

## Original Research

### Assessment of the retention of complete denture using various border moulding materials

<sup>1</sup>N.Sasikala, <sup>2</sup>Sravani Sanampudi, <sup>3</sup>Kondapally Ajay Kumar, <sup>4</sup>N. P. Swathi, <sup>5</sup>Anilkumar Billu, <sup>6</sup>Venkata Saiteja Mungara

<sup>1</sup>Reader, Department of Prosthodontics, Narayana Dental College, India;

<sup>2,3,5</sup>Practitioner, India;

<sup>4</sup>Senior Lecturer, CKS Theja Dental Sciences and Research Institute, Tirupati, Andhra Pradesh, India;

<sup>6</sup>Senior Lecturer, Department of Prosthodontics Including Crown and Bridge and Implantology, CKS Teja Institute of Dental Sciences and Research, Tirupati, Andhra Pradesh, India

#### ABSTRACT:

**Background:** The rehabilitation of patients who are edentulous presents a significant challenge in dental practice. The process of border molding a custom tray to ensure a precise fit with the vestibular tissues prior to obtaining the final impression is a well-established practice in the field of complete denture prosthodontics. Hence; the present study was conducted for assessing retention of complete denture using various border moulding materials. **Materials & methods:** A cohort of forty patients, aged between 60 and 70 years, who sought complete denture fabrication, was randomly selected for this study. The participants were categorized into four distinct groups: Group 1 consisted of patients for whom border moulding was executed using green stick impression compound; Group 2 included those whose border moulding was performed with polysulphide elastomer; Group 3 comprised patients with border moulding conducted using polyether impression material; and Group 4 involved patients for whom border moulding was carried out with polysiloxane impression material. Downward pulling force was applied to measure retention. All the results were recorded in Microsoft excel sheet and were subjected to statistical analysis using SPSS software. **Results:** Mean retentive forces among study group 1 group 2, group 3 and group 4 were 4.11 Kg, 4.53 Kg, 7.12 Kg and 8.37 Kg respectively. On comparing the retentive forces, significant results were obtained. **Conclusion:** Notable distinctions emerged when comparing green stick impression compound with various elastomeric materials. Polyvinyl siloxane demonstrated a higher efficacy for border moulding compared to the other substances evaluated.

**Key words:** Complete denture, Border moulding, Retention

Received: 23 June, 2024

Accepted: 27 July, 2024

**Corresponding author:** N.Sasikala, Reader, Department of Prosthodontics, Narayana Dental College, India

**This article may be cited as:** Sasikala N, Sanampudi S, Kumar KA, Swathi NP, Billu A, Mungara VS. Assessment of the retention of complete denture using various border moulding materials. *J Adv Med Dent Scie Res* 2024;12(8):97-100.

#### INTRODUCTION

The rehabilitation of patients who are edentulous presents a significant challenge in dental practice. Edentulism carries both functional impairments and psychosocial ramifications, which can be addressed through the provision of removable dentures. The efficacy of this treatment approach is influenced not only by the patient's acceptance of the new dentures but also by their proficiency in utilizing them, which is largely contingent upon the quality of the dentures themselves.<sup>1,2</sup> Consequently, the success of traditional complete denture therapy is subject to a variety of factors, including the patient's age, personality traits,

prior experience with dentures, expectations regarding treatment, aesthetic considerations, the morphology and anatomy of the residual ridge, the quality of the dentures, the techniques employed in their fabrication, the dentist's level of expertise, and the dynamics of the dentist-patient relationship.<sup>3,4</sup>

The process of border molding a custom tray to ensure a precise fit with the vestibular tissues prior to obtaining the final impression is a well-established practice in the field of complete denture prosthodontics. Historically, low fusing impression compound, first introduced by the Green brothers in 1907, served as the primary material for this

technique. The procedure for border molding with low fusing impression compound is typically segmented into distinct phases, where individual sections of the tray borders are molded during separate applications. Research conducted by Woelfel et al. revealed that a cohort of seven dentists averaged 17 insertions when employing low fusing impression compound for border molding on the same patient. While this method yields accurate impressions, it is recognized as being both time-intensive and laborious. Ideally, the material utilized for border molding should engage the entire vestibular sulcus area in a single insertion while in its plastic state.<sup>5- 7</sup>Hence; the present study was conducted for assessing retention of complete denture using various border moulding materials.

**MATERIALS & METHODS**

The present research was conducted for assessing retention complete denture using various border moulding materials. A cohort of forty patients, aged between 60 and 70 years, who sought complete denture fabrication, was randomly selected for this study. The participants were categorized into four distinct groups: Group 1 consisted of patients for whom border moulding was executed using green stick impression compound; Group 2 included those whose border moulding was performed with polysulphide elastomer; Group 3 comprised patients with border moulding conducted using polyether impression material; and Group 4 involved patients for whom border moulding was carried out with polysiloxane impression material. For the border moulding utilizing low fusion impression compound, a sectional technique was employed, whereas a single-step procedure was utilized for the elastomeric materials. A primary impression of the upper arch was

taken using an appropriately sized impression stock tray. This impression was subsequently poured with dental plaster to create a primary impression cast. The cast was then meticulously outlined, and relief was incorporated to fabricate customized impression trays using auto polymerizing acrylic resin. A digital force measurement gauge was employed to assess the retention of each denture base by inserting it into the patients' oral cavities. The force measuring gauge was attached to a hook on the denture base, and a downward pulling force was applied to measure retention. All the results were recorded in Microsoft excel sheet and were subjected to statistical analysis using SPSS software.

**RESULTS**

Forty participants were categorized into four distinct groups: Group 1 consisted of patients for whom border moulding was executed using green stick impression compound; Group 2 included those whose border moulding was performed with polysulphide elastomer; Group 3 comprised patients with border moulding conducted using polyether impression material; and Group 4 involved patients for whom border moulding was carried out with polysiloxane impression material. Mean retentive forces among study group 1 group 2, group 3 and group 4 was 4.11 Kg, 4.53 Kg, 7.12 Kg and 8.37 Kg respectively. On comparing the retentive forces, significant results were obtained. In terms of retentive forces, various border moulding materials were found to be of following order:

Green stick impression compound<Polysulphide elastomer material<Polyether elastomer material<Polysiloxane elastomeric impression material

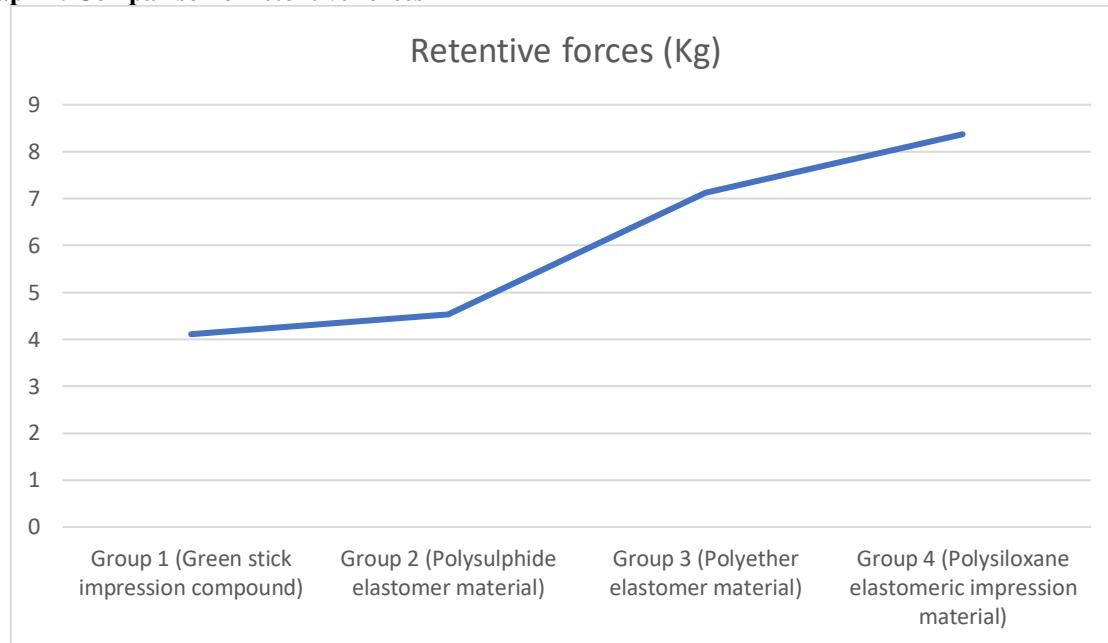
**Table 1: Retentive forces**

Study groups	Retentive forces (Kg)	
	Mean	SD
Group 1 (Green stick impression compound)	4.11	0.82
Group 2 (Polysulphide elastomer material)	4.53	0.91
Group 3 (Polyether elastomer material)	7.12	1.23
Group 4 (Polysiloxane elastomeric impression material)	8.37	1.55

**Table 2: Individual group comparison in terms of Retentive forces**

Group Vs	Group	p-value
Group 1 Vs	Group 2	0.38
Group 1 Vs	Group 3	0.03*
Group 1 Vs	Group 4	0.00*
Group 2 Vs	Group 3	0.04*
Group 2 Vs	Group 4	0.00*
Group 3 Vs	Group 4	0.04*

\*: Significant

**Graph 1: Comparison of retentive forces**

## DISCUSSION

Edentulism poses a significant challenge that adversely affects the quality of life and nutritional status of patients. A considerable number of edentulous individuals, especially within the elderly population, require rehabilitative interventions on a global scale. Research consistently indicates that mandibular implant overdentures offer greater patient satisfaction and enhanced quality of life compared to traditional complete dentures. Demographic trends related to population aging suggest that the demand for the rehabilitation of edentulous patients will persist for many decades to come. Despite this, conventional complete dentures remain a widely favored treatment option for those who are edentulous, as they contribute positively to oral health-related quality of life. These dentures are generally well-received due to their ability to provide satisfactory aesthetics, facilitate normal speech, and offer occlusal support necessary for effective chewing. It is essential that complete dentures are designed for comfort and lead to high levels of patient satisfaction, which are regarded as the primary objectives of treatment.<sup>8-11</sup> Hence, the present study was conducted for assessing retention of complete denture using various border moulding materials.

Forty participants were categorized into four distinct groups: Group 1 consisted of patients for whom border moulding was executed using green stick impression compound; Group 2 included those whose border moulding was performed with polysulphide elastomer; Group 3 comprised patients with border moulding conducted using polyether impression material; and Group 4 involved patients for whom border moulding was carried out with polysiloxane impression material. Mean retentive forces among study group 1 group 2, group 3 and group 4 was 4.11

Kg, 4.53 Kg, 7.12 Kg and 8.37 Kg respectively. Pachar RB et al compared the effect of different border molding materials on complete denture retention in 10 completely edentulous patients. Each patient underwent three distinct border molding techniques. In group I, the border molding utilized green stick impression compound. Group II employed putty consistency addition silicone for the border molding process. In group III, both the border molding and the final impression were executed using polyether impression material in a single procedure. The mean age  $\pm$  standard deviation (SD) for group I was 57.40, which was identical for group II and group III as well. The differences in age among the groups were not statistically significant. The overall mean value for group I was recorded at 4.59, while group II had a mean of 4.7, and group III exhibited a mean of 6.72. The differences in these mean values were statistically significant. Notably, the green stick compound with a light body final wash yielded the lowest mean values for complete denture retention. In contrast, dentures fabricated using polyether final impression material demonstrated the highest mean values for retention, followed by those made with putty rubber base border molding and a light body final wash. The superior retentive value of polyether compared to the other materials tested suggested its potential for future advancements in achieving optimal denture retention.<sup>12</sup>

In the present study, on comparing the retentive forces among different study groups, significant results were obtained. In terms of retentive forces, various border moulding materials were found to be of following order: Green stick impression compound < Polysulphide elastomer material < Polyether elastomer material < Polysiloxane elastomeric impression material. Jassim TK et al

determined differences in the denture base retention for acrylic maxillary CDs when using 2 different techniques and impression materials. The trays of ten participants were divided into two distinct treatment groups: the P-group and the Z-group. In the P-group, additional vinyl silicone was employed for a single-step border molding procedure, which was subsequently followed by a light-body final-wash impression. Conversely, the Z-group utilized green stick compound for sectional border molding, with a final wash conducted using a zinc oxide-eugenol material. The data revealed that the mean retention values were significantly greater in the P-group ( $4.02 \pm 1.66$  kgf) compared to the Z-group ( $1.48 \pm 0.90$  kgf). These findings indicate that the single-step border molding technique, when applied to the upper arch with the incorporation of vinyl silicone, results in improved retention of the acrylic denture base.<sup>13</sup>

## CONCLUSION

Notable distinctions emerged when comparing green stick impression compound with various elastomeric materials. Polyvinyl siloxane demonstrated a higher efficacy for border moulding compared to the other substances evaluated.

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