INTRODUCTION

The tooth loss always results in the resorption of the residual alveolar ridge to some extent.1 There are many mechanical anatomical, metabolic factors that are responsible for the degree of the alveolar ridge resorption.1 As the resorption continues the maxillary alveolar ridge migrates upwards and inwards,2 whereas the mandibular alveolar ridge migrates in a downwards and outward direction.3 Thus the arrangement of the artificial teeth becomes more difficult in a the patient with long term edentulism.4 In such patients the teeth should not be placed in the original location on the crest of the ridge.5 It would result in discomfort, loss of retention and denture instability.5

For the arrangement of mandibular posterior teeth the reference of the retromolar pad has been used in the dental literature.6, 7, 8 But unfortunately this landmark is not stable and changes with the increasing age. Furthermore the literature has stated that using a single soft tissue landmark, as a reference for the teeth arrangement is not reliable.9

The intercondylar distance however is a stable and a bony landmark that remains fairly static throughout life.3

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ABSTRACT

The objective of this study was to find out the potential relationship of intercondylar distance with mandibular intermolar distance. It was a cross-sectional comparative study and was carried out from August 2011 to Jan 2012.

The present study was carried out on 250 dentate subjects selected from the department of Prosthodontics, Lahore Medical and Dental College, Lahore. The orthodontically treated subjects and those with congenital or acquired orofacial deformities were also excluded. All the subjects with a history of temporo-mandibular joint dysfunction and pain were not included in the study. The impression of the maxillary arch was obtained using irreversible hydrocollide. The vernier caliper was used to measure the distance between the mesiobuccal cusp tips of mandibular first molars. The distance between both the condyles was recorded using an arbitrary face bow. The intercondylar distance was measured in millimeters with the help of the vernier caliper. For accuracy every distance was measured three times by the same operator and the mean taken. For the statistical analysis the data was recorded on the proforma.

The statistical results of the present study showed that the Pearson correlation coefficients (r) for the intercondylar distance and mandibular intermolar are showing positive correlation and significant (r=0.54 p=0.0005). It was concluded that the Intercondylar distance measurement can be utilized for the arrangement of posterior teeth in edentulous patients.

Key words: Posterior teeth arrangement, Inter condylar distance, Intermolar distance, Complete denture
The purpose of the present study was to determine the positional relationship of the intercondylar distance and interdental distance of mandibular first molars to provide reliable and reproducible guide for the posterior teeth arrangement.

**METHODOLOGY**

The study was carried out on 250 dentate subjects of both genders, with age ranged 20 to 40 years. A total of 149 (59.6%) male and 101 (40.4%) female were included. Demographic data and the informed consent of all the participants were obtained. All the subjects with a history of temporo-mandibular joint dysfunction and pain were not included in the study. The orthodontically treated subjects and those with congenital or acquired orofacial deformities were also excluded.

The impression of mandibular arch was taken using two stage impression techniques. The additional silicon putty and light body (Reprosal-Dentsply CAULK, USA) in a metal perforated tray was used. The dental cast was fabricated using dental stone type IV (Elite Rock Zhermack). The vernier caliper was used for measuring the distance between the mesio-buccal cusps tips of mandibular first molars.

The intercondylar distance was measured with the arbitrary face bow (Hanau-H2). The fork was attached to the teeth with silicon impression material (Elite H-D+: Zhermack Spa). The tragus canthus lines were drawn. The hinge axis were marked 13 mm anterior to the upper border of the tragus. The marks were confirmed by the manual palpation. The intercondylar distance was recorded in millimeters using the vernier caliper. Every distance was measured three times by the same operator to ensure the accuracy and the mean was taken. The data was recorded on the proforma for statistical analysis.

The statistical software (SPSS version 11) was used for data analysis. The quantitative variables, the intercondylar distance, the mandibular intermolar distance were presented as mean and ± standard deviation. The qualitative variable like gender was presented as frequency and percentages. Pearson’s correlation coefficient was applied to find out the correlation among mandibular intermolar distance with intercondylar distance. P-value ≤ 0.05 was considered for significance. Partial correlation coefficient was also computed after controlling of age to observe an effect of age on correlation.

**RESULTS**

The study was comprised of a total of two hundred and fifty dentate subjects. Out of these 149 (59.6%) were male and 101 (40.4%) were female. Mostly the age of the subjects was ranging from 20 to 25 years that is 142 (56.8%) as shown in figure 1. The average age in the present study was 25.07±3.47 years (95% CI: 24.64 to 25.50). Out of these 250 patients, the average age of the male was 25.97±3.69 years and female was 23.75±2.59 years respectively.

The average intercondylar distance obtained in the study was 124.96±8.34 mm (95% CI: 123.92 to 126) and the mandibular intermolar distance was 45.63±3.58 mm (95% CI: 45.18 to 46.07). The intercondylar and mandibular intermolar average distances were significantly higher in male than the female (p<0.01) as shown in Table 1.

The intercondylar and the intermolar distances means are in the ratio of 1: 2.73.

The results of the study, therefore suggested that the ratio of 1:2.73 can be utilized for the posterior teeth arrangement. When the correlation test was applied between the intercondylar and mandibular intermolar distances, the Pearson correlation coefficients r were showing significant positive correlation (r=0.54 p=0.0005) Table 2.

Similarly the correlation coefficients were estimated for the gender. The correlation was positive and not significant for male while for female, the correlation of intercondylar distance and mandibular intermolar distance was positive and significant (r = 0.25; p=0.011).

Age was not effected in relationship. Partial correlation coefficients were presented in Table 3.

The slight difference was observed in correlation after controlling age.

**TABLE 1: COMPARISON OF TOOTH MEASUREMENT BETWEEN GROUPS**

<table>
<thead>
<tr>
<th>Variables</th>
<th>Male n=149</th>
<th>Female n=101</th>
<th>P-Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercondylar Distance (mm)</td>
<td>129.46±7.04</td>
<td>118.31±5.01</td>
<td>0.0005*</td>
</tr>
<tr>
<td>Mandibular Intermolar Distance (mm)</td>
<td>47.11±3.03</td>
<td>43.44±3.19</td>
<td>0.0005*</td>
</tr>
</tbody>
</table>

Independent sample t test applied (* significant difference)
.mm = Millimeters .n = Number
TABLE 2: CORRELATION BETWEEN INTERCONDYLAR DISTANCES WITH MANDIBULAR INTERMOLAR DISTANCE

<table>
<thead>
<tr>
<th>INTERCONDYLAR DISTANCE</th>
<th>Overall</th>
<th>Male</th>
<th>Female</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n=250</td>
<td>n=149</td>
<td>n=101</td>
</tr>
<tr>
<td>R</td>
<td>p-value</td>
<td>r</td>
<td>p-value</td>
</tr>
<tr>
<td>Mandibular Intercanine Distance (mm)</td>
<td>0.24</td>
<td>0.0005*</td>
<td>0.19</td>
</tr>
<tr>
<td>Mandibular Intermolar Distance (mm)</td>
<td>0.54</td>
<td>0.0005*</td>
<td>0.36</td>
</tr>
</tbody>
</table>

*Significant  .mm = Millimeters  .n = Number

TABLE 3: PARTIAL CORRELATION BETWEEN INTERCONDYLAR DISTANCES WITH INTERMOLAR AFTER CONTROLLING AGE

<table>
<thead>
<tr>
<th>INTERCONDYLAR DISTANCE</th>
<th>Overall</th>
<th>Male</th>
<th>Female</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n=250</td>
<td>n=149</td>
<td>n=101</td>
</tr>
<tr>
<td>Partial r</td>
<td>p-value</td>
<td>Partial r</td>
<td>p-value</td>
</tr>
<tr>
<td>Mandibular Intermolar Distance (mm)</td>
<td>0.51</td>
<td>0.0005</td>
<td>0.33</td>
</tr>
</tbody>
</table>

*Significant  Control variable = Age

DISCUSSION

The ideal tooth arrangement improves the complete denture stability, comfort, aesthetics and function. When there are no previous records such as photographs or dental casts, it is difficult to determine where the denture teeth should be placed to satisfy the patient’s esthetics demands. The methods that are available for the mandibular posterior teeth arrangement are based on the soft tissue references that show variation and are not stable.

However the intercondylar distance is a stable and reproducible landmark. The present study was an attempt to investigate the potential relationship between the intercondylar distance and interdental dis-
tance of mandibular first molars to have a reliable and reproducible guide for the arrangement of the posterior teeth.

The study was conducted at the outpatient department of Lahore Medical and Dental College. A total of 250 subjects were selected randomly. All these subjects were Pakistani Nationals. The population sample was comprised of 149 (59.6%) males and 101 (40.4%) females respectively, with the age ranged from 20 to 40 years. The average age of male patients was 25.97±3.69 years and female was 23.75±2.59 years.

Keshvad A et al also conducted their study to find out the positional relationship of the intercondylar and intermolar width to aid in denture teeth positioning. The procedure of the stone cast fabrication was also the same.3

In the present study, with the help of the vernier caliper the distance between the mesio-buccal cusps tips of mandibular first molars was measured. The intercondylar distance was measured by an arbitrary face bow (Hanau –H2), as used by Keshvad et al.3 They have further stated insignificant difference in values of the intercondylar distance, when recorded with an arbitrary and a kinematic face bow. Keshvad et al further concluded that the arbitrary face bow can be utilized effectively for measuring the intercondylar distance3.

In the present study the intercondylar distance showed the mean value that correlates well with the mean value stated by Lazic B et al.10 However Keshvad et al1 has reported an increased value of mean than in the present study. A significantly higher mean value of intercondylar distance was obtained in male than in female. These findings are in agreement with the findings reported Keshvad et al3 and Lazic B et al10 in their respective studies. All of these studies have found gender based variations as in the present study.

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In our study the mean mandibular intermolar distance value was in agreement with the mean reported by Kashvad et al.3 A strong correlation between the intercondylar and the mandibular intermolar distance measurements was obtained (r=0.54, p=0.005) just as found by kashvad et al3 in their study(r=0.4582, p=0.042). When the mean measurement of mandibular intermolar distance and intercondylar distance were compared, the ratio obtained was (1:2.73). Similarly Kashvad et al3 reported their ratio (1:2.52) that is almost similar to the ratio in the present study. The results of the present study concluded that this ratio can be used for the posterior teeth arrangement.

The value of the results of this work is that the artificial posterior tooth arrangement has been determined anatomically by the intercondylar distance. This landmark is stable and reproducible and does not change as a result of resorption or ageing.

However, no assessments were made regarding skeletal relationships or ethnic variation. Further studies are necessary to find out if these factors lead to different ratios.

**CONCLUSION**

1. There is significant and a positive correlation between the intercondylar and mandibular intermolar distances.
2. The intercondylar and mandibular intermolar distance ratio that could be utilized for the mandibular posterior teeth arrangement is 1:2.73.
3. Intercondylar distance measurements may be helpful in the arrangement of the teeth in edentulous patients.
4. Average intercondylar and mandibular intermolar distances were found to be significantly higher in male than female.

**REFERENCES**