

Original Article

Relationship between Intercondylar Width and Intermolar Distance – A Radiographic Study

Aditya Kapoor¹, Rupesh Gupta², Monika Sinha¹, Radhika Beri¹, Abhishek N³

¹Department of Prosthodontics, New Delhi Municipal Council, New Delhi, ²Department of Orthodontics, New Delhi Municipal Council, Dwarka, ³Department of Prosthodontics, Vatsalaya Inventures, New Delhi, Delhi, India



***Corresponding author:**

Dr. Aditya Kapoor Department of Prosthodontics, New Delhi Municipal Council, New Delhi, Delhi, India.

drkapooraditya@gmail.com

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ABSTRACT

Objectives: To study the relationship between intercondylar width and intermolar distance in dentulous patients, the result of which may be applied to edentulous patients for teeth setting with maxillary first molar in focus.

Material and Methods: Sixty subjects consisting of 30 males and 30 females were selected, and maxillary impressions were made, followed by making study models; the intermolar distance was measured by marking the mesiobuccal cusp of maxillary molars and transferring the same for measurement. The subjects were then subjected to reverse Towne view (open mouth) and intercondylar width was measured between the exterior most points of both condyles on the X-ray film. The ratio between intercondylar width and intermolar distance was measured. The values were also subjected to statistical analysis.

Results: A high correlation existed between Intercondylar Width and intermolar distance in the dentulous patients. The intercondylar width, intermolar distance, and the ratio between intercondylar width and intermolar distance were higher in males than females.

Conclusion: Intercondylar width and intermolar distance were significantly correlated. Intercondylar width, intermolar distance, and the ratio between them were more in males than females.

Keywords: Intercondylar Width, Intermolar Distance, Dentulous.

INTRODUCTION

The temporomandibular joint (TMJ) is a ginglymous diarthroidal joint and is the only movable joint of the skull. The condyle, one of the bones of the TMJ, is the articulating surface of the mandible. From the anterior view, it has a medial and lateral projection termed poles.^[1] The condylar dimension varies considerably between individuals, and the shape also presents great interindividual variations.

There are myriad studies that have used anterior teeth as a guide to teeth setting for complete dentures. The maxillary and mandibular first molars are set up after positioning all teeth, even though Angle's Class I relation is aimed to be achieved. This gives another perspective to the concept of teeth setting, which is mostly dependent on anterior teeth positioning being done first and the posterior teeth being placed after.

This study aims to correlate if any relationship exists between intercondylar width and intermolar distance in dentulous subjects which may help in teeth arrangement in edentulous patients. It will

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give an additional tool for teeth setting by giving a perspective towards giving consideration to posterior teeth.

Aim and objectives

1. Radiographically assess intercondylar width in dentulous subjects.
2. Assess intermolar distance in dentulous subjects.
3. Study the relationship between intercondylar width and intermolar distance in dentulous subjects.
4. Determine if the derived ratios can be applied to edentulous patients for teeth setting initiating with placement of molars.

MATERIAL AND METHODS

The study was conducted in the Department of Prosthodontics, including Crown and Bridge, M. M. College of Dental Sciences and Research, Mullana (Ambala). For the study, 60 dentulous subjects above the age of 20 years were selected.

Materials

1. Irreversible Hydrocolloid Impression Material (Zelgan)
2. Type IV Gypsum Product (Die Stone – Kalrock)
3. Type III Gypsum Product (Dental Stone – Gypstone)

Equipments

1. Digital orthopantomogram with extended cephalostat (Orthophos XG-5)
2. Printer (dry view 8100 laser imager)
3. X-ray film (DI-HT dry imaging film)
4. Digital vernier caliper
5. Weighing machine

Method

The study was carried out on 60 dentulous subjects. Subjects above 20 years of age were selected. The selection criteria were:

- a. No history of orthodontic treatment or any extraction except third molars.
- b. No history of TMJ pain or dysfunction.
- c. No full veneer crowns involving canines and molars.

- d. No evidence of periodontal disease or pathological tooth mobility.
- e. No signs of attrition, chipping of cusps, or altered anatomy due to developmental disturbances or other factors.

The samples were divided into two groups based on sex and age, as described in Table 1.

A subject was chosen from Group IA, and the study was carried out.

Making of the study model

The study model was made by making a maxillary impression of the subject with irreversible hydrocolloid impression material, and the study model was poured in die stone. The base was made of dental stone.

Measuring the intermolar distance

The study model was placed on a flat surface, and the highest point of the mesiobuccal cusp of the maxillary first molars on both sides was marked with three colors – red, blue, and black. The casts were then inverted on a plain sheet of paper. The transferred marks were encircled, and the distance between these points was measured with a digital vernier caliper. The readings were measured three times, and their mean was calculated. This distance was the intermolar distance.

Measuring the intercondylar width

The intercondylar width was measured in two steps: first was the shooting of the X-ray, followed by marking on the computer screen, and finally, the printing of the image.

The values obtained were subjected to statistical analysis.

The same procedure was carried out on the remaining 29 subjects of Group I and 30 subjects of Group II.

RESULTS

In Table 1, a high correlation between intercondylar width and intermolar distance was seen when males and females were taken as one group.

Table 1: Statistical analysis of comparison of intercondylar width (ICW) and intermolar distance (IMW) in males and females

			t-test		T	df	Significance (Two-Tailed)	
	Mean	Standard Deviation	Standard Error Mean	95% Confidence Interval of the Difference				
				Lower				Upper
ICW (Cm) – IMW (MEAN) (Cm)	7.36733	0.64283	0.08299	7.20127	7.53340	88.774	59	0.001**

df: degrees of freedom, **indicate the high correlation between the two values in study.

1. A high correlation existed between intercondylar width and intermolar distance.
2. There was a high correlation between intercondylar width and intermolar distance in males. The same observation was seen in females.

DISCUSSION

The studies done on the relationship between intercondylar width and intermolar distance are very few. Keshvad *et al.*^[2] attempted to find a correlation between them in dentulous subjects.

Sex differences in the human skull have been well established and are of anatomic interest and even practical identification. Tradowsy^[3] observed that the anatomic intercondylar distance was larger in males than in females. The reverse Towne (open mouth) was used as the radiographic projection technique for determining the intercondylar width in the subjects. The visualization of condyles is improved as the patient's mouth is opened so that the condylar heads are located inferior to the articular eminence.^[4] Lazic *et al.*^[5], in their study, calculated the intercondylar distance in 101 subjects from 20 to 80 years of age. Yoon *et al.*^[6], in their study of the condylar form, concluded that the parabola was an accurate way to characterize the form of the condyle. Anthropologists, unlike prosthodontists, measure the intercondylar distance from the exterior pole of the condyle to determine more precisely the border of an X-ray image. According to the Finite Element Model study of the mandibular condyle done by van Rujiven *et al.*^[7], there was no deformation in the mediolateral direction on inspection of the frontal cross-section. The mediolateral strain was negligible. In using digital X-rays, Miles and Razzano^[8] observed that the same excellent-quality image was obtained each time, and there was no loss of quality associated with the conventional chemical processing. According to Analoui and Buckwalter,^[9] the various advantages of digital radiographs included permanent and prompt access to data with no loss or degradation over time. The distance between the cusp tips of the mesiobuccal cusps of the maxillary first molars was done in accordance with the study done by Garfunkel.^[10] It can be stated with the aid of this study that intercondylar width and intermolar distance are significantly correlated.

Clinical implications of the study

The ratios derived between intercondylar width and intermolar distance in dentulous subjects can be applied to edentulous patients for the probable placement of the maxillary first molars. The edentulous patient will be exposed to reverse Towne (open mouth) view X-ray, and intercondylar width will be determined on the X-ray. Then, by using the

ratio derived from the study, the intermolar width will be determined mathematically. This will be done by dividing the intercondylar width of the patient by the ratio derived from the study. The intermolar width can then be used for the buccolingual placement of the maxillary first molar. Hence, the ratios could be used as an additional aid in the placement of the maxillary first molar in edentulous patients.

CONCLUSION

The intercondylar width and intermolar distance were significantly correlated. Also, the intercondylar width and intermolar distance in males were more than in females in both age groups, confirming the study by Tradowsy in which it was stated that the intercondylar distance of males was higher than that of females.

Ethical approval

The research/study complied with the Helsinki Declaration of 1964.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent.

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Conflicts of interest

There are no conflicts of interest.

Use of artificial intelligence (AI)-assisted technology for manuscript preparation

The authors confirm that there was no use of AI-assisted technology for assisting in the writing or editing of the manuscript and no images were manipulated using the AI.

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