower anterior face height has reduced to normal from autorotation of mandible, the mildly retrusive chin is normal and the maxillary segment is not anteinclined in the post treatment lateral cephalogram(table 3).

V. Discussion And Conclusion

The case as presented was a combination of maxillary prognathism and vertical maxillary excess. Vertical maxillary excess is of 2 types, open and closed bite[2].This particular case was of closed type vertical maxillary excess malocclusion. Although it has been identified as one of the most difficult syndrome to correct orthodontically the pathogenesis of this malformation remains unknown[3].The main tool to correct such malocclusion is a headgear assembly which often proves to be costly and out of the reach of poor sub-urban people of India. Thus designing a variant of headgear was important and beneficial to serve such mass and class of people, moreover this proved to be easy to fabricate, customized to the individual head perimeter and cheap as it is made from daily household materials. Regarding the clinical aspect of the appliance we have seen it has delivered the appropriate amount of force (360grams of force approximately measured in 7 occasions) in a proper direction. The main of the headgear was served as we have re-directed the maxillary growth in a superior and posterior direction thus obliterating the sagittal and vertical discrepancy between maxilla and mandible.

Thus we can conclude that the new and indigenous design is easy to fabricate, cheap and yet performs good based on clinical criterions, Although further cross-sectional studies are required to perform on a bigger sample size to comment on the efficacy of the newly designed applian**ce.**

Illustrations

Figure-1 Headgear assembly

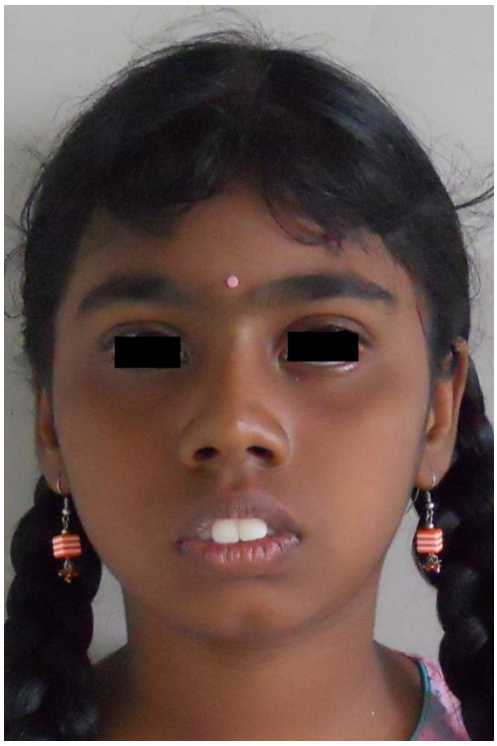

Figure-2 frontal view of the patient pretreatment

Figure-3 Profile view of the patient pretreatment

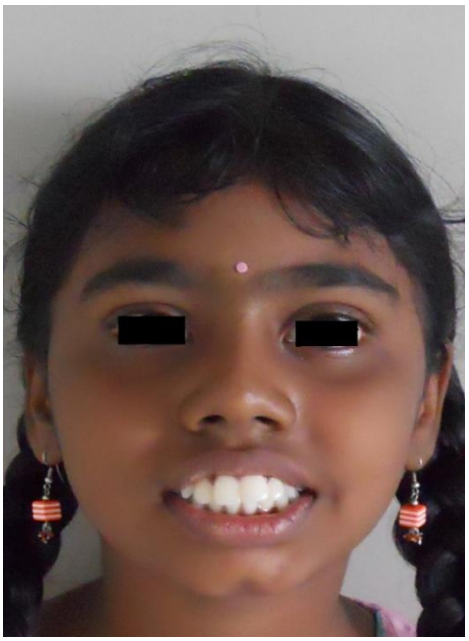

Figure-4 frontal smile view of the patient pretreatment

Figure-5 maxillary and mandibular anterior teeth pre-treatment

Figure-6 lateral cephalogram of the patient pre-treatment

Figure-7 headgear attached to the intra oral splint

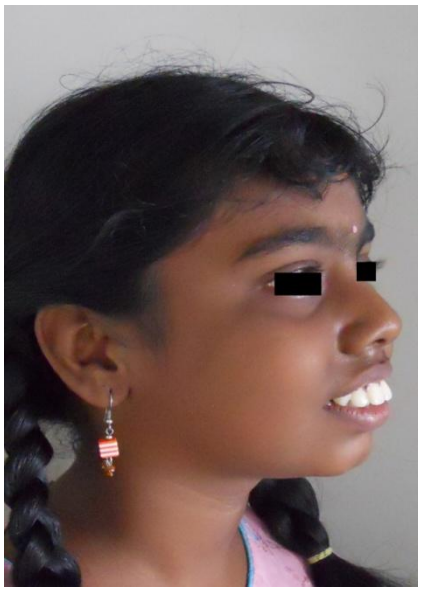

Figure-8 ¾ th smile view of the patient pretreatment

Figure-9 lateral cephalogram of the patient post-treatment

Figure-10 frontal view of the patient post-treatment

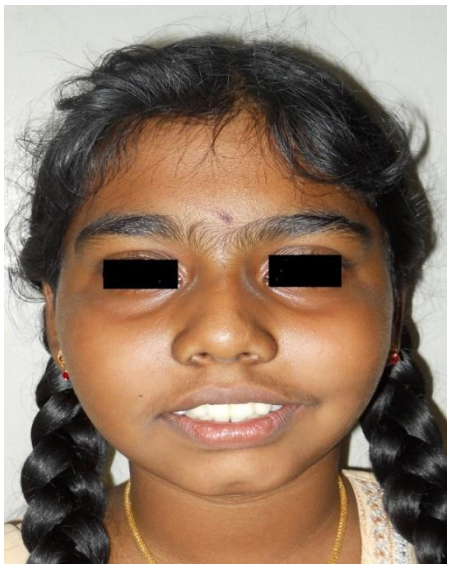

Figure-11 frontal smile view of the patient post-treatment

Figure-12 ¾ th smile view of the patient post-treatment

Figure-13 Profile view of the patient post-treatment

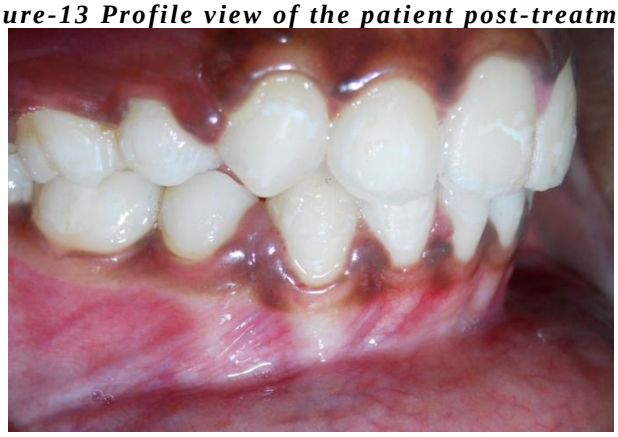

Figure-14 maxillary and mandibular anterior teeth post-treatment

TABLE

Table 1. Cephalometric analysis part a) pre-treatment

Steiner's Analysis SN-FH= 4°

Measurements	Mean	Actual	Inference
SNA	82°	84°	prognathic Maxilla
SNB	80°	78°	retrognathic Mandible
Go-Gn to SN	32°	33°	Mild vertical growth pattern
ANB	2°	6°	Skeletal Class II
SND	76°	74°	retruded

Table 2. Cephalometric analysis part b) pre-treatment

1 to NA (mm)	4 mm	10 mm	Severely proclined upper incisors
1 to NA	22^0	40^0	
1 to NB (mm)	4 mm	10mm	
1 to NB	25^0	38^0	Severly proclined lower incisors
1 to 1	131^0	91^0	Bidental proclination
Occl to SN	14^0	16^0	Downward rotated occlusal and palatal plane
PP to SN	8^0	10^0	

Table 3 COMPOSITE ANALYSIS-SKELETAL post-treatment

PARAMETER	PRETEATMENT	END OF PHASE ONE
SNA	84	83
SNB	78	80
ANB	6	3
N PERP TO PT A	+3	+2
N PERP TO POG	-5	-4
GO-GN TO SN	33	32
ANGLE OF INCLINATION	81	81
LAFH	64	63

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[3]. Stephen A. Schendel, Albertt E Carlotti Jr."Variations of total vertical maxillary excess" - Am J Orthod Dentofacial Orthop 1985; 43(8): 590-596.