



ORIGINAL RESEARCH PAPER

Medical Science

EVALUATION OF CHANGE IN VERTICAL DIMENSION FROM CENTRIC RELATION POSITION TO PROTRUSIVE JAW RELATION POSITION IN EDENTULOUS AND DENTULOUS SUBJECTS ; A PILOT STUDY.

KEY WORDS: complete denture, protrusive record, vertical dimension

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INTRODUCTION ;

The vertical dimension of Lower third of face is maintained by the maxillary and mandibular complement of teeth . It is established that in a dentulous patient while protruding from maximum intercuspation to edge to edge relation , there is an increase in the vertical dimension. Complete denture patients loses these vertical stops and anterior overlaps. Such patients when protrude the mandibular jaw to the front a visible drop in vertical dimension is noticed. In the construction of a complete denture prosthesis for an edentulous patient Interocclusal records are made to record centric relation and eccentric relations [1] . Protrusive and lateral records are made to obtain the sagittal condylar guidance angle (H) and lateral condylar guidance angle(L) respectively [2] . Gothic arch tracing is still a widely practiced method to record the centric and eccentric relation in an edentulous subject [3]. The centric records are made at the established vertical dimension. Such records are bound to be perforated. However, there is conflict of opinion amongst the specialist regarding the perforation or non perforation of protrusive records. In order to address this confusion , this study was undertaken to find out what happens to the vertical dimension of occlusion when the patient protrudes from centric relation position to protrusive position.

Thus, the aim of this study was to evaluate the changes or otherwise, in the vertical maxillomandibular relationship of dentulous and edentulous patients from centric relation position to protrusive position by using lateral cephalograms.

The objectives of this experimental study were as follows :

1. To measure the vertical dimension at centric relation and protrusive relation in dentulous subjects on digital lateral cephalograms
2. To measure the vertical dimension at centric relation and protrusive relation in edentulous subjects on digital lateral cephalograms while using central bearing plates and screws to maintain the established vertical dimension of occlusion.
3. To compare and analyze the change in vertical dimension from centric relation and protrusive relation in dentulous and edentulous subjects
4. Relate the findings of the study in order assess if the protrusive records be perforated or non perforated .

Material and Methods

This experimental study was approved by the Institutional Research Advisory Committee. All procedures followed in the study were in accordance with the ethical standards of the responsible committee on human experimentation (institutional and national) and with the Helsinki Declaration of 1975, as revised in 2008 (5). Informed consent was obtained from all patients for being included in the study.

Ten dentulous volunteers and ten edentulous patients reported to the Out Patient department were selected based on the inclusion and exclusion criteria.

Inclusion criteria

Persons of Indian nationality from the region of Bhopal were included in the study. Dentulous patients having Class I molar relation within the age group of 18-25yrs were selected to eliminate any age changes such as wear of teeth and TMJ Pathologies etc so as to record unhindered jaw positions and movements. Edentulous patients requiring complete denture having class I jaw relation, well formed ridges, within the age group of 40- 60 yrs were included.

Exclusion criteria

Subjects having attrition & history of previous orthodontic treatment in case of dentulous group were excluded. Subjects having signs and symptoms of TMJ disorders and /or Neuromuscular disorders were excluded for both dentulous and edentulous groups.

The edentulous patients group had mean age of - 56.7 which included 7 males and 3 females . In the dentulous group the age range was 20-25 years with mean age 22.1 years which included 5 males and 5 females.

Method used for dentulous patient ;

The dentulous subjects were randomly selected as the criteria laid out in the study. Digital Lateral cephalograms (Kodak 8000c Digital Paoramic And Cephalometric System, Carestream Health Inc. Rochester , France) were made at two positions such as intercuspal position and edge to edge protrusive position.

Method used for edentulous patient ;

Edentulous patients who reported to the department for construction of complete denture prosthesis were selected as per the criteria laid out in the study. Conventional complete denture procedures such as primary impression, secondary impression, face bow transfer , vertical jaw relation and tentative centric relation recording by using wax checkbite method were performed on the patient. After the articulation of maxillary and mandibular casts on the semi adjustable non arcon articulator (Hanau H2, Whipmix Corporation, USA), central bearing point and plate and extra oral gothic arch tracers(height tracers) were attached to the occlusal rims in usual manner . The patient were trained to close in centric relation and make protrusive and lateral excursive movements in horizontal plane of the mandibular tracing plate until a correct Typical /Classical, pointed form of the tracing was obtained. A thin transparent sheet was attached to the mandibular tracing plate to preserve the tracing from smudging. Two perforations were made in the transparent sheet, one at the centric relation point (apex of gothic arch tracing) and second at 6 mm on the protrusive path.

Standardized Lateral Cephalograms were made at centric relation and protrusive jaw relation for all the subjects with exposure for 1.2secs at 78 KV, 12mA. All radiographs were taken with the patients standing and in natural head position without

incorporation of interocclusal recording media between the central bearing plates to eliminate errors resulting from thickness, consistency etc of the recording media.

The height of lower third of the face was measured using Kodak digital imaging software - Version 6.7. For this purpose cephalometric landmarks ANS ; Anterior nasal spine (the tip of the bony anterior nasal spine, in the median plane) and Me ; Menton (the most inferior midline point on the mandibular symphysis) were used [4].

The observations for the vertical height of the face for dentulous and edentulous patients at centric and protrusive positions are described in the Table no. 1 and 2 respectively.

RESULT

For statistical analysis Mann Whitney U Test was applied to ascertain significance in the change of vertical dimension in dentulous and edentulous subjects. The result of the study is mentioned in Table no. 3 & 4.

Among the dentulous group the mean vertical dimension at centric relation (64.3 mm) was lesser than vertical dimension at protrusive relation (66.3mm). However, among edentulous group the mean vertical dimension at centric relation (70.2 mm) was greater than vertical dimension at protrusive relation (69.16mm). The difference in change of vertical dimension from centric relation to protrusive relation between the dentulous and edentulous groups was statistically significant (p= 0.000).

DISCUSSION

Cephalometric analysis has proved to be valuable tool in dental research and diagnosis. One of the most useful applications of cephalometry for prosthodontic reconstruction is to reestablish the spatial position of lost structures such as the teeth [5-7] . Monteith B D (1985) [8], Athanasiou A E (1995) [9] have used cephalometry as a diagnostic tool in prosthodontics to evaluate the results of prosthodontic rehabilitation.

Based on the information available in the literature digital lateral cephalograms were used to record and assess the change in vertical dimension in the experimental groups of this study.

Singh SI, Thombare RU (2011) Evaluated the validity of interocclusal plaster records made while recording protrusive jaw relation, using extraoral tracing device. In their study 76.67 % protrusive records were non-perforated [10].

The factors regulating mandibular movements such as Neuromuscular system as limited by the movements of the two condyles, guiding influences of the contacting teeth, the anatomy and physiology of the TMJs [11], the rotational axes of the mandible play a major role in determining the mandibular position. In an edentulous patient the guiding influence of teeth is missing which may lead to the decrease in the vertical dimension as observed in this study. Similarly, the central bearing plate and central bearing point should remain in contact while the interocclusal record is being made. An observation of mandibular movements on the horizontal tracing plate shows that the spring loaded tracing pin of the extraoral tracer lowers in protrusive jaw relation. Many a times the vertical incisal pin has to be raised out of contact from the incisal table while adjusting the protrusive record on the articulator. Hence, a correlation could be made between the amount of vertical pin movement and decrease in vertical dimension studied on the radiographs. Vassilis K, Vergos VK, Aris-Petros D, Tripodakis AP (2003) in their radiographic study found out that the interocclusal recording materials produce small vertical discrepancies ranging from 2 to 74 microns [12]. The thickness and consistency of the interocclusal recording media may cause change in vertical dimension.

Limitations of this cross sectional study are – possibility of

radiographic distortion, small sample size. The metal parts of the tracing assembly placed inside and outside the mouth might have led to radiographic distortion.

Conclusion

The observations of the study shows an increase in vertical dimension from centric relation to protrusive relation position in dentulous group. Whereas a decrease in vertical dimension from centric relation to protrusive relation position was seen in edentulous patients. Hence within the limitations of the study it can be concluded that the protrusive records should be perforated.

Table no 1 ; Vertical dimension at centric relation and protrusive relation in the dentulous group

DENTULOUS SUBJECT	VD AT CR	VD AT PROTRUSION	DIFFERENCE IN VD [INCREASE in VD]
1	61.0	61.6	0.6
2	65.4	69.1	3.7
3	63.9	65.9	2.0
4	70.0	73.6	3.6
5	55.7	58.6	2.9
6	64.2	64.6	0.4
7	66.2	66.9	0.7
8	59.7	61.4	1.7
9	62.4	65.1	2.7
10	74.3	76.3	2.0
Total	642.8	663.1	20.3
Mean	64.3	66.3	2.0

Table no 2 : Vertical dimension at centric relation and protrusive relation in the edentulous group

EDENTULOUS SUBJECT	VD AT CR	VD AT PROTRUSION	DIFFERENCE IN VD [DECREASE VD in mm]
1	68.5	67.0	1.5
2	65.0	61.2	3.8
3	68.7	67.3	1.4
4	71.2	70.8	0.4
5	67.9	65.9	2.0
6	72.6	73.0	+0.4
7	85.8	86.2	+0.4
8	73.1	70.2	2.9
9	63.2	64.3	+0.8
10	66.2	65.7	0.5
Total	702.2	691.6	10.9
Mean	70.22	69.16	1.09

Table no 3; Mann Whitney U Test; Descriptive Statistics

Group	Study Variable	N	Mean	Std. Deviation	Minimum	Maximum
Dentulous	Vertical Dimension at Centric Relation	10	64.28	5.240	56	74
	Vertical dimension at Protrusion	10	66.310	5.4911	58.6	76.3
	Difference in vertical dimension	10	2.0300	1.20374	.40	3.70
Edentulous	Vertical Dimension at Centric Relation	10	70.22	6.333	63	86
	Vertical dimension at Protrusion	10	69.160	6.8846	61.2	86.2
	Difference in vertical dimension	10	-1.0900	1.51103	-3.80	0.80

Table no 4 : Mann Whitney U Test; Statistical Analysis

	Group	N	Mean Rank	Sum of Ranks	Mann-Whitney U	Asymp. Sig. (2-tailed)
Vertical Dimension at Centric Relation	Dentulous	10	7.65	76.50	21.500	0.031*
	Edentulous	10	13.35	133.50		
	Total	20				
Vertical dimension at Protrusion	Dentulous	10	9.25	92.50	37.500	.345
	Edentulous	10	11.75	117.50		
	Total	20				
Difference in vertical dimension	Dentulous	10	15.10	151.00	4.000	0.000*
	Edentulous	10	5.90	59.00		
	Total	20				

***p<0.05, significant**

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