

Original Research

Effect of vertical dimension of occlusion on smile in dentulous patients

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ABSTRACT:

Background: Reduced VDO is correlated with diminished face contour, thin lips with narrow vermilion borders, and drooping commissures. The present study determined effect of vertical dimension of occlusion on smile in dentulous patients. **Materials & Methods:** 60 dentulous subjects of both genders were subjected to Polyvinyl siloxane occlusal registrations 2, 4, 6, and 8 mm in thickness were fabricated from articulated stone casts. Inter-labial gap height, inter-commissural width, incisal edge to upper lip, and incisal edge-to-lower lip measurements and the display zone area was measured. **Results:** Inter-labial gap height (mm) with OVD 0 was 11.3, 2 was 13.1, 4 was 14.5, at 6 was 15.4 and at 8 was 16.2. Inter-commissural width (mm) at 0 OVD was 63.8, at 2 OVD was 63.3, at 4 OVD was 63.6 and at 6 was 63.4 and at 8 OVD was 63.1. Smile index at 0 OVD was 6.3, at 2 OVD was 5.2, at 4 OVD was 5.1, at 6 OVD was 4.5, at 8 OVD was 4.1. Incisal edge upper lip at 0 was 8.5, at 2 was 8.3, at 4 was 8.1, at 6 was 8.0, at 8 was 8.0. Incisal edge lower lip at 0 was 2.4, at 2 was 4.1, at 4 was 5.2, at 6 was 6.0 and at 8 was 7.2. Display zone area (mm²) at 0 was 532.8, at 2 was 620.5, at 4 was 650.6, at 6 was 730.2 and at 8 was 750.6. The difference was significant ($P < 0.05$). **Conclusion:** With increasing occlusal vertical dimension, the inter-labial gap height, incisal edge to lower lip distance, and display zone area grow. With a rise in occlusal vertical dimension, the grin index falls.

Key words: display zone, smile index, occlusal vertical dimension

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INTRODUCTION

Vertical dimension at occlusion (VDO) is a comfort zone which is formed by the musculoskeletal balance during growth. The arrangement of the muscles around the face and the underlying skeletal architecture both have an impact on the facial morphology.¹ Age-related changes to the periodontal tissue, teeth, and orofacial musculature eventually have an impact on the smile.² As people age, their muscles lose tonicity and flexibility, resulting in a larger transverse and smaller vertical grin. Reduced VDO is correlated with diminished face contour, thin lips with narrow vermilion borders, and drooping commissures.³

Resorption of alveolar bone and tooth loss are two examples of the hard tissue alterations brought on by diminished VDO.⁴ Greater interocclusal restorative space and a decreased requirement for clinical crown lengthening or endodontic operations may result from increasing VDO. Additionally, boosting the VDO

may improve face aesthetics by changing the overjet and overbite of the anterior teeth.⁵

Greater interocclusal restorative space is provided by increasing the OVD, which may reduce the need for clinical crown lengthening or endodontic operations. Additionally, increasing the OVD affects the relationship between the anterior teeth's vertical and horizontal overlap, which may improve face esthetics.⁶ There has been discussion over the effects of raising the OVD. While some academics think that raising the OVD is virtually never recommended, others see it as a changeable location that can be changed without having negative effects.⁷ The present study determined effect of vertical dimension of occlusion on smile in dentulous patients.

MATERIALS & METHODS

The present study comprised of 60 dentulous subjects of both genders. All were informed regarding the study and their written consent was obtained.

Data such as name, age, gender etc. was recorded. Using metal stock trays, irreversible hydrocolloid impressions were created. We acquired arbitrary hinge facebow transfers. Maximum intercuspation silicone occlusal registrations were also obtained. From articulated stone casts, 2, 4, 6, and 8 mm thick polyvinyl siloxane occlusal registers were created. Images of people smiling were captured using a tripod-mounted digital single lens reflex camera at occlusal vertical dimensions of 0, 2, 4, 6, and 8. The

head position was stabilized by a wall-mounted head-positioning device. Computer software was used to measure the inter-labial gap height, inter-commissural breadth, incisal edge to upper lip, and incisal edge to lower lip. We calculated the smile index by dividing width by height. Software tracing was used to measure the display zone's size. Results thus obtained were subjected to statistical analysis. P value less than 0.05 was considered significant.

RESULTS

Table I Distribution of patients

Total- 60		
Gender	Males	Females
Number	32	28

Table I, graph I shows that out of 60 patients, males were 32 and females were 28.

Table II Measurement of smile parameters

Parameters	OVD	Mean	P value
Inter-labial gap height (mm)	0	11.3	0.02
	2	13.1	
	4	14.5	
	6	15.4	
	8	16.2	
Inter-commissural width (mm)	0	63.8	0.12
	2	63.3	
	4	63.6	
	6	63.4	
	8	63.1	
Smile index	0	6.3	0.01
	2	5.2	
	4	5.1	
	6	4.5	
	8	4.1	
Incisal edge upper lip	0	8.5	0.25
	2	8.3	
	4	8.1	
	6	8.0	
	8	8.0	
Incisal edge lower lip	0	2.4	0.01
	2	4.1	
	4	5.2	
	6	6.0	
	8	7.2	
Display zone area (mm ²)	0	532.8	0.05
	2	620.5	
	4	650.2	
	6	730.2	
	8	750.6	

Table II shows that inter-labial gap height (mm) with OVD 0 was 11.3, 2 was 13.1, 4 was 14.5, at 6 was 15.4 and at 8 was 16.2. Inter-commissural width (mm) at 0 OVD was 63.8, at 2 OVD was 63.3, at 4 OVD was 63.6 and at 6 was 63.4 and at 8 OVD was 63.1. Smile index at 0 OVD was 6.3, at 2 OVD was 5.2, at 4 OVD was 5.1, at 6 OVD was 4.5, at 8 OVD was 4.1. Incisal edge upper lip at 0 was 8.5, at 2 was 8.3, at 4 was 8.1, at 6 was 8.0, at 8 was 8.0. Incisal edge lower lip at 0

was 2.4, at 2 was 4.1, at 4 was 5.2, at 6 was 6.0 and at 8 was 7.2. Display zone area (mm²) at 0 was 532.8, at 2 was 620.5, at 4 was 650.6, at 6 was 730.2 and at 8 was 750.6. The difference was significant (P< 0.05).

DISCUSSION

An aesthetically pleasing smile depends significantly on the surrounding lips. As age advances, lips undergo several predictable changes such as

decreased lip volume, loss of lip architecture, and lip lengthening.⁸ These changes lead to less amount of the maxillary tooth display on smile. Minimal and gradual attrition of the occlusal surfaces is generally compensated by passive eruption of teeth. However, excessive occlusal attrition may result in pulpal pathology, occlusal disharmony, impaired function, and aesthetic disfigurement of the face due to loss of VDO.⁹ The present study determined effect of vertical dimension of occlusion on smile in dentulous patients. We found that out of 60 patients, males were 32 and females were 28. Parmar et al¹⁰ examined the impact of increased vertical dimension on patients without teeth on the positions of their lips when smiling. Using articulated stone casts, polyvinyl siloxane interocclusal bite records with various thicknesses of +1, +2, +3, and +4 mm were created for each participant. A D-SLR camera installed on a tripod stand was used to take posed smile pictures at various increasing vertical dimensions of +1, +2, +3, and +4 mm while maintaining a constant distance of five feet from the face. The participants' heads were stabilized using a head positioning device. The height of the inter-labial gap, the distance from the incisal border to the lower lip, and the area of the display zone all significantly increased with increasing occlusal vertical dimension. As the occlusal vertical dimension rose, the smile index considerably dropped. Inter-commissural width and the distance from the incisal border to the top lip did not significantly differ.

We found that inter-labial gap height (mm) with OVD 0 was 11.3, 2 was 13.1, 4 was 14.5, at 6 was 15.4 and at 8 was 16.2. Inter-commissural width (mm) at 0 OVD was 63.8, at 2 OVD was 63.3, at 4 OVD was 63.6 and at 6 was 63.4 and at 8 OVD was 63.1. Smile index at 0 OVD was 6.3, at 2 OVD was 5.2, at 4 OVD was 5.1, at 6 OVD was 4.5, at 8 OVD was 4.1. Incisal edge upper lip at 0 was 8.5, at 2 was 8.3, at 4 was 8.1, at 6 was 8.0, at 8 was 8.0. Incisal edge lower lip at 0 was 2.4, at 2 was 4.1, at 4 was 5.2, at 6 was 6.0 and at 8 was 7.2. Display zone area (mm²) at 0 was 532.8, at 2 was 620.5, at 4 was 650.6, at 6 was 730.2 and at 8 was 750.6. Gross et al¹² reported that an increase in VDO in the range of 2–6 mm did not show any significant change in the lower face height measurement when viewed in anterior direction at clinical rest position. Chou et al¹¹ measured how the dimensions of the grin changed as the occlusal vertical dimension was increased. In this study, 30 dentistry students between the ages of 21 and 30—12 men and 18 women took part. The height of the inter-labial gap, the distance from the incisal border to the lower lip, and the area of the display zone all considerably increased with an increase in the occlusal vertical dimension. McNamara et al¹² performed video analysis of posed smile at MI and found the average inter-labial gap height and inter-commissural width to be 10.4 ± 3.7 mm and $61.1 \pm$

5.4 mm, respectively. Bloom and Padayachy¹³ had stated that facial aesthetics can be considered as a rationale for altering VDO. Changes in soft tissue and hard tissue with varying VDO should be evaluated and quantified before performing the treatment for obtaining a predictable aesthetic outcome.

CONCLUSION

Authors found that with increasing occlusal vertical dimension, the inter-labial gap height, incisal edge to lower lip distance, and display zone area grow. With a rise in occlusal vertical dimension, the grin index falls.

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