

Orthopedic Combination Pull Headgear with an Expanded Inner Bow for Class II Correction

Tanmay Sharma, Santosh Kumar, Zuber Ahamed Naqvi, Ridam Jain, Bhaskar Gupta, Manoj Sharma

ABSTRACT

A successful orthodontic treatment depends upon proper diagnosis and treatment plan, as in this case combination pull headgear was used for correction of skeletal class II discrepancy. At the end of treatment an improvement in the facial profile was observed and skeletal as well as occlusal correction was achieved.

Keywords: Orthopedic, Profile, Skeletal class II, Dental.

How to cite this article: Sharma T, Kumar S, Naqvi ZA, Jain R, Gupta B, Sharma M. Orthopedic Combination Pull Headgear with an Expanded Inner Bow for Class II Correction. *J Orofac Res* 2012;2(2):104-108.

Source of support: Nil

Conflict of interest: None declared

INTRODUCTION

The principle of orthopedic headgear treatment is to restrict forward growth of the maxilla by applying orthopedic forces on the maxilla. Cervical headgear therapy has been extensively studied for the last 50 years; however, treatment results have varied greatly.¹ This may be explained by the use of different modifications of the headgear treatment.²⁻⁹ The direction and the force of traction has varied greatly, and high-pull, straight-pull, cervical-pull headgears, or combinations with different forces have been used.^{2,3,5,10} Forces from 150 to 200 gm may be used to move teeth^{2,3,11} while forces over 450 gm are assumed to surpass the tooth-moving threshold and been used to control dental anchorage.^{2,3,11,12} Strong forces are needed to produce orthopedic skeletal effects on the maxilla, which are essential in the treatment of class II malocclusion.¹²⁻²⁰

The structure of the inner and outer bow has varied. The inner bow may be used with or without expansion^{21,22} and it may or may not bear on the upper incisors. Bayonets have been used along the vertical or horizontal plane. The length of outer bow and its angle against inner bow has also varied.^{2,3} Furthermore, in many studies headgear therapy has not been used alone, but with fixed or functional appliances^{23,24} with or without tooth extractions.^{4,5,25} The age at the onset of treatment has also been suggested to be a critical factor.²⁶ The headgear has been used either intermittently or continuously.^{20,27} Therefore, it is difficult to compare different results of the headgear therapy, and it is important to recognize what kind of headgear therapy is studied. In addition, the malocclusion itself may result from

various maxillary and mandibular skeletal and dental relationships.²⁸⁻³² This heterogeneity of class II malocclusion probably adds some variability to the results. Recent findings suggest that class II malocclusion is related to a narrow maxilla. This narrow maxilla was observed even in children younger than 6 years of age.³³ To achieve a permanent skeletal correction of the malocclusion and prevention of the protrusive growth, the widening of this narrow maxilla seems to be essential.¹⁹ In a previous study³⁴ this widening was achieved by using headgear alone without any other appliances, when the headgear was used with a widened inner bow as suggested by Ricketts et al.²² The claimed side-effects of the treatment were distal tipping and extrusion of the first molars in excess of normal eruption, may be avoided by using a face bow with a long and rigid outer bow that has been bent upward.^{21,35,36,38}

CASE REPORT

A 10-year-old boy present with the chief complains of forwardly placed teeth. On clinical examination it was found that he had convex profile (Fig. 1) having potentially competent lip with Angle's class II division 1 malocclusion with proclined and protruded upper and lower incisors (Figs 2 to 5). Having skeletal class II pattern due to prognathic and macrognathic maxilla with average growth pattern (Fig. 6). It was decided to treat the patient by two phase therapy in the first phase it was decided to restrict the maxillary growth this would help in correction of class II skeletal pattern, class II molar relation, class II canine



Fig. 1: Pretreatment extraoral photographs



Fig. 2: Pretreatment left lateral



Fig. 5: Pretreatment intraoral photograph (left lateral)



Fig. 3: Pretreatment right lateral



Fig. 6: Pretreatment lateral cephalogram



Fig. 4: Pretreatment intraoral photograph (right lateral)

relation and convex profile. After the correction of these objectives it was decided to correct protrusive upper and lower lip, protruded and proclined upper incisors in second phase with help of orthodontic fixed mechanotherapy.

Because the patient was in growing stage and approximately 65 to 85% of the growth was remaining (CVMI-2) with class II skeletal pattern and average grower it was decided to use orthopedic force by the use of face bow and combination headgear (Fig. 7). For this purpose upper molar were banded and molar tubes were welded to it. A Kloehn-type cervical headgear with a large inner bow and long outer bow was used to treat the class II division 1 malocclusions. The 4 mm horizontal bayonets were bent to the inner bow to keep teeth out of contact with cheeks or lips. The inner bow was engaged so, that the distance between the bow and the anterior teeth was 3 mm. The ends of the inner bow were bent inward to prevent the rotation of the first molars mesiopalatally or to rotate the first molars into their correct position. To prevent distal tipping of the first molar crowns and extrusion of the first molars over the amount of the normal eruption, the long rigid outer bow was bent 30 degrees upward. To prevent buccal and distal tipping of the first molar crowns, the molar tubes were placed as close to the gingival margin and the rotation center of



Fig. 7: Patient wearing combination pull headgear



Fig. 8: Posttreatment lateral cephalogram

the first molars as possible.³⁷ In the attachment of the headgear to teeth, double tubes were used, and the upper and outermost tube was used for the attachment. A force of 500 gm per side was used for cervical traction. The force was measured with a force gauge (dontrics).

The expansion of the inner bow and the amount of force used were controlled at 6 to 8 weeks intervals. The patients were asked to wear the headgear 12 to 14 hours a day, in the evenings and at nights, and to keep a daily diary of his headgear wear. The treatment was finished when correction of the class II molar relationship to the class I molar relationship was achieved regardless of the amount of possible horizontal overjet (Figs 8 to 13). These changes also corresponds to the change in cephalometric variables as shown by Table 1.

After the treatment of 1 and a half year molars are in class I relationship was achieved with reduction in convex profile and end on canine relationship. Now, the patient shall be treated in second phase therapy, i.e orthodontic treatment.



Fig. 9: Posttreatment left lateral



Fig. 10: Posttreatment right lateral

Table 1: Cephalometric analysis		
Variable	Pretreatment	Posttreatment
SNA	85°	81°
SNB	78°	78°
ANB	7°	3°
Wits appraisal	+ 7 mm	+ 3 mm
N Pt A	+ 2 mm	- 4 mm
N Pog	- 9 mm	- 11 mm
Go Gn to SN	31°	33°
Y-axis	59°	62°
Facial axis	89°	90°
Face height ratio (Jaraback ratio)	64.34%	64.16%
Upper incisor to NA (mm)	8 mm	8 mm
Upper incisor to NA (degree)	28°	29°
Lower incisor to NB (mm)	8 mm	8 mm
Lower incisor to NB (degree)	30°	30°
Lower incisor to mandibular plane angle	99°	100°
Interincisal angle	114°	115°
Upper molar to Ptv	15 mm	16 mm

DISCUSSION

In the present case, it has been shown that class II malocclusions with a protrusive maxilla may be corrected to class I molar relationships by using orthopedic cervical



Fig. 11: Posttreatment extraoral photograph



Fig. 12: Posttreatment intraoral photograph (right lateral)



Fig. 13: Posttreatment intraoral photograph (left lateral)

headgear as the only appliance, provided that an expanded inner bow and upward-bent long outer bow are used. Concurrent to the correction of the malocclusion, both the maxillary and mandibular dental arches were significantly widened.³⁴ The cephalometric analysis (Table 1) suggest

that the observed improvement of the occlusion was achieved by inhibiting the forward growth of the maxilla, and by anterior and downward rotation of the palate. The forward growth of the mandible followed the normal growth pattern and was not significantly affected by the treatment. During treatment, the mandible rotated upward and forward following the normal growth pattern.^{39,40} This result is consistent with the observation by Cook et al.⁴¹

Hence, it can be suggested that the expansion of the maxillary dental arch enabled normal mandibular growth. Therefore, the expansion of the inner bow of the headgear is an essential part of the method.

CONCLUSION

Class II division 1 malocclusions with a protrusive maxilla were corrected to class I molar relationships using orthopedic cervical headgear as the only treatment appliance. The headgear was used with an expanded inner bow and a long outer bow bent upward. During the treatment period, the mandible grew forward according to the normal growth pattern. This normal mandible growth is likely to be achieved by widening the maxilla with the expanded inner bow.⁴² This suggests that orthopedic cervical headgear used with a long upward bent outer bow and a widened inner bow is a suitable method to treat the class II division 1 malocclusions.

REFERENCES

1. Kloehn SJ. Guiding alveolar growth and eruption of teeth to reduce treatment time and produce a more balanced denture and face. *Am J Orthod* 1947;17:10-33.
2. Bowden DE. Theoretical considerations of headgear therapy: A literature review. *Br J Orthod* 1978;5:145-52.
3. Bowden DE. Theoretical considerations of headgear therapy: A literature review, Clinical response and usage. *Br J Orthod* 1978;5:173-81.
4. Tulloch JF, Medland W, Tuncay OC. Methods used to evaluate growth modification in class II malocclusion. *Am J Orthod Dentofacial Orthop* 1990;98:340-47.
5. Tuncay OC, Tulloch JF. Apparatus criticus: Methods used to evaluate growth modification in class II malocclusion. *Am J Orthod Dentofacial Orthop* 1992;102:531-36.
6. Hubbard GW, Nanda RS, Currier GF. A cephalometric evaluation of nonextraction cervical headgear treatment in class II malocclusions. *Angle Orthod* 1994;64:359-70.
7. Tulloch JF, Phillips C, Koch G, Proffit WR. The effect of early intervention on skeletal pattern in class II malocclusion: A randomized clinical trial. *Am J Orthod Dentofacial Orthop* 1997; 111:391-400.
8. Tulloch JF, Proffit WR, Phillips C. Influences on the outcome of early treatment for class II malocclusion. *Am J Orthod Dentofacial Orthop* 1997;111:533-42.
9. Tulloch JF, Phillips C, Proffit WR. Benefit of early class II treatment: Progress report of a two-phase randomized clinical trial. *Am J Orthod Dentofacial Orthop* 1998;113:62-72.

10. Firouz M, Zernik J, Nanda R. Dental and orthopedic effects of high-pull headgear in treatment of class II, division 1 malocclusion. *Am J Orthod Dentofacial Orthop* 1992;102:197-205.
11. Reitan K. Biomechanical principles and reactions. In: Graber TM, Swain BF (Eds). *Current orthodontic concepts and techniques*. vol 1. Philadelphia, Penn: WB Saunders 1975:111-228.
12. Graber TM. Dentofacial orthopedics. In: Graber TM (Ed). *Current Orthodontic Concepts and Techniques*. Philadelphia, Penn: WB Saunders; 1969;2:919-988.
13. Klein PL. An evaluation of cervical traction on the maxilla and the upper first permanent molar. *Angle Orthod* 1957;27:61-68.
14. Moore AW. Orthodontic treatment factors in class II malocclusion. *Am J Orthod* 1959;45:323-52.
15. Poulton DR. Changes in class II malocclusions with and without occipital headgear therapy. *Angle Orthod* 1959;29:234-50.
16. Ricketts RM. The influence of orthodontic treatment on facial growth and development. *Angle Orthod* 1960;30:103-33.
17. Wieslander L. The effect of orthodontic treatment on the concurrent development of the craniofacial complex. *Am J Orthod* 1963;49:15-27.
18. Sandusky WC. Cephalometric evaluation of the effects of the Kloehn type of cervical traction used as an auxiliary with the edgewise mechanism following Tweed's principles for correction of class II, division 1 malocclusion. *Am J Orthod* 1965;51:262-87.
19. Haas AJ. Palatal expansion: Just the beginning of dentofacial orthopedics. *Am J Orthod* 1970;57:219-55.
20. Armstrong MM. Controlling the magnitude, direction and duration of extraoral force. *Am J Orthod* 1971;59:217-43.
21. Bench RW, Gugino CF, Hilgers JJ. Bioprogressive therapy, part V. *J Clin Orthod* 1978;12:48-69.
22. Ricketts RM, Bench RW, Gugino CF, Hilgers JJ, Schulhof RJ. *Bioprogressive Therapy*. Denver, Col: Rocky Mountain Orthodontics 1979.
23. Ghafari J, Shofer FS, Jacobsson-Hunt U, Markowitz DL, Laster LL. Headgear versus function regulator in the early treatment of class II, division 1 malocclusion: A randomized clinical trial. *Am J Orthod Dentofacial Orthop* 1998;113:51-61.
24. Weiland FJ, Ingervall B, Bantleon HP, Droschl H. Initial effects of treatment of class II malocclusion with the Herren activator, activator-headgear combination and Jasper Jumper. *Am J Orthod Dentofacial Orthop* 1997;112:19-27.
25. O'Reilly MT, Nanda SK, Close J. Cervical and oblique headgear: A comparison of treatment effects. *Am J Orthod Dentofacial Orthop* 1993;103:504-09.
26. King GJ, Keeling SD, Hocevar RA, Wheeler TT. The timing of treatment for class II malocclusions in children: A literature review. *Angle Orthod* 1990;60:87-97.
27. Brown P. A cephalometric evaluation of high-pull molar headgear and face-bow neck strap therapy. *Am J Orthod* 1978;74:621-32.
28. Moyers RE, Riolo ML, Guire KE, Wainright RL, Bookstein FL. Differential diagnosis of class II malocclusions. *Am J Orthod* 1980;78:477-94.
29. McNamara JAJ. Components of class II malocclusion in children 8-10 years of age. *Angle Orthod* 1981;51:177-202.
30. Carter NE. Dentofacial changes in untreated class II division 1 subjects. *Br J Orthod* 1987;14:225-34.
31. Rosenblum RE. Class II malocclusion: Mandibular retrusion or maxillary protrusion? *Angle Orthod* 1995;65:49-62.
32. Bishara SE, Jakobsen JR, Vorhies B, Bayati P. Changes in dentofacial structures in untreated class II division 1 and normal subjects: A longitudinal study. *Angle Orthod* 1997;67:55-66.
33. Baccetti T, Franchi L, McNamara J, Tollaro I. Early dentofacial features of class II malocclusion: A longitudinal study from the deciduous through the mixed dentition. *Am J Orthod Dentofacial Orthop* 1997;111:502-09.
34. Kirjavainen M, Kirjavainen T, Haavikko K. Changes in dental arch dimensions by use of an orthopedic cervical headgear in class II correction. *Am J Orthod Dentofacial Orthop* 1997;111: 59-66.
35. Kuhn RJ. Control of anterior vertical dimension and proper selection of extraoral anchorage. *Angle Orthod* 1968;38:340-49.
36. Greenspan RA. Reference charts for controlled extraoral force application to maxillary molars. *Am J Orthod* 1970;58:486-91.
37. Worms FW, Isaacson RJ, Speidel TM. A concept and classification of centers of rotation and extraoral force systems. *Angle Orthod* 1973;43:384-401.
38. Mirja Kirjavainen, Turkka Kirjavainen Kirsti Hurmerinta, Kaarina Haavikko. Orthopedic cervical headgear with an expanded inner bow in class II correction. *Angle Orthod* 2000;70(4):317-25.
39. Björk A. Prediction of mandibular growth rotation. *Am J Orthod* 1969;55:585-99.
40. Skieller V, Björk A, Linde-Hansen T. Prediction of mandibular growth rotation evaluated from longitudinal implant sample. *Am J Orthod* 1984;86:359-70.
41. Cook AH, Sellke TA, BeGole EA. Control of the vertical dimension in class II correction using a cervical headgear and lower utility arch in growing patients: Part I. *Am J Orthod Dentofacial Orthop* 1994;106:376-88.
42. Björk A, Skieller V. Growth of the maxilla in three-dimensions as revealed radiographically by the implant method. *Br J Orthod* 1977;4:53-64.

ABOUT THE AUTHORS

Tanmay Sharma (Corresponding Author)

Senior Lecturer, Department of Orthodontics and Dentofacial Orthopedics, Mahatma Gandhi Dental College and Hospital Sitapura, Jaipur, Rajasthan, India, e-mail: drtanmaysharma@gmail.com

Santosh Kumar

Professor and Head, Department of Orthodontics and Dentofacial Orthopedics, Kothiwal Dental College and Research Center Moradabad, Uttar Pradesh, India

Zuber Ahamed Naqvi

Senior Lecturer, Department of Orthodontics and Dentofacial Orthopedics, Mahatma Gandhi Dental College and Hospital, Jaipur Rajasthan, India

Ridam Jain

Consultant Orthodontist, Private Practice, Jaipur, Rajasthan, India

Bhaskar Gupta

Senior Lecturer, Department of Orthodontics and Dentofacial Orthopedics, Mahatma Gandhi Dental College and Hospital, Jaipur Rajasthan, India

Manoj Sharma

Senior Lecturer, Department of Orthodontics and Dentofacial Orthopedics, Saraswati Dental College and Hospital, Lucknow Uttar Pradesh, India