

## CHARACTERISTICS OF SKELETAL CLASS III MALOCCLUSION AND ITS ASSOCIATED DENTO ALVEOLAR COMPENSATION

**Bushra Mehboob, Ghulam Rasool, Meyzgan Amin**

Department of Orthodontics, Khyber College of Dentistry, Peshawar, Pakistan

### ABSTRACT

**Objectives:** To determine the extent of contribution of the maxilla and mandible to the development of class III malocclusion and the associated dentoalveolar compensation in such patients.

**Materials and Methods:** Pretreatment cephalometric radiographs of 45 patients were obtained from the records of Department of Orthodontics, Khyber College of Dentistry, Peshawar. Different landmarks namely Sella, Nasion, point A, point B, ANS, PNS, Gonion and Menton were identified and four angular measurements were recorded.

**Results:** Out of 45 patients, 24 were male and 21 female. It was found that 60% of patients had a prognathic mandible, 31% had a retrognathic maxilla, while in 9% of patients both maxilla and mandible were at fault. The dentoalveolar compensation was 93% in maxillary arch and 40% in mandibular arch.

**Conclusion:** This study revealed that majority of class III patients suffered from mandibular protrusion and that maxillary incisors showed greater compensation as compared to mandibular incisors.

**Key Words:** Class III malocclusion, Dentoalveolar compensation, Mandibular prognathism.

### INTRODUCTION

Class III malocclusion is a significant problem that can be disturbing both socially and functionally. Many factors have been implicated in its etiology and a strong genetic background has been established in literature.<sup>1,2</sup> The prevalence of class III malocclusion varies according to ethnicity; it is high among Asians of the far east (12%) and low in Caucasians (1-4%).<sup>3-7</sup>

Class III malocclusion is a complex entity and analysis of the various components show that it can result from numerous contributions i.e. maxillary deficiency, mandibular excess or both.<sup>8</sup> Analysis of these various components can provide valuable insight into prevalence of class III malocclusion among various ethnic groups and can also help in better understanding of its etiology. Often in patients with such skeletal

discrepancy, dentoalveolar compensation is seen in which the alveolar processes and teeth try to achieve balance with changing jaw position or size thus resulting in normal incisor position despite changes in sagittal jaw relationship.<sup>9,10</sup> A better understanding of features and dental effects of class III malocclusion is thus necessary to establish as an additional base for effective treatment planning. The aim of this study was to assess individual characteristics of skeletal class III malocclusion and its associated dentoalveolar compensatory mechanisms in a sample of orthodontic patients visiting Khyber College of Dentistry Peshawar.

### MATERIALS AND METHODS

Pre-treatment lateral cephalometric radiographs of 45 patients were obtained from the Department of Orthodontics, Khyber College of Dentistry, Peshawar. The chronological ages of patients ranged from 12 to 32 years. The criteria for inclusion was an ANB angle of less than 0°. Cases of cleft palate and other cranio-facial syndromes were excluded from the study.

#### Correspondence:

**Dr. Bushra Mehboob**

Khyber College of Dentistry,

Peshawar, Pakistan

Cell: 0333-9299542

Email: bushesmmm@hotmail.com

Each cephalogram was traced by one investigator and rechecked for accuracy. The films were traced on x-ray viewer with proper illumination. Four angular measurements i.e. Sella Nasion to point A (SNA), Sella Nasion to point B (SNB), Lower incisor to mandibular plane (IMPA) and Upper incisor to palatal plane (UI-PP) angles were taken in this study. The Steiner's<sup>11</sup> standard value for SNA  $81^{\circ} \pm 2^{\circ}$  and SNB  $78^{\circ} \pm 2^{\circ}$  was used to assess the skeletal position of maxilla and mandible. Tweed's<sup>12</sup> standard value for IMPA and Reidel's<sup>13</sup> standard value for upper incisor to palatal plane angle were used for the analysis of dentoalveolar compensation.

**RESULTS**

Out of the total of 45 patients 24(53%) were females and 21(47%) were males. Patients with maxillary retrusion with, an SNA of less than  $81^{\circ}$ , were 31% while patients with mandibular prognathism, value of SNB more than  $78^{\circ}$ , comprised 60% of the sample. It was found that 9% of patients were combination cases with both the maxilla and the mandible at fault (Figure 1). As regards to dentoalveolar compensation, it was found that 93% of the patients had UI to Palatal plane angle of more than  $107^{\circ}$ . Among this group, 60% presented with mandibular prognathism, 30% suffered from maxillary retrusion while 10% had combination of maxillary and mandibular discrepancies. Similarly lower incisors were compensated in 40% of the patients with a value of IMPA less than  $90^{\circ}$ . This was seen in 61% of the patients with mandibular prognathism and 39% with maxillary retrusion (Table 1).

**DISCUSSION**

As a result of the recent advancements in cephalometry it is now an established fact that there can be a variety of features at fault for class III malocclusion. In this study 31% of patients had maxillary retrusion. Similar finding has been reported in the international literature.<sup>14-16</sup> Also 60% patients had mandibular prognathism while only 9% were combination cases. This is in contradiction with the study of Ellis and McNamara<sup>17</sup> where they found combination cases to be the most common problem among class III adults. The higher prevalence of mandibular protru-

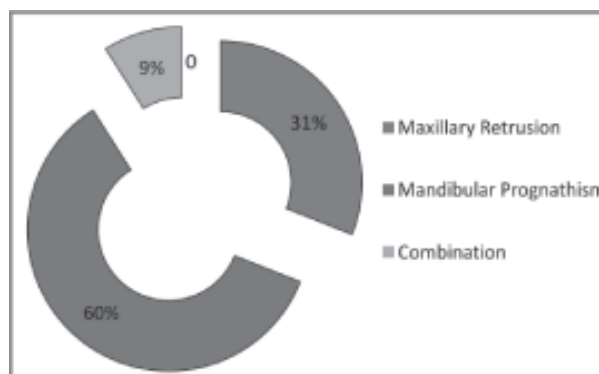


Fig. 1: Skeletal Characteristics

sion in the present study correlates with studies of Koodaryan et al,<sup>3</sup> Sanborn et al,<sup>18</sup> and Jacobson et al<sup>19</sup> but differs from the study of Dietrich.<sup>20</sup> No studies on features of class III malocclusion are available from Pakistan, however it has been postulated that some Asian ethnic groups show a tendency towards class III malocclusion<sup>21</sup> and a strong genetic background especially for mandibular prognathism has often been reported in literature.<sup>22</sup>

Dentoalveolar compensation was another component that was analyzed in this study. It is a known fact that incisal adaptation takes place with regard to growth changes in sagittal jaw relationships.<sup>23,24</sup> According to the results, 93% cases showed compensation in the upper arch while in 40% of the cases, lower incisors compensated by lingual tipping. This is a significant finding since it shows that maxillary incisors compensated themselves secondary to mandibular protrusion even when maxilla was normally positioned. Also both upper and lower incisors compensated themselves to a greater degree in response to mandibular prognathism. This shows that skeletal position of mandible plays an important role in incisor inclination. These results are comparable to the studies of Ishikawara et al,<sup>25</sup> Ceylan et al,<sup>26</sup> Spalj et al<sup>27</sup>, Staudt et al<sup>28</sup> and Soliman et al.<sup>29</sup> This high degree of compensation shows that in growing dentition, role of other functional influences especially of circum oral musculature with regards to nature's attempt to correct the underlying skeletal discrepancy cannot be disregarded.

Table 1: Associated Dentoalveolar Compensation in Skeletal Class III

S. No.	Dentoalveolar compensation	Total Percentage	Mandibular Prognathism	Maxillary Retrusion	Combination
1.	Upper incisors	93%	60%	30%	10%
2.	Lower incisors	40%	61%	39%	0

**CONCLUSION**

The most common feature of class III malocclusion was found to be a prognathic mandible with normally positioned maxilla. Also maxillary incisors compensated to the underlying skeletal problem to a far greater extent than mandibular incisors.

**RECOMMENDATIONS**

The study is the first of its kind in Khyber Pakhtunkhwa region of Pakistan. A more in depth research with a larger population size and specially keeping in view the genetic components of class III malocclusion is required for better identification and treatment planning of these patients.

**REFERENCES**

1. Bui C, King T, Proffit W, Bowers SF. Phenotypic characterization of class III patients, a necessary background for genetic analysis. *Angle Orthod* 2006; 76: 564-9.
2. Frazier-Bowers S, Rincon-Rodriguez R, Zhoul J, Alexander K, Lange E. Evidence of linkage in a Hispanic cohort with a class III dentofacial phenotype. *J Dent Res* 2009; 88(1): 55-60.
3. Koodaryan R, Rafiqi A, Hafezeqoran A. Components of adult class III malocclusion in an Iranian population. *J Dent Res Dent Clin Dent Prospect* 2009; 3(1): 20-3.
4. Helm S. Malocclusion in Danish with adolescent dentition: an epidemiologic study. *Am J Orthod* 1968; 54: 352-68.
5. Mills LF. Epidemiological studies of occlusion 4: The prevalence of malocclusion in population of 1,455 school children. *J Dent Res* 1966; 45: 132-40.
6. Baccetti T, Reyes BC, Mcnamara JA. Gender differences in class III malocclusion. *Angle Orthodontist* 2005; 75: 510-19.
7. Bukhary MT. Comparative cephalometric study of class III malocclusion in Saudi and Japanese adult females. *Journal of Oral Science* 2005; 47(2): 83-90.
8. Rakosi T, Schilli W. Class III anomalies: a coordinated approach to skeletal, dental, and soft tissue problems. *J Oral Surg*; 39: 860-65.
9. Ohnishi K. Relationships between apical base relation and incisal inclination in school children: a longitudinal study by lateral cephalometric roentgenograms. *Nippon Kyosei Shika Gakkai Zasshi* 1969; 28: 12-32.
10. Bibby RE. Incisor relationships in different skeleton facial patterns. *Angle Orthod* 1980; 50: 41-4.
11. Steiner CC. Cephalometrics for you and me. *Am J Orthod* 1959 ; 39: 729-55.

12. Tweed CH. The Frankfort mandibular incisor angle (FMIA) in orthodontic diagnosis, treatment planning and prognosis. *Angle ortho* 1954; 24: 121-69.
13. Reidel RA. An analysis of dentofacial relationships. *American Journal of Orthodontics* 1957; 43: 103-19.
14. Sanborn RT. Differences between the facial skeletal patterns of class III malocclusion and normal occlusion. *Angle orthodont* 1955; 25: 208-22.
15. Jacobson A. Mandibular prognathism. *Am J Ortho* 1974; 66: 140-71.
16. Guyer E, Ellis E, Mc namara JA, Behrents R. Components of class III malocclusion in juvenile and adolescents. *Angle Orthodontics* 1986; 56: 7-30.
17. Ellis E, McNamara JA. Components of adult class III malocclusion. *J Oral and Max Surg* 1984; 42: 295-305.
18. Sanborn RT. Differences between facial skeletal patterns of class III malocclusion and normal occlusion. *Angle Orthod Soc* 1970; 46: 131-43.
19. Jacobson A. Application of the “wits” appraisal. *Am J Orthod* 1976; 70: 179-89.
20. Dietrich UC. Morphological variability of skeletal class III relationships as revealed by cephalometric analysis. *Trans Europe Orthod Soc* 1970; 46: 131-43.
21. Singh G. Morphologic determinants in the etiology of class III malocclusions: A review. *Clinical Anatomy* 1999; 12: 382-405.
22. Gheriani AA, Maher BS, Gheriani AS, Sciote JJ, Abu Shahaba FA, Al azemi R etal. Segregation analysis of mandibular prognathism in Libya. *J Dent Res* 2003; 82(7): 523-7.
23. Bibby RE. Incisor relationship in different skeleton facial patterns. *Angle Orthod* 1980; 50: 41-4.
24. Ohnishi K. Relationships between apical base relation and incisal inclination in school children: a longitudinal study by lateral cephalometric roentgenograms. *J Jap Orthod Soc* 1969; 29: 12-32.
25. Ishikawara H, Nakamura S, Iwasaki H, Kitazawa S, Tsukada H, Sato Y. Dento alveolar compensation related to variations in sagittal jaw relationships. *The angle orthodontics* 1999; 69: 534-8.
26. Ceylan I, Yavuz I, Arslan F. The effects of overjet on dentoalveolar compensation. *Eur J Orthod* 2003; 25: 325-30.
27. Spalj S, Mestrovic S, Lapstervarga M, Slaj M. Skeletal components of class III malocclusion and compensation mechanisms. *J Oral Rehabil* 2008; 35: 629-37.
28. Staudt CB, Kilaridis S. Different skeletal types underlying class III malocclusion in random population. *Am J Orthod Dentofacial Orthop* 2009; 136: 715-21.
29. Soliman NL, El- Balran MM, Abou-zaeid AW, Sarry El-din AM, Zaki ME. The relationship between over jet size and dentoalveolar compensation. *Indian J Dent Res* 2009; 20: 201-5.