



## A COMPARATIVE STUDY OF CONDYLAR GUIDANCE OF EDENTULOUS PATIENTS RECORDED FROM PROTRUSIVE RECORDS WITH ANTERIOR TEETH AND GOTHIC ARCH TRACING –AN INVIVO STUDY

### Dental Science

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### ABSTRACT

This study was conducted to compare the condylar guidance of edentulous patients obtained from protrusive records with gothic arch tracing and after arranging the anterior teeth.

**METHODOLOGY:** A total of 20 subjects, with mean age of 55 years, having edentulous maxillary and mandibular arches were selected. In method A, Protrusive inter occlusal records were made at 6 mm of protrusion which were transferred to a semi-adjustable articulator to obtain the values of condylar guidance. In method B, Protrusive inter occlusal record were made by instructing the patient to protrude to edge to edge position. The records were transferred to the articulator and right and left condylar guidance values were recorded.

**RESULTS:** The mean condylar guidance angle obtained from method A was higher compared to method B.

**CONCLUSION:** The mean condylar guidance for each patient obtained from method A was more and statistically highly significant when compared to method B.

### KEYWORDS

Condylar guidance, protrusive interocclusal records, articular eminence.

### INTRODUCTION:

Successful treatment of edentulous patients is based on long term reestablishment of function and the preservation of the alveolar bone.<sup>1</sup> Condylar guidance is the path, the condylar path is precise and constant and that it guides the movements of the mandible.<sup>2</sup> Condylar path is a controlling factor and is peculiar to each individual patient.<sup>3,4</sup> Other factor which influence the path of the condyle along the articular eminence is the anterior guidance. During protrusive movement, as the mandible moves forward there is an influence of the anterior guidance which affects the exact path of the condyle.<sup>5,6,7</sup>

A protrusive inter occlusal record can register the influence of the condylar paths over the movements of the mandible. Protrusive record is made by guiding the patient to 6mm of protrusion.<sup>2</sup> In the laws of articulation, the incisal guidance provided by the anterior teeth is an important part of the control. This guidance is always decided by the dentist. The protrusive records obtained from incisal guidance which is determined by the horizontal and vertical overlap of the anterior teeth, is more influential in controlling the movements of the mandible than the condylar path, because the condylar paths are farther away from the cusp inclines.<sup>3</sup>

Hence, this study is intended to compare the condylar guidance values of edentulous patients obtained from protrusive records with gothic arch tracing and after arranging the anterior teeth.

### OBJECTIVES:

- 1) To compare the condylar guidance values of edentulous patients obtained from protrusive records with gothic arch tracing and after arranging the anterior teeth.
- 2) To compare the condylar guidance values of edentulous patients between the right and left condyles obtained from protrusive records with gothic arch tracing and after arranging the anterior teeth.

### METHODOLOGY:

Criteria For Selection Of Subjects:

Cases selected were edentulous subjects with

1. Good neuromuscular control.
2. Subjects with Class I jaw relationship
3. No signs and symptoms of temporomandibular disorders.
4. No history of uncontrolled systemic disorders.
5. No history of craniofacial surgery/trauma.
6. No hard and soft tissue abnormalities.

### STUDY DESIGN:

Study was conducted among 20 patients, with a mean age of 55 years in the age group of 40-75 years, each having edentulous maxillary and mandibular arches visiting to outpatient department in a dental college and hospital over a period of six months. Ethical clearance was

obtained from the institutional ethical board to conduct the study among patients. Further, the patients were appraised about the purpose of the study and their consent in regional language (Kannada) was recorded voluntarily. Subjects were explained that nonparticipation in the study will not affect their prospects of availing treatment from the institution.

### DETERMINATION OF CONDYLAR GUIDANCE:

#### A) Determination Of Condylar Guidance From Protrusive Inter-occlusal Records With Gothic Arch Tracing:

The standard steps for complete denture fabrication was followed to obtain jaw relation. Tentative centric relation was done by swallowing act which was registered by static or pressure less method with nick and notch indexing. Centric relation record was made by using bite registration paste (REGISIL RIGID, Super Fast Set, DENTSPLY).

Maxillary cast was mounted on a semi-adjustable articulator (Hanau Articulator Model Wide-Vue) with a face-bow transfer (Spring-bow; Teledyne) (fig.1). Mandibular cast was mounted with centric relation record made using bite registration paste (fig.2).



Fig 1:FACE BOW TRANSFER



FIG 2:CENTRIC RELATION RECORD

Extra oral tracers were attached to the maxillary and mandibular occlusal rims after verifying the parallelism of the same (fig.3,4). The protrusive interocclusal records were made using bite registration paste (REGISIL RIGID, Super Fast Set, DENTSPLY) by asking the subjects to protrude the mandible for 6mm (fig.5,6).The value of condylar inclination was noted when the records were seated correctly on the rims. Similarly, the procedure was repeated for the otherside. Both the condylar guidance values were noted(fig.7).



FIG 3: ATTACHMENT OF TRACERS (FRONT VIEW)



FIG 4: ATTACHMENT OF TRACERS (SIDE VIEW)



FIG 5: TRACING IN CENTRIC RELATION



FIG 6: TRACING IN PROTRUSIVE



FIG 7: ADJUSTMENT OF CONDYLAR GUIDANCE BASED ON METHOD A

**b) Determination of Condylar Guidance from protrusive inter-occlusal records after anterior teeth arrangement:**

For each subject, the tracers were removed and programming of the articulator (Zeroing of the Hanau Wide Vue articulator) was done. Anterior teeth arrangement was done according to subject's esthetics and phonetics as well as following standard teeth arrangement principles. Protrusive inter-occlusal record were made using bite registration paste (REGISIL RIGID, Super Fast Set, DENTSPLY) by instructing the subject to protrude to edge to edge position (fig.8,9). The records were transferred to the articulator and right and left condylar guidance values were adjusted (fig.10).



FIG 8: ANTERIOR TRY IN

FIG 9: ANTERIOR TRY IN-PROTRUSIVE RECORD

FIG 10: ADJUSTMENT OF CONDYLAR GUIDANCE BASED ON METHOD B

The right and left condylar guidance values of subjects obtained from protrusive inter occlusal records with gothic arch tracing and after anterior teeth arrangement were subjected for statistical analysis.

**RESULTS:**

The condylar guidance values of right and left side obtained from method A, minimum was 250 and maximum was 350. The condylar guidance values of right and left side obtained from method B, minimum was 150 and maximum was 250

1. The mean condylar guidance angle of right side obtained from method A was more compared to method B. The mean condylar guidance angle of right side obtained from method A were statistically highly significant when compared to method B.(Table 1)
2. The mean condylar guidance angle of left side obtained from method A was more when compared to method B. The left side mean condylar guidance angle obtained from method A was statistically highly significant when compared to method B.(Table 2)
3. The mean condylar guidance angle for each patient obtained from method A were statistically highly significant when compared to method B.(Table 3)
4. There was no significant difference between the right and left sides of the mean condylar guidance values obtained from method A and method B.(table 4)

**Table 1: Comparison Between The Condylar Guidance Angles Of Right Side Obtained By Protrusive Records Of Gothic Arch Tracing And Anterior Try -in Techniques.**

Technique	Mean	Standard deviation	t value	p value*	Level of significance
Gothic arch tracing	29.75	3.79	12.70	< 0.001	HS
Anterior try in	20.00	2.80			

\*Paired t test

**Table 2: Comparison Between The Condylar Guidance Angles Of Left Side Obtained By Protrusive Records Of Gothic Arch Tracing And Anterior Try -in Techniques.**

Technique	Mean	Standard deviation	t value	p value*	Level of significance
Gothic arch tracing	30.00	3.62	12.70	< 0.001	HS
Anterior try in	20.25	2.55			

\*Paired t test

**Table 3. Comparison Between Mean Condylar Angle For Each Patient Obtained By Protrusive Records Of Gothic Arch Tracing And Anterior Try-in Techniques.**

Technique	Mean	Standard deviation	t value	p value*	Level of significance
Gothic arch tracing	29.87	3.48	10.35	< 0.001	HS
Anterior try in	20.12	2.26			

\*Unpaired t test

**Table 4. Comparison Of Right And Left Condylar Guidance Angle Obtained By Protrusive Records Of Gothic Arch Tracing Technique And Anterior Try In Technique:**

Subjects	Side	Mean	Standard deviation	Mean difference	t value	p value*	Level of significance
Gothic arch tracing technique	Right	29.75	3.79	0.25	0.21	0.83	NS
	Left	30.00	3.62				
Anterior try in technique	Right	20.00	2.80	0.25	0.29	0.77	NS
	Left	20.25	2.55				

\*Unpaired t test

**DISCUSSION:**

In completely edentulous patients, condylar paths are determined by the following factors:<sup>7</sup>

1. The bony fossae.
2. The tone of the muscles responsible for mandibular movements and their nerve controls.
3. Limitations imposed by the attached ligaments.
4. Shape and movements of the menisci.

The anterior guidance is considered to be a variable rather than a fixed factor. It is the guidance established by the contact relationship of the upper and lower anterior teeth during the movement of the mandible (fig.16). It is usually expressed in degrees of angulation from the horizontal plane by a line drawn in the sagittal plane between the incisal edges of the upper and lower incisor teeth when closed in centric occlusion or in maximal intercuspation. Because of its proximity to the masticating tooth surfaces, it has a dominant influence on the contacting surfaces of the teeth posterior to it. Fortunately the anterior guidance is largely under the control of the dentist, and is usually set at an angle between 10° to 20°. It should never be more than the condylar guidance. It is the anterior end controlling factor.

A protrusive interocclusal record can register the influence of the condylar path over the movements of the mandible. It enables the condylar guidance of the articulator to be set to an approximation of the path of condylar movements in the patient.<sup>8</sup>

However, despite the proven advantage, the gothic arch tracer remains a largely underutilized tool. The reason is the difficulty in assembling the extra oral gothic arch tracer that makes such human error so prevalent. With gothic arch tracers the process was cumbersome and fraught with anxiety.<sup>9</sup>

The misconception exists because many dentists think the condylar paths control the movement of the mandible entirely. In the laws of articulation, the incisal guidance provided by the anterior teeth is an important part of the control. This guidance is always decided by the dentist. The protrusive records obtained from incisal guidance which is determined by the horizontal and vertical overlap of the anterior teeth, is more influential in controlling the movements of the mandible than the condylar path, because the condylar paths are farther away from the cusp inclines.<sup>3</sup>

The mean condylar guidance values for each patient obtained from protrusive records of gothic arch tracing technique gave higher values when compared with the anterior try in technique, results were statistically highly significant. The reason for high condylar guidance values incase of protrusive records of gothic arch tracing when

compared to protrusive records of anterior try in, protrusive records was made at 6mm of protrusion in gothic arch tracing technique but in anterior try in technique it was made at 2-4 mm of protrusion. Craddock believed that it was important to keep the distance of protrusion the same because the sagittal condylar angle changes with the amount of protrusion. He further contended that different angles could be obtained with the same record. He used an articulator with the Frankfort plane as a reference. It became apparent that protrusive displacement of the mandible for 6 mm or less may result in decreased angulation of the condylar path.<sup>6</sup>

When varying amount of protrusion were incorporated in the records a typical range from 15° to 35° was obtained. The reasons may be that a lack of precise voluntary neuromuscular control was evident in varying amounts of protrusion achieved in response to a constant request to bite for example edge to edge. Such a request may produce protrusion varying from 1.5 to 3mm.<sup>6</sup>

Jose DS et al stated that the protrusive displacement of the mandible for less than 6 mm may result in decreased angulation of the condylar path.<sup>8</sup>

After comparing the right and left side mean condylar guidance angle, in each technique the left side mean condylar guidance angle was comparatively higher than that of right side mean condylar guidance angle. But there was no statistically significant difference between the right and left sides of the mean condylar guidance values obtained from protrusive records of gothic arch tracing technique and anterior try in technique. The reason for comparatively higher mean condylar guidance angle between the techniques may be due to variation in the anatomy of the temporomandibular joint.<sup>4</sup> Corbett NE et al stated that in protrusion the condylar head of the mandible follows closely the anatomical form of the articular eminence.<sup>10</sup>

Within the limitations of this study, it can be concluded that

1. The mean condylar guidance values for each patient obtained from protrusive records of gothic arch tracing technique was more and statistically highly significant when compared with the anterior try in technique.
2. In each technique the left side mean condylar guidance angle was comparatively higher than that of right side mean condylar guidance angle. But there was no statistically significant difference between the right and left sides of the mean condylar guidance values obtained from protrusive records of gothic arch tracing technique and anterior try in technique.

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