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"Correlation between Sagittal Condylar Guidance Obtained By Gothic Arch Tracing an Interocclusal Record and By Panoramic Radiographic Tracing in Edentulous Subjects: A Clinicoradiographic Analysis"

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Abstract:
Aim: *Correlate and analyze the sagittal condylar guidance obtained by protrusive interocclusal records by extraoral Gothic arch tracing and panoramic radiograph tracing in edentulous subjects.*
Methodology: *Sagittal condylar guidance was determined in 10 edentulous subjects by protrusive interocclusal records using Gothic arch tracing transferred to Hanau™ Wide-Vue articulator(Whip Mix Corporation) after facebow transfer (HANAU™ Spring Bow, Whip Mix Corporation,). Angle of sagittal condylar guidance was determined in panoramic radiographs by joining the height of curvature of the glenoid fossa and articular eminence which was then be related to constructed Frankfurt's horizontal plane.*
Results and Conclusion: *Correlation between the condylar guidance acquired using protrusive interocclusal records and panoramic imaging for both right and left side was insignificant. The average values by the interocclusal record method was 18.5° on the right side and 20° on the left side and by radiographic method was 17° on the right side and 17.3° on the left side. Although, statistically the study failed to show the correlation. But, clinically the obtained angles by both the methods are similar without much difference (1.5 R, 2.7 L).Gothic arch tracing gave quite similar readings as suggested by the radiographic landmarks and can be continued as a successful clinical method.*
Keywords: *Edentulous subjects, Gothic arch tracing, Interocclusal records, Panoramic tracing, Saggital condylar guidance*

I. Introduction

Successful prosthesis is made in harmony with the stomatognathic system. Most essential component of stomatognathic system i.e condylar path inclination has to be understood, recorded and transferred precisely. Purpose of protrusive jaw relation is to set condylar elements of articulator that will reproduce inclinations, which are similar /comparable to that of patient's temporomandibular articulation [1].

Compared to clinical methods, radiographic measurement involves stable bony landmarks and can be standardized.[4] Literature indicates use of lateral cephalograms, pantomographs and tomographs for recording condylar guidance. Studies have shown that radiographic methods can record condylar guidance more accurately than other methods.[3,4]

II. Materials And Method

The study was carried out in the Dept. of Prosthodontics, KLE V.K Institute of Dental Sciences, Belgaum. 10 completely edentulous subjects with high well rounded class I ridges, sufficient inter-arch space, class I ridge relation, and good neuromuscular coordination were randomly selected and written informed consent was obtained. Patients with temporomandibular disorders, flabby ridges, any local defect/lesion/deformity or disease, systemic debilitating disease, or musculoskeltal diseases were excluded. Study was given clearance by the Institutional Ethical Review Committee.

Protrusive interocclusal records

All regular complete denture procedures were followed till tentative jaw relation, was mounted on Hanau™ Wide Vue articulator model 183 (Whip- Mix cooperation, USA) by facebow (Hanau™ springbow, Whip- Mix cooperation, USA) transfer taking Fankfort horizontal plane as the reference plane. Hight tracers were attached on the occlusal rims and extraoral Gothic arch tracing was performed. Interocclusal centric and protrusive records were made by bite registration plaster (Kalabhai cooperation, India). Interocclusal records

were transferred to the articulator centric was verified. Protrusive record was transferred on to the articulator and sagittal condylar guidance was programmed by single operator for all cases. This angle of the sagittal condylar guidance is recorded separately for right and the left side.

Panoramic tracing

Radiographic procedures were carried out in Department of Oral Radiology. Radiographs were made by the single operator in the same radiographic unit (Kodak 8000c, France) with exposure factors of 90 kVp and 10 mA. The sagittal outlines of the left and right articular eminence and glenoid fossae were traced on a transparent acetate tracing sheet .The left and right "orbitale" and "porion" were identified and the Frankfurt horizontal plane was constructed by joining the two landmarks on each side.[5] The most superior point on the articular eminence and the most inferior point on the articular tubercle were identified and a second line to represent the mean condylar path inclination was constructed by joining the two points.[5] The angle formed by the intersection of the two lines was determined to represent the angle of sagittal condylar inclination. This was determined by the two operators and the average taken as the true value. (Fig 1, 2)[5]

Statistical Analysis

Statistical analysis was carried out in SPSS 16 software (Statistical Package for the Social Sciences, IBM Software Group, USA). Spearman-Rho's test was used to find the correlation between the sagittal condylar guidance between left and right sides and between the two methods on each side.Cronbach's alpha was used to identify the degree of reliability of the radiographic method.[5]

III. Results

The sagittal condylar guidance determined by both methods for 10 subjects. (Table 1) summarizes the range, mean, and standard deviation of condylar guidance values obtained using both the methods on the right and left side.[5] The mean difference between the condylar guidance values obtained using both methods was 1.5° for the right side and 2.7° for the left side, with the radiographic values being lower.[5] This difference between the values was found to be insignificant between the two methods for the right side (P = 0.109) and left side (P = 0.094), respectively(Table 2, 3). The study failed to show correlation between the condylar guidance values of right and left sides in same subjects obtained using the protrusive interocclusal registration (Table 4) and also by the panoramic radiograph separately (Table 5). The inter-observer reliability in identification and determination of condylar guidance by the panoramic radiographic method using Cronbach's alpha showed a high degree of reliability with 0.922 on the right side and 0.911 on the left side, respectively.[5]

Table 1 Descriptive Statistics

SIDE		N	Minimum	Maximum	Mean	Std. Deviation
right	gothic arch	10	10	25	18.50	4.116
	radiograph	10	12	25	17.00	3.432
	Valid N (listwise)	10				
left	gothic arch	10	15	25	20.00	4.082
	radiograph	10	15	30	17.30	4.739
	Valid N (listwise)	10				

Table 2 Correlation on right side by intraoral records and panoramic tracing

			gothic arch R	radiograph R
Spearman's rho	gothic arch R	Correlation Coefficient	1.000	.538
		Sig. (2-tailed)	.	.109
		N	10	10
	radiograph R	Correlation Coefficient	.538	1.000
		Sig. (2-tailed)	.109	.
		N	10	10

Table 3 Correlation on left side by intraoral records and panoramic tracing

			gothic arch L	radiograph L
Spearman's rho	gothic arch L	Correlation Coefficient	1.000	.557
		Sig. (2-tailed)	.	.094
		N	10	10
	radiograph L	Correlation Coefficient	.557	1.000
		Sig. (2-tailed)	.094	.
		N	10	10

Table 4 Correlation between right and left side by intraoral records

			gothic arch R	gothic arch L
Spearman's rho	gothic arch R	Correlation Coefficient	1.000	.457
		Sig. (2-tailed)	.	.184
		N	10	10
	gothic arch L	Correlation Coefficient	.457	1.000
		Sig. (2-tailed)	.184	.
		N	10	10

Table 5 Correlation between right and left side by panoramic tracing

			radiograph R	radiograph L
Spearman's rho	radiograph R	Correlation Coefficient	1.000	.584
		Sig. (2-tailed)	.	.076
		N	10	10
	radiograph L	Correlation Coefficient	.584	1.000
		Sig. (2-tailed)	.076	.
		N	10	10

IV. Discussion

In this study the average condylar guidance obtained by the interocclusal record method was 18.5° on the right side and 20° on the left side and by radiographic method was 17° on the right side and 17.3° on the left side. In support of these results el-Gheriani and Winstanley [6] and Zamacona et al. have reported significant variation between the left and right condylar guidance values. This is because the right and left eminences seldom have exactly the same slants, contours, and declivities.[7] In contrast to this a bilateral symmetry of the right and left sagittal condylar guidance angle:31° on both sides has also been reported using protrusive interocclusal records in a study by Donegan SJ, Christensen LV.[8]

Correlation between the condylar guidance acquired using protrusive interocclusal records and panoramic images for both right (P 0.109) and left sides (P 0.094) was observed which is insignificant. Brewka[9] in 1981 stated that radiographic methods and clinical methods are in disagreement. Christensen and Slabbert[4] in a 1978 review have stated that "no radiographically determined sagittal condylar guidance angle coincided with that obtained with the use of intra-oral records."

Krishna D. Prasad, Namrata Shah and Chethan Hegde stated that Considering the inaccuracies of the interocclusal record technique with inherent errors of up to 30°; the radiographic method(panaromic) may have clinical relevance.[5] This difference may be attributed to the choice of dentulous subjects in their study , 6 mm protrusion in the tracer method while edge to edge position was used in wax bite method, the inconsistency of interocclusal record methods, i.e regardless of the material used, sagittal condylar angle changes with the degree of protrusion,[10] and that intra-oral record represents only one point along the condylar path.[8] Limitations of the radiographic method in edentulous patients are panoramic distortion, problem head and reference plane orientation, change in beam direction due to positioning errors that leads difficulty in distinguishing the articular eminence outline from the zygomatic arch. And articular eminence inclination in the radiographic image represents the mean sagittal condylar path inclination. This may be different from the guiding inclination with approximately 4-6 mm of protrusion.[4]

Considering the radiographic, clinical limitations the obtained angles by both the methods are similar without much difference (1.5 R, 2.7 L). Gothic arch tracing gave quite similar readings as suggested by the radiographic landmarks and can be continued to be used as a successful clinical method. But for the definite correlation for the clinical implication of orthopantomogram for obtaining the condylar guidance for edentulous subject further research is needed.

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