Shape of the Upper Alveolar Arch in Albanian Subjects

SUMMARY

Classification of dental and alveolar arches is a question widely discussed and a lot of ways have been presented to describe various types of them. It is considered to be a catenary curve, a parabolic curve, an elliptical curve, or a hyperbolic curve. Mathematical functions to accurately describe the dental arch form are proposed, but they can not be easily used. So a standard method to qualitatively analyze the shape of dental arch is lacking. The present study is done in 150 Albanian adult subjects that have done a magnetic resonance imaging of a head. The slices of maxillary alveolar arch with complete alveolar sockets were selected, and its form was classified as elliptic, round, U-shape or V-shape (based on Thompson’s classification).

In 74.7% of cases the upper alveolar shape was considered to be elliptic, in 3.3% to be round, in 14.7% to be U-shape and in 7.3% to be V-shape. The results showed no significant differences between males and females. To the authors knowledge this is the first published study related to Albanian subjects and further investigations concerning arch size data, are needed.

Keywords: Dental Arch, shape; Alveolar Arch, shape

Introduction

Previous studies related to the upper and lower dental arches usually evaluated their size and shape. Discussions of the methods to describe the shape are of great diversity in literature. About a century ago, Hawley considered the dental arch shape to be triangle-like, with the base between 2 mandibular condyles and, in its anterior part, as an arc of a circle that consists of 6 anterior teeth. Later on, Mc Connail and Scher compared the dental arch shape to a catenary curve, which means that it resembles to a catenary chain of constant length, but variable in the distance between its points of suspension. Other studies has considered the shape to be as one of these curves: an elliptic curve, or a parabolic curve, or a hyperbolic curve, or as mixed curves. Also, other dental arch forms are described by Thompson (cited by Nakatsuka and Kumabe): square, round-square, round, and round V-shaped forms.

Recently, under computer applications, the shape has been subjected to sophisticated statistical analyses and mathematical equations.

The aim of the present study is to specify the shape of the upper alveolar arch in a series of normal Albanian adult subjects.

Material and Methods

The study was based on images taken from magnetic resonance imaging examinations of the head of 150 Albanian adult subjects (80 males and 70 females). The examinations were done in the University Hospital Centre “Mother Theresa” in Tirana, Albania during the period September 2008 - January 2009.

The cases with results of examination, related to orofacial diseases or abnormalities were excluded from
the study. The T1-weighted slices of maxillary alveolar arch, with clearly visible alveolar sockets, were selected. The shape of the arch form was classified based on Thompson’s classification, as elliptic shape, round shape, U-shape and V-shape (Fig. 1). Two experienced specialists of the field (R.Q. and N.L.), independently, made the classification of alveolar arches; in all cases the decision was a result of the consensus.

### Results

According to sex, the elliptic shape was found slightly more frequently in males than in females (Tab. 1; the round shape was found in males in 3 cases or 3.75% and in females in 2 cases or 2.86%. Similarly, the U-shape was found in males in 15% and in females in 14.29%. However, the V shape was found in males in 6.25% and in females in 8.57%. No statistically significant differences were seen between males and females regardless the shape.

From the total of 150 cases, 112 cases or 74.67% were considered to have an elliptic shape, 5 cases or 3.33% were considered to have a round shape, 22 cases or 14.67% were considered to have a U shape, and 11 cases or 7.33% to have a V-shape (Tab. 1).

### Discussion

The shapes of alveolar and dental arches are determined by interplay between genetic factors and many different external environmental factors. It is accepted that the primary factors involved in the determination of final tooth position are resting pressures of the lips, cheeks and tongue. The classification of dental (and alveolar) arches is a question widely discussed in literature. Many attempts done, and many classifications proposed, which means that a unique classification, accepted from all, does not

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### Table 1. The results of the alveolar arch shape according to sex

<table>
<thead>
<tr>
<th>Patients</th>
<th>Elliptic shape</th>
<th>Round shape</th>
<th>U-shape</th>
<th>V-shape</th>
</tr>
</thead>
<tbody>
<tr>
<td>Males</td>
<td>60 (75.00%)</td>
<td>3 (3.75%)</td>
<td>12 (15.00%)</td>
<td>5 (6.25%)</td>
</tr>
<tr>
<td>Females</td>
<td>52 (74.29%)</td>
<td>2 (2.86%)</td>
<td>10 (14.29%)</td>
<td>6 (8.57%)</td>
</tr>
<tr>
<td>Total</td>
<td>112 (74.67%)</td>
<td>5 (3.33%)</td>
<td>22 (14.67%)</td>
<td>11 (7.33%)</td>
</tr>
</tbody>
</table>
exist. So, the final result is that there is lack of a standard and time effective method to qualitatively analyze the shape of dental arch till now. Having so much “noise in the image” of dental (and alveolar) arch shape, the authors agree that metrical and mathematical definitions are interesting, but not always very easy to be used, because an arch that fitted a precise pattern is to be regarded as an exception rather than a rule. Following this statement, it is said that no generalized universal arch shape seems to be applicable to the individual and that algebraic and geometric formulae provide symmetry which does not account for individual variations. The analysis and comparison of some mathematical functions to describe the dental arch shape, proposed in literature, have shown that even if any of them (the fourth-order polynomial function) can be used to predict an individualized ideal arch, when defining the dental arch mathematically, the more the error was reduced, the more irregular were the curvatures that were produced.

The present study is based on Thompson’s classification of dental arch shape; this is a simple and useful one, applied exactly or modified from some other authors: Izard, Nakatsuka, Kadanoff cited by Lang, Nojima etc.

The most found shape of the upper alveolar arch in the present study was the elliptic one in 74.7% of the cases; other authors have also found this shape to be the most common (Izard in 75%, Nakatsuka in 58.1%, and Kadanoff in 50.6%). The second type of shape in range was the U-shape found in 14.7% of cases in the present study (Izard has found it in 5%, Nakatsuka in 21%, and Kadanoff in 4%). The V-shape was found in 7.3% of cases in the present study, while Nakatsuka has found it in 16.1%. The less common shape was the round one, found in 3.3%, while Nakatsuka has found it in 4.8%. Nojima classified the dental arch shape into square, ovoid, and tapered arch forms, and in Caucasians and Japanese persons with class I, II, and III malocclusions found that more than 80% of the Caucasian had ovoid and tapered arch forms and more than 80% of the Japanese had ovoid and square arch forms, resulting in the predomination of ovoid (elliptic) forms.

The present study didn’t show any sexual dimorphism; this is a conclusion of other studies, too.

Conclusion

There are proposed some methods to evaluate the shape of the upper alveolar and dental arch shape. Based in a simple classification, the most common shape in Albanians was the elliptic one, followed by U-shape, V-shape and round shape.

References


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