

## Effect of sublingual crescent extension on retention, stability and patient satisfaction of mandibular complete denture

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### Abstract

Many patients with moderate to severely resorbed mandibular residual ridges are not satisfied with their mandibular complete denture mostly due to lack of retention. Objective of the present study was to assess the effect of sublingual crescent extension on mandibular complete denture retention and patient satisfaction. Fourteen edentulous patients with Atwood Class V mandibular ridge were included. Two dentures were made using different techniques: one with sublingual crescent extension and the other conventional impression technique without sublingual crescent extension. The retention of each denture was measured at insertion and after two weeks. The satisfaction levels for two different dentures were assessed by Visual Analog Scale (VAS) after two weeks. There was significantly increase in retention of denture with sublingual crescent extension ( $P < 0.05$ ). After two weeks of insertion, there was an improvement in denture retention in both dentures ( $p < 0.05$ ). Statistically significant differences were also observed in patient satisfaction. It was concluded that sublingual crescent extension ensured greater retention and more satisfied than conventional dentures and the impression should be made to record this area routinely.

**Key Word:** sublingual crescent

### Introduction

The rehabilitation of edentulous mandible with complete dentures is the one of the most difficult treatments encountered in daily prosthodontic practice. This is more obvious for patients with moderate to severely resorbed mandibular residual ridges. Most of these patient reports dissatisfied to their mandibular complete denture and this is mostly due to lack of retention.

Factors affecting the retention of complete dentures are maximal extension of the denture base and maximal intimate contact of the denture base with its basal seat. All these factors are easy to get for maxillary denture however, in mandibular complete dentures, loss of peripheral seal frequently occurs in the anterior part of the alveololingual sulcus because of the close approximation between the denture border and the sulcus is difficult to maintain at all times because the depth of the sulcus varies during function. These factors are the reasons why patients experience difficulty with using a mandibular complete denture compared to maxillary complete dentures [1].

The designs of lingual flange to improve retention and stability of mandibular complete dentures by establishing the border seal have

been described in various concepts. Lewis (1954) [2] first introduced as sublingual fold space and it was also described the importance of this region in mandibular complete denture retention. It was also reported that the technique for reposition of sublingual fold by means of surgical procedure in case of congenital absence of sublingual space Lewis (1958) [3]. Friedman(1957) named this region as sublingual crescent area [4].

The glossary of prosthodontics terms defined the sublingual crescent: the crescent shaped area on the anterior floor of the mouth formed by the lingual wall of the mandible and the adjacent sublingual fold. It is the area of the anterior alveolingual sulcus GPD 9 (2017) [5]. Extension of the denture area over the resting tissue of sublingual crescent area complete the border seal and increase the covering surface of the denture, resulting in greater retention and stability.

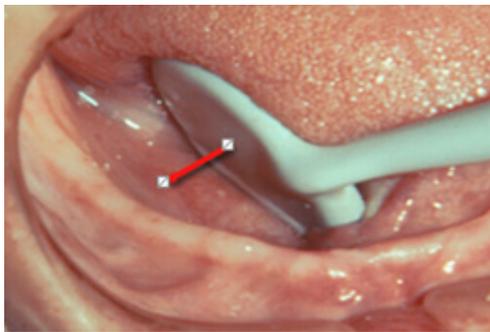


Figure 1. Sublingual crescent area

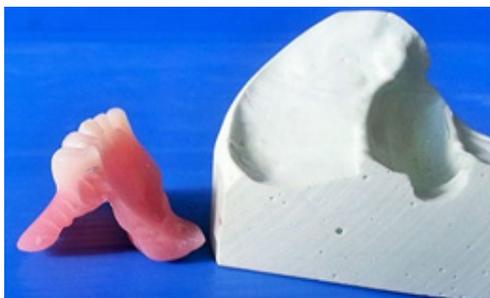


Figure 2. Cross section of denture and cast of sublingual crescent extension at sublingual region

## Material and Methods

Fourteen edentulous patients attending to the Department of Prosthodontics, UDMM were selected according to the selection criteria. Two mandibular complete dentures were constructed for each patient: One with sublingual crescent extension and the other without sublingual crescent extension method. Dentures were fabricated according to the standardized methods and principles used in Department of Prosthodontics.

Primary impression was made by alginate impression material with stock tray and closed fitting tray was fabricated for peripheral tracing.

### For the denture without Sublingual Crescent Extension,

The peripheral tracing with green stick compound were done by conventional manner (segment by segment) followed the technique of Nagao et al. (1995) [6] after the special tray had been tried and the periphery was shortened about 2-3 mm for tracing material.

Secondary impression was made with Zinc Oxide Eugenol impression material and it was poured in dental stone after boxed-in procedure to get the master cast. The record block was fabricated on permanent base plate and Jaw Relationship was recorded. The other steps of denture processing such as mounting the cast, setting up and try in wax denture were done in conventional manner according to standardized method.

### For the denture with Sublingual Crescent Extension

Border molding with second tray was done by using green stick compound as above method expect the sublingual crescent

region. For sublingual crescent extension, the green stick compound was molded into a shelf extending downward and backward over the sublingual crescent region. During recording, the tongue should be in its normal rest position so the patient was instructed to gently place the tip of tongue contact against the lingual side of the tray handle. To locate the site of contact accurately, a small bulb was created on the lingual surface of the tray handle. If the extension of sublingual crescent was inadequate, more material was added and the procedure was repeated.

The properly recorded sublingual crescent extension might bulge upward from the tray borders more than normal. It is approximately crescent or half spindle-shaped extension to either sides of midline.



Figure 3. Bordered custom tray with green stick compound (Sublingual Crescent extension)

And then the impression compound was relieved in the frenal notch area to expose the opening of sublingual duct. After recording the final impression with Zinc Oxide Eugenol impression paste, the master cast was poured by the boxing method. The denture base was fabricated by heat cured acrylic resin and the remaining procedures were made as usual manner.

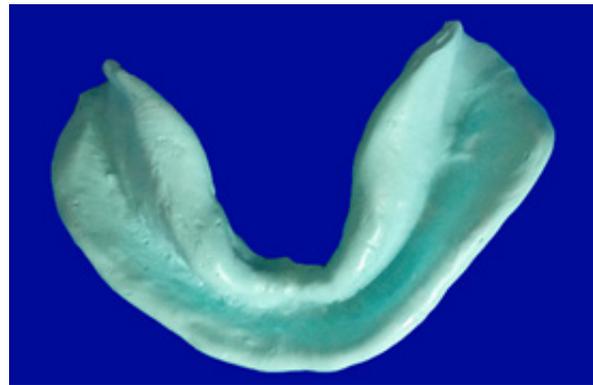


Figure 4. Final impression with zinc oxide impression paste recording the sublingual crescent extension method

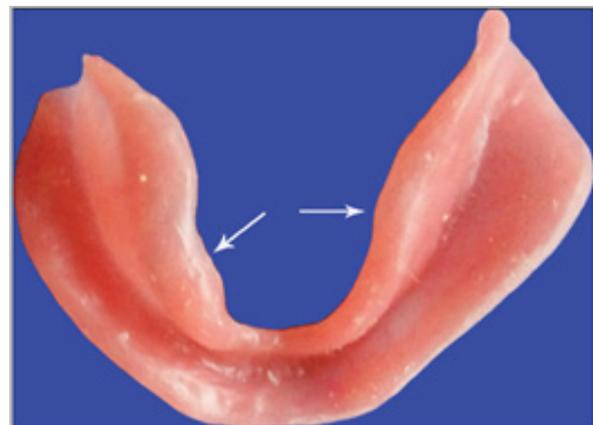


Figure 5. Impression surface of mandibular complete denture with sublingual crescent extension

### Measuring retention and stability

After correcting post-insertion complaints, the retention and stability were measured by Push and Pull gauge for base line data. And then the patient was allowed to use the first denture for two weeks and was asked to return to the department for further assessment.

After two weeks, in the second visit, retention and stability of first denture were measured again and patient satisfaction was assessed by Visual Analog Scale (VAS): patients were asked to mark on the line with 100mm range independently away from researcher concerning with general satisfaction on their dentures.

And then the second denture was delivered and the complaints were corrected. After correcting the complaints, retention and stability were measured. Before the second dentures were inserted, each patient was informed not to wear the denture for at least 8 hours after leaving from clinic. And then the patient was allowed to use the second denture for two weeks and was asked to return to the department for further assessment. The same assessment procedures were followed as the first denture. After final assessment and data collection, the subject was provided with one denture of their own preference.

Results were displayed by the descriptive statistics using frequency tables and graphs. The differences between clinical parameters with two different dentures were compared by using paired t test.

## Results

The figure 6 displayed the retention of dentures with sublingual crescent extension was significant greater than the denture without sublingual crescent extension on both two different times. The mean retention values of dentures without sublingual crescent extension at insertion and 2 weeks after denture insertion were (0.73 ± 0.3 kgf) and (1.04 ± 0.5 kgf) and the mean retention values of sublingual crescent extension were (1.23 ± 0.5 kgf) and (1.72 ± 0.9 kgf). Significant difference could be found in retention of two different types of dentures obtaining from border molding without sublingual crescent and with sublingual crescent (P < 0.05).

The mean values of stability of dentures without sublingual crescent at insertion time and 2 weeks after insertion were (1.02 ± 0.4kgf) and (1.39 ± 0.5kgf) respectively (figure 7).



Figure 6. Comparison of retention forces between two different dentures at insertion and after 2 weeks

Whereas the denture with sublingual crescent gave the mean values (1.58 ± 0.5kgf) at denture insertion time and (1.95 ± 0.8kgf) 2 weeks after denture insertion. There was statistically significant difference between two different methods.

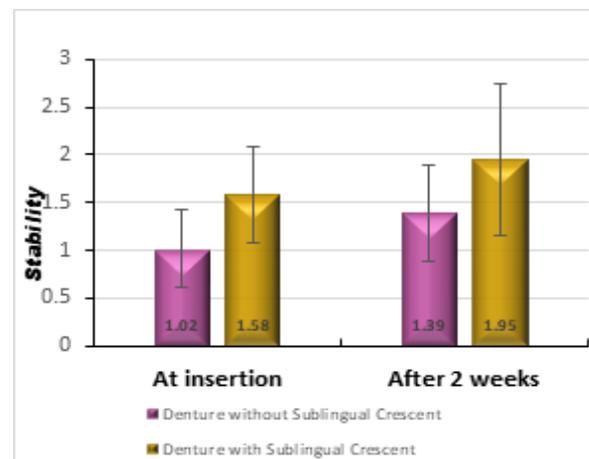


Figure 7. Comparison of stability between two different dentures at insertion and after 2 weeks

There was statistically significant difference in patient satisfaction by VAS method between two different dentures. The mean (+SD) score of patient satisfaction for dentures without sublingual crescent extension was 86.36 % (±13.9) and dentures with sublingual crescent extension was 93.72 % (±5.9) (figure 8).

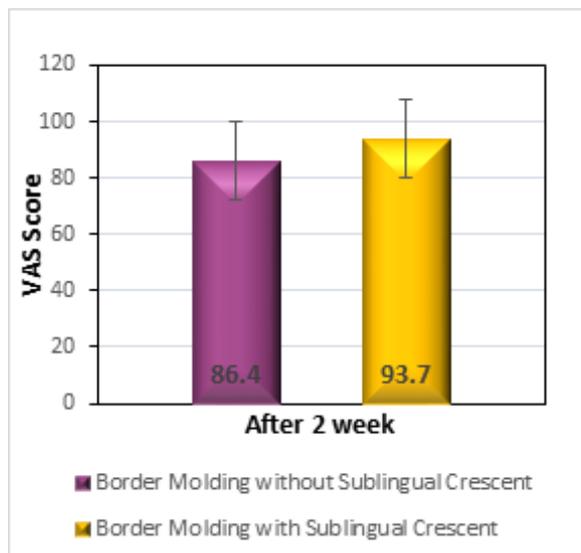


Figure 8. Comparison of satisfaction scores between two different dentures at insertion and after 2 weeks

### Discussion

In case of severely resorbed ridge especially Atwood Class V mandible, the ridge lies at the same level as the floor of the mouth and muscle attachments are close to the top of the resorbed ridge and loss of peripheral seal is mostly occurs in anterior mandibular alveolingual sulcus because of loss of contact between denture flange and sublingual tissue. Therefore, satisfactory retention would be difficult to achieve with conventional denture.

In this study, border molding with low fusing compound (green stick compound) into a shelf downward and backward over the sublingual crescent region until desired extension was obtained was performed to provide the appropriate horizontal extension of anterior lingual flange. It increased the areas that contact the underlying tissue and so augmenting simple adhesion and resulting in increased retention and stability of mandibular complete denture. Since the sublingual gland is flexible and highly compressible, placement of

sublingual crescent extension in a biologically acceptable fashion ensures the border seal, increase covering surface and greater retention. The green stick compound is very advantageous because of its ability to soften easily and quick hard at mouth temperatures. Hence, incremental technique can be followed for border molding and corrections and additions are easily accomplished and the material of choice for many practitioners, dental students and academicians as suggested by Solomon (2011) [7]. This properties is very important for this study because the repeated molding is needed until the desired extension provide into the sublingual space. Moreover the green stick compound can be easily accomplished by additions or corrections of the earlier molded segments. For this reason, green stick compound is appropriate material for this study rather than the material which has high tissue displacement.

Previous study by analyzed the retention of mandibular denture base with or without sublingual crescent extension. According to the study of Gupta, Luthra, & Shikha (2016) [8], the mean retention force of denture with sublingual crescent extension was the range between (19.4-96.27gm) which is disagreed with the retention force of recent study. This difference could be caused by measuring method that are modified as extra oral device with spring balance and lever with loading apparatus in previous study. The effect of spring and lever influence the value of retention force and this effect may be reduced the value of retention force. However they concluded that sublingual crescent extension was associated with significantly improved retention of denture base which is consistent with the results of present study.

Statistical analysis in this study also

revealed a time dependent increased in the denture retention and stability for both mandibular dentures producing from two different border molding methods. Some of the patients (5 patients out of 14) in recent study were previous dentures wearers and they got adaptation to dentures within short period of time as the new dentures wearers were difficult to adapt. Regarding the retention force, the previous dentures wearers showed increasing retention during follow up period and new dentures wearers show no or little increase. It may be postulated that 2 weeks is insufficient period for adaptation in new denture wearers.

The easy dislodgment during function can cause dissatisfaction of the patient. VAS was used to assess the patient's satisfaction which gives objective measurement that represents the subjective feeling. The VAS has been extensively used for measurement of a variety of clinical outcomes, such as pain, nausea, respiratory symptom, anxiety level, denture stability and level of satisfaction [9]. In recent study, VAS was used to compare the satisfaction level of two differences types of dentures over a certain time period. According to results, all participants were satisfied with both mandibular complete dentures. But they pointed out that the retention and stability were surely enhanced with the denture constructed by sublingual crescent recording method.

### **Conclusion**

The mandibular complete dentures with sublingual crescent extension significantly enhance in retention, stability and patient satisfaction. Therefore, the impression should be made to record this area routinely in resorbed mandibular ridge.

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