Anterior Tooth Size Discrepancies among different classes of Malocclusion

REHAN HAMID¹, MUHAMMAD AZEEM², MARYAM HANIF³, ARFAN UL HAQ⁴, USMAN SHAKOOR⁵

ABSRACT

Aim: To find the correlation between anterior Bolton ratios and different classes of malocclusions.

Methods: The study was conducted at Department of Orthodontics, Faisalabad Medical University & de'Montmorency college of Dentistry, where total of 45 plaster models of three malocclusion groups were randomly selected, with 15 plaster models of each malocclusion group. Anterior Bolton ratios were measured on model and class of malocclusion was diagnosed on plaster model by Angle’s system of molar classification.

Results: Statistically significant correlation exists between anterior Bolton ratio and class III malocclusion group.

Conclusion: Anterior Bolton ratio discrepancies are more frequent in class III malocclusion group.

Keywords: Bolton ratio; Class III.

INTRODUCTION

Occlusion can be defined as relationship between upper and lower teeth while functions and parafunctions. Ideal occlusion can be labeled as hypothetical concept with perfect alignment and inter-arch relationships. Normal occlusion can be labeled as any deviation from ideal occlusion which is satisfactory aesthetically and functionally.

Normal occlusion can be judged by different parameters. As per Andrews there are six keys of occlusion. These six keys are: Correct inter-arch relationship with normal molar relationship, mesial crown angulation of all the teeth, correct labiolingual inclination of teeth, absence of torsiversion, absence of spaces between the teeth and flat occlusal plane. Later on, Bennet proposed the 7th key of normal occlusion which is known as correct teeth size or normal Bolton ratios.

According to Angle there are three classes of malocclusion named as, Class I, II and III malocclusion. Correct molar relationship as per Angle is one in which mesiobuccal cusp of upper first molar occludes with the buccal groove of lower first molar along with correct line of occlusion. Correct Bolton ratios are important for proper occlusal interdigitation, and normal overjet and overbite. Any discrepancy in Bolton ratios can result in spaces, crowding, and abnormal overjet and overbite.

Following this rationale, it can be expected that Bolton ratios are different in different malocclusion groups. This present study was aimed at finding the correlation between anterior Bolton ratios and different classes of malocclusions.

METHODOLOGY

The cross sectional study was conducted at the Department of Orthodontics, Faisalabad Medical University & de'Montmorency college of Dentistry, in which models of untreated 45 subjects were included. 15 models were of class I malocclusion, 15 of class II and 15 of class III malocclusion group. Duration of study was from March 2016 to January 2018.

Following patients were included: Fully erupted teeth till second molars, no transverse issue, no severe vertical dysplasia and good quality pre-treatment models. Any patient having prior history of orthodontic treatment, having tooth wear or any dental tooth pathology was excluded. Plaster casts were used to evaluate the anterior Bolton ratios using formulae:

\[
\text{Anterior Bolton Ratio (B')} = \frac{\text{Sum of mesiodistal width of mandibular 6 Anteriors \times 100}}{\text{Sum of mesiodistal width of mandibular 6 Anteriors}} \times 100
\]

Ten models were randomly reassessed 1 week later to determine the reliability and method of error by Dahlberg formula, the method error was found to be 2.9% and data was found out to be reliable.

Statistical analysis: The means, standard deviations, and range of anterior Bolton ratios were calculated for both the genders in three malocclusion groups, if no gender difference was found, the anterior Bolton ratios of both the genders were
combined for each malocclusion group. The mean ratios were compared in three malocclusion groups using ANOVA test. The data was analyzed using SPSS 19.0.

RESULTS
Age distribution is shown in Table I and II. No statistically significant sex difference was found between the anterior Bolton ratios in the 3 malocclusion groups. Thus the mean anterior ratios were combined for both the genders. In the anterior Bolton ratio, a statistically significant difference was found between the Bolton standard and the Class III malocclusion group (Table III).

Table I: Age distribution (N=45)

<table>
<thead>
<tr>
<th>Age (years)</th>
<th>n</th>
<th>Mean</th>
<th>SD</th>
<th>Minimum</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>18.11</td>
<td>45</td>
<td>3.45</td>
<td>14</td>
<td>24</td>
<td></td>
</tr>
</tbody>
</table>

Table II: Descriptive stats for age (N=45)

<table>
<thead>
<tr>
<th>Class I (n=15)</th>
<th>Class II (n=15)</th>
<th>Class III (n=15)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>18.23</td>
<td>18.12</td>
</tr>
<tr>
<td>SD</td>
<td>3.89</td>
<td>3.59</td>
</tr>
</tbody>
</table>

Table III: Comparison of anterior Bolton ratios in 3 malocclusion groups and Bolton standards (P values)

<table>
<thead>
<tr>
<th>Bolton standards</th>
<th>Class I</th>
<th>Class II</th>
<th>Class III</th>
</tr>
</thead>
<tbody>
<tr>
<td>Class I</td>
<td>0.371</td>
<td>0.578</td>
<td>0.078</td>
</tr>
<tr>
<td>Class II</td>
<td>0.171</td>
<td>0.198</td>
<td></td>
</tr>
<tr>
<td>Class III</td>
<td>0.004</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

DISCUSSION
This present study was aimed at finding the correlation between anterior Bolton ratios and different classes of malocclusions. Results showed that in the anterior Bolton ratio, a statistically significant difference was found between the Bolton standard and the Class III malocclusion group.

No statistically significant sex difference was found between the anterior Bolton ratios in the 3 malocclusion groups. This is in agreement with the findings of studies by Araujo, Nie, Alkofide, Richardson and Al-Tamim. Findings of our study are in contrast with the findings of studies by Smith et al and Lavelle et al where gender differences were found.

A statistically significant difference was found between the Bolton standard and the Class III malocclusion group. This is in agreement with the studies by Araujo, Nie, and Alkofide. Findings of our study are in contrast with the findings of studies by Crosby and Usyal where no malocclusion differences were found.

Inclusion criteria of present study, we selected patients in age range of 12-14 years which is in accordance with the study by TA et al. We selected patients in age range of 12-14 years in order to minimize the influence of tooth wear, caries or restorations on Bolton ratios.

There are many techniques to calculate the anterior Bolton ratios such as, eye balling method in which size of upper lateral incisors and upper second premolars are checked visually, three dimensional methods and Vernier calipers. We utilized vernier caliper method in present study which is in accordance with evidence.

Clinical implication of present study is that Bolton issues are more frequent in class III malocclusion thus require special measures to counter that while treatment planning of any class III case. Limitations of current study are its small sample size and cross sectional approach. Further large scale studies are suggested.

CONCLUSION
- It was concluded that Bolton ratios and vertical facial types are not correlated.
- Further large scale studies are suggested to establish strong correlation between Bolton ratios and vertical facial types.

REFERENCES


