

## Determination of the distal extension of mandibular complete denture base in relation to the retromolar pad coverage

Phyo Ei Ei Htay<sup>1</sup>, Thiri Kyaw<sup>2</sup>, Than Swe<sup>3</sup>

1. Magway Teaching Hospital, Department of Medical Services

2. Department of Prosthodontics, University of Dental Medicine, Mandalay

3. Department of Prosthodontics, University of Dental Medicine, Yangon

### Abstract

The correct denture base outline is one of the fundamental important factors in order to obtain successful complete denture, which should provide not only the good technical qualities of denture but also patient satisfaction, especially patient comfort. It is more difficult to be achieved in mandibular complete denture. In fact, there is a controversy about its coverage extent on the retromolar pads as there are various concepts among different authors. This study, therefore, had been designed to determine the distal margin of removable mandibular complete denture base in relation to the retromolar pad coverage by comparing the retention and comfort among different coverage levels of the retromolar pads. Twenty edentulous patients (Ten patients with high well-rounded alveolar ridges and ten patients with low well-rounded alveolar ridges) were included. After denture base plate had been made, the retention and comfort among different coverage levels (Posterior third, Middle third and Anterior third) of the retromolar pads were measured and analyzed. In both types of the ridge, when the denture base plates were

reduced from posterior third to middle third coverage, the retention was not significantly different ( $p>0.05$ ) while patient comfort scores were significantly increased. In contrast, the retention of the denture base plates was significantly decreased ( $p<0.001$ ) whereas the patient comfort scores were not significantly different after reducing to anterior third coverage. Therefore, it was concluded that the mandibular complete denture should be extended up to the middle third region of the retromolar pads in both types of the ridge.

**Key words:** denture base outline, retromolar pad, retention, patient comfort

### Introduction

Successful complete denture construction is still challenging in daily dental practice. Its prime objective is to create the stable and retentive bases, carrying the artificial teeth, which provide the edentulous patients to be comfortable and proper function [1]. Indeed, the correct denture base outline is crucial to obtain peripheral seal, which is a vital factor in enhancing the denture retention [2]. Undoubtedly, it is more difficult to be obtained in mandibular complete denture.

In mandibular region, retromolar pad, which is pear-shaped in general and situated at the distal end of the mandibular alveolar ridge, plays an essential role in obtaining peripheral seal so that the denture base should be extended onto the retromolar pads [3].

Nevertheless, there are various concepts about the coverage level of the retromolar pads. Boucher (1964) [4], Wright (1966) and Abe (2007) [5] recommended that the distal margin of denture base outline should be extended to the posterior third of the retromolar pads. However, Zarb, et al. (1997) [6], Nagao, et al. (1995) [7] and Sato, et al. (1998) [8] stated that it should be terminated at the middle third of the retromolar pads whereas Grant and Johnson (1992) assumed that it should cover only on the anterior third of the retromolar pads [9]. Differently, Kawabe (1992) also stated that the denture base should be ended at the anterior part of the retromolar pads unless the alveolar ridge is severely resorbed [10]. Therefore, there is still unclear on which part of the retromolar pads (posterior third, middle third or anterior third) should be covered to obtain the best result.

Another important factor that should not be neglected is patient perception. Most practitioners emphasize only on improving the quality of the denture and make little consideration on patient comfort and satisfaction. In actual fact, comfort is paramount in determining success of denture. Majority of patients are stressed from discomfort once they start wearing complete dentures that have been constructed with great technical quality. As a result, they may have no willing to wear these anymore. Obviously, when the operator attempts to make more comfortable denture for the patient, the patient's stress will be released and one's life will turn out to be comfortable

and joyous [11].

For that reason, in complete denture construction, retention of the denture can be considered as the important and prerequisite factor objectively and also subjectively, patient comfort plays an important role in denture success.

Therefore, this study was designed to determine the distal margin of removable mandibular complete denture by measuring the retention in different coverage levels of retromolar pads and evaluating the comfort of the patient in each level of retromolar pad coverage.

### **Materials and Methods**

Twenty edentulous patients attending the Department of Prosthodontics, University of Dental Medicine, Yangon, were selected according to the selection criteria. They were divided into two groups: Group 1 comprised of ten patients with high well-rounded mandibular ridge or Atwood's Class III and Group 2 consisted of ten patients with low well-rounded mandibular ridge or Atwood's Class V.

Firstly, the impression making was done to obtain precise peripheral border from functional impression and working cast was completed with die stone. Then, the working cast was duplicated by using agar powder and two denture base plates were made by using heat cured acrylic resin, with distal base outline extending to posterior third of the retromolar pads.

On one of the working casts, the retromolar pad regions on both left and right sides were highlighted and measured the mesiodistal dimension of these regions by using digital slide caliper. After that, these areas were marked into three equal parts (Posterior third, middle third and anterior third) with permanent

marker pen.

On one of the base plates, these marks in the retromolar pad regions were transferred from the working cast and stainless steel wire retraction hook was placed at the anterior midline region of the base plate to be retracted.

Next, the denture base plate was inserted in a subject's mouth and retention of the base plate was measured by using Analog Push-Pull gauge. Then, subjective evaluation of patient's comfort was assessed by Modified Smith's Questionnaire method [12]. After the denture base plate had been reduced from posterior third to middle third coverage, retention and comfort score were assessed again. Finally, the denture base plate was reduced to anterior third coverage and assessments were also done. Then, the denture was fabricated on another denture base plate according to the standard principles and technique of the Department of Prosthodontics.

## Results

Figure 6 and 7 represent the retention of denture base plates at posterior third coverage, middle third coverage and anterior third coverage of the retromolar pads in two groups. The mean values were  $(1.876 \pm 0.52 \text{ kgf})$ ,  $(1.933 \pm 0.48 \text{ kgf})$  and  $(0.74 \pm 0.38 \text{ kgf})$  respectively in Group 1, and  $(1.016 \pm 0.24 \text{ kgf})$ ,  $(1.001 \pm 0.28 \text{ kgf})$  and  $(0.415 \pm 0.16 \text{ kgf})$  respectively in Group 2. There were no significant differences between posterior third coverage and middle third coverage while significant differences were found between middle third coverage and anterior third coverage ( $p < 0.001$ ) in both groups.

Figure 8 and 9 display the comfort scores at different coverage levels of the retromolar pads in two groups where 80% in Group 1 and 70% in Group 2 scored discomfort

in the posterior third coverage while 100% in Group 1 and 80% in Group 2, remaining 20% scored very comfort, expressed comfort in the middle third coverage. In the anterior third coverage, 60% scored comfort and only 40% scored very comfort in both groups.

## Discussion

Retromolar pad is an important anatomical landmark which plays an essential role in mandibular complete denture construction. It not only enhances in retention and support of the denture base but also serves as a good landmark for the orientation of occlusal plane. It is composed of tissues which are different in nature: the distal portion of retromolar pad is non-keratinized mucosa and glandular in nature whereas the anterior and middle third portions are comprised of keratinized masticatory mucosa [13]. Because of this, the distal portion of retromolar pad should be considered as unfavorable denture bearing area and does not play an important role in retention and support of the denture.

In this study, therefore, there was no dramatic alteration in the retention of the denture base plates when they were reduced from the posterior third coverage to the middle third coverage of retromolar pads. This study is also consistent with the concepts of Zarb, et al. (1997), Nagao, et al. (1995) and Sato, et al. (1998).

In low well-rounded alveolar ridge, the results were similar with that of Group 1 when comparing the mean retention among different coverage levels of the retromolar pads, i.e. the retention was not significantly different between the posterior third coverage and the middle third coverage, although the mean values of retention were much lower than that of Group 1. Thus, it can be assumed that the type of alveolar ridge does not influence on the

retromolar pad coverage, which reveal the disagreement with the concept of Kawabe (1992).

Moreover, the results are not too different from the research done by Ichikawa (2012) [14] in which retention was measured in four regions, namely the distal end dome of the retromolar pad region, the posterior margin of the retromolar pads, the middle part and the anterior margin of the retromolar pads. Likewise, mean retention among the distal end dome, posterior margin and middle third were not significantly different ( $p > 0.05$ ) compared to the anterior margin of the retromolar pads.

With regard to the patient comfort, in this study, over three quarter of patients scored discomfort on wearing denture with posterior third coverage of the retromolar pads while only few people, having the experience of wearing dentures, scored comfort. This may be due to the facts that fibers of the buccinators and superior constrictor muscles, the pterygomandibular raphe, and the terminal part of the tendon of the temporalis muscle are inserted in the distal part of the retromolar pads. The action of these muscles restricts the placement of extra pressure on the distal part of the retromolar pads and causes tightness and discomfort to the patients [15]. After removing the posterior third of the denture base plates, nearly all patients felt more comfort and the remaining scored very comfort.

In the success of removable prosthesis, the subjective factors connected with the patient are also important as well as the operator's skill and the quality of dentures [16]. Actually, the vast majority of patients would prefer to have their teeth replaced with the least amount of material so that the optimum extent of complete denture should be determined for

increased patient comfort if there is little or no change in retention and the denture functions are not sacrificed [17,18,19].

## Conclusion

The distal margin of mandibular complete denture base should be positioned at the middle third coverage of the retromolar pads in both high well-rounded and low well-rounded alveolar ridges.

## References

1. Faber. Retention and stability of mandibular dentures. *Journal of Prosthetic Dentistry*. 1967 March;17(3): 210-218.
2. Wright CR. Evaluation of the factors necessary to develop stability in mandibular denture. *Journal of Prosthetic Dentistry*. 1966 May-June;16: 414-430.
3. Pendleton EC. The minute anatomy of the lower jaw in relation to the denture problem. *Journal of American Dental Association*. 1942 May;29(5): 719-736.
4. Boucher CO. *Swenson's Complete Dentures*. St. Louis: The C.V. Mosby; 1964.
5. Abe J. *The Suction Mechanism of The Lower Complete Denture*. 1st ed. Tokyo: Hyoron; 2007.
6. Zarb GA, Bolender CL, Carlsson GE. *Boucher's Prosthodontic Treatment for Edentulous Patients*. 11th ed. St. Louis: Mosby Company; 1997.
7. Nagao M, Kobayashi K, Suzuki, T. *Impressions of Edentulous Patients*. Tokyo: Ishiyaku EuroAmerica, Inc; 1995.
8. Sato Y, Tsuga Y, Akagawa Y, Tenma H. A method for quantifying complete denture quality. *Journal of Prosthetic*

- Dentistry. 1998 July; 80(1): 52-57.
9. Grant AA, Johnson TIW. Removable Denture Prosthodontics. 2nd ed. Edinburgh: CHURCHILL LIVINGSTONE; 1992.
  10. Kawabe S. Kawabe's Complete Dentures. 1st ed. Tokyo: Ishiyaku EuroAmerica,Inc; 1992.
  11. Yoshihiro S. Practical points in making complete dentures suction effective and functional - General views on edentulous ridge characteristics and denture movements. Dental Outlook. 2012 June; 120(2): 8.
  12. Smith M. Measurement of personality traits and their relation to patient satisfaction with complete denture. Journal of Prosthetic Dentistry. 1976 May; 35(5): 492-503.
  13. Jacobson TE, Krol AJ. A contemporary review of the factors involved in complete dentures. part III: support. Journal of Prosthetic Dentistry. 1983 March; 49: 306-313.
  14. Ichikawa M. An investigation of retentivity for different amounts of retromolar pad coverage by the denture base. Journal of The Academy of Clinical Dentistry. 2012 June; 32(1-2): 57-64.
  15. Zarb GA, Bolender CL, Carlsson GE. Prosthodontic Treatment for Edentulous Patients: Complete Dentures and Implant-supported Protheses. Twelfth ed. St.Louis: Mosby; 2004.
  16. Knezovi D, Zlatari E. Patient's satisfaction with partial dentures. Acta Stomatol Croat. 2000; 34(4): 373-378.
  17. Levin B, Gamer S, Francis ED. Patient preference for a mandibular complete denture with a broad or minimal base: A preliminary report. Journal of Prosthetic Dentistry. 1970 May; 23(5): 525-528.
  18. Thein Kyu. Effect of modifying the extent of palatal coverage of maxillary complete denture on retention, biting force and patient satisfaction. 2007; Dr.D.Sc. (Prosthodontics) Thesis, University of Dental Medicine, Yangon, Myanmar.
  19. Muraoka H. A Color Atlas of Complete Denture Fabrication: A Clinical Technique Using Interim Dentuers. Tokyo: Quintessence; 1989.

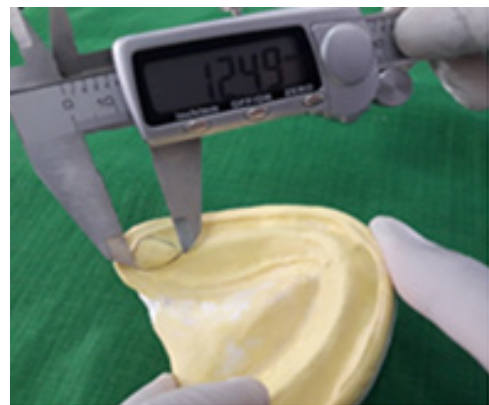


Figure 1. Measuring the mesio-distal dimensions of the retromolar pad



Figure 2. Dividing the RMP into three parts equally on the working cast



Figure 3. Denture base plate covering the posterior third of the retromolar pad



Figure 4. Denture base plate covering the middle third of the retromolar pad



Figure 5. Denture base plate covering the anterior third of the retromolar pad

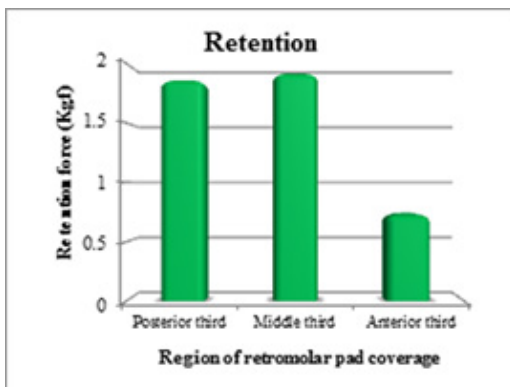


Figure 6. Comparison of mean retention of

denture base plates among different coverage levels of the retromolar pads in high well-rounded ridges

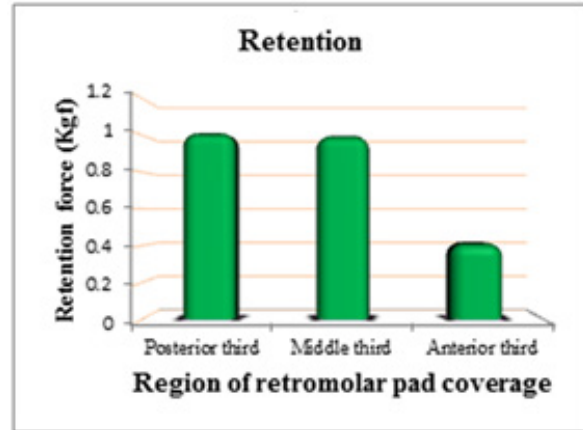


Figure 7. Comparison of mean retention of denture base plates among different coverage levels of the retromolar pads in low well-rounded ridges

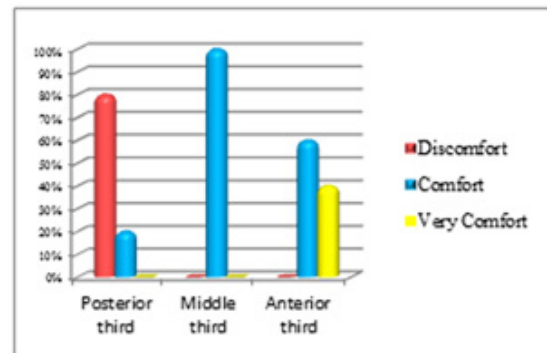


Figure 8. Comparison of comfort score among different coverage levels of the retromolar pads in high well-rounded ridges

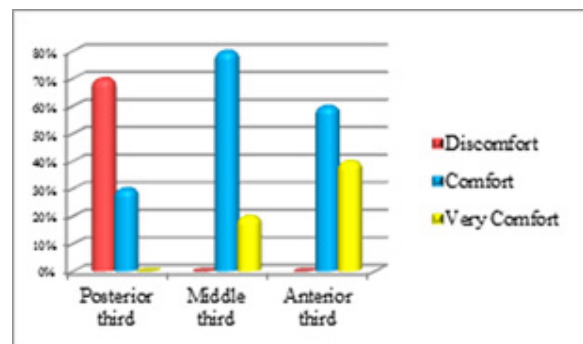


Figure 9. Comparison of comfort score among different coverage levels of the retromolar pads in low well-rounded ridges