DETERMINATION OF LOWER FACIAL HEIGHT THROUGH MANDIBULAR MORPHOLOGY USING LATERAL CEPHALOMETERY

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ABSTRACT

The objective of the present study was to correlate the mandible morphology and lower facial height in occlusion through lateral cephalographs. Moreover the cephalometric measurements can be used as records for future complete dentures fabrication. It is a descriptive study and was carried out at the Prosthodontic Department of Lahore Medical and Dental College, Lahore from July 2011 to January 2012.

A total of 120 completely edentulous patients of both genders were selected and the age ranged 35 years and above. Demographic data and informed consent of all the patients were taken. The patients with the facial asymmetry, acquired and congenital orofacial deformity were excluded from the study. All those patients not willing to undergo radiography were also not included. The cephalographs of each patient was carried out after the insertion of the complete dentures. The Rickets cephalometric analysis was used to analyze the mandibular shape by (gonial angle) and the mandibular arch. The lower facial height in occlusion was measured by three angles (superior, median, inferior).

The results of the present study showed that there is a positive and a strong correlation between mandibular gonial angle with all the three angles determining the lower facial height. Furthermore the median and inferior angles were found to be having significant correlation with the mandibular arch angle. The regressions for gonial angle (Gonial=103.527+0.466(inferior) and for mandibular arch angle (arch =30.519-0.271(superior) +0.227(inferior) were statistically significant.

It was concluded that the mandibular morphology can be used to evaluate the lower facial height in occlusion in the Pakistani population and is complementary to the routinely used methods for the complete denture fabrication.

Key Words: Lower facial height, Cephalometery, Edentulism, Facial proportions.

INTRODUCTION

The lower facial height is defined as “the distance measured between two points when the occluding members are in contact.” Another more precise definition is “the distance measured between any 2 points in maxilla and mandible when the teeth are in maximum intercuspation.” The occlusal vertical records are important whenever fabricating a complete denture. The errors in establishing vertical jaw relations result in uncomfortable dentures that are damaging to the stomatognathic system. Many methods are available in the dental literature to determine vertical relation. These methods are soft tissue references that show age related variations. However the cephalometric method is based on the bony reference points that are stable and reproducible. This method can serve as diagnostic aid. The osseous morphology “the mandibular shape” could help in the Prosthodontic treatment as it is independent of this position. The objective of the present study is to correlate the mandibular morphology with the lower facial height in edentulous subjects.

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Received for Publication: June 21, 2013
Revision Accepted: July 5, 2013
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METHODOLOGY

A total of 120 edentulous patients seeking complete denture treatment were selected from the Outdoor Prosthodontics Department of Lahore Medical and Dental College, Lahore. 60 male and 60 female patients were included. The age range was 35 years and above. The demographic data and informed consent of all the patients were taken. The subjects with any facial asymmetry, congenital and acquired orofacial deformity and patients not willing to undergo radiography were excluded. Complete dentures were fabricated for all the patients using a semi-adjustable articulator. Mandibular and maxillary acrylic trays formed from secondary impression were used and the final impressions were made with zinc oxide eugenol.

The wax rims were added and the maxillomandibular relationship records were taken to determine the rest position of the mandible. The distance between two arbitrarily points were selected, one on the nose and one on the chin, with the patient seated in an upright position looking directly forward and the head unsupported, after swallowing. Then every patient was instructed to close the mouth until the lips first touch and the distance between the two points was measured.¹⁰

The occlusal lower facial height was established by subtracting three to four mm from the rest vertical position. The centric relation was recorded and the denture bases were mounted on the semi-adjustable articulator. After trial the dentures were processed with heat cure acrylic resin. After the insertion of the complete dentures the lateral cephalograph was taken.

The cephalogram manufactured by Villa (Italy) model number MRO5 with standardized ear plugs, nose clamp and chin support was used to carry out lateral cephalography. The Rickets cephalometric analysis was to analyze the mandibular arch angle and the mandibular shape by gonial angle) Fig: 4, 5. The lower facial height in occlusion was measured by three angles (superior, inferior median) Fig: 1, 2, and 3.

Fig 1: Superior angle (OVD sup): measured from the condylar point to ANS and to the chin point.

Fig 2: Inferior angle (OVD inf): measured from the Gonion to ANS and to the chin point.

Fig 3: Median angle (OVD med): measured from the Xi point to ANS and to the pm point.
RESULTS

The statistical analysis was obtained with the descriptive analysis (mean, sd) Tab 1.

Correlations in simple regression were calculated between the three angles that estimate the lower facial height and the two angles that estimate the mandibular shape (Tab 2). The correlation coefficients were between 0.517 and 0.166. The correlation of superior angle with mandibular arch angle was insignificant (0.071). The correlation between inferior angle and mandibular arch angle (0.000) was highly significant. Similarly the highly significant correlation was observed between the median and mandibular angle arch (0.00).

The correlations between superior, inferior and median angles with gonial angle (0.001, 0.000, and 0.000) were also highly significant. All correlations were positive and variables had same directions (Tab 2).

**Regression model for gonial angle is**

Gonial=103.572+0.466 (Inferior)

Superior and median angles were excluded from the model as these variables were insignificant (0.260

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**TABLE 1: DESCRIPTIVE ANALYSIS**

<table>
<thead>
<tr>
<th>Mean</th>
<th>Std. Deviation</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Superior angle</td>
<td>35.20</td>
<td>1.863</td>
</tr>
<tr>
<td>Median angle</td>
<td>40.28</td>
<td>4.157</td>
</tr>
<tr>
<td>Inferior angle</td>
<td>44.64</td>
<td>4.665</td>
</tr>
<tr>
<td>Mandibular arch angle</td>
<td>36.50</td>
<td>2.477</td>
</tr>
<tr>
<td>Gonial angle</td>
<td>121.84</td>
<td>3.236</td>
</tr>
</tbody>
</table>

**TABLE 2: CORRELATIONS**

<table>
<thead>
<tr>
<th>Go</th>
<th>Mandibular Arch Angle</th>
</tr>
</thead>
<tbody>
<tr>
<td>Superior angle</td>
<td>.295</td>
</tr>
<tr>
<td>Median angle</td>
<td>.365</td>
</tr>
<tr>
<td>Inferior angle</td>
<td>.460</td>
</tr>
</tbody>
</table>

Pearson correlation .001 .071 .000 .000 .000 .000

Sig. (2-tailed) 120 120 120 120 120 120

N

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**TABLE 3: REGRESSION ANALYSIS FOR GONIAL ANGLE**

<table>
<thead>
<tr>
<th>Model</th>
<th>Sum of Squares</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regression</td>
<td>287.895</td>
<td>95.965</td>
<td>11.619</td>
<td>.000b</td>
</tr>
<tr>
<td>Residual</td>
<td>958.096</td>
<td>8.259</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>1245.992</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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a. Dependent Variable: Gonial angle
b. Predictors: (constant), inferior, superior, median angles

**. Correlation is significant at the 0.01 level (2-tailed)**
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**TABLE 4: REGRESSION ANALYSIS FOR MANDIBULAR ARCH ANGLE**

<table>
<thead>
<tr>
<th>Model</th>
<th>Sum of Squares</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regression</td>
<td>216.049</td>
<td>72.016</td>
<td>16.254</td>
<td>.000 b</td>
</tr>
<tr>
<td>Residual</td>
<td>513.951</td>
<td>4.431</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>730.000</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

a. Dependent Variable: Mandibular arch angle
b. Predictors: (constant), inferior, superior, median angles

**DISCUSSION**

In the Dental literature there is no precise method available for determining the lower facial height accurately. In the present study the attempt has been made to determine the correlation of the mandibular shape and the lower facial height in occlusion through lateral cephalometry. However the study is not applicable on the patients neither with the acquired and congenital orofacial deformity nor for the patients having facial asymmetry. The similar study has been carried out by J D Orthlieb and co workers to find out the correlation between the mandibular shape and the lower facial height in occlusion in dentate subjects. Barzoza et al also used the cephalometric angles and measurement to evaluate the lower facial height as in the present study. Similarly Ciftci, Zeng and VS Bhat utilized the lateral cephalographs for evaluating vertical relation in their respective studies. In the present study the Niswonger’s method was utilized to record the lower facial height in occlusion as done by the McCord, Koler. Furthermore VS Bhatt concluded that the Niswonger’s method has a strong correlation with the cephalometric method.
The mandibular morphology was evaluated by the mandibular arch and the gonial angles as did by the JD Orthelib. Similarly the angles measured to evaluate the lower facial height in occlusion were same in both the studies. The Rickets cephalometric analysis was used to describe mandibular shape by 2 angles as done by Orthelib. The correlations were calculated and the coefficients of correlation in the present study were between 0.517 and 0.166. However coefficients of correlation were between 0.691 and 0.438 in the study by Orthelib et al in the dentate patients.

In the study we found highly significant correlation between the inferior and the medial angle with the mandible arch angle similar to the JD Orthelib study. However in contrast to their study the insignificant correlations were obtained for superior angle and mandibular arch angle. When the lower facial height was correlated with gonial angle we obtained highly significant and positive correlation as obtained by Orthelib (r=0.517) (r=0.697).

**CONCLUSION**

From the results of the present study it was concluded that there is a positive and a strong correlation between the mandibular morphology and the lower facial height. Therefore following the cephalometric measurement of mandibular gonial angle and mandibular arch angle it may be possible to evaluate, by calculation the patients ideal lower facial height of occlusion using regression formula.

Furthermore the lateral cephalographs can help in evaluating the lower facial height of edentulous patients in Pakistani population. This method is an additional method that is inexpensive, simple and complementary to the conventional methods used to evaluate the lower facial height. The same lower facial height may also be used for future prosthetic reconstruction.

**REFERENCES**