Short Communication

Predictable Reproduction of the Buccal Shelf Area in Mandibular Dentures

Jhen-Dong He, DDS[a]/Tsau-Mau Chou, DMD, MScD, DScD[b]/Hong-Po Chang, DMD, PhD[c]/
Jen-Hao Chen, DDS, MSD[d]/Yi-Hsin Yang, MS, PhD[c]/Dorsey J. Moore, DDS[e]

The objective of this study was to assess whether a periodontal probe measurement could be used to obtain a predictable reproduction of the buccal shelf areas in mandibular dentures. One hundred patients were measured for the anterior, middle, and posterior width of the buccal shelf with a periodontal probe. This measurement was then compared with that of the corresponding portion of the existing denture. At each portion, there were statistically significant differences in the width of the buccal shelf and that of the corresponding portion of the existing denture from dental clinics of general dentists. The periodontal probe could be used to measure the width of the buccal shelf to obtain a predictable reproduction of the buccal shelf areas in mandibular dentures. *Int J Prosthodont 2007;20:535–537.*

The primary stress-bearing area in most impression techniques of the mandible is the buccal shelf.[1] The buccal shelf is bounded medially by the crest of the residual alveolar ridge, laterally by the external oblique ridge, anteriorly by the buccal frenum, and posteriorly by the retromolar pad.[2] This area is important because of its right angle relationship to the vertical occlusal forces and large dense cortical bone support.

[a]*Graduate Student in Prosthodontics, Graduate Institute of Dental Sciences, Kaohsiung Medical University, Kaohsiung, Taiwan.*
[b]*Professor, Department of Prosthodontics, Kaohsiung Medical University Hospital and Faculty of Dentistry, College of Dental Medicine, Kaohsiung Medical University, Kaohsiung, Taiwan.*
[c]*Associate Professor, Graduate Institute of Dental Sciences, Kaohsiung Medical University, Kaohsiung, Taiwan.*
[d]*Lecturer, Department of Prosthodontics, Kaohsiung Medical University Hospital and Faculty of Dentistry, College of Dental Medicine, Kaohsiung Medical University, Kaohsiung, Taiwan.*
[e]*Professor Emeritus, Department of Removable Prosthodontics, School of Dentistry, University of Missouri-Kansas City, Missouri.*

Correspondence to: *Dr Tsau-Mau Chou, Department of Prosthodontics, College of Dental Medicine, Kaohsiung Medical University, 100 Shih-Chuan 1st Road, Kaohsiung 80708, Taiwan. E-mail: pro11sth@kmu.edu.tw*

Unfortunately, dentures often fail to cover this area in its entirety because of extension inadequacy of the impression stage,[2,3] thus causing fit, retention, and stability problems. Developing the proper border extensions is a key step in preparing the impression tray for a satisfactory impression. This procedure can be facilitated by careful observation of labial and buccal vestibular spaces along with measurements made with a periodontal probe.[4]

The objectives of this study were to assess whether a periodontal probe measurements could be used to obtain a predictable reproduction of the buccal shelf and to identify whether there were significant differences between the widths of the anatomic buccal shelf and the corresponding denture portions from dental clinics of general dentists.

Materials and Methods

One hundred patients and their complete dentures from the dental clinics of general dentists were clinically examined. All patients were measured at the anterior (buccal frenum area), posterior (anterior edge of the retromolar pad), and middle (center of anteropos-

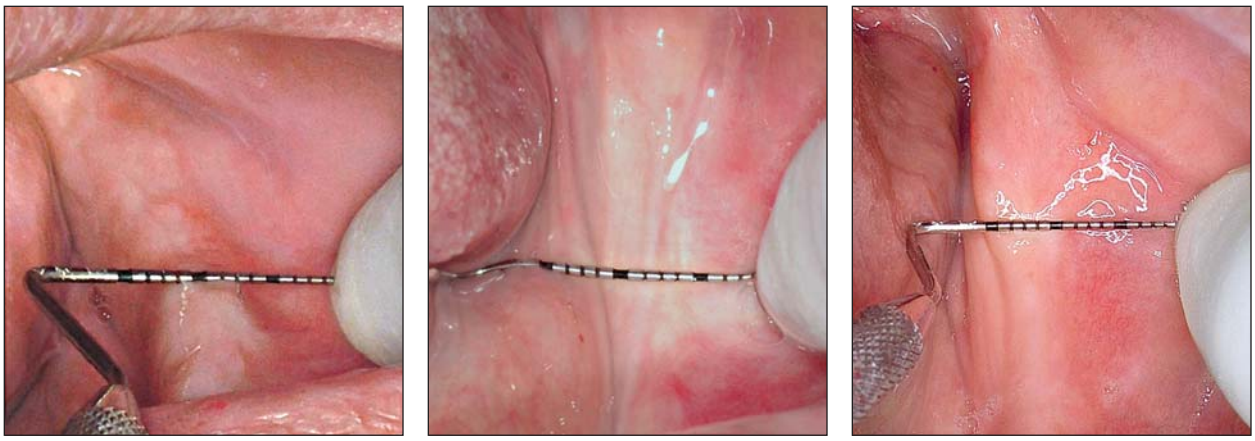

Fig 1 Measuring the widths of the buccal shelf with a periodontal probe: *(left to right)* anterior width, middle width, posterior width.

Table 1 Gender and Age Distribution of the Subjects

Gender	N	Mean age (y)
Female	58	76.57
Male	42	75.85
Total	100	76.26

Table 2 Widths (mm) (Mean ± SD) of the Buccal Shelf and Dentures

Site	Buccal shelf	Denture	Paired *t* test
Anterior			
Right	8.8 ± 1.2	7.8 ± 1.6	< .0001
Left	8.8 ± 1.1	7.8 ± 1.7	< .0001
Combined	8.8 ± 1.1	7.8 ± 1.5	< .0001
Middle			
Right	11.1 ± 1.2	8.2 ± 1.7	< .0001
Left	11.2 ± 1.2	8.2 ± 1.8	< .0001
Combined	11.1 ± 1.2	8.2 ± 1.6	< .0001
Posterior			
Right	13.3 ± 1.1	7.0 ± 1.9	< .0001
Left	13.3 ± 1.1	6.9 ± 1.9	< .0001
Combined	13.3 ± 1.1	7.0 ± 1.8	< .0001

Table 3 Widths (mm) (Mean ± SD) of the Buccal Shelf and Denture According to Gender

Site	Buccal shelf	Denture	Paired *t* test
Anterior			
Men	9.2 ± 1.0	7.8 ± 1.4	< .0001
Women	8.4 ± 1.1	7.7 ± 1.6	< .0001
t	.0004	.7940	
Middle			
Men	11.5 ± 0.2	8.3 ± 1.7	< .0001
Women	10.9 ± 0.2	8.1 ± 1.5	< .0001
t	.0079	.5906	
Posterior			
Men	13.7 ± 0.9	7.0 ± 1.9	< .0001
Women	12.9 ± 1.2	7.0 ± 1.7	< .0001
t	.0004	.9973	

terior width of buccal shelf) widths of the buccal shelf with a periodontal probe (Hu-Friedy). The widths of the buccal shelf were measured from the crest of the residual alveolar ridge to the external oblique ridge. The probe was placed so that it lay along the mucosa covering the buccal shelf. The measurements were then made with the corresponding portions of the existing denture (Fig 1). The paired *t* test was used to identify discrepancy between the 2 measurements.

To assess the reliability of the measurements, 2 examiners independently operated a pilot study of 26 patients. The 2-sample *t* test was used to compare gender difference and both-side variance.

Results

The correlation coefficients were around 0.85, indicating a high level of reproducibility between different examiners. The gender and age distribution of the subjects in this sample are shown in Table 1.

The mean width of the buccal shelf was smallest at the anterior portion and largest at the posterior portion. The left and right values were nearly the same (anterior $r = 0.9408$, middle $r = 0.9553$, and posterior $r = 0.9548$). Statistical comparison between the widths of the buccal shelf and the corresponding portion of the existing denture is shown in Table 2. At each portion, there was a statistically significant difference in the width of the buccal shelf and that of the corresponding portion of the existing denture ($P < .0001$). The width of the corresponding portion of the existing denture was smaller than that of the buccal shelf at the anterior, middle, and posterior portions. There were also statistically significant differences in the widths of these 3 portions between males and females ($P < .0001$, $P < .001$ and $P < .0001$, respectively; Table 3). The width of the buccal shelf in males was larger than in females.

Discussion

There have been few studies on the width of the buccal shelf. The results of this study demonstrated that periodontal probe measurements could be used to obtain a predictable reproduction of the buccal shelf areas in mandibular dentures.

At the buccal shelf area, the denture border can be extended to, on, or even over the external oblique ridge; therefore, the ridge must be recorded by making the impression.[5] The buccinator muscle has its lower fibers attached to the buccal shelf and the external oblique ridge. Thus, visualization may not be accurate because of the attachment of the buccinator muscle.

The findings of this study suggest that clinicians should use a periodontal probe to measure the width of the buccal shelf before fabricating complete dentures. Then, the measurement can be made with the corresponding portion of the custom impression tray to determine if it extends properly.

Conclusion

1. The general dentist usually foreshortens the buccal shelf.
2. This study shows how to achieve a properly extended buccal shelf for the custom impression tray. The periodontal probe is an excellent dental tool to achieve the goal.

Acknowledgments

This study was supported by the College of Dental Medicine of Kaohsiung Medical University, Kaohsiung, Taiwan.

References

1. Smutko GE. Making edentulous impressions. In: Winkler S (ed). Essentials of Complete Denture Prosthodontics, ed 2. St Louis: Mosby, 1988:88–106.
2. Davis DM. Developing an analogue/substitute for the mandibular denture-bearing area. In: Zarb GA, Bolender CL, Eckert SE, Jacab RF, Fenton AH, Mericske-Stern R (eds). Prosthodontic Treatment for Edentulous Patients: Complete Dentures and Implant-Supported Prostheses, ed 12. St Louis: Mosby, 2004:232–251.
3. Watt DM, MacGregor AR. Designing Complete Dentures, ed 2. Bristol: Wright, 1986:85–87.
4. Kluth EV. Use of the periodontal probe to determine border extensions of impression trays. J Prosthet Dent 1986;56:746–747.
5. Hayakawa I. Principles and Practices of Complete Dentures: Creating the Mental Image of a Denture. Tokyo: Quintessence, 2001:21–23.

Literature Abstract

Microabrasion of cast metal margins—A warning

This observational study aimed to examine the damage risk to dental alloys exposed to microabrasion. Plastic test patterns were beveled to simulate casting margins and were cast in a variety of dental alloys. The specimens were grossly divested using blunt mechanical forces and rotary instruments and the residual investment was removed using chemical divestment. The cast specimens were exposed to horizontal and vertical streams of low-pressure microabrasion with 50-μm aluminum oxide particles. Measurements of lost metal structure were made using a measuring microscope. Considering the fact that this study was not scientifically designed and that no statistical analysis of the data was performed, presentation of the numerical results may be misleading. However, the fact that microabrasion can cause damage to casting margins has been well demonstrated. Adoption of appropriate measures for prevention of this damage is suggested by the authors.

Mansueto MA, Verrett RG, Phoenix RD. *J Prosthodont* 2007;16:136–140. **References:** 8. **Reprints:** Dr Michael A. Mansueto, Department of Prosthodontics (7912), University of Texas Health Science Center, 7703 Floyd Curl Drive, San Antonio, TX 78229-3900. E-mail: mansueto@uthscsa.edu—*Tapan N. Koticha, National University of Singapore Faculty of Dentistry, Singapore*