

Reliability of Protrusive Condylar Guidance Values on Arcon Articulator and its Reading with Lateral Cephalogram

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ABSTRACT

Aim: The purpose of this study is to evaluate the protrusive condylar guidance values on arcon type of articulator and its reading with the lateral cephalogram, So that it can determine the amount of discrepancy between the sagittal condylar guidance values on arcon articulator and lateral cephalogram

Materials and methods: Twenty subjects between the age group of 20 to 35 years free from temporomandibular joint dysfunction, patient with no temporomandibular joint deformities and healthy dentition were taken in to consideration. Hanau (wide view) arcon type of articulators were programmed with protrusive interocclusal records which is taken with impression compound. The values which are obtained from these articulators are compared with the lateral cephalometric x ray by tracing it on a tracing paper. The data which were obtained was sent to statistical analysis (fisher's F test) test for comparison.

Results: Table 1 and table 2 shows that the mean and standard deviation of sagittal condylar guidance values of right side and left side respectively for 20 subjects (N), obtained by arcon articulators and cephalometric tracings. The mean sagittal condylar guidance values for arcon articulator and cephalometric tracings were 35.22 and 35.85 on right side and 34.51 & 35.85 on left side. The mean sagittal condylar guidance values of two different groups were found to be non significant 0.157 on right side and highly significant (0.01) on the left side. Table 3 shows the mean sagittal condylar guidance values of right side and left side on arcon articulator is 35.22 on right side and 34.51 on left side respectively and no significant difference (0.12) was seen.

Conclusion: On the basis of the finding of this study it may be concluded that the mean difference in the sagittal condylar guidance values of an arcon articulator and lateral cephalogram is non significant on right side and highly significant on left side. The mean sagittal condylar guidance values of right side and left side of the condyle shows no significant difference. The values which are obtained on the right side of the condyle are slightly lesser than the left side of the condyle.

Keywords: Articular eminence, arcon articulator, protrusive condylar guidance, cephalometric tracing.

INTRODUCTION

The temporomandibular joint is a complex joint and undergoes various mandibular

movements like functional movements or border movements. So the movements of the mandible should be in harmony with the patient

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temporomandibular joint for a success of fixed or removable type of prosthesis¹. So the protrusive condylar guidance values which are obtained from a patient are useful in getting lateral condylar path and Bennett angle. So there are two types of mandibular movements which occur in a patient mouth they are rotational and translational moment, so these moments depend on the morphology of temporomandibular joint fossa when the patient protrudes the mandible forward up to some extent rotational moment of a condyle occurs if it goes beyond the mandible undergoes translation. The protrusive condylar guidance² of a patient is obtained in a edge to edge relation because in edge to edge only rotational moment of a condyle occurs with in the fossa. These edge to edge relation of a patient is obtained from interocclusal records which is taken with impression compound. There are various record which are used to transfer the maxillomandibular relationship to the articulator such as pantographic tracing, gothic arch tracing, interocclusal record and radiographic method. In this study the maxillomandibular relationship was transferred with the interocclusal records from patient to articulator. These interocclusal records placed on a patients mandibular cast on arcon type of articulator and condylar guidance is adjusted until the maxillary cast gets coincides in to the record. The values which are obtained on the right and left side of the condyles are noted these are said to be the protrusive condylar guidance of a patient. In a radiographic method the condylar guidance value is obtained from the slope of the articular eminence. The slope of the articular eminence when it is referred with the Frankfort horizontal plane on a lateral cephalogram gives protrusive condylar guidance of a patient in a lateral cephalogram. So these condylar guidance values of lateral cephalogram and hanau wide view arcon type of articulator were sent to the statistical analysis for fisher's F test and 't' test for a group comparison and the level of significance was founded.

MATERIALS AND METHOD

Twenty complete dentate subjects in the age group of 20 - 35 years with good temporomandibular joint function, no deviation and angles class 1 molar relation was considered. Patient should be in a healthy dentate condition.

Maxillary and mandibular alginate impressions were taken and it is poured with a type 3 dental stone, two sets of impressions and casts were pored. The centric relation record was taken with an impression compound by asking the patient to bite his mandible in its posterior position in a maximum intercuspation. This centric relation record was secured, facebow registration was done by using a modeling wax sheet as a bite registration material on a jig. Hanou facebow or spring bow is attached to a jig and facebow registration was done and it is transferred on to a articulator. Before transferring the facebow registration on to an articulator zeroing of an articulator was done both the horizontal and lateral condylar guidance values are set at zero. After the zeroing of an articulator was completed the facebow transfer was done. The maxillary cast was secured in to the registered modeling wax bite and it is mounted. Mandibular cast was placed in to that record and mounted in a maximum intercuspation relation.

Interocclusal records were obtained on right side and left side in a premolar and molar region in edge to edge relation, these interocclusal records were placed on a mandibular cast on articulator and condylar inclination is adjusted until the maxillary cast get coincide in to that interocclusal record and condylar inclination values were noted on right side and left side. These procedure is repeated for three to four times and values are noted. These values are the protrusive condylar guidance values of arcon type of an articulator.

The protrusive condylar guidance values are compared with the lateral cephalogram. Digital Lateral cephalometric image of Kodak 8000C unit with standardized radiographic parameters (78kv/12/mA/1ssec) following manufacturer's manual was taken in a centric relation record, the slope of the articular eminence was constant and it is used as a reference for condylar guidance. A line drawn on the slope of the articular eminence and it is referred with the frankfort horizontal plane will gives the amount of condylar inclination. The tracing was done as radiographic tracing method on a tracing paper and the angle formed between them are noted. The tracing was done two or three times and average is taken as a sagittal lateral condylar guidance value of a particular patient. Both the right

and left side of the cephalometric readings were noted. The data which were obtained is subjected to a ANOVA fisher's F test for group comparison and t test for intragroup comparison and level significance (p) was calculated.

RESULTS

Table 1 and table 2 shows that the mean and standard deviation of sagittal condylar guidance values of right side and left side respectively for 20 subjects(N), obtained by arcon articulators and cephalometric tracings. The mean sagittal condylar guidance values for arcon articulator and cephalometric tracings were 35.22 and 35.85 on right side and 34.51 & 35.85 on left side. The mean sagittal condylar guidance values of two different groups were found to be non significant 0.157 on right side and highly significant (0.01) on the left side. Table 3 shows the mean sagittal condylar guidance values of right side and left side on arcon articulator is 35.22 on right side and 34.51 on left side respectively and no significant difference(0.12) was seen.

Table 1: Mean sagittal condylar guidance values of the two different groups on the right side.

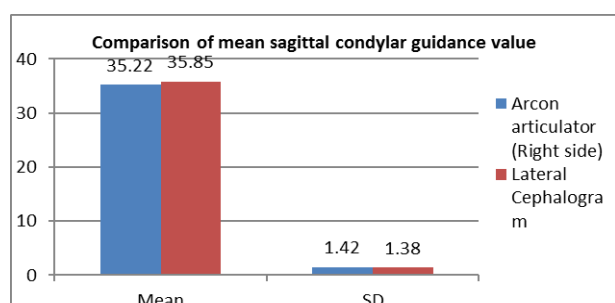
Groups	Mean ± SD	SE M	Unpaired 't' value	P value
Arcon articulator(group 1) (Right side)	35.22 ± 1.42	0.44	1.42	0.157 NS
Lateral Cephalogram (group 2)	35.85 ± 1.38			

P>0.05 NS

P<0.05*S

P<0.01** HS

SEM= Standard error of mean



Graph 1: Comparison of mean condylar guidance value.



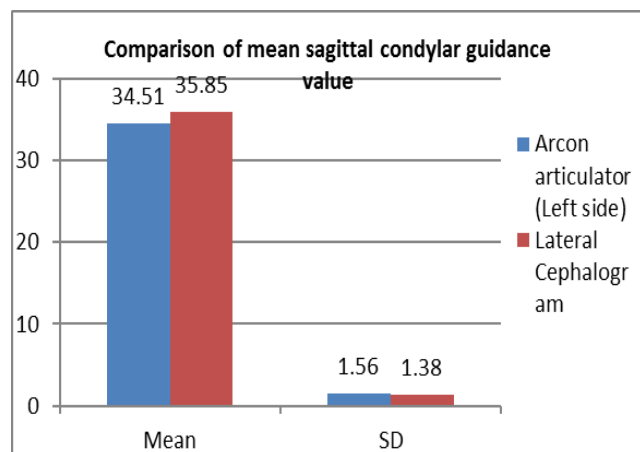
Fig 1: Obtaining protrusive interocclusal records.



Fig 2: Interocclusal records on articulator.

Table 2: The mean sagittal condylar guidance values of the two different groups on the left side:

	Mean ± SD	SE M	Unpaired 't' value	P value
Arcon articulator(group 1) (Left side)	34.51 ± 1.56	0.46	2.87	<0.01*
Lateral Cephalogram (group 2)	35.85 ± 1.38			



Graph 2: Comparison of mean sagittal guidance value.



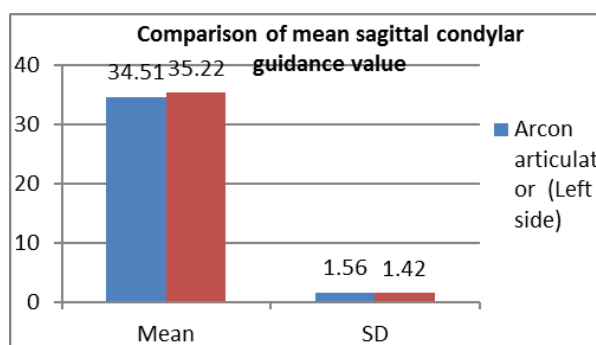
Fig 3: Right side condylar inclination.



Fig 4: Left side condylar inclination.

Table 3: The intra group comparison of sagittal condylar guidance values of right and left side on arcon articulator.

	Mean $\pm$ SD	SE M	Unpaired 't' value	P value
Arcon articulator(group 1) (Left side)	34.51 $\pm$ 1.56	0.47	1.50	0.12 NS
Arcon articulator(group 1) (Right side)	35.22 $\pm$ 1.42			



Graph 3: Comparison of mean sagittal condylar guidance value.



Fig 5: Lateral cephalogram showing tracing.

DISCUSSION

The 20 samples were selected in this study between the age group of 20 to 35 years, the complete craniodentofacial growth will be completed at this age. The range of sagittal condylar values was 25 to 45° for arcon articulator. The hanou wide vue arcon type of articulator with its particular facebow consist of orbitale as and anterior point of reference which organizes the maxillary cast in 3 planes. Various facebow systems are used for orientation of maxilla which can adjust the plane +_16 mm and this has no effect on centric occlusaion but it has an effect on eccentric condylar readings. Axis orbitale is the most commonly used and reliable anterior reference point in facebow³. The modeling wax sheet is adapted over the lucia jig and it is placed over the maxillary teeth and anterior reference point is adjusted. Once the facebow registration was done all the screws are tightened and it is transferred to articulator and maxillary cast is placed in that wax indentations on jig and mounting is done. Centric and interocclusal records of patient are obtained with an impression compound because impression compound is a rigid material and there will be a no rebound of material while adjusting the condylar inclination⁴. Interocclusal records of a patient are taken in a end on position because in edge to edge position patient will have only a hinge moment beyond that the condyle tends to translate) -fig 1. The centric relation record which is obtained with an impression compound is placed on a maxillary cast and the mandibular cast is mounted in that centric relation position. After complete mounting of the maxillary and mandibular casts in centric relation position the lateral interocclusal records are placed on a mandible and condylar inclination is adjusted until the maxillary cast get coincide in that lateral interocclusal records)fig 2, The readings of the condylar guidance on the right side and left side of the condyle are noted these readings are said to be the protrusive condylar guidance values) fig 3&4.

Digital lateral cephalogram of a patient is used as a standard to check the condylar guidance, high quality images, speed of application and low radiation dosage and as accurate as manual⁵ technique are obtained and tracings can be done on this image) fig 5. The Slope of the articular eminence is taken as a standard and it is referred

with the Frankfort horizontal plane. The angle formed between them is noted and this will give the amount of condylar inclination of that patient⁶. The slope of the articular eminence varies from patient to patient in younger age groups the articular eminence is prominent and in older age groups due to resorption slope of the articular eminence is flat⁷.

A difference in sagittal condylar guidance between arcon articulator and cephalogram is noted, the mean sagittal condylar guidance of the right side of an arcon articulator is 35.22 and the lateral cephalogram is 35.85. and no significant difference of 0.157 is noted. The mean sagittal condylar guidance of the left side of an arcon articulator is 34.51 and the lateral cephalogram is 35.85 and the no significant difference of **<0.01*** is noted . The mean sagittal condylar guidance values of right side and left side of an arcon articulator is 35.22 on right side and 34.51 on left side respectively and no significant difference(0.12) was seen.

CONCLUSION

On the basis of the finding of this study it may be concluded that the mean difference in the sagittal condylar guidance values of an arcon articulator and lateral cephalogram is non significant on right side and highly significant on left side. The mean sagittal condylar guidance values of right side and left side of the condyle shows no significant difference. The values which are obtained on the right side of the condyle are slightly lesser than the left side of the condyle.

CONFLICT OF INTEREST

No potential conflict of interest relevant to this article was reported.

REFERENCES

1. Okeson JP. Management of temporomandibular disorders and occlusion. 4th ed. St. Louis: Mosby; 2004. p. 540-2.
2. A comparative study to evaluate the discrepancy in condylar guidance values between two commercially available arcon and non arcon articulators:clinical study. Indian journal of dental research 22 (6),2011

3. Weinberg LA. An evaluation of face-bow mounting. J Prosthet Dent 1961;11:32-42 \
4. Campos AA, Nathanson D. Compressibility of two polyvinyl siloxane interocclusal record materials and its effect on mounted cast relationships. Campos AA, Nathanson D. Compressibility of two polyvinyl siloxane interocclusal record materials and its effect on mounted cast relationships. J Prosthet Dent 1999;82:456-61.J Prosthet Dent 1999;82:456-61
5. Davis DN, Mackay F. Reliability of cephalometric analysis using manual and interactive computer methods. Br J Orthod 1991;18:105-9.
6. Gheriani AS, Winstanley RB. Graphic tracings of condylar paths and measurements of condylar angles. J Prosthet Dent 1989;61:77-87.
7. Isberg A, Westesson PL. Steepness of articular eminence and movement of the condyle and disk in asymptomatic temporomandibular joints. Oral Surg Oral Med Oral Pathol Oral Radiol Endod 1998;86:152-7.