

THE ROLE OF INTERCONDYLAR DISTANCE IN THE POSTERIOR TEETH ARRANGEMENT

¹IRFAN AHMED SHAIKH, BDS, FCPS Resident

²KHEZRAN QAMAR, FCPS

³AMIR IMDAD ALI, BDS, MSc

⁴SAJID NAEEM, FCPS

ABSTRACT

The objective of this study was to determine the relationship of intercondylar distance with maxillary intermolar distance. It was cross-sectional comparative study and was conducted at the Department of Prosthodontics, Lahore Medical and Dental College, Lahore from June 2011 to November 2011.

A total of 250 dentate subjects were selected according to the inclusion criteria. The impression of the maxillary arch was obtained using alginate. The vernier caliper was used to measure the distance between the mesiobuccal cusp tips of maxillary first molars. With the help of an arbitrary facebow the intercondylar distance was recorded. The distance obtained between the two condylar rods was measured in millimeters with the vernier caliper. Every distance was measured three times to ensure the accuracy and the mean was taken. The data were recorded on the proforma for the statistical analysis.

Pearson correlation coefficients (r) for the intercondylar distance and maxillary intermolar showed positive correlation and significant ($r=0.53$ $p=0.0005$). Intercondylar distance provides significant measurements for the arrangement of posterior teeth in edentulous patients.

Key words: Tooth arrangement, Inter condylar distance

INTRODUCTION

In completely edentulous patients the residual ridge resorption occurs after the tooth loss.¹ The degree of the residual ridge resorption results from a combination of mechanical anatomical, metabolic factors.¹ Due to the ongoing resorption the maxillary alveolar process migrates upwards and inwards.² While the mandibular ridge migrates downwards and outwards.³ The long term edentulism thus makes the arrangement of the artificial teeth more confusing.⁴ In these cases, placing the denture teeth in the original

location on the crest of the ridge before it was resorbed, causes discomfort and denture instability.⁵

In the dental literature there are studies available that has utilized the anatomical landmarks for the arrangement of the teeth.^{6,7} Several anatomic landmarks shows fixed positional relationships to some natural teeth.⁸ These landmarks serve as guides in replacing natural teeth with artificial teeth.⁸ These includes the width of the mouth, interalar width, bizygomatic width and the interpupillary distance.^{9,10} However it is also stated that these relationships might be used as

¹ Demonstrator, Dept. of Prosthodontic, Lahore Medical and Dental College, Canal Bank North, Tulpura, Lahore 53400, Pakistan. Email: irfanahmedshaikh80@yahoo.com, Phone No: 03342728011

² Assist Prof, Prosthodontics, 213 – B, Revenue Employees Cooperative Housing Society, Lahore, E-mail: drsajidnaeem@hotmail.com, Phone No: 042-35185858, 0300-4577548

³ Associate Prof, Oral Biology, H#98/1, B-block, Phase 1 DHA, Lahore. Phone No: 042-35727746, 0301-4532633

⁴ Professor, 213 – B, Revenue Employees Cooperative Housing Society, Lahore, E-mail: drsajidnaeem@hotmail.com, Phone No: 042-35185858, 0300-4245331

references if applied in combination, more-over they are subjective to change with the increasing age.⁹

Most of the studies considered anterior tooth arrangement and there is little research regarding the posteriors. Few studies have shown that the maxillary tuberosity could be utilized for the posterior teeth arrangement. However they have further stated that this landmark becomes less reliable as atrophy increases.¹¹

Similarly few researchers have correlated the intercondylar distance with maxillary intermolar distance. It has been stated that the intercondylar distance is a stable landmark that remains fairly static throughout life.³ The inter condylar distance is also not affected by the resorption as the other anatomical landmarks do.

The purpose of this study was to determine the relationship of intercondylar distance and interdental distance of maxillary first molars to provide reliable and reproducible guide for the arrangement of the posterior teeth.

METHODOLOGY

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

The impression of maxillary arch was taken using two stage impression techniques. For this 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 distance between the mesio-buccal cusps tips of maxillary first molars were measured with the help of the vernier caliper.

Intercondylar distance was measured with the help of 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 and the hing axis were marked 13 mm anterior to the upper border of the tragus. The marks were confirmed by the manual palpation. The distance between the two condylar rods were recorded in millimeters using the vernier caliper. Every distance was measured three times by the same operator to ensure the accuracy. The mean value was taken. The data was recorded on the proforma for statistical analysis.

The data was analyzed in statistical software (SPSS version 11). Quantitative variables intercondylar distance, maxillary intermolar distance were presented as mean and $\pm$ standard deviation. A qualitative variable like sex was presented as frequency and percentages. Pearson's correlation coefficient was applied to find out the correlation among maxillary intermolar distance with intercondylar distance. P-value ≤ 0.05 was considered for significance. Partial correlation coffieicent were also computed after controlling of age to observe an effect of age on correlation.

RESULTS

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

The average intercondylar distance obtained in the present study was 124.96 ± 8.34 mm (95%CI: 123.92 to 126) and the maxillary intermolar distance was 53.19 ± 3.4 mm (95%CI: 52.77 to 53.61). The intercondylar and maxillary intermolar average distances were significantly higher in male than female ($p < 0.01$) as shown in table 1

The intercondylar and the intermolar distances means are in the ratio of 1: 2.34. According to the results obtained, it is thereby suggested that this ratio can be used for the purpose of the posterior teeth arrangement. When the correlation test was applied between the intercondylar and maxillary intermolar distances, the Pearson correlation coefficients (r) were showing positive correlation and significant ($r = 0.53$ $p = 0.0005$) Table 2.

Similarly the correlation coefficients were also estimated for the gender. The correlation was positive and not significant for male while for female, the correlation of intercondylar distance and maxillary

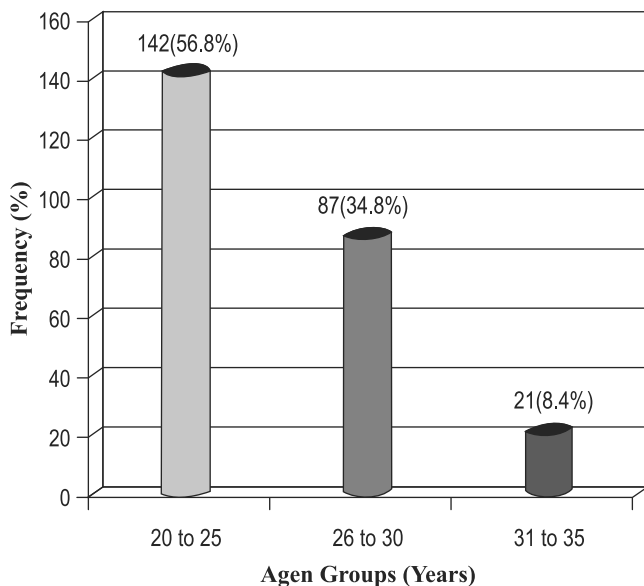


Fig 1: Age distribution of the patients
n=250

TABLE 1: COMPARISON OF TOOTH MEASUREMENT BETWEEN GROUPS

Variables	Male n=149	Female n=101	P- Values
Intercondylar Distance (mm)	129.46±7.04	118.31±5.01	0.0005*
Maxillary Intermolar Distance (mm)	54.41±3.11	51.39±2.99	0.0005*

Independent sample t test applied
(* significant difference)
.mm =Millimeters .n =Number

TABLE 2: CORRELATION BETWEEN INTERCONDYLAR DISTANCES WITH MAXILLARY INTERMOLAR DISTANCE INTERCONDYLAR DISTANCE

	Overall N=250		Male n=149		Female n=101	
	R	p-value	R	p-value	R	p-value
Maxillary Intermolar Distance (mm)	0.53	0.0005*	0.44	0.0005*	0.18	0.08

* Significant
.mm=Millimeters .n=Number

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

	Overall N=250		Male n=149		Female n=101	
	Partial r	p-value	Partial r	p-value	Partial r	p-value
Maxillary Intermolar Distance (mm)	0.49	0.0005	0.42	0.0005	0.18	0.07

* Significant Control variable= Age
.mm=Millimeters
.n=Number

intermolar distance was positive and significant ($r = 0.18$; $p=0.08$).

Age was not effect in relationship. Partial correlation coefficients were presented in table 3. There is slightly difference were observed in correlation after controlling age.

DISCUSSION

The artificial teeth arrangement is one of the objectives of denture fabrication. The teeth arrangement becomes more difficult in the resorbed residual ridges. Moreover many of the studies available considered the anterior tooth arrangement and there is little research regarding the posteriors. The methods that are available for the posterior teeth arrangement are based on the hard tissue references that show resorption 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 distance of maxillary first molars to provide reliable and reproducible guide for the arrangement of the posterior teeth.

The study was carried out at the outpatient department of Lahore Medical and Dental College, for which 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. The age range of the subjects was 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.

Similarly just like our study Keshvad A et al³ conducted their study to find out the positional relationship of the inter condylar and intermolar width to aid in denture teeth positioning. The procedure of the stone cast fabrication was also similar.³

In the present study, the vernier caliper was used to measure the distance between the mesio-buccal cusps tips of maxillary first molars. The measurement were obtained three times by the same operator to avoid biasness of the results, as used in various studies.^{3,6,10}

For measuring the distance between the two condyles an arbitrary face bow (Hanau –H2) was used, as used by Keshvad et al.³ They have also found no significant difference of the values of the inter condylar distance, when recorded with an arbitrary and a kinematic face bow. Keshvad et al³ further concluded that the arbitrary face bow can be used effectively for measuring inter condylar distance.³

In the present study the intercondylar distance showed the mean value that correlates with the mean value reported by Lazic B et al.¹² However the mean of the intercondylar distance of the present study is less than the values reported by Keshvad et al.³ A significantly higher mean value of intercondylar distance was found for male than for female. These findings are in agreement with the findings reported Lazi B et al¹² and Keshvad et al³ in their respective studies. All of these studies have reported gender based variations as in the present study.

In this study the mean maxillary intermolar distance value was in agreement with the mean reported by Kashvad et al.³ A strong correlation between the intercondylar and the maxillary intermolar distance measurements was found ($r=0.53$, $p=0.005$) just as found by kashvad et al³ in their study ($r=0.612$, $p=0.004$). When the mean measurement of maxillary inter molar distance and inter condylar distance were compared the ratio obtained was 1:2.34. Similarly Kashvad et al³ reported their ratio (1:2.19) that is almost similar to the ratio in the present study. From the results of the present study it was concluded that this ratio can be used for the posterior teeth arrangement.

The value of the results of this work is that denture posterior tooth arrangement has been determined anatomically by the intercondylar distance. This land-

mark is stable and reproducible and does not change as a result of resorption or ageing.

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

CONCLUSION

The present study showed that;

The positive and the significant correlation is present between the intercondylar and maxillary intermolar distances.

The intercondylar and maxillary intermolar ratio that could be utilized for the maxillary posterior teeth arrangement is 1:2.34.

Intercondylar distance measurements may be helpful in the arrangement of the teeth in edentulous patients.

Average intercondylar and maxillary intermolar distances were found to be significantly higher in male than female.

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