ORIGINAL ARTICLE
RELATIONSHIP OF THE INTER-CONDYLAR WIDTH WITH MANDIBULAR INTER-CANINE WIDTH

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Background: Aesthetic tooth selection and physiological tooth arrangement are the objectives of the complete denture fabrications. The objective of this study was to determine the relationship of the inter-condylar width with mandibular inter-canine width. **Methods:** This cross-sectional comparative study was conducted in Department of Prosthodontics, Lahore Medical and Dental College, Lahore from January to June 2011. A total of 250 dentate subjects were selected according to the inclusion criteria. Maxillary and mandibular arch impressions were taken. The distance between the cusp tips of mandibular canines was measured by using vernier calliper. The inter condylar width was measured using arbitrary face bow. The width between the two condylar rods was measured with vernier calliper in millimetres. Every width was measured three times by the same operator to ensure the accuracy. Data recorded on the Performa for statistical analysis. **Result:** Pearson correlation coefficients (r) for the inter condylar width and mandibular inter-canine are showing positive correlation and significant (r=0.24, p=0.0005). **Conclusions:** Inter-condylar width provides significant measurements for the selection of anterior teeth in edentulous patients.
Keywords: Inter-condylar width, Inter-canine width, Aesthetic, Complete denture, Edentulous, Tooth selection

INTRODUCTION

Aesthetic tooth selection and physiological tooth arrangement are the objectives of the complete denture fabrications.[1] The aesthetic restoration improves the self esteem and the self confidence of the patient.[2] The appearance of the entire lower half of the face depends upon the dentures.[3] By proper selection of the artificial teeth the natural and the aesthetic appearance can be restored.[2] The ideal tooth selection that maximises the comfort, aesthetics and function has been discussed in the literature for many dacedes.[4]

In the literature there is much emphasis on the selection of maxillary anterior teeth than mandibular anterior teeth. The anatomical landmarks such as the mandibular labial vestibule and the face form are used for the selection of mandibular anterior teeth.[5]

The alveolar bone resorption of the mandibular anterior section results in the alveolar process migrating inwards posteriorly.[6] This results in the mandible becoming narrower anteriorly.[7] Placing the artificial teeth in the original crest location results in the denture instability and discomfort. This is because the ridge has now moved to a new position.[8]

The face form concept is not stable all the times.[9] The alteration in the face form due to increasing age affects this concept.[9] The soft tissue landmarks are also subjected to change.[10] The racial and gender differences were also detected when these landmarks were evaluated individually.[10] However the inter-condylar width remains static throughout life. It can be utilised for the selection of the width of the anterior teeth.

The rational of the present study was to determine the relationship between the inter-condylar width and the mandibular inter-canine width in the dentate subjects. This research describes a new method for the selection of mandibular anterior teeth and statistically tests the reliability of the method.

MATERIAL AND METHODS

A total of 250 dentate subjects (149 male and 101 female) were randomly selected from Lahore Medical and Dental College Lahore. The age was ranging from 20–40 years. Demographic data and informed consent of all the patients were taken. The exclusion criteria included subjects with restored and attritioned canines, congenital or with acquired oro-facial deformity. All the subjects treated orthodontically or with a history of tempro-mandibulr joint pain or dysfunction were also excluded.

Maxillary and mandibular arch impressions were taken in a metal perforated tray by using two stage impression techniques, with additional silicon putty and light body (Reprosal-Dentsply CAULK, USA). Dental stone type IV (Elite Rock Zhermack) was used for cast fabrication. The width between the cusps tips of mandibular canines was measured with the vernier calliper.

The inter-condylar width was measured using arbitrary face bow (Hanau-H2) at rest position. The silicon (Elite H-D+:Zhermack Spa) impression material was used to attach the facebow fork to the teeth. The tragus canthus lines were drawn and the hinge axis were marked 13 mm anterior to the upper border of the tragus. The marks were confirmed by the manual

palpation. The width between the two condylar rods was measured in millimetres with the help of the vernier calliper. Every width was measured thrice by the same operator to ensure the accuracy, and the mean was taken. The data was recorded on the Performa for statistical analysis.

Data were analysed using (SPSS-11). The quantitative variables inter-condylar width and the mandibular inter- canine widths were presented as Mean±SD. The qualitative variable like sex was presented as frequency and percentages. Pearson's correlation coefficient was used to determine the correlation among mandibular inter-canine width with inter-condylar width; $p \leq 0.05$ was considered significant. Partial correlation coefficient was also computed after controlling of age to observe an effect of age on correlation.

RESULTS

In the present study 250 dentate subjects were included. Most of the patients belonged to 20–25 years of age that is 142 (56.8%). The average age of the patients was 25.07±3.47 years. Out of 250 patients, 149 (59.6%) were male and 101 (40.4%) were female. (Table-1). The average inter-condylar width was 124.96±8.34 mm. Averages of mandibular inter-canine width was 24±2.09 mm. The average widths of inter- condylar and mandibular inter-canine were significantly higher in male than female ($p < 0.01$) (Table-2). The mean inter-condylar width and the mean inter-canine width are in the ratio of 1:5.10. This ratio can be used directly for the purpose of teeth selection. Pearson correlation coefficients (r) for the inter-condylar and mandibular inter-canine widths were showing positive correlation and significant ($r=0.24$; $p=0.0005$) (Table-3). Similarly correlation coefficients were also estimated for gender. Correlation was positive and not significant for male while for female, correlation of inter-condylar width and mandibular inter-canine width was negative ($r= -0.32$, $p=0.001$).

Partial correlation coefficients are presented in Table-4. Age was not effect in relationship. There is slightly difference were observed in correlation after controlling age.

Table-1: Age of the patients (Years)

Age (Years)	Mean±SD	Range
Overall	25.07±3.47	20–36
Male	25.97±3.69	20–36
Female	23.75±2.59	20–33

Table-2: Tooth measurement between groups (mm)

Variables	Male (n=149)	Female (n=101)	p
Inter-condylar Width (mm)	129.46±7.04	118.31±5.01	0.0005*
Mandibular Inter-canine Width	28.02±2.01	26.63±1.19	0.0005*

Independent sample *t*-test applied (*significant differences)

Table-3: Correlation between inter-condylar width with mandibular inter-canine width

	Overall n=250		Male n=149		Female n=101	
	r	p	r	p	r	p
Mandibular Inter-canine Distance (mm)	0.24	0.0005	0.19	0.019	-0.32	0.001

Table-4: Partial correlation between inter- condylar width with inter- canine after controlling age

	Overall n=250		Male n=149		Female n=101	
	r	p	r	p	r	p
Mandibular Inter-canine Width (mm)	0.19	0.002	0.18	0.03	-0.32	0.001

DISCUSSION

The population sample was comprised of 149 (59.6%) males and 101 (40.4%) females. The patients selected were in the age range of 20–40 years. The average age of male patients was 25.97±3.69 years and female was 23.75±2.59 years. Just similar to our study Keshvad A *et al*[5] conducted their study to find out the relationship of inter-condylar and mandibular inter-canine width to aid in denture teeth positioning. The laboratory procedures used for the cast fabrication was also similar. In this study, the vernier calliper was used to measure the inter-canine width on a stone cast with the help of vernier calliper and repeated three times, as used by Varjao FM[3], Smith BJ[8] and Keshvad *et al*[5] in their respective studies. For the measurement of the inter-condylar width an arbitrary face bow (Hanau-H2) was used as used by Keshvad *et al.*[5] They also reported no significant difference between the readings of inter- condylar width when recorded with an arbitrary and a kinematic face bow. They further concluded that the arbitrary face bow can be used effectively for measuring inter-condylar distance.[5]

The mean inter-condylar width in the present study correlates with the findings of Lazic B *et val*[10] but is less than the values reported by Keshvad *et al.*[5] The mean of the inter-condylar width for males was considerably higher than for females. The gender based variations was also been reported by Lazi B *et al*[10] and Keshvad *et al*[5]. All of these studies showed a higher mean inter-condylar width of males compared to that of females as in the present study.

The mean mandibular inter-canine width of the subjects in the present study was almost similar to Keshvad *et al*[5]. However it was less than the values reported by Gomes *et al*[4], and greater than that reported by Varjao *et al.*[3]

In the present study the ratio between the mean inter-condylar and mandibular inter-canine width was 1:5.1. Similarly in a study by Kashvad *et al*[5] the ratio obtained was 1:4.39 which is almost same as the ratio in

the present study. Both of these studies concluded that this ratio can be utilised for the selection of artificial anterior teeth.

There was no significant difference found between the mean inter-canine width measurements in relation to sex. The means for inter-canine width measurements were a little higher for males than females. This finding is in accordance with the study carried out by Keshvad *et al.*[5]

On the bases of this study we found that the inter-condylar width measurement can be used for the selection of the anterior teeth. The inter-condylar width is reproducible stable and authentic landmark. It is not affected by the constraints of soft tissues and resorption as the other anatomical landmarks do. However, it is not suggested that this method is the only way to position anterior teeth; rather it is an additional aid especially for the completely edentulous patients without pre extraction records. No assessment was made regarding skeletal relationships or ethnic variation. Further studies must necessarily be carried out to determine if these factors lead to different ratios.

CONCLUSION

Inter-condylar and inter-canine widths show positive and significant correlation. The inter-condylar and mandibular inter-canine width ratio that could be used for the selection of mandibular anterior teeth is 1:5.10.

Inter-condylar width may provide significant measurements for the selection of the teeth in edentulous patients. Average inter-condylar and mandibular inter-canine widths were significantly higher in male than female.

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