

Skeletal patterns underlying class III malocclusion

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Abstract

Introduction: The Skeletal Class III malocclusion is characterized by mandibular prognathism, maxillary deficiency or both. The aim of this study was to find out different skeletal pattern of class III malocclusion in patients seeking orthodontic treatment at Khyber College of Dentistry.

Material and Methods: The study was carried out on patients presenting with skeletal class III relationship from January 2009 to January 2011. The patients were selected from the orthodontics files of the Department of Orthodontics, Khyber College of Dentistry.

Results: Out of the total patients, 83 patients were found to have skeletal class III. Seventy one (85.5 %) cases were diagnosed as true skeletal class III malocclusions. The skeletal discrepancy was highest in mandible 50.74 %, followed by combination of mandibular and maxillary disharmony 28.16 %, maxillary involvement alone as 19.12 %.

Conclusions: The different skeletal types would help in the evaluation of treatment effects in Class III malocclusion.

Keywords: Skeletal Class III; Skeletal discrepancy; mandibular prognathism; maxillary retrognathism; micrognathism

Introduction

Dentofacial skeletal anomalies generally occur as a result of a differential in growth of the upper facial skeleton to the lower facial skeleton, resulting in discrepancy of the normal relationship that exists between the upper and lower jaw.¹⁻³ Class III malocclusion is a subject of interest and concern to not only Orthodontist but also to oral and maxillofacial surgeon. Dental class III malocclusion has no significant skeletal discrepancy whereas skeletal class III malocclusion is associated with a wide variety of underlying skeletal and dental patterns.^{4,5}

The skeletal manifestation can be due to mandibular anterior positioning (prognathism) or growth excess (macrognathia), maxillary posterior

positioning (retrognathism) or growth insufficiency (micrognathia), or combination of mandibular and maxillary discrepancies.^{6,7} The prevalence of this type of malocclusion in white population is less than 5% but rises to as much as 12% in Chinese and Japanese populations.^{4,5,8,9}

Ellis & McNamara⁷ analyzed a sample of Class III adult individuals who were selected on the basis of molar relationship. Pure maxillary retrusion and pure mandibular prognathism were found in 19.5% and 19.2% of the subjects, respectively. Guyer et al.¹⁰ evaluated a sample of patients with Class III malocclusion, who were aged 5 to 15 years. The authors divided the subjects into 4 consecutive age groups and compared them with Class III malocclusion with serial Class I control subjects. Analysis of the skeletal component combinations showed that 25% of the class III subjects had pure maxillary skeletal retrusion whereas less than 20% had pure mandibular prognathism. From the above-mentioned argument it can be concluded that Class III malocclusion can exist with a number of combinations of skeletal and dentoalveolar components within the facial skeleton.

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The objectives of the present study is to find different skeletal pattern underlying skeletal class III malocclusion.

Material and Methods

The descriptive, crosssectional study carried was based on retrospective data collected from patients presenting with skeletal class III relationship from January 2009 to January 2011. The patients were selected from the orthodontics files of the Department of Orthodontics, Khyber College of Dentistry.

Inclusion criteria were:

Patients with true skeletal Class III malocclusion in whom functional treatment was not of benefits.

- Good quality pretreatment lateral cephalograms made on the same cephalostat (PlanmecaPromax, Finland) with a magnification factor of 0.9
- Class III relationship of the first molars, determined by clinical evaluation of each patient in centric relation to rule out functional Class III malocclusion

- Concave profile;
- Anoverjet of ≤ 0 mm

• No cleft palate or other craniofacial anomaly
The collected data was analyzed by SPSS10. Lateral cephalometry of the patients were studied for finding mandibular and maxillary relationships (ANB, Wits), positions (SNB, SNA), and relative sizes (GoPg and ANS-PNS related to SN) and LFH for each case.

Results

Out of the total patients, 83 patients were found to have skeletal class III. Seventy one, (85.5 %) cases were diagnosed as true skeletal class III malocclusions, patients (60.4%) were males and (39.6%) were females with male to female ratio of 1.5:1 (Figure (Fig) 1. Subjects' age ranged from 16–32, with a mean age of 21 years \pm 4.

Comparison of linear and angular measurement of Class III adults and norms

using independent sample t-test and U Mann-Whitney statistical test had significant values $P = .05$ for most of the results Table I.

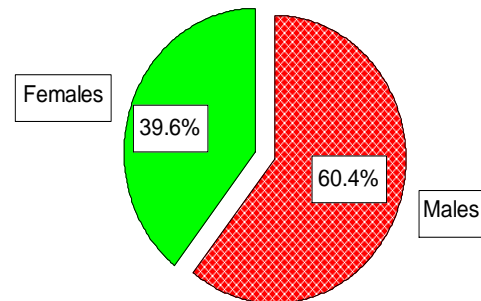


Figure I: Gender Distribution

Table I. Comparison of linear and angular measurement of Class III adults and norms using independent sample t-test and U Mann-Whitney statistical test

| Component | N = 71 | Z Value | Asymptotic significance (2-tailed) |
|-----------------------|--------|---------|------------------------------------|
| | | | |
| Cranial base | | | |
| S-Ar (dg) | 4.542 | -3.398 | 0.000 |
| N-S-Ar (dg) | 3.378 | -5.380 | 0.000 |
| N-S-Ba (dg) | 3.855 | -3.829 | 0.000 |
| N-S-Ba (dg) | 5.127 | -0.788 | 0.431 |
| SN-FH (dg) | 2.949 | -2.612 | 0.009 |
| Maxillary | 3.540 | -3.398 | 0.001 |
| SNA (dg) | 2.733 | 0.001 | 0.001 |
| Co-A (mm) | 5.952 | -5.025 | 0.000 |
| Mandibular | 6.150 | -4.820 | 0.000 |
| B-N perp (mm) | 5.948 | -5.253 | 0.000 |
| SNB (dg) | 3.350 | -5.731 | 0.000 |
| GoMe/FH (dg) | 5.936 | -4.243 | 0.000 |
| GoGn/SN (dg) | 5.626 | -4.216 | 0.000 |
| Co-Gn (mm) | 7.804 | -3.982 | 0.000 |
| Facial angle (dg) | 3.583 | -6.002 | 0.000 |
| Intermaxillary | 2.726 | -7.927 | 0.000 |
| PP/Go-Me (dg) | 5.923 | -4.778 | 0.000 |
| Dentoalveolar | 2.900 | -2.485 | 0.013 |
| U1/PP (dg) | 7.442 | -4.700 | 0.000 |
| U1/SN (dg) | 8.026 | -3.770 | 0.000 |
| L1/A Pog (mm) | 2.298 | -6.497 | 0.000 |
| L1/A Pog (dg) | 6.011 | -2.480 | 0.013 |
| IMPA (dg) | 8.022 | -8.186 | 0.000 |
| Overjet (mm) | 2.241 | -8.632 | 0.000 |
| U1/L1 (dg) | 10.622 | -4.275 | 0.000 |
| Facial height | 6.375 | -2.317 | 0.021 |
| LAFH/TAFH | 0.024 | -0.885 | 0.376 |

The skeletal discrepancy was mainly in 36 patients (50.74 %) due to mandibular

involvement, (mandibular prognathism and macrogenia was 30.74 % and 12 % respectively while 8.74 % had both). Maxilla alone was accounted for 15 patients (12 % patients retrognathism 9.12 % micrognathia) and there was a combination of mandibular and maxillary disharmony in 20(28.16%) patients.

Dental compensation was common, with proclined maxillary incisors in 26.1% and retroclined mandibular incisors in 28.3% (Table II).

Table II Frequency of skeletal involvement in Class III malocclusion.

| Skeletal Class III | Number of patients (n) | Percentages % |
|------------------------|------------------------|---------------|
| Mandibular Involvement | 36 | 50.74 |
| Maxillary involvement | 15 | 21.26 |
| Combination of both | 20 | 28.16 |
| Total | 71 | 100% |

Discussion

This study was done to find out the number of patients seeking orthodontic treatment for skeletal class III malocclusion. These subjects were important as their treatment also involves orthognathic surgery treatment planning. The mean age of the patients seeking treatment was same as previous studies in different parts of globe.^{4, 5, 6, 7}

A developing Class III malocclusion can exhibit maxillary skeletal retrusion, mandibular skeletal protrusion, or some combination of the two. In addition, an excessive or deficient vertical facial dimension is frequently displayed and will have an impact on the diagnostic and therapeutic decisions.⁹⁻¹²

The analysis of Skeletal Class III malocclusion in this study 85 % which is comparable to the study 75.4 %⁵ and 75.0 %⁸ but higher than 68.6 %⁷.

The international literature shows the high prevalence of mandibular skeletal protrusion among the patients with Class III malocclusion and corroborate that the mandible is strongest contributor to skeletal class III malocclusion (ranging from 42% to 50 %).^{5,7,8,13,14}

In our study skeletal discrepancy due to mandibular involvement was found to be in 50 % of the patients, which is in accordance with the results of Staudt⁵ Jacobson⁸ and Sanborn¹⁶ for adults but more than the results of studies in mixed dentition by Ellis et al,⁷ Borzabad¹³ and Dietrich.¹⁷

The reason attributed is that the growth which takes places in growing children and thus modify the facial features by development of skeletal class III combination of the mandibular and maxillary contribution is mentioned, in our study the both jaw contribution was noted as 28.6 %, which is greater than the studies done.^{5,13,14} This might be due to the geographic difference, genetic make up and the type of study undertaken. Maxillary involvement in our study was 21.12% which is consistent with previous studies.^{5,8,13,14}

The introduction of mandibular and maxillary relative sizes in our study improved the differentiation between the various skeletal types of class III malocclusion. Thus paving the way for specific diagnosis and treatment planning for each type.

In this context treatment timings should be considered, since mandibular and maxillary skeletal structures are modified at different times.¹⁵

Dental aberrations were represented by a significant protrusion and labial inclination of maxillary incisors whereas mandibular incisors showed lingual inclination. Dental compensation was common, with proclined maxillary incisors in 26.1% and retroclined mandibular incisors in 28.3% ,these findings are consistent with those reported by

Jacobson⁸ Ellis et al⁷Spalj¹¹ Borzabadi¹³ and Guyer et al.¹⁵

Conclusions

The different skeletal types would help in the evaluation of treatment effects in Class III malocclusion. This would further help to study the genetic studies and help in selection of proper type of orthognathic surgery.

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