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Clinical study to evaluate the duration of masticatory cycles after reducing the occlusal vertical dimension in edentulous patients

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Abstract

Determining the Vertical Dimension of Occlusion (OVD) is an important step in fabricating complete dentures for edentulous patients. Studies indicate that the change in OVD affects the patient's biting force and may affect masticatory efficiency.

Purpose: The purpose of this study was to evaluate the duration of the masticatory cycles in complete denture wears after reducing the Occlusal vertical dimension.

Materials and Methods: Twenty completely edentulous subjects, 4 females and 16 males, their ages were between (40-70) years precipitated in this study. One upper and two lower complete dentures were fabricated for each subject, the first set of upper and lower complete dentures were made with a suitable OVD, while the second set of complete dentures were made with reduced OVD (about 3 mm). The Duration of twenty masticatory circle was performed two months after the patient delivered the first complete denture. The same procedures were repeated for the second set of complete denture wears.

Results: The mean of The Duration of twenty masticatory cycles in the patients who wear complete dentures with suitable OVD was 11.22 seconds, while for the patients who wear complete dentures with reduced OVD was 11.99 seconds.

Conclusions: The value of the Duration of twenty masticatory cycles in dentures with an appropriate OVD was smaller than that of the decreased OVD in the research sample. There are statistically significant differences in the mean of the Duration of twenty masticatory cycles between the two groups at the confidence level of 95%.

Keywords: Masticatory cycles, complete dentures, Occlusal Vertical Dimension (OVD)

Introduction

Occlusal Vertical Dimension (OVD) is the distance measured between two points when the dental arches are in occlusion at maximum intercuspation [1]. Determination of the correct OVD for edentulous patients is one of the most important steps in making dentures with adequate esthetics and function [2]. According to Sharry [3] determining VDO is not a precise process, and many experts will come to this dimension using different methods. Different methods have been proposed for determining VDO [4-6] and many of them were used by various authors [5, 6] in edentulous people as well as in people with teeth.

All of these methods are inaccurate in determining the vertical occlusal dimension that may result in a plus or a low dimension.

A decreased OVD can lead to the appearance of lesions, such as angular cheilitis, facial disharmony, and temporomandibular disorders; meanwhile, an increased VDO may lead to the onset of joint and muscle pain, tension in functional speech, difficulty in swallowing, impaired chewing, tooth sensitivity due to traumatogenic forces, pathologic bone resorption, abnormal wearing of teeth, the appearance of an elongated face, and a facial expression of fatigue [7].

Many edentulous patients have adapted to a vertical dimension which has decreased due to bone resorption and posterior tooth wear. Restoring the proper vertical dimension is further complicated because the rest position may be subject to change. 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 [8]. McGee found that patients tend to register a reduced vertical dimension of occlusion because they feel more comfortable in this position [9].

Niswonger observed that the patients whose vertical dimension of occlusion was excessive complained that they could not use the dentures tissue change until an interocclusal for mastication because of continual soreness on the residual ridges. Trauma to the ridges of these patients caused continuous distance of 4/32 inch had been obtained. Not until this space had developed was the patient able to masticate food with satisfaction and comfort [10]. Tenth felt that nature may shorten muscles, but rarely, if ever, is their functional length increased. There are conflicting reports in the literature regarding the effects of decreasing the OVD. Some authors have suggested that the stomatognathic system naturally adapts to decreases in OVD, for example in cases of tooth loss or severe dental attrition. Conversely, other authors have suggested that a decrease in OVD can predispose the patient to TMD. Nevertheless, there is no strong evidence in the literature supporting either of these statements [11]. McGee found that patients tend to register a reduced vertical dimension of occlusion because they feel more comfortable in this position [9].

The loss of natural teeth leads to bone resorption, temporomandibular dysfunction, 8 and muscular hypotonicity, which may affect structures involved in mastication [12]. Furthermore, treatment success depends not only on management or preparation of the patient, but also on the clinical quality of the dentures [13-16]. Food is generally eaten in mouthfuls, and the processing of a mouthful has been reported to involve a mastication sequence of 10 to 40 chewing cycles [17, 18]. Some studies have reported findings in which subjects were generally represented by a point regarding age and number of cycles required to chew and swallow the model food with both natural dentition [19-22] and dentures [20-28]. Some researchers have reported that edentulous individuals, when provided with optimal complete dentures, presented with masticatory efficiency lower than in those with natural teeth.

The aim of this study was to assess the duration of the masticatory cycles in complete denture wears after reducing the Occlusal vertical dimension.

Material and Methods

Twenty completely edentulous subjects, 4 females and 16 males, their ages were between (40-70) years precipitated in this study. One upper and two lower complete dentures were fabricated for each subject, the first set of upper and lower complete dentures was made with a suitable OVD, while the second set of complete dentures were made with reduced OVD (about 3 mm), figure (1). The Duration of twenty masticatory cycles test was performed two months after the patient delivered the first complete denture. The same procedures were repeated for the second set of complete denture wears.

The maxillary cast of each patient was mounted in a semi adjustable articulator (Hanau H2) using a face bow (face bow

Hanau). OVD was established using the physiological rest positions associated with phonetic and esthetic techniques figure (2, 3) [29]. Centric relation was established according to dynamic records based on physiological movements of the jaws, including opening, closing, and lateral movements performed by the patient [29]. These records were performed to position the mandibular casts on the articulators. Artificial teeth were selected, and bilateral balanced occlusion was obtained [30]. The dentures were waxed, processed, finished, and polished for insertion and follow-up.

Mastication tests were performed using natural food. Each patient received an apiece of natural food (walnut) weighing a total of 3 g [31]. The food was chewed for 20 cycles, The patients were instructed to chew the natural food with slight movements and not to swallow the food. The number of cycles was determined to be close to the moment of natural swallowing figure (4). The cycles were monitored by an examiner and timed in seconds by a digital watch. Patients were allowed to select the chewing side.

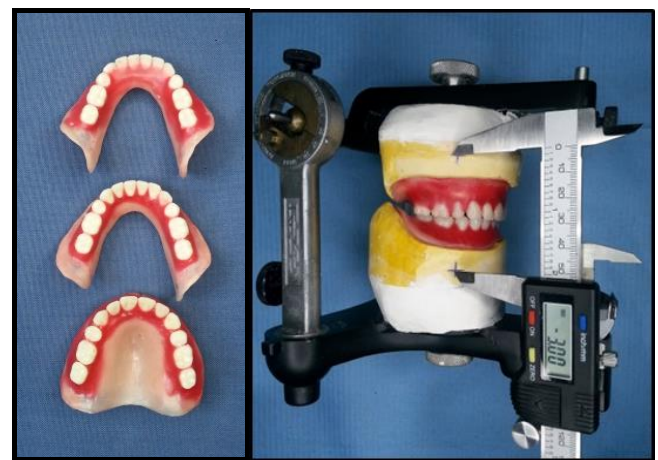


Fig 1: Reducing the OVD by 3 mm at the premolars area in articulator

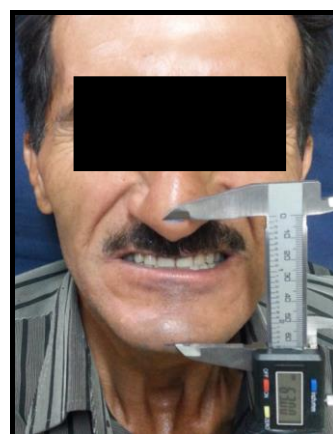


Fig 2: Suitable OVD

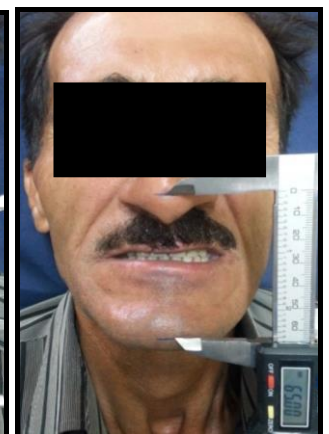


Fig 3: Reduced OVD



Fig 4: Duration of twenty masticatory cycles

Results

The mean time required to perform 20 masticatory cycles was 11.22 seconds at patients with appropriate Occlusal vertical dimension. But the patients with decreased Occlusal vertical dimension was 11.99 seconds Table (1).

Table 1: The mean time required to perform 20 masticatory cycles

Duration of 20 masticatory cycles		patient
low	appropriate	
13.395	12.97	1
11.85	11.78	2
12.5	10.085	3
12.5	9.14	4
10.445	11.85	5
12.755	12.44	6
13.06	12.71	7
12.925	12.92	8
14.57	13.66	9
13.36	12.955	10
14.1	12.4	11
10.325	9.14	12
12.5	11.65	13
10.93	10.085	14
10.17	9.645	15
11.755	11.64	16
12.76	12.095	17
9.495	8.94	18
9.88	9.175	19
10.525	9.17	20
11.99	11.2225	Mean

Statistical study: Independent *t* test was Conducted to compare the differences in the Duration of the twenty masticatory cycles, between the two studied conditions (the appropriate OVD and the low OVD in the research.

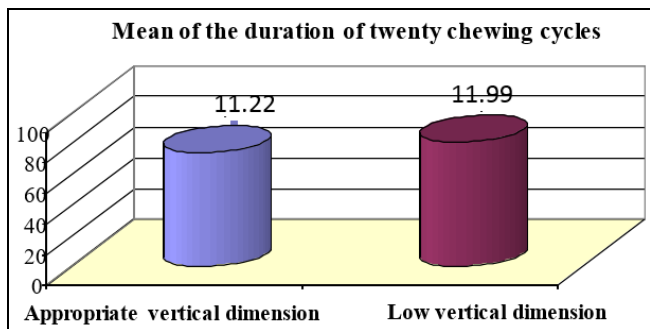


Chart 1: Represents the mean of The Duration of twenty masticatory cycles in the research sample according to the condition studied.

Table 2: Independent t test results

The duration of 20 chewing cycles (in seconds)			
significance of differences	significance level	t	difference between two mediums
There are no significant differences	0.124	1.572	0.77

By conventional criteria, this difference is not considered to be statistically significant.

Discussion

In this study, There are statistically significant differences in the mean of the Duration of twenty masticatory cycles between the two groups Tables(2), chart (1), independent *t*

test was used, table (2), The value of the Duration of twenty masticatory cycles in dentures with reduced OVD was longer than that of the suitable OVD in the research sample. This could lead to greater chewing of food [17, 18], as well as the complex neuromuscular skills required to overcome the limitations of dentures.

Patients with reduced OVD showed a longer time to complete twenty chewing cycles. This can be explained by the fact that chewing the food required more time due to increase of the inter occlusal space. The dentures with suitable OVD perhaps required a lower amount of force to chew the food and small time to perform 20 mastication cycles [28]. These results are consistent with the study of Fouda, S.M., *et al.* [32, 33], values vary from one patient to another, it may be due to the different of muscular capacity and ability in complete denture wears [25].

In the present study, the reduction in the number of cycles occurred mainly at the end of mastication. The reduction of cycles in this specific chewing period may have occurred due to a greater capacity of patients to chew food with suitable OVD.

Conclusion

Within the limits of this study. The value of the Duration of twenty masticatory cycles in dentures with reduced OVD was longer than that of the suitable OVD in the research sample. There are statistically significant differences in the mean of the Duration of twenty masticatory cycles required to chew the test between the two groups at the confidence level of 95%.

References

1. Researches O, Supervision T. The glossary of prosthodontic terms. J Prosthet Dent. 2005. 94(1):10-92.
2. Heartwell CM Jr., Rahn Arthur O. Syllabus of Complete Dentures. Philadelphia: Lea & Febiger. 1986; (4th ed):228-30.
3. Sharry J. Complete Denture Prosthodontics, New York, McGraw-Hill Book Company, Inc, 1962.
4. Atwood DA. A cephalometric study of the clinical rest position of the mandible: Part III: Clinical factors related to variability of the clinical rest position following the removal of occlusal contacts. Journal of Prosthetic Dentistry. 1958; 8(4):698-708.
5. Swerdlow H. Roentgencephalometric study of vertical dimension changes in immediate denture patients. The Journal of Prosthetic Dentistry. 1964; 14(4):635-650.
6. Van Willigen J, Rashbass C, Melchior H. 'Byte-ryte', an apparatus for the determination of the preferred vertical dimension of occlusion required for the construction of complete denture prosthesis. Journal of Oral Rehabilitation. 1985; 12(1):23-25.
7. Discacciati JAC *et al.* Increased vertical dimension of occlusion: signs, symptoms, diagnosis, treatment and options. The Journal of Contemporary Dental Practice. 2013; 14(1):123.
8. Toolson LB, Smith DE. Clinical measurement and evaluation of vertical dimension. Journal of Prosthetic Dentistry. 1982; 47(3):236-241.
9. Mc GG. Use of facial measurements in determining vertical dimension. J Am Dent Assoc. 1947; 35(5):342-50.
10. Swerdlow H. Vertical dimension literature review. Journal of Prosthetic Dentistry. 1965; 15(2):241-247.
11. Moreno-Hay I, Okeson J. Does altering the occlusal

- vertical dimension produce temporomandibular disorders? A literature review. *Journal of oral rehabilitation*. 2015; 42(11):875-882.
12. Gunne H-SJ, Wall A-K. The effect of new complete dentures on mastication and dietary intake. *Acta Odontologica Scandinavica*. 1985; 43(5):257-268.
 13. Bakke M *et al.* Unilateral, isometric bite force in 8-68-year-old women and men related to occlusal factors. *European Journal of Oral Sciences*. 1990; 98(2):149-158.
 14. Wilding R. The association between chewing efficiency and occlusal contact area in man. *Archives of oral biology*. 1993; 38(7):589-596.
 15. Julien K *et al.* Normal masticatory performance in young adults and children. *Archives of oral biology*. 1996; 41(1):69-75.
 16. Christensen L, Mohamed S. Bilateral masseteric contractile activity in unilateral gum chewing: differential calculus. *Journal of oral rehabilitation*. 1996; 23(9):638-647.
 17. Woda A, Mishellany A, Peyron MA. The regulation of masticatory function and food bolus formation. *Journal of oral rehabilitation*. 2006; 33(11):840-849.
 18. Shinkai RS *et al.* Dietary intake in edentulous subjects with good and poor quality complete dentures. *The Journal of prosthetic dentistry*. 2002; 87(5):490-498.
 19. Peyron M-A *et al.* Influence of age on adaptability of human mastication. *Journal of neurophysiology*. 2004; 92(2):773-779.
 20. Wayler AH *et al.* Masticatory performance and food acceptability in persons with removable partial dentures, full dentures and intact natural dentition. *Journal of gerontology*. 1984; 39(3):284-289.
 21. Fontijn-Tekamp F *et al.* Biting and chewing in overdentures, full dentures, and natural dentitions. *Journal of dental research*. 2000; 79(7):1519-1524.
 22. Shikano Y. Clinical study of evaluation on masticatory function in complete denture wearers. A comparison of masticatory movements between normal natural dentition and complete denture wearers. *Nihon Hotetsu Shika Gakkai Zasshi*. 1990; 34(2):318-332.
 23. Karkazis H, Kossioni A. Surface EMG activity of the masseter muscle in denture wearers during chewing of hard and soft food. *Journal of oral Rehabilitation*. 1998; 25(1):8-14.
 24. Michael CG *et al.* Biting strength and chewing forces in complete denture wearers. *The Journal of Prosthetic Dentistry*. 1990; 63(5):549-553.
 25. Brills N. Reflexes, registrations and prosthetic therapy. *J Prosthet Dent*. 1957; 7:341-360.
 26. Lucas P, Luke D. Methods for analysing the breakdown of food in human mastication. *Archives of Oral Biology*. 1983; 28(9):813-819.
 27. Rissin L *et al.*, Clinical comparison of masticatory performance and electromyographic activity of patients with complete dentures, overdentures, and natural teeth. *The Journal of prosthetic dentistry*. 1978; 39(5):508-511.
 28. Van der Bilt A *et al.* Modulation of the mandibular stretch reflex sensitivity during various phases of rhythmic open-close movements in humans. *Journal of Dental Research*. 1997; 76(4):839-847.
 29. Zarb GA *et al.*, *Prosthodontic Treatment for Edentulous Patients-E-Book: Complete Dentures and Implant-Supported Protheses*. Elsevier Health Sciences, 2013.
 30. Al-Ali F, Heath M, Wright P. Simplified method of estimating masticatory performance. *Journal of oral rehabilitation*. 1999; 26(8):678-683.
 31. Kinash O, Rozhko M, Kostyshyn A. Efficiency of Using Mastication Test with Food Stimuli While Performing Electromyographic Studies in Dental Patients. *Архів клінічної медицини*. 2018; (1):23-24.
 32. Fouda SM *et al.*, Effect of patient's personality on satisfaction with their present complete denture and after increasing the occlusal vertical dimension: a study of edentulous egyptian patients. *International journal of dentistry*, 2014.
 33. Goiato MC *et al.*, Analysis of masticatory cycle efficiency in complete denture wearers. *Journal of Prosthodontics: Implant, Esthetic and Reconstructive Dentistry*. 2010; 19(1):10-13.