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DETERMINATION OF JAW VERTICAL POSITION USING SIVERMAN AND MORYIA'S PHONETIC METHOD ON DENTISTRY

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Abstract: Introdution: this study had the purpose in determining the jaw vertical position of dentate patients. The vertical dimension study has been done for several years but, nowadays it has been a challenge to dentistry. The subjects were 17 dentate individuals attending the occlusion clinic of the dentistry course at the Universidade do Vale do Itajaí, Santa Catarina Brazil. **Materials and Methods:** the survey was conducted with dentistry students of both sexes between 18 to 25 years old with full dental arch. Two dots were done on gingival margin of premolars, one in maxilla and the other one in the jaw in both sides. The subjects' Occlusion Vertical Dimension (OVD) was measured in both sides with the teeth in maximum intercuspation using a dry point compass. With the jaw interference guide (JIG) in position, the subject was asked to pronounce the "S" sound several times. After obtaining a tangent contact of the lower incisors on the JIG ridge, measures were done between the two points and transferred to a ruler to be transformed into millimeters. To the Moryia's method, the jaw ridge was raised with resin of a different color for a better visualization and the phonetic test done again but now using continuously pronounced vowel sounds. The distance between the two marked starting points, were measured again and transformed into millimeters. **Results:** to the Silverman test the space between maxilla and jaw at the right and left side varied from 1.0 mm to 3.0mm during the phonetic tests getting an average of 1.97mm for both sides. The standard deviation to the right side was 0.59mm and 0.51mm to the left side. When a 95% confidence interval is established the accepted values for the right side are from 1.68% to 2.25% and from 1.72mm to 2.21mm to the left side. The data for each subject evaluated are described in table 1. For the Moriya's test the average value to the right side was 3.38mm and 3.15mm to the left side with a standard deviation of 0.80 to the right side and 0.89 for the left one. For the same confidence interval of 95% the accepted values are from 2.30mm to 3.76mm (right side) and 2.72mm a 3.58mm (left side). **Conclusion**: within the limitations of this study, it was concluded that for the Silverman phonetic test the average distance for both sides (right and left) were of 1.97mm and the standard deviation of 0.59 (right side) and 0.51 (left side). For Moryia's test the average distance for the right side were of 3.38mm and to the left were of 3.15mm, with standard deviation of 0.80 (right side) and 0.89 (left side). This is why the authors show the importance of phonetic tests to analyze and determining the Vertical Dimension on oral rehabilitation. **Keywords:** Vertical dimension, Phonetic test, Occlusion Vertical Dimension, Rest Vertical Dimension.

INTRODUCTION

The vertical dimension study has been done for several years but, nowadays it has been a challenge to dentistry. The vertical dimension is understood as the measurement between two points one in the maxilla and the other one in the jaw vertically aligned. When this measurement is taken with the teeth in intercuspation, is known as Occlusion Vertical Dimension (OVD). If this measurement is taken with the jaw in the rest position, will be called Rest Vertical Dimension (RVD). Yamagata et al (1983), Bajunaid et al (2017), Bhat and Gopinathan (2006). The freeway functional space is the difference between these two measurements, the OVD and the VDR. It's about 3.00 millimeters. Even with the teeth lost the Rest Vertical Dimension (RVD) remains stable so it can be used to reestablish the OVD. Reestablish the OVD always was an important step in dentistry, but it means to use in most of the time, static measurements or phonetic tests as of Silverman and Pound's methods to determine proportions between

the medium and inferior thirds of the face. More than 30 years ago, according to Rivera-Morales and Mohl (1990) the phonetic method, using sibilant sounds was introduced into dentistry literature to determine the rest vertical dimension but it was never scientifically proven. Moryia et al (1990) studied and developed a new method for determining the Vertical Dimension of Rest. It consists in pronouncing repeatedly the vowels "I "and "U "in a continuous way. When you pronounce this sound continuously, the jaw maintains itself closer to the vertical rest position. This study had the purpose in determining the jaw vertical position using Silverman and Moriya's test, a literature classic concept (Silverman, 1953). The lip contact position with the closed mouth as a method was investigated whether the technique was useful for determining the occlusal vertical dimension. The relationship between the space between the maxillary and mandibular front teeth in the lip contact position with the closed mouth and the areas of the prolabia was also investigated. (Watarai et al, 2018)

MATERIALS AND METHODS

This research was carried out with a quantitative sample and 17 subjects participated. These were in the age range of 18 to 25 years old, of both sexes, being treated at the Occlusion Clinic of the Dentistry Course of UNIVALI. They agreed to participate in this study and signed an informed consent form. The data were collected over a period of six months. The criteria for the inclusion of the subjects in the research were the presence of all teeth in both arcs and that the integrity of these teeth did not adversely affect the occlusal relationship. After all the patients were examined and checked the teeth and arches, a Jaw Interference Guide was made (JIG) and adjusted leaving a palatal ridge some millimeters higher than occlusion vertical dimension. Two dots were done on

gingival margin of premolars, one in the maxilla and the other one in the jaw in both sides. The subjects' occlusion vertical dimension (OVD) was measured in both sides with the teeth in maximum intercuspation using a dry point compass. With the jaw interference guide in position, the subjects were asked by the researcher to pronounce the "S" sound several times in the meaning word "Mississipi" and on the counting of sixty to sixty-six. It was used carbon paper to register the contact between the incisal of the lower incisors and the ridge of the JIG. This ridge was worn till the lower tooth just had a tangent contact with the surface of the set. After obtaining this condition, measures were done between the two points with the teeth in contact with the surface of the ridge set using the dry point compass and these measures transferred to a ruler to be transformed into millimeters. To the Moryias' test, the jaw ridge was raised with resin of a different color for a better visualization and the phonetic test done again but now using vowel sounds. The researcher asked to the subject to pronounce the vowel "I" continuously. According to Moryia when these vowels are continuously pronounced, the jaw position keeps closer to the Rest Vertical Position (RVP). The distance between the two starting points marked, were measured again, and transformed into millimeters.

RESULTS

To the Silverman's method the space between maxilla and jaw at the right and left side varied from 1.0 mm to 3.0mm during the phonetic tests getting an average of 1.97mm for both sides. The standard deviation to the right side was 0.59mm and 0.51mm to the left side. When a 95% confidence interval is established the accepted values for the right side are from 1.68% to 2.25% and from 1.72mm to 2.21mm to the left side. The data for each subject evaluated are in table 1.

For the Moriya's method the average value to the right side was 3.38mm and 3.15mm to the left side with a standard deviation of 0.80 to the right side and 0.89 for the left one. For the same confidence interval of 95% the accepted values are from 2.30mm to 3.76mm (right side) and 2.72mm a 3.58mm (left side). The data for each evaluated subject are in table 2.

DISCUSSION

The Occlusion Vertical Dimension is an important reference for the stomatognathic system health during its function. Its clinical reestablishment when lost, follows a very known phonetic method proposed by Silverman in the 50's being used as a popular guide, but its accuracy has been tested for little scientific methods. For obtaining the register of the Jaw Vertical Position it has been used two phonetic methods; the Silverman and Moriya's' methods and a Jaw Interference Guide which according to Costa et al. (2000). This research tell that it is useful for determining the Vertical Dimension using the phonetic method. The study has been done with subjects with complete natural dentition so, in all subjects the Occlusion Vertical Dimension, was preserved and the muscle function too. Two phonetic methods were used as follow: Silverman and Moriya's method. The first using the pronunciation of sounds with the consonant "S" or counting from sixty to sixty six and the second method pronouncing continuedly the vowel "I" proposed by Moriya (1990). It has been obtained the meaning average interocclusal values; 3.38mm for the left side and 3.15mm for the right side very close to those recommended by the author (3.0mm between the occlusal surface of posterior teeth). On the vowel "I"I speaking continuously, the Jaw kept very close to the Rest Vertical Dimension, it turns possible determine the Functional Freeway Space which is the difference between this two positions; the Rest Vertical Dimension and the Occlusion Vertical Dimension. In relation to the pronunciation of sibilant sounds (S, Z, Sh, Zh, Ch), it is known that they take the jaw closer to the Occlusion Vertical Dimension and among these sounds the S is the more used in the reading and speech (Wullff & Bereged 1991). And the use of these sounds was recommended by Burnet (1999). According to Silverman (1952; 2001), the pronunciation of words with "S", take the edge of the lower incisors about 1.00mm from the upper incisors. It is the closest position to OVD. We can see that the value obtained in this study with Silverman's method was on average 1.97mm, almost the doble of the value recorded by the author. Miralles et. al (2001) using the phonetic method, pronunciation of the word "Mississipi, recorded clearance values that varied from 1.13mm to 3.39mm between the maxilla and the jaw. The authors suggest that the measurement of the Functional Free Space (FFS) depends on the method used and the patient's clinic rest condition and that the phonetic method alone would not be safe for this purpose. Additionally clinical skill and experience can be critical factors in correctly determining FFS. Goetten and Tonelli (2002) also carried out this study and found the following values of distance between the surfaces of the teeth of maxilla and mandible. For Silverman's method 1.85mm for the right side with a standard deviation of 0.54mm and to the left side of 1.87mm with a standard deviation of 0.646. For the method proposed by Moriya the values found for this distance were 3.175 mm and 3.350 mm with a standard deviation of 3.175 and 1.027 for the right and left sides respectively. The average values found in this study were close to those found by the authors especially if a 95%confidence interval was established. The variation in Free Functional Space in the same patient, shown in this study is like Harper's et al. (2000) who consider this space to be very variable in the

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	Silverman's method		Moriya's method	
Average	1,97	1,97	3,38	3,15
Standard deviation	0,59	0,51	0,80	0,89
Down limit	1,68	1,72	2,30	2,72
Upper limit	2,25	2,21	3,76	3,58

Table 1: Average values, for the right and left sides, when subtracting the Occlusion Vertical Dimension (OVD) from Jaw Vertical Position (JVP), for Silvermann's and for Moriya's method.

	Occlusion Vertical Dimension (mm)		Jaw Vertical Position (mm)	
Subject	R (mm)	L (mm)	R (mm)	L (mm)
1	12,5	15,0	14,5	16,5
2	13,5	12,5	15,5	14,5
3	15,0	13,0	17,0	15,0
4	12,5	13,0	14,5	15,0
5	12,0	11,5	15,0	14,5
6	14,0	14,0	16,0	16,5
7	11,0	11,0	13,0	13,5
8	11,0	10,5	13,5	12,5
9	15,0	15,5	17,5	18,0
10	16,5	16,5	18,5	18,5
11	15,0	15,5	16,5	17,0
12	16,0	16,0	18,0	18,0
13	15,0	15,0	17,0	17,0
14	15,0	15,0	16,0	16,0
15	14,0	14,0	15,0	15,0
16	12,0	12,5	14,0	14,5
17	11,0	12,0	14,0	14,0
Average	13,59	13,68	15,62	15,65
Standard Deviation	1,805	1,837	1,625	1,712

Table 1: Occlusion Vertical Dimension (OVD) measurements and the Jaw Vertical Position (JVD) according to Silverman's method
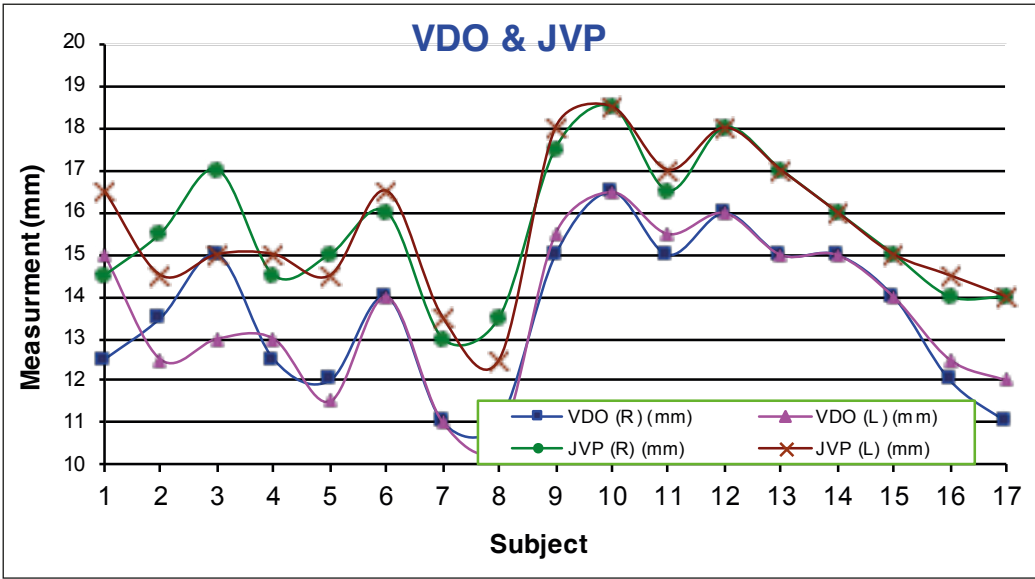
	Occlusion Vertical Dimension (mm)		Jaw Vertical Position (mm)	
Subject	R (mm)	L (mm)	R (mm)	L (mm)
1	12,5	15,0	15,0	17,0
2	13,5	12,5	16,5	15,0
3	15,0	13,0	18,0	14,5
4	12,5	13,0	15,5	16,5
5	12,0	11,5	16,0	15,5
6	14,0	14,0	18,0	18,5
7	11,0	11,0	15,0	15,5
8	11,0	10,5	14,0	13,0
9	15,0	15,5	18,0	18,5
10	16,5	16,5	19,0	19,0
11	15,0	15,5	20,0	19,0
12	16,0	16,0	21,0	21,0
13	15,0	15,0	18,0	18,0
14	15,0	15,0	18,0	18,0
15	14,0	14,0	16,0	16,0
16	12,0	12,5	16,0	16,5
17	11,0	12,0	15,5	15,5
Average	13,59	13,68	17,03	16,88
Standard Deviation	1,805	1,837	1,916	2,012

Table 2 Occlusion Vertical Dimension (OVD) measurements and Jaw Vertical Position according to Moriya's method.
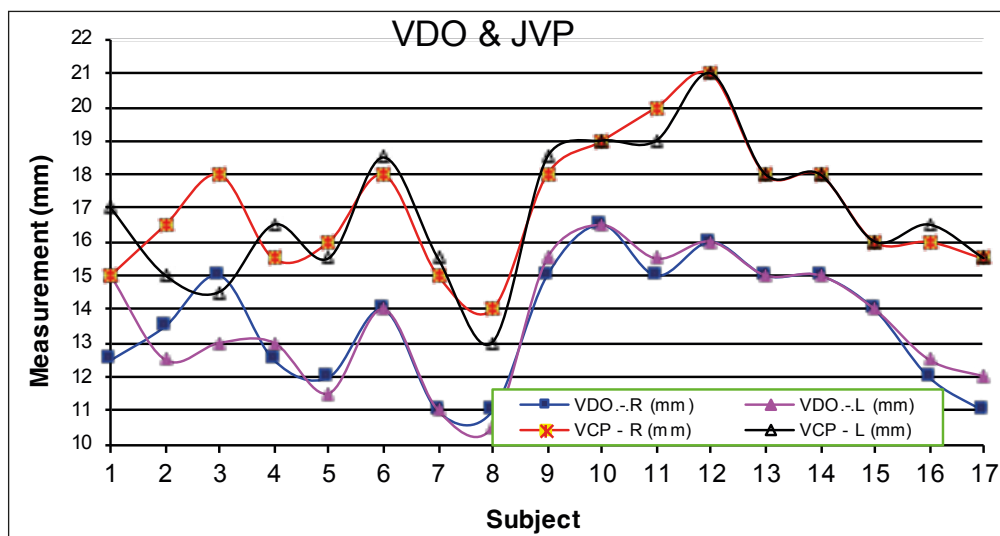
	Silverman Method		Moryia Method	
Subject	R (mm)	L (mm)	R (mm)	L (mm)
1	1,0	1,5	2,5	2,0
2	2,0	2,0	3,0	2,5
3	2,0	2,0	3,0	1,5
4	2,0	2,0	3,0	3,5
5	3,0	3,0	4,0	4,0
6	2,0	2,5	4,0	4,5
7	2,0	2,5	4,0	4,5
8	2,5	2,0	3,0	2,5
9	2,5	2,5	3,0	3,0
10	2,0	2,0	2,5	2,5
11	1,5	1,5	5,0	3,5
12	2,0	2,0	4,0	4,0
13	2,0	2,0	3,0	3,0
14	1,0	1,0	3,0	3,0
15	1,0	1,0	2,0	2,0
16	2,0	2,0	4,0	4,0
17	3,0	2,0	4,5	3,5
Average	1,97	1,97	3,38	3,15
Standard Deviation	0,59	0,51	0,80	0,89
Lower limit	1,68	1,72	2,30	2,72
Upper limit	2,25	2,21	3,76	3,58

Table 3: Difference between Jaw Vertical Position (JVP) and Occlusion Vertical Dimension (OVD) according to the two methods, Silverman's and Moryia's.
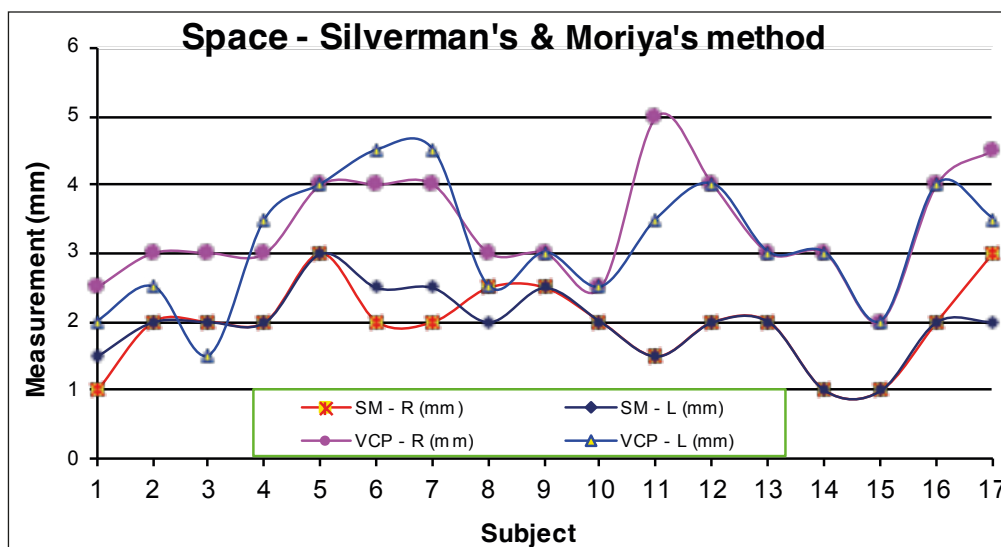
same patient, depending on some factors as head position, emotional condition, presence of all teeth and measurement time. The author also states that the functional free space varies from 3.0mm to 10.0mm from one patient to another. This variation observed in this study was from 2.0mm to 4.5mm to the right side and an average value of 3.38mm (CI= 2.30mm to 3.76mm) and standard deviation of 0.80mm and, 1.50mm to 4.50mm to the left side, average value of 3.15mm (CI=2.72 to 3.58mm) and standard deviation of 0.89mm. Martin et al.(2000) found in a group with normal occlusion a free functional space of 2.63 with standard deviation of 1.38mm. Pereira and Compagnoni (1993) found to this space in bimaxillary edentulous patients who use recent complete dentures 0.20mm to 4.70 with an average value 2.01mm. The result of this research shows that most studies do not present similar results. It can be explained by Mello (1987) who states that the skill of the operator, absence of fixed references or references used, expose the scientific fragility of the methods currently used related by Yamagata et al (1983) and Bajunaid et al (2017). These results clarified that the lip contact position with the closed mouth obtained the excellent reproducibility comparing to the conventional methods. These findings suggested that the area of the prolabium of the upper lip might offer an effective index for individual determination of the correct free-way space. (Watarai et al, 2018) In this way, the authors propose a combination of methods for the clinical determination of the vertical dimension. According to Bhat and Gopinathan (2006) conventional methods used to determine the vertical dimension are not reliable. Phonetic method was more reliable method than the physiologic rest position method in measuring the OVD. (El-esaw et al, 2022). To determine the OVD, the use of a combination of techniques is the most suitable method to date. (Mouhibi et al 2020) Scientific methods to give an exact vertical dimension are yet to be evolved.

CONCLUSION

Within the limitations of this study, it was concluded that for the Silvermann phonetic test the average distance for both sides (right and left) were of 1.97mm and the standard deviation of 0.59 (right side) and 0.51 (left side). For Moryia's test the average distance for the right side were of 3.38mm and to the left were of 3.15mm, with standard deviation of 0.80 (right side) and 0.89 (left side). This is why the authors show the importance of phonetic tests to analyze and determining the Vertical Dimension on oral rehabilitation.

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