

A Retrospective Evaluation Of Various Methods To Determine Vertical Loss In Full Mouth Rehabilitation Patients

Research Article

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Abstract

The aim of this study was to retrospectively evaluate the commonly used technique for evaluating vertical dimension loss in patients who are required for full mouth rehabilitation among dental students. A total of 145 data entries were taken after reviewing 86000 patient data, duplicate and missing entries were omitted. So a total of 114 entries were evaluated. The data was collected from patient records in Saveetha Dental College, over a period of one year. The evaluation was based on the technique used by the dental students, to measure the loss of vertical dimension. The results of the study were subjected to statistical analysis. Data analysis was done using SPSS software version 23.0. Chi-square test and frequency evaluation was done to evaluate the most frequently used method to record vertical loss. It was found that about 93.3% of students have used the Niswonger and Thomson method and 6.7% have used the Tactile perception method although found to be statistically not significant. Pearson (Chi-Square Value - 8.559 and p-value - .638) ($p > 0.05$) The present study concluded that most of the dental students preferred Niswonger and Thomson method for determining loss of vertical dimension.

Keywords: Vertical Dimension; Techniques To Record Vertical Dimension; Tooth Supported Full Mouth Rehabilitation.

Introduction

Vertical dimension is the length of the face as determined by the amount of separation of the jaws^[1]. Restoring Correct vertical dimension of occlusion is one of the most important steps with adequate function and esthetics^[2]. Restoring the vertical dimension of face is one of the fundamental principles of the spherical theory of occlusion to create a happier and more comfortable patient, more efficient mastication, and a perceptible favorable change in facial contour. Causes of vertical dimension loss is due to abrasion, loss of all of the teeth, loss of molar support on either or both sides, and the early loss of six year molars which allows drifting of teeth.

Effects Of Decreased Vertical Dimensions

It will have a direct effect of a reduction of the vertical dimen-

sion is the production of temporomandibular joint disturbances including partial subluxation and those symptoms known as Costen's syndrome, symptoms of these include: impaired hearing, noises in the ear, stuffiness of the ear, sinus disturbances, headaches, burning of the side of the nose and throat, tenderness of the temporomandibular joint on palpation, burning tongue and vertigo, sometimes the meniscus perforates and gets damaged. Although there are many controversies in literature .

Effects Of Increased Vertical Dimension

Pain and clicking in the temporomandibular joint, Increased lower facial height, difficulty in swallowing and speech, stretching of facial muscles, increased volume of the oral cavity and cheek bite will also occur.

Importance in recording vertical jaw relation is given because any

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errors in this record produce the first sign of discomfort [3]. Vertical jaw relation can be recorded in two positions, vertical dimension at rest and vertical dimension at occlusion. VDO (vertical dimension at occlusion) - it is the length of the face when the teeth are in contact and the mandible is in centric relation and the other is VDR (vertical dimension at rest), it is the length of the face when the teeth are separated and the mandible is in a physiologic rest position. Both vertical dimensions are subject to change resulting from loss of teeth.

When at rest the tooth does not maintain contact at rest. The space between the teeth at rest is called the free way space. The free way space exists only at rest. During occlusion, the teeth come in contact with one another and the space is lost. The vertical dimension at occlusion (VDO) should always be 2 - 4 mm lesser than the vertical dimension at rest (VDR). $VD \text{ at rest} = VD \text{ at occlusion} + \text{freeway space}$ [4].

Many patients have adapted to decreased vertical dimension due to bone resorption and posterior tooth wear. One of the more controversial aspects of jaw relation involves vertical rest position. Establishment of a correct vertical dimension of occlusion is of concern and it is considered essential to establish a correct vertical rest position. Rest position acts as a reference point during recording the vertical dimension at occlusion. Restoring the proper vertical dimension is complicated because the rest position may be subject to change [5].

According to Gottlieb, a German named Wallisch was one of the first to define the physiologic rest position of the mandible. In 1906, Wallisch described the mandibular rest position as that position of the mandible wherein all muscle action is eliminated and the mandible is passively suspended. He reported that in this position the opposing teeth do not contact [6]. Boucher et al. noted that if the vertical dimension is too great the patient may complain of soreness of the residual ridges, tightness of facial muscles, and clicking of the dentures during speech. If the vertical dimension is too small, the patient will look older as the lower half of the face is compressed, the cheeks and lips are drooped and chin protrudes. Altering the vertical dimension of occlusion result in traumatic occlusion [7].

The physiologic rest position has been considered by some to remain constant throughout life regardless of the presence or absence of the teeth [8]. Swerdlow found that the vertical dimension of rest varies after natural tooth contacts are lost. Also, the rest vertical dimension can undergo a reduction comparable to the loss of occlusal vertical dimension [9]. Atwood reported instability of the rest position and a decrease in rest face height after removal of occlusal contacts [5]. A variety of techniques have been proposed to determine measurements for the correct vertical dimension of occlusion [8], [8,10], [11], [12]. Accuracy and repeatability of the measurement, adaptability of the technique, type and complexity of the equipment needed, and the length of time required to secure the measurement are the criteria to be considered when selecting the best method to use.

There are numerous beliefs and theories put forward as to the determination of vertical dimension. Some believe that the vertical dimension restored should be the same as probably what existed prior to the edentulous situation [13]. Although many techniques to determine the correct vertical dimension of occlusion have

been proposed like the use of pre extraction records, physiologic rest position, closing forces (boos bimeter method), tactile sense, phonetics, esthetic appearance, open rest method, facial measurements, deglutition and the electromyographic method [14]. Finding a reliable method to determine the correct vertical dimension of occlusion has always been a challenge for the clinicians in the field of complete denture prosthodontics. Previously our team has a rich experience in working on various research projects across multiple disciplines The [15-17][18-29].

Methods To Record Vertical Dimension At Rest [30] by using Facial measurements after swallowing and relaxing, Tactile sense, Measurements of anatomical landmarks, Speech and by analysing facial expression.

Methods To Record Vertical Dimension At Occlusion include

Mechanical Methods Includes

- Ridge relation - by seeing the parallelism of ridges and measuring distance from incisive papilla to mandibular incisors
- Pre extraction records includes Profile photographs, Profile silhouettes, Radiography, Articulated casts and Facial measurements
- Measurements from another denture

Physiological Methods include

Using a Powerpoint, Using wax occlusal rims, Physiological rest position, Phonetics, Aesthetics, Swallowing method, Tactile sense or neuromuscular perception and Patients perception of comfort.

The main objective of this study was to evaluate which type of centric relation method is frequently used by the dental clinicians in an institutional setting.

Materials And Methods

Sample Collection

Retrospective study has been conducted. A total of 145 patient data were taken from 86000 of patient data after reviewing, duplicate and missing entries were omitted. All the data was reviewed from the Dias Data set between 01 June 2019 and 31 march 2020, ethical approval was done by university ethical committee (SDC/SIHEC/2020/DIASDATA/0619-03200). Samples with improper data and repetitions of the data were excluded from the study. Then the sample size has come to 114. The data is then arranged and checked for the frequency of different methods used for recording vertical loss in full mouth rehabilitation cases.

Inclusion Criteria

Patients with VD loss, who require full mouth rehabilitation, patients with informed consent and patients with good neuromuscular coordination.

Exclusion Criteria

Patients without informed consent and Complete edentulous pa-

tients.

Statistical Analysis

The results of the study were subjected to statistical analysis. Data analysis was done using SPSS software. Frequency evaluation and Chi-square test was done to evaluate the type of finish line configuration given to various teeth.

Dependable Variables include the type of technique used to determine vertical loss and the practitioner.

Independent Variables include the age, gender, type of material and technique of fabrication used.

Results And Discussion

From the retrospective study, the frequency of students using different types of techniques to determine the vertical loss was Tactile perception method has a count of 9 and the Niswonger and Thomson method with a count of 105.(Table 1)

The bar chart shows the percentage of various techniques used to determine vertical loss. Niswonger and Thomson technique was used by 92.11% students and Tactile perception technique was used by 7.89% students.(Figure 1)

Out of all the data collected, 3rd year postgraduates reported the highest percentage of cases followed by 2nd year postgraduates and 1st year postgraduates with a percentage of 64.91, 29.82 and 5.26.(Figure 2)

In 1st year postgraduate students all of them have used Niswonger and Thomson method to record vertical dimension, in 2nd year postgraduates, 3 have been reported using tactile perception method and 31 have been use Niswonger and Thomson method and among 3rd year postgraduates, 6 have been reported using tactile perception method and 68 have been use Niswonger and Thomson method.(Table 2)

The bar diagram shows the percentage of various techniques used by various postgraduates to record VD. In 1st year postgraduate students all of them have used Niswonger and Thomson method to record vertical dimension with an overall percentage of 5.26, in 2nd year postgraduates, 2.63% of them have been reported using tactile perception method and 27.19% have been use Niswonger and Thomson method and among 3rd year postgraduates, 5.26% have been reported using tactile perception method and 59.65% have been use Niswonger and Thomson method.(Figure 3)

The determination and establishment of vertical dimension has

always been a challenge to the prosthodontist in different eras, as it is the most significant and intricate step in the construction of a complete denture for the rehabilitation of an edentulous patient. This has ultimately led to establishing the vertical dimension by employing various means. Methods to establish the occlusal vertical dimension can either be subjective or objective. The subjective methods comprise evaluation of esthetics, phonetics, swallowing and patient comfort. The objective methods comprise electromyographic records, biting power and the utilization of facial measurements.

Still no accurate method of assessing the vertical dimension of occlusion in edentulous patients is available to the dentists[31]. Several procedures have been developed in an attempt to establish a clinically useful, reproducible rest position. Gillis’ asked the patient to pronounce the letter “M” while sitting upright. He believed that the mandible assumes the lowest position of the speaking space in this manner. Others recommend recording a vertical rest position after the patient is asked to wet the lips, say “Mississippi” and then hold that position.” These “phonetic” procedures have provided clinicians with fairly reproducible measures which have been found useful as a guide in denture construction and other dental procedures[32].

Hickey et al.’ reported that clinical rest position could be identified through electromyographic (EMG) measurements. They found that muscle activity was minimal at the clinical rest position when measured by having subjects say “14” and swallow [33]. Yemm reviewed the literature on clinical rest position and concluded that muscle activity was minimal at clinical rest position. He postulated that the principal factor determining clinical rest position was not tonic. Muscle activity but rather the result of an equilibrium between the force of gravity and the elasticity of the soft tissue. Little or no muscle activity was believed necessary to maintain clinical rest position [34].

There are various procedures used for restoring vertical dimension, some of which have proved to be very successful. In the mouths of patients who have suffered complete destruction of all identification of their original dental anatomy or jaw relationships, the establishment of the teeth on the curved surface described by Monson is most successful. The mandibular teeth are restored so that their occlusal surfaces conform to a spherical surface with a four inch radius. The center of this segment of the spherical surface is in the region of the glabella, and the curvature of the surface is concentric with the condyle paths. The upper teeth are restored in such a manner that they harmonize and properly occlude with the lower teeth. The restorations placed on the teeth of the upper jaw govern the amount of vertical opening that is established. Such an arrangement allows complete freedom of the mandible, and also permits a more even distribution of the forces of mastication.Our institution is passionate about high quality ev-

TABLE 1: Table shows the frequency of techniques used to record vertical dimension (VD) loss. The most commonly used method was the Niswonger and Thompson method (92.11%) when compared to the Tactile perception method.(7.89%)

TECHNIQUE	Frequency	Percentage
TACTILE - PERCEPTION	9	7.89
NISWONGER AND THOMSON	105	92.11
Total	114	100.0

Figure 1 :- The bar graph shows the total percentage of different techniques used to record vertical dimension loss. X axis represents the technique used and Y axis represents the total percentage of different techniques used. Most commonly used method was the Niswonger and Thomson method (92.11%) when compared to the Tactile perception method.(7.89%)

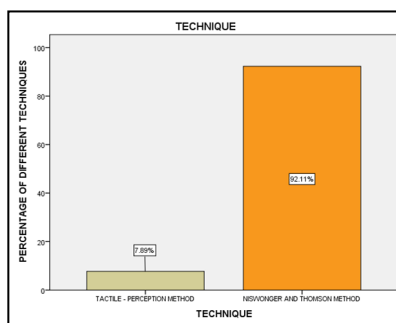


FIGURE 2: The bar graph shows the frequency distribution of postgraduate students done with Full mouth rehabilitation cases. X axis represents the different years of postgraduate students in the department of prosthodontics and Y axis represents the total percentage of postgraduate students done with Full mouth rehabilitation cases. Purple colour represents 3rd year postgraduates, bluish green represents 2nd year postgraduates and dark grey colour represents 1st year postgraduate students.

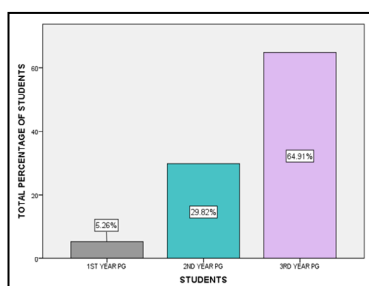
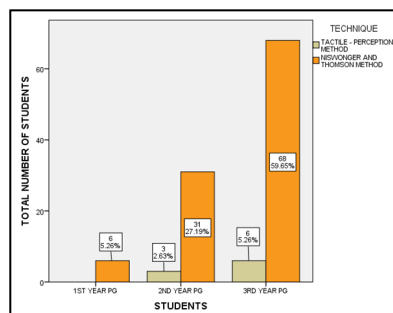


TABLE 2: The table shows the association of different techniques to record vertical dimension and different years of postgraduate students in full mouth rehabilitation cases. Association between the type of technique used and various postgraduate students was found to be statistically not significant.(Chi-Square Value - 8.559 and p-value - .638) (p>0.05).

STUDENT	TECHNIQUE		TOTAL	Pearson Chi-Square Value - 8.559 p-value - .638
	TACTILE - PERCEPTION METHOD	NISWONGER AND THOMSON METHOD		
1ST YEAR PG	0	6	6	
2ND YEAR PG	3	31	34	
3RD YEAR PG	6	68	74	
TOTAL	9	105	114	

Figure 3: The bar graph shows the association between type of technique for determining VD loss and their use among postgraduate students. X axis represents the different years of post graduate students and Y axis represents the total number of students using different types of techniques. Association between the type of technique and various postgraduate students was found to be statistically not significant.(Chi-Square Value - 8.559 and p-value - .638) (p>0.05). However, niswonger and thomson technique was most commonly used by 3rd year post graduate students.



idence based research and has excelled in various fields [35-45].

Conclusion

Within the limitations of the study it can be concluded that Ni-swonger and Thomson method was the most commonly used technique to record the vertical dimension among all post graduate students. Further extensive research can be conducted with larger sample size and more reliable and less technique sensitive methods should be used in recording vertical dimension.

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Author Contributions

First author, Dr. Sai Teja Reddy performed the analysis, and interception and wrote the manuscript. Second author, Dr.Subhabrata Maiti contributed to conception, data design, analysis interpretation and critically revised manuscripts. The third author, Dr. Keerthi Sasanka Participated in the study revised the manuscript as per guideline, alignments and formatting. All the authors have discussed the results and contributed to the final manuscript.

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