

Original Research

Comparative Analysis of two Border Molding Techniques and Materials on Maxillary Complete Denture Retention

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ABSTRACT:

Background: Functioning of a complete denture depends to a great extent on the impression technique. There are various factors associated with the retention of complete dentures, which may be broadly grouped as biological, physical and mechanical. The peripheral margins of the denture at all the points should be so formed that the tissues, when at rest or under muscular tension, will remain in close contact with the margins, thus preventing the ingress of air between the denture and tissues. **Aim of the study:** To compare efficacy of two border molding techniques on maxillary complete denture retention. **Materials and methods:** The study was conducted in the Department of Dentistry of Shridevi Institute of Medical science and research hospital, Tumakuru, Karnataka. For the study, we randomly selected 7 completely edentulous patients who reported to the department seeking prosthodontic rehabilitation. The age of the patients ranged from 40-70 years. Patients with well formed residual alveolar ridges, no severe undercuts or bony exostosis, firm mucosa, no inflammation or ulceration and having normal TMJ function were selected for the study. Patients having high palatal vaults were excluded from the study. For each patient, the primary impression was made with Hydrocolloid impression material in a perforated tray and was poured in dental stone to obtain primary cast. For sectional border molding, low fusing impression compound was used and procedure was done by following the guidelines. For single step border molding an injectable heavy viscosity PVS was used according to the given guidelines. **Results:** In the present study, the retention of denture formulated with single-step border molding and sectional border molding was compared for 7 subjects. We observed that in all the subjects, the denture bases formulated by sectional border molding technique has more retention as compared to single step technique. As per statistical analysis, the results are statistically significant. **Conclusion:** From the results of the present study, this can be concluded that both the techniques of border molding discussed in this study, single step border molding and sectional border molding, offer satisfactory retention, however, sectional border molding is more efficient with respect to the retention.

Key words: Border molding, sectional border molding, single step border molding, retention.

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INTRODUCTION:

Functioning of a complete denture depends to a great extent on the impression technique. Several impression techniques

have been described in the literature since the turn of this century when Greene brothers introduced the first scientific system of recording dental impression.^{1,2} Border molding is

an important step in the fabrication of complete dentures. There are various factors associated with the retention of complete dentures, which may be broadly grouped as biological, physical and mechanical. The peripheral margins of the denture at all the points should be so formed that the tissues, when at rest or under muscular tension, will remain in close contact with the margins, thus preventing the ingress of air between the denture and tissues.³ The method of obtaining such peripheral seal is border molding by which the shape of the border of the tray is made to conform accurately to the contour of buccal and labial vestibules. This essential requirement of the tray's fit ensures an optimal peripheral seal. These factors of retention can be achieved by means of an accurate border molding followed by an accurate final impression.⁴ The final impression procedure for a complete denture entails capturing the vestibule through border molding procedure and then making an impression of the edentulous arch. Border molding a custom tray to adapt it closely to the tissues of the vestibule before making the final impression is a time-honored procedure in complete denture prosthodontics.^{5,6} Hence, the present study is planned to compare efficacy of two border molding techniques on maxillary complete denture retention.

MATERIALS AND METHODS:

The study was conducted in the Department of Dentistry of Shridevi Institute of Medical science and research hospital, Tumakuru, Karnataka. The ethical clearance for study protocol was obtained from ethical committee of the institution. For the study, we randomly selected 7 completely edentulous patients who reported to the department seeking prosthodontic rehabilitation. The age of the patients ranged from 40-70 years. Patients with well formed residual alveolar ridges, no severe undercuts or bony exostosis, firm mucosa, no inflammation or ulceration and having normal TMJ function were selected for the study. Patients having high palatal vaults were excluded from the study. An informed written consent was obtained from all the patients after explaining them the procedure of the study. For each patient, the primary impression was made with Hydrocolloid impression material in a perforated tray and was poured in dental stone to obtain primary cast. Two custom impression trays were made for each patient and were reduced 2 to 3 mm from the periphery. After preparation of the custom trays, border molding was done by following two methods, Sectional border molding and single step border molding. For sectional border molding, low fusing impression compound was used and procedure was done by following the guidelines. For single step border molding an injectable heavy viscosity PVS was used according to the given guidelines. After taking the impressions, they were boxed and cases were poured. Each final cast was used to prepare waxed denture bases. Prefabricated stainless steel hooks were attached to anterior palatal region of the waxed

upbases. The casts with waxed up bases were flaked and processed in a curing unit. After the completion of the process, the bases were carefully finished and checked in mouth for excessive acrylic resin on borders. For the measurement of the retention of the denture bases, a digital force meter was used. The readings of the digital force meter were set to be in kgf. Patient was advised to stand upright with maxilla parallel to the floor and the force was directed perpendicular to evaluate retention. Now, the hook of force meter was engaged in the stainless-steel hook in the denture base and force was applied by pulling downward. The reading on force meter at the instance when denture dislodged was taken as the retention force. Same procedure was done for both the denture bases for each patient and date was tabulated.

The statistical analysis of the data was done using SPSS version 11.0 for windows. Chi-square and Student's t-test were used for checking the significance of the data. A p-value of 0.05 and lesser was defined to be statistical significant.

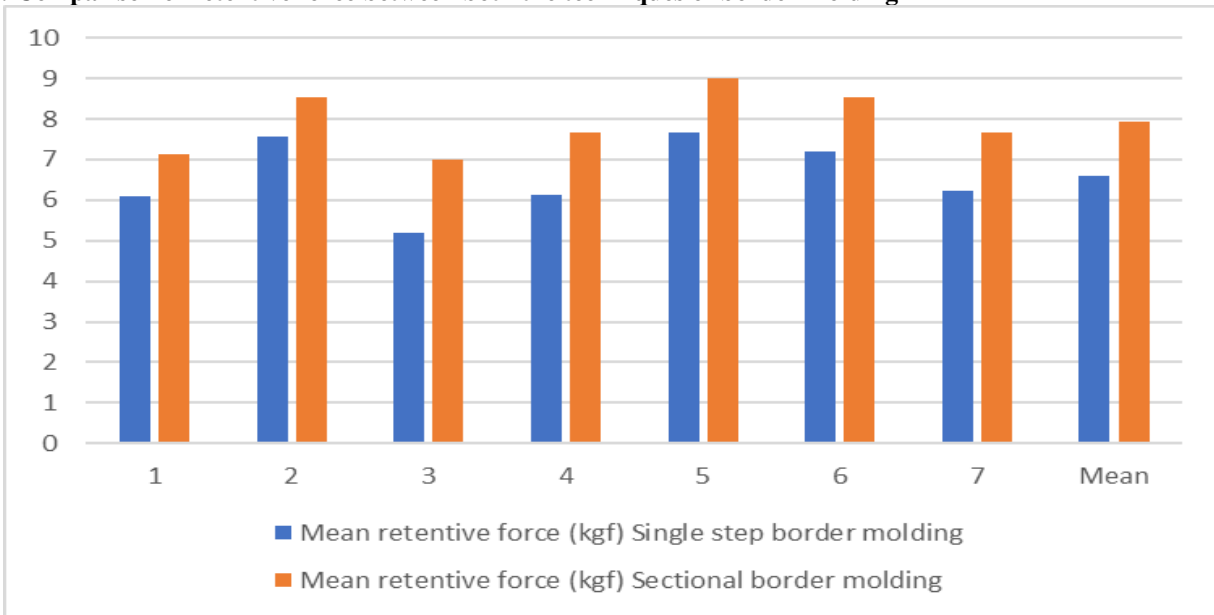
RESULTS:

In the present study, the retention of denture formulated with single-step border molding and sectional border molding was compared for 7 subjects. Table 1 and Fig 1 shows the comparison of the retentive force of denture bases formulated using single step border molding techniques and sectional border molding technique. We observed that in all the subjects, the denture bases formulated by sectional border molding technique has more retention as compared to single step technique. As per statistical analysis, the results are statistically significant (p<0.05).

Table 1: Comparison of the Mean retentive force of denture bases formulated using single step border molding techniques and sectional border molding technique

Patient number	Mean retentive force (kgf)		p-value
	Single step border molding	Sectional border molding	
1	6.1	7.12	0.002*
2	7.58	8.55	
3	5.2	6.98	
4	6.14	7.65	
5	7.65	9.01	
6	7.21	8.55	
7	6.24	7.68	
Mean	6.58	7.93	

Fig1: Comparison of retentive force between both the techniques of border molding



DISCUSSION:

In the present study, we observed that denture bases formulated with sectional border molding has better retention as compared to made by single step border molding. The results are statistically significant. On comparing with previous studies, the results were consistent. Qanungo A et al compared the single-step border molding technique using injectable heavy viscosity addition silicone with sectional border molding technique using low fusing impression compound by evaluating the retention of heat cure trial denture bases. Ten completely edentulous patients in need of prostheses were included in this study. Two border molding techniques, single-step (Group 1) and sectional (Group 2), were compared for retention. Both border molding techniques were performed in each patient. In both techniques, definitive wash impression was made with light viscosity addition silicone. The final results were analyzed using paired t-test to determine whether significant differences existed between the groups. The t-value infers that there was a significant difference between Group 1 and Group 2. The retention obtained in Group 2 (mean = 9.05 kgf) was significantly higher than that of Group 1 (mean = 8.26 kgf). They concluded that the sectional border molding technique proved to be more retentive as compared to single-step border molding although clinically the retention appeared comparable. Yarapatineni R et al compared the retention between sectional border molding using low fusing greenstick compound and single step border molding using condensation silicone (putty) impression material in three stages- A. Immediately following border molding, B. After final impression and C. With the finished permanent denture base. In this study evaluation of retentive values of sectional border molding (Group I) (custom impression

trays border molded with green stick compound) and single step border molding (Group II) (border molding with condensation silicone (putty) impression material). In both techniques definitive wash impression were made with light body condensation silicone and permanent denture base with heat cure polymerization resin. Group II was significantly higher than Group I in test-A. The t-value infers that there was significant difference between Group I and Group II. Group I was significantly higher than Group II in test -B. The t-value infers that there was significant difference between Group I and Group II. Group II was higher than Group I in test -C. The t-value was 0.1239. But it was found to be statistically insignificant. Within the limitation of this clinical study border molding custom tray with low fusing green stick compound provided similar retention as compared to custom impression tray with condensation silicone in permanent denture base.^{7,8} Kaur S et al determined the effect of border molding on the retention of the maxillary denture base. Two special trays, one with full extensions to the periphery and one 2 mm short from the borders were made on the cast obtained from the preliminary impression. Border molding was done on the tray which was short from borders. On both trays, the final impression was made with zinc oxide eugenol impression paste. Heat cure denture bases were fabricated on the prepared casts and retention was measured using specially designed instrument. Mean force with border molding (2765.0 g) was larger than mean force without border molding (1805.0 g) at P < 0.01 level. In terms of percentage, too, the mean improvement (59.4%) in force of dislodgement was statistically highly significant. The results of this study suggested that the dentures made with border molding will provide better retentive force than the

dentures made without border molding. Arora AK et al analyzed the effect of different materials and techniques in current use on peripheral shaping of complete denture impression. The study was conducted to compare and evaluate the maxillary border morphology produced using tissue conditioner as control and low fusing impression compound, Polyether, Pattern resin and periphery wax as border molding materials. The study was carried out on 15 denture wearer patients with well formed, rounded edentulous maxillary arch with adequate width and height. On each patient, border moldings were done, with tissue conditioner which was loaded on the borders of previous maxillary denture of the patient (control group), low fusing impression compound (Group 1), polyether (Group 2), Pattern resin (Group 3) and Peripheral wax (Group 4), respectively on special tray made for the patient. Sulcus width height and area was then measured for each group using stereomicroscope. They concluded that the polyether was the best material for border molding which will give most accurate borders to a denture.^{9,10}

CONCLUSION:

From the results of the present study, this can be concluded that both the techniques of border molding discussed in this study, single step border molding and sectional border molding, offer satisfactory retention, however, sectional border molding is more efficient with respect to the retention.

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