Original Article

Anatomy

A guide for Bucco-lingual Position of Posterior Teeth Arrangement in Complete Dentures

1. Aamir Mehmood Butt 2. Suneel Kumar Punjabi 3. Kashif Ali Channar

1. Asstt. Prof. of Prosthodontics, LUM&HS, Jamshoro 2. Asstt. Prof. of Maxillofacial Surgery, LUM&HS, Jamshoro 3. Asstt. Prof. of Maxillofacial Surgery, LUM&HS, Jamshoro

ABSTRACT

Objective: To see the relationship between intercondylar distance and the maxillary & mandibular intermolar distances in dental students.

Study Design: Cross-sectional comparative study

Place and Duration of Study: This study was conducted at Institute of Dentistry, Liaquat University of Medical and Health Sciences Jamshoro/Hyderabad, from August 2009 to January 2010.

Materials and Methods: One hundred fully dentate BDS students with age ranging from 21 to 25 years, free from facial and dental deformities were examined. Upper and lower arch impressions were taken using stock trays. Dental cast were made using dental stone type IV. Vernier Caliper was used to measure the linear distances between mesiobuccal cusp tips of the maxillary & mandibular 1st molars on the cast. Intercondylar distance was measured using arbitrary face bow (Hanau-H2) at rest position. Fork was attached to the teeth with silicone impression material. Hing axis marks were made 13 mm anterior to the upper border on the tragus canthus lines on both sides of the face .The mark was confirmed by placing the middle fingers of both hands over the marks & students were advised to open & close the jaw by 20mm, the tactile sensation of rotating condyle confirmed the hinge axis location. The face bow was assembled by inserting the fork intraorally & placing the condylar rods over the hinge axis marks.Thereafter, face bow is removed from the face without changing the position of condylar rods & the distance between the two condylar rods was measured in millimeters with the help of Vernier Caliper. Every distance was measured three times to ensure the accuracy and mean taken.

Results: The statistically significant result of this study proved that the highest correlation was found between the intercondylar distance & Maxillary Intermolar Distance ($r = 0.261$, $p = 0.009$), while the lowest correlation was found between Intercondylar Distance and Mandibular Intermolar Distance ($r = 0{\cdot}202$, $P=0{\cdot}04$).

Conclusion: The observed relationship between the intercondylar and Maxillary Intermolar Distance could prove a useful guide for the buccolingual position of aritificial posterior teeth in edentulous patients.

Key Words: Esthetics, Complete denture, Edentulous, Tooth arrangement.

INTRODUCTION

While dealing with complete denture, stability of patient's denture is one of the major & potentially difficult treatment objectives in order to rehabilitate the patient's oral function, esthetics, health, comfort and confidence.[1]. Size & position of prosthetic teeth have a crucial role in stability especially in lower CDs as they are subjected to destabilizing forces from the tongue, lips and cheeks if they are placed in hindrance with function of this structures.[2]

According to literature the paramount location of the artificial teeth is the one occupied by natural predecessors.[3, 15, 16] However, The residual ridge resorption continues after tooth extraction. Therefore, Long-term edentulousness leads to loss of the alveolar bone in multifaceted patterns and makes the subsequent orientation of the denture teeth even more wondering.[1] specially, when dentist has not previous record or data like; dental casts, to satisfy the patients esthetics, functional necessity and alignment of teeth.[4]

Literature suggested many concepts and theories to describe where prosthetic teeth of CD should be positioned. Including, some of mechanical principles [5,6], biometric guides, [7] neutral zone concept, [8] mathematical formulas based on natural teeth position and dimensions.[9]

Neutral zone technique got far more popularity than any other technique from biomechanical point of view. However, in cases where there is excessive bone resorption accompanied by prominent & high muscle attachment may cause horizontal discrepancy in locating the neutral zone. This horizontal discrepancy may pose leverage forces & may destabilize the prostheses.[10] However, there is an agreement that these leverage forces are well counterbalanced by favourable and seating forces resulting from optimal placement of teeth and polished surfaces of denture being in harmony with the tongue, lips and-cheeks.[2,8,11]

The intercondylar distance remains fairly static throughout life[4].therefore, an effort has made to relate this stable anatomical landmark to intermolar distance in order to establish more accurate position of posterior teeth that would ultimately helps to make stable & functional complete dentures.

MATERIALS AND METHODS

This Cross-sectional comparative study was conducted at institute of dentistry, Liaquat University of Medical and Health Sciences Jamshoro/Hyderabad, from August 2009 t0 January 2010. One hundred fully dentate students irrespective of their gender within the age group of 20 to 25 years were included for the study purpose. The students with attrition of canines, orthodontic appliances, history of facial alterations, crown & bridge work, & TMD were excluded from the study. The purpose of the study was explained & written consent was taken to each individual.

Demographic information like age and sex were recorded. Selection of subjects was on clinical basis. Maxillary and Mandibular arch impressions were taken in irreversible hydrocolloid (fast setting alginate name: phase plus by Zhermack Spa) by using stock trays. Dental stone type IV (Elite Rock Zhermack) material was used for Dental cast.

Vernier Caliper was used to measure the following linear distances on the cast: including, linear distance between the mesiobuccal cusps tips of maxillary molars; linear distance between the mesiobuccal cusp tips of mandibular molars.

Intercondylar distance was measured by using arbitrary face bow (Hanau-H2) at resting position. Fork was attached to the teeth with silicon (Elite H-D+: Zhermack Spa) impression material. Hing axis marks were made 13 mm anterior to the upper border on the tragus canthus line on both sides of the face. The mark was confirmed by placing the middle fingers of both hands over the marks & students were advised to open & close the jaw by 20 mm; the tactile sensation of rotating condyle confirmed the hinge axis location. The face bow was assembled by inserting the fork intraorally & placing the condylar rods over the hinge axis marks. Thereafter, face bow is removed from the face without changing the position of condylar rods & the distance between the two condylar rods was measured in millimeters with the help of Vernier Caliper which is more precise than a millimeter ruler. The reading of every distance was measured three times to ensure the accuracy and mean taken. Data obtained was recorded and then subjected to statistical analysis.

Quantitative variables were presented as mean and ± standard deviation. A qualitative variable like sex was presented as frequency and percentages. Pearson's correlation coefficient was used to determine the correlation among maxillary intermolar distance, mandibular intermolar distance with intercondylar distance. P-value ≥ 0.05 was considered for significance.

RESULTS

This analytical cross sectional study was conducted in the Institute of Dentistry, Liaquat University of Medical and Health Sciences, Jamshoro to make assessment of the relationship of intercondylar distance with inter canine distance arches. Total 100 fully dentate students were enrolled in this study based on certain inclusion and exclusion criteria.

Out of 100 students, 86(86.0%) were males and 14(14.0%) were females & mean age + SD was 23.80 + 1.10 years (n = 100). (Table 1)

In this study the Mean intercondylar distance + SD (Range) was 128.51 + 1.99 (n = 125 to 132), mode was 130.0 and median was 130. Table No. (Table 2)

The mean of Intercondylar distance + SD with male was 128.76 + 1.9 mm whereas with female was 127.00 + 1.840 mm having a significant difference (p = 0.002). (Table No. 3)

The mean + SD (Range) of Maxillary intermolar distance was 51.64 + 3.99 (46 – 60). Whereas Mean + SD (Range) Mandibular intermolar distance was 41.18 + 3.45 (36 – 50). Table No: (Table 4)

Table No.1: Gender distribution (n-100)

Gender	Frequency	Percentage
Male	86	86.0%
Female	14	14.0%

Table No.2: measurements of intercondylar distance study participants (n-100)

Range	125 to 132
Minimum	125
Maximum	132
Mean	128.51
Standard Deviation	1.99

Table No. 3: Relationship of intercondylar distance with Gender Difference (n = 100)

Gender	Mean	SD	P value
Male	128.76	1.9	0.002*
Female	127.00	1.840	

* P value is statistically significant

Table No.4: Measurements of maxillary and mandibular interdental distance of study participants (n = 100)

	Maxillary Intermolar Distance	Mandibular Intermolar Distance (D)
Range	46 to 60	36 to 50
Minimum	46	36
Maximum	60	50
Mean	51.64	41.18
Standard Deviation	3.99	3.45

A two-tailed significant Pearson correlation coefficient (r) test was performed to determine the relationship of intercondylar distance with intermolar distance. The

highest correlation was found between Maxillary Intercondylar Distance and Maxillary Intermolar Distance (r = 0.261, p = 0.009), while the lowest correlation was found between Intercondylar Distance and Mandibular Intermolar Distance (r = 0·202, P=0·04).

Table No.5: Relationship of intercondylar distance with maxillary & mandibular intercanine distance (n = 100)

Pearson's Correlation (r)	Mean	SD	P value
Intercondylar Distance Maxillary Intermolar Distance	128.51 51.64	1.997 3.997	< 0.009*
Mandibular Intermolar Distance	40.96	3.413	0.04*

* P value is statistically significant

Fig 1

Fig 2

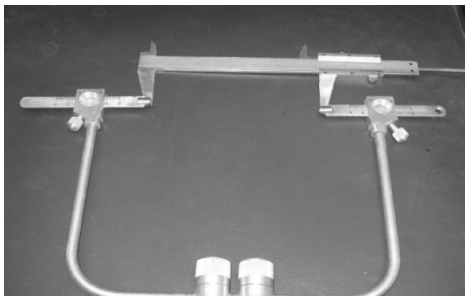

Fig 3

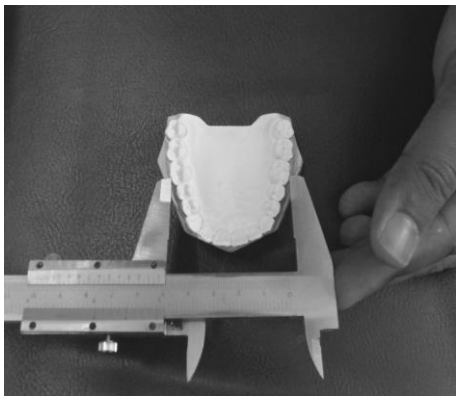

Fig 4

DISCUSSION

Keeping in view the importance of the forces generated by various oral structures on the teeth and polished surfaces of CDs and their effect on the stability of CD, many approaches to set teeth have been suggested and used in removable prosthodontics.[12] Amongst all of these approaches, every approach has advantages & disadvantages when compared to others. Furthermore, these approaches are efficient enough when used with patients who have unaltered oral & peri oral musculature, adequate neuromuscular control and acceptable amount of residual ridge for support. Unfortunately, the proportion of patients with these features is dramatically decreasing. Therefore, in this study effort has been made to evolve more scientific method by investigating the relationship between inter-condylar width & inter-molar distance in order to establish more accurate guide for bucco-facial position of posterior teeth in removable prostheses.

Selected group of students comprised of 86(86%) males and 14(14%) females with age group of 21 years to 25 years. Students younger than 20 years of age were not included since the width of both arches increase significantly between the 8 to 20 years of age.[13]

The results of our study shows, the mean intercondylar distance was higher than the values reported by Keshvad et al[4], Biserka Lazi et al[14] and Shaikh IA & Qamar K.[15] Higher value of mean ICW represent dominant 86(86%) male participation in the study. nevertheless, mean ICW for males in Biserka Lazi et al[14] is in accordance to this study.

When the subjects were separated by gender wise shows, a higher mean of intercondylar distance was found in males as compared to females. Variation based on gender has also been reported by Biserka Lazi et al[14] and Keshvad et al[4]. All of these studies showed a higher mean intercondylar distance of males compared to that of females.

The mean maxillary intermolar and mandibular intermolar distance of subjects in this study was almost similar to Keshvad et al.[4] However, values are lesser than reported by B. Rai et al.[13]

The mean dental inter-arch measurements were compared with the mean intercondylar distance to following mathematical indices, which could be used directly for the reasons of teeth planning:

Upper intermolar / Intercondylar distance = 1:2.488

Lower intermolar / Intercondylar distance = 1:3.137

In this study the ratio between the mean intercondylar and maxillary & intermolar distances are similar to the values reported Keshvad et al.[4]

The limitation of this study for instance inaccuracies common to making the dental casts or minor positional differences that can occur during the ear rods (face-bow) placement might have affected the results. Furthermore, there was no consideration given to skeletal & ethinic variations. Further studies considering the above mentioned variables with greater

sample size are needed before concluding the results to the population.

CONCLUSION

Following conclusions can be drawn from the current study:

- Intercondylar distance and maxillary intermolar and mandibular intermolar distances are showing positive significant correlation and the ration obtained between these variables may be used for the assortment & planning of artificial teeth

REFERENCES

1. Grave AM, Becker P. Evaluation of the incisive papilla as a guide to anterior tooth position. J Prosthet Dent 1987; 57:712-4.
2. Fish E. Principles of Full Denture Prosthesis. 7th Ed. London: Staple Press,Ltd;1948
3. Varjao FM, Nogueira SS. Nasal width as a guide for the selection of maxillary complete denture anterior teeth in four racial groups. J Prosthodont 2006; 15:353-8
4. Keshvad A, Winstanley RB, Hooshmand T. Intercondylar width as a guide to setting up complete denture teeth. J Oral Rehabil 2000; 27:217-26.
5. Wright Cr, Swartz Wh, Godwin Wc. Mandibular Denture Stability: A New Concept. Overbeck;1961.
6. Lammie G. Aging Changes and the Complete Lower Denture. J Prosthet Dent. 1956;6:450-64.
7. Pound E. Esthetic Dentures and Their Phonetic Values. J Prosthet Dent. 1951;1:98-111.
8. Beresin Ve, Schiesser Fj. The Neutral Zone in Complete Dentures. The Journal of Prosthetic Dentistry. 1976;36(4):356-67.
9. El-Gheriani As. A New Guide for Positioning of Maxillary Posterior Denture Teeth. Journal of Oral Rehabilitation. 1992;19(5):535-8.
10. Wee Ag, Cwynar Rb, Cheng Ac. Utilization Of The NeutralZone Technique For A Maxillofacial Patient. Journal of Prosthodontics. 2000;9(1):2-7.
11. Gt. Mcdonald H, Larsen. The Neutral Zone Space: A Clue to Denture Stability. Gen Dent. 1984; 32(6):510-1.
12. Cagna Dr, Massad Jj, Schiesser Fj. The Neutral Zone Revisited: From Historical Concepts to Modern Application. The Journal of Prosthetic Dentistry. 2009;101(6):405-12.
13. Rai B, Kaur J, Dhattarwal S, et al: Changing Maxillary and Mandibular Inter-canine and Inter-molar Distance between 8 to 20 years: Male and Female. The Internet Journal of Forensic Science. 2008; 3(1):22-5.
14. Lazic B, Tepavcevic B, Keros J, et.al: Intercondylar distances of the human temporomandibular joints. Coll Antropol 2006; 30:37-41.
15. Shaikh IH, Qamar K, Naeem S. Relationship of the inter condylar distance with maxillary intercanine distance. Pak Oral Dental J 2011; 31(2):470-3.
16. Dahri WM, Butt Am, Ahmed B. Relationship of intercondylar distance with intercanine distance in dental students. J Pak dent assoc.2012; 21:141-144.

Address for Corresponding Author:
Dr. Aamir Mehmood Butt
Assistant professor & Incharge,
Department of Prosthodontics,
Liaquat University of Medical & Health Sciences,
Jamshoro
e-mail: aamirdentist@yahoo.com
Contact# 03009371044