ASSESSMENT OF MORPHOLOGICAL VARIATION OF MANDIBULAR ARCH IN SUBJECTS WITH DIFFERENT TYPE OF MALOCCLUSION

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ABSTRACT

Background: The identification of a suitable arch form can be achieved and used in the treatment of each case. The configuration of the bony ridge that forms the curving shape defines the dental arch form. The present study was conducted to assess morphological variation of mandibular arch in subjects with different type of malocclusion.

Materials & Methods: 104 subjects with malocclusion of both genders were included. Oral examination and impression of arches was obtained using alginate material and dental stone was poured to fabricate a model cast (positive replica). Arch form was determined in all subjects.

Results: Out of 104 females, males were 40 and females were 64. In class I, mean canine width was 32.4 mm, in class II was 30.6 mm and in class III was 34.8 mm, canine depth found to be 4.3 mm, 5.2 mm and 3.6 mm in class I, II and III respectively, W/D ratio was 7.12 mm in class I, 5.40 mm in class II and 9.12 mm in class III. The most common arch form in class I was tapered seen in 52%, in class II was ovoid seen in 43% and in class III was square seen in 53%.

Conclusion: Most common arch form in class I was tapered, in class II was ovoid and in class III was square.

Key words: Dental arch, Malocclusion, Model cast, Morphological variations

I. INTRODUCTION

The identification of a suitable arch form can be achieved and used in the treatment of each case. The configuration of the bony ridge that forms the curving shape defines the dental arch form.¹ Different methods have been developed to describe the dental arch morphology ranging from simple classification of arch shape, through combinations of linear dimensions, to complex mathematical equations. In 1932, Chuck classified the arch forms as tapered, ovoid and square for the first time. In addition, Paranhos et al expressed these arch forms as narrow, normal and wide.²

The maxillary and mandibular dental arches are key components of the masticatory complex. Therefore, adequate spatial alignment of the dental arches is vital for proper function in mastication, verbalization, and respiration.³ Given the importance of the masticatory complex throughout the life span of an individual, discrepancies in maxillary/mandibular dental arch relationships, collectively referred to as malocclusion, are of great interest both biologically and clinically. A large body of literature on malocclusion, dating back to Angle’s 1899 original description of Class I, II, and III malocclusion, has served as a baseline for studying and understanding the wide range of variation seen within the dental arches.⁴

Angle’s classes of malocclusion are of high variability in the shape and size of arch form. In addition, the width, length and depth of dental arches have had considerable implications in modern orthodontic diagnosis and
treatment planning so as to achieve early diagnosis of oral disease and aids in the prevention of its occurrence. Several researchers studied the mandibular arch, while some others studied the maxillary arch, however, many others studied both arches. This study was conducted to assess morphological variation of mandibular arch in subjects with different type of malocclusion.

II. MATERIALS & METHODS

The present study comprised of 104 subjects with malocclusion of both genders. All were informed regarding the study and their written consent was obtained.

Information such as name, age, gender etc. was recorded. Oral examination and was performed and impression of arches was obtained using alginate material and dental stone was poured to fabricate a model cast (positive replica). The cast was then marked with two reference points at the canine tips, these points were used to perform to measure the inter-canine width and to determine the Canine depth (CD) linear distance measurement. Measurements were performed using an electronic digital caliper. The arch form was assessed according to Park et al. method in accordance to the values obtained from the measurements. When this canine width: depth ratio is less than 6, it can be assumed that the arch form is tapered. If the depth is between 6 and 8, then the arch form can be considered as ovoid, however, if the depth is more than 8, the arch form can be considered as square. After the arch form was determined, it was then related to the occlusal pattern. Results thus obtained were subjected to statistical analysis. P value less than 0.05 was considered significant.

III. RESULTS

Table I shows that out of 104 females, males were 40 and females were 64.

Table II Canine width and depth measurements in different malocclusion

<table>
<thead>
<tr>
<th>Class</th>
<th>Canine width</th>
<th>Canine depth</th>
<th>W/D ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Class I</td>
<td>32.4</td>
<td>4.3</td>
<td>7.12</td>
</tr>
<tr>
<td>Class II</td>
<td>30.6</td>
<td>5.2</td>
<td>5.40</td>
</tr>
<tr>
<td>Class III</td>
<td>34.8</td>
<td>3.6</td>
<td>9.12</td>
</tr>
<tr>
<td>P value</td>
<td>0.05</td>
<td>0.02</td>
<td>0.001</td>
</tr>
</tbody>
</table>

Table II, graph I shows that in class I, mean canine width was 32.4 mm, in class II was 30.6 mm and in class III was 34.8 mm, canine depth found to be 4.3 mm, 5.2 mm and 3.6 mm in class I, II and III respectively, W/D ratio was 7.12 mm in class I, 5.40 mm in class II and 9.12 mm in class III. The difference was significant (P< 0.05).

Graph I Canine width and depth measurements in different malocclusion
Table III Arch form according to Angle’s classification

<table>
<thead>
<tr>
<th>Form</th>
<th>Class I</th>
<th>Class II</th>
<th>Class III</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tapered</td>
<td>52%</td>
<td>37%</td>
<td>8%</td>
</tr>
<tr>
<td>Ovoid</td>
<td>40%</td>
<td>43%</td>
<td>39%</td>
</tr>
<tr>
<td>Square</td>
<td>8%</td>
<td>20%</td>
<td>53%</td>
</tr>
<tr>
<td>P value</td>
<td>0.01</td>
<td>0.02</td>
<td>0.04</td>
</tr>
</tbody>
</table>

Table III, graph II shows that most common arch form in class I was tapered seen in 52%, in class II was ovoid seen in 43% and in class III was square seen in 53%. The difference was significant (P< 0.05).

Graph II Arch form according to Angle’s classification

IV. DISCUSSION

The study of relationships between the shape of maxillary and mandibular arches, in cases of moderate or severe malocclusion, also serves as an important venue for research on morphological integration. Definitions of
morphological integration are varied across the literature, but all revolve around a central theme: morphological integration is a measure of interaction between two or more components within a system.6

There is a large degree of variation in the expression of morphological integration in the maxillae and mandibles of different primate groups, indicating different evolutionary trajectories in the formation of the masticatory complex.7 The present study was conducted to assess morphological variation of mandibular arch in subjects with different type of malocclusion.

In present study, out of 104 females, males were 40 and females were 64. Al- Shammout et al8 found that canine width and depth linear measurements were performed on 93 study models to determine the arch form. Canine width to depth ratios were calculated and compare with occlusal patterns and between genders. The most common class was Class I (54.8%), more females (p< 0.05).

We found that in class I, mean canine width was 32.4 mm, in class II was 30.6 mm and in class III was 34.8 mm, canine depth found to be 4.3 mm, 5.2 mm and 3.6 mm in class I, II and III respectively, W/D ratio was 7.12 mm in class I, 5.40 mm in class II and 9.12 mm in class III. Miller et al9 found that a significant differences were identified between Class II forms (increased projection of upper arch relative to the lower arch) and Class III forms (lower arch projection beyond the upper arch) in symmetrical shape variation, including anteroposterior arch discrepancies and abnormal anterior arch divergence or convergence. Partial least squares analysis demonstrated that Class III dental arches have higher levels of covariance between upper and lower arches (RV=0.91) compared to the dental arches of Class II (RV=0.78) and Class I (RV=0.73). These high levels of covariance, however, are on the lower end of the overall range of possible masticatory blocks, indicating weaker than expected levels of integration.

The importance of this study is that determination of arch form in relation to the different occlusal pattern is a prerequest to orthodontic treatment in order to obtain the best outcome. As far as esthetic is concerned, tapered arch form presents a better smile arc than a square arch form which provides a flatter smile arc that is not esthetically pleasing.10 Space availability and stability of dentition are the factors of particular significance especially in a tapered arch group as the inter-canine width is the narrowest comparing the ovoid and square variety. Any arch expansion of the tapered arch group is adversely affecting the proper alignment of the lower labial segment since this region is constrained by circumoral musculature.11

V. CONCLUSION

Authors found that most common arch form in Class I malocclusion was tapered, in Class II malocclusion was ovoid and in Class III malocclusion was square.

REFERENCES