

Effect of Two Different Impression Materials in Recording Mean Retention Bases on Heat Cure Acrylic Resins

Shahnaila Sharif¹, Hina Memon¹, Nizam uddin Buriro¹, Naseem Shaikh¹,
Uzma Bashir² and Muhammad Rizwan Memon²

Effect of Two
Different
Impression
Materials on
Heat Cure
Acrylic Resins

ABSTRACT

Objective: This study was undertaken to compare the forces of retention for maxillary polymethyl methacrylate denture bases fabricated by using single step low fusing green stick compound (Group 1) and single step border moulding using addition silicone (putty) impression material (group 2).

Study Design: Randomised control trial study

Place and Duration of Study: This study was conducted at the Department of Prosthodontics, Institute of Dentistry Liaquat University of medical and health science Jamshoro from April to September 2021.

Methods: A sample of 90 edentulous patients, 45 in each group with age group 40-60 yrs, both genders were included in this study. Retention values of customised heat cure acrylic denture bases (Group 1 border moulded with green stick compound and Group II - border molded with addition silicone putty impression material) were recorded using digital force gauge machine company attached to wire loop at the center anterior part of each plate. Definitive wash impression were made with light body addition silicone for both groups.

Results: The average age of the patients was 51.27 ± 5.4 years. There were 44(48.9%) male and 46(51.1%) female. Mean retention was found to be higher in group 2 (addition silicone : 32.75 ± 6.78) as compared to group 1 (green stick compound : 29.94 ± 10.89 ; $p=0.0005$).

Conclusion: It was concluded that the heavy bodied addition silicone is a better material for border moulding as compared to low fusing green stick impression compound.

Key Words: Complete dentures, addition silicone, green stick compound, border moulding materials

Citation of article: Sharif S, Memon H, Nizam ud din Buriro, Shaikh N, Bashir U, Memon MR. Effect of Two Different Impression Materials in Recording Mean Retention Bases on Heat Cure Acrylic Resins. Med Forum 2024;35(7):20-23. doi:10.60110/medforum.350704.

INTRODUCTION

Edentulism is a debilitating and irreversible condition common amongst elderly population¹. For years, the most often recommended course of treatment for edentulous patients has been the fabrication of complete dentures². Thus, a complete denture needs to meet the three main goals of prosthodontics: support, stability, and retention³. The definition of retention is the ability of a prosthesis to resist forces of dislodgment along the path of insertion and the resistance of a denture to vertical movement away from tissues⁴.

There are certain factors that are more important than other in retention of complete dentures such as anatomical, physiological, physical, mechanical, muscular⁵.

The most crucial clinical procedure in full denture construction—border moulding—is necessary to establish retention. Border moulding is the process of reshaping the imprint tray's border portions by manually or functionally manipulating the tissues next to the border to replicate the vestibule's size and shape. This will aid in forming the peripheral seal between the oral tissues and denture borders, preventing air from entering and causing the denture to loosen⁶. There are numerous materials available for recording peripheral seals, but the most often utilised ones are low-fusing green sticks due to their quick setting time, detail reproduction ability, affordability, reusability, and lack of noticeable dimensional changes after hardening.

Although addition silicon records all boundaries on a single placement, it is simple to handle, has a sufficient amount of working time, is free of undercuts, and is a time-saving method^{7,8}. These materials have been the subject of numerous research. In maxillary edentulous arches, single step border moulding (mean 8.26 kgf) and sectional border moulding (mean 9.05 kgf) utilising two distinct techniques differed significantly, according to a study by Qanungo A et al⁷. Yarapatineni R et al.'s

¹. Department of Prosthodontics, Institute of Dentistry, LUMHS, Jamshoro, Sindh.

². Department of Prosthodontics, Muhammadi Dental College, LUMHS, Jamshoro, Sindh.

Correspondence: Muhammad Rizwan Memon, Professor, Institute of Dentistry LUMHS, Jamshoro, Sindh.

Contact No: 0333-9307810

Email: muhammad.rizwan@lumhs.edu.pk

Received: December, 2022

Accepted: May, 2023

Printed: July, 2024

subsequent investigation revealed no discernible difference between sectional border moulding (mean 3835.07) and single step border moulding (mean 4025.14)⁸.

One common issue with people who have complete dentures is retention. Despite numerous studies, there is a lack of data and conflicting statements regarding retention. International data compares both materials, but the implementation of the results is not feasible in our population because of differences in genetics, anatomy, denture design, and skill. Additionally, a limited amount of local studies have been carried out, it has been noted. Therefore, the goal of this study is to compare the retention of border moulding materials composed of green stick compound and addition silicon for maxillary complete dentures. This study was beneficial for dental practitioners to use either green stick compound or addition silicon impression materials for recording accurate peripheral seal and it will also be beneficial for population in terms of improving quality of denture retention.

METHODS

The present study was conducted at department of Prosthodontics LUMHS Jamshoro for a period of 6 months from April to September 2021. Total 90 edentulous patients were selected using non probability consecutive sampling technique and divided into two groups randomly. The exclusion criteria included fibrous ridge, resorption of ridge, tissue undercuts to eliminate the effect of mechanical factors on dentures retention, bony exostoses, and tori. Informed consents were taken from all participants the procedure of methodology was explained in detailed before commencement of our data collection.

Metal stock impression trays were selected for each patient and initial impression were made using green stick impression compound material (Harvard). The primary cast were fabricated with (lab stone Gerecco) followed by custom tray fabrication using self cure acrylic resin (material name). After functional trimming of 2 mm of self cure acrylic resin trays, group-1 participants had their border mouldings done by addition silicone and group 2 had their border mouldings done by green stick compound impression

material (Harvard) followed by final impressions made with a light body addition silicone material (Aquasil® Ultra Smart Wetting® Impression Material; Dentsply Sirona, York, USA) for both groups. All materials were used as outlined in the manufacturers' guidelines. The borders of denture bases were properly moulded by functional movements of surrounding musculature. The final cast were poured by using type 2 dental stone (material) for both groups. Final plates were fabricated using heat cure acrylic resin (material). Wire loop (0.7mm round stainless steel wire) were constructed and secured with the help of self cure acrylic resin (material name) at centre of anterior ridge portion of processed heat cure plate. Patients were asked to sit in upright position on dental chair with occlusal plane parallel to the floor. The heat cure acrylic denture plate for both groups were inserted in patient's mouth with uniform finger pressure. After a wait of one minute to allow the denture base plate to reach in stable position, the force gauge device was attached to the wire loops attached to plates to assess the forces of retention required to dislodge the denture base. The procedure of dislodgment by pulling force was repeated three times with each plate in same patient and the mean reading was noted down in proforma. Data was analysed using SPSS version 24. Mean value were calculated for quantitative variables like age of patients and dislodging force whereas frequency and percentage were calculated for qualitative variables like gender.

RESULTS

A total of 90 patients were randomly distributed in two groups, i-e group A, impressions were taken with green stick impression compound and group B with light body addition silicone. The forces of retention were assessed for both group (fig 1). The average age of the patients was 51.27 ± 5.4 years (figure 2). There were 44 (48.9%) male and 46 (51.1%) female. Gender distribution with respect to groups is shown in (figure 3). Comparison of mean retention pressure of maxillary complete denture between groups is presented in figure 4. Mean retention was significantly high in group B as compare to group A (32.75 ± 6.78 vs. 29.94 ± 10.89 ; $p=0.0005$).



Figure No.1: Retention Values for Different Patients

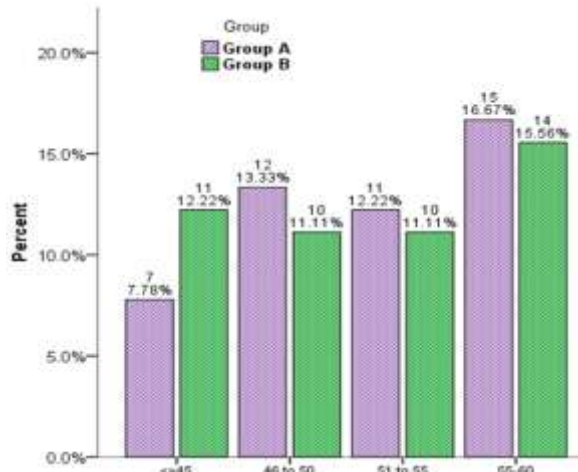


Figure No. 2: Age Distribution of the Patients With Respect to Groups

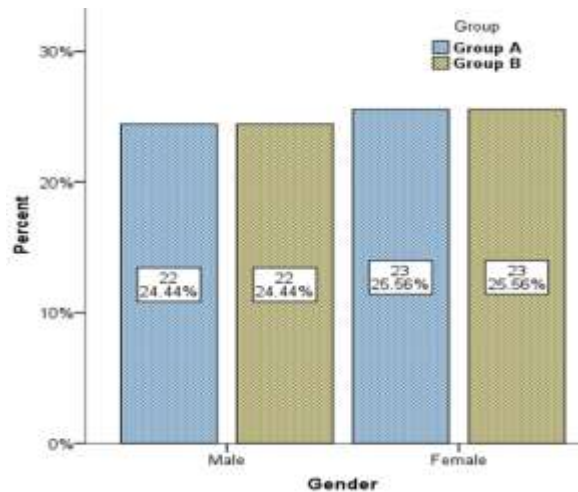


Figure No. 3: Gender Distribution of the Patients With Respect To Groups

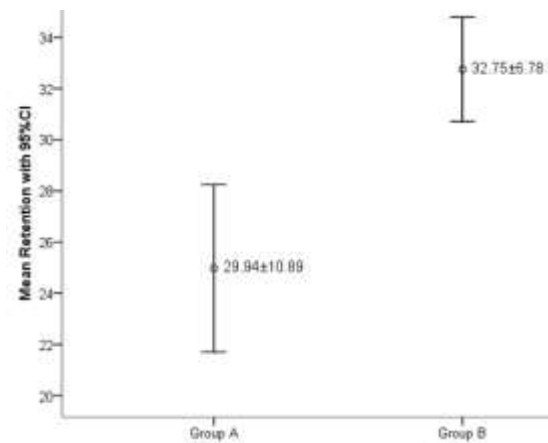


Figure No. 4: Comparison of mean retention pressure of maxillary complete denture between groups

Table No. 1: Descriptive Statistics of Age with Respect to Groups

	Group A	Group B
Mean	51,40	51,13
Std Deviation	5,41	5,44
Average age	51.27±5.4 years	

Table No. 2: Descriptive Statistics Of Gender

Gender	Total Number	Frequency
Males	44	48,9 %
Females	46	(51.1%)

Table No. 3: Mean Retention values for both groups

Group 1	29.94±10.89
Group 2	32.75±6.78
P-value	0,005

DISCUSSION

One of the key components of removable prosthodontics is the construction of complete dentures⁹, as dental restorations enhance both overall oral health and quality of life. However, precise replication of the oral foundation using impression techniques is essential for a complete denture to function as intended. To do this, records of the maximal coverage of denture-supporting areas within physiological bounds must be made^{8,-10}. A polished and finished denture foundation should have optimal retention, and its boundaries should be in physiological balance with the surrounding soft tissues of the mouth¹¹. Since border moulding concentrates on biological, physical, and mechanical aspects to help achieve retention through final impression method, it is regarded as a crucial step in the production of complete dentures¹². The comparatively recent implications of new materials and devices have called into question the conventional wisdom, even though the traditional approaches to impression making in complete denture fabrication have served the profession well over the years. These approaches allow for the fabrication of accurate, pressure-controlled, definitive impressions without the need to develop custom impression trays. There are many viscosities of VPS impression material available, and a certain level of control over tissue placement can be achieved by applying these materials thoughtfully and varying points throughout impression procedures. To compare the mean retention pressure of maxillary complete denture, heat cure plates were made by using addition silicon and green stick compound border moulding materials. A total of 90 patients of both genders were chosen at random. Two groups of patients were formed from this group. The patients who took part in the trial were chosen based on their age, which varied between 40 and 60 years old. The impression material's viscosity¹³ and the tray's proximity of the oral tissues can both contribute to the pressure applied during an imprint technique.

When the maxillary complete denture's mean retention pressure was compared between the groups, group 2's mean retention was shown to be considerably higher than group 1's (32.75 ± 6.78 vs. 29.94 ± 10.89 ; $p=0.0005$). This demonstrates that silicone addition dominates impression compound as a superior material for border moulding.

Other studies corroborated our findings. In their investigation, Jassim et al. found that while using green stick composite material for the denture bases, the mean retention force was lowered when the final impression was created using zinc eugenol. When a light-body final impression material and additional vinyl silicon border moulding material were used, the measured mean retention values increased noticeably¹⁴. In a different study, Gupta et al. used heavy body addition silicones for border moulding and found that the group using heavy bodied addition silicone had mean vestibular depths and widths of 12.31 ± 1.29 mm and 6.44 ± 0.76 mm, respectively. This suggests that heavy-bodied addition silicone produces dentures with more precise borders and better retention¹⁵.

CONCLUSION

Based on the study it was concluded that the heavy bodied addition silicone is a better material for border moulding as compared to low fusing impression compound. In addition, single step done with heavy bodied addition silicone was found to be viable and advantageous alternative to conventional border moulding (sectional border moulding), as it results in reduction of chair side time, less discomfort for the patient and less efforts for the dentist.

Author's Contribution:

Concept & Design of Study:	Shahnila Sharif
Drafting:	Hina Memon, Nizam uddin Buriro
Data Analysis:	Nizam uddin Buriro, Naseem Shaikh, Uzma Bashir, Muhammad Rizwan Memon
Revisiting Critically:	Shahnila Sharif, Hina Memon
Final Approval of version:	By all above authors

Conflict of Interest: The study has no conflict of interest to declare by any author.

Source of Funding: None

Ethical Approval: No.PR-058 dated 08.03.2021

REFERENCES

1. Emami E, de Souza RF, Kabawat M, Feine JS. The impact of edentulism on oral and general health. *Int J Dent* 2013;2013:498305.
2. Vamsi Krishna CH, Rao AK, Sekhar NC, Shastry YM. Rehabilitation of maxillary arch with attachment-retained mesh-reinforced single complete denture. *BMJ Case Rep* 2014; 2014:bcr2013201122.
3. Shetty TB, Rodrigues S, Saldanha S. Rehabilitation of a patient with an interim pharyngeal obturator; a Case Report. *Karnataka Prosthodontics J* 2016;1(1):8-12
4. Olvera N, Jones JD. Alternatives to traditional complete dentures. *Dent Clin North Am* 2014;58(1):91-102
5. Darvell BW, Clark RK. The physical mechanism of complete denture retention. *Br Dent J* 2000;189(5):248-52
6. Kaur S, Datta K, Gupta SK, Suman N. Comparative analysis of the retention of maxillary denture base with and without border molding using zinc oxide eugenol impression paste. *Ind J Dent* 2016;7(1):1-5
7. Qanungo A, Aras MA, Chitre V, Coutinho I, Rajagopal P, Maysore A. Comparative evaluation of border molding using two different techniques in maxillary edentulous arches: a clinical study. *J Ind Prosthodont Soc* 2016;16:340-5
8. Yarapatineni R, Vilekar A, Kumar GA, Aravind P, Kumar PA. Comparative evaluation of border molding, using two different techniques in maxillary edentulous arches- an in vivo study. *J Int Oral Health* 2013;5:82-7.
9. Jayaprakash MB, Sahu K, Khan M, Khoriya S, Jadhav S, Rendre B, et al. Management of flabby ridge cases: A challenge in clinical practice. *Int. adv health sci.* 2014;1(5):32-7.
10. Tasleem R, Bin Saeed MH, Javed MU. Comparison of complete denture fabricated by two different border molding materials, in terms of patients' satisfaction. *J Ayub Med Coll Abbottabad* 2013;26(3-4):78-80.
11. Patel JR, Sethuraman R, Chaudhari J. Comparative evaluation of border morphology produced by three different border molding materials. *Int J Contem Dent* 2010;1(3).
12. Olivieri A, Zuccari AG, Olivieri D. A technique for border molding with light – polymerized resin. *J Prosthet Dent* 2003;90:101.
13. Hyde TP. A randomised controlled trial of complete denture impression materials. *J Dent* 2014;42:895–901.
14. Jassim TK, Kareem AE, Alloaibi MA. In vivo evaluation of the impact of various border molding materials and techniques on the retention of complete maxillary dentures. *Dent Med Probl* 2020;57(2):191-6.
15. Gupta R, Luthra RP, Sirohi R. Comparison of border morphology recorded using two border molding materials. *J Adv Med Dent Scie Res* 2015;3(4):122-4..