



A COMPARATIVE STUDY OF DIFFERENT FINAL IMPRESSION MAKING TECHNIQUES FOR MANAGING RESORBED MANDIBULAR RIDGES - AN IN VIVO STUDY

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ABSTRACT

Complete denture prosthodontics is essential for addressing tooth loss and its related disabilities. The effectiveness of complete dentures depends on precise impression techniques and materials, which have significantly advanced from early methods like carving wood or ivory blocks to more sophisticated practices informed by an in-depth understanding of oral tissues. Dentures, comprising artificial teeth and a supportive denture base, aim to restore appearance, occlusion, and oral function, while evenly distributing biting forces to the oral tissues and bone. Accurate impression-making is critical for denture functionality, retention, and oral health. Impression techniques must adapt to different materials and patient needs, ensuring the entire denture-bearing surface is captured with consideration of biological and anatomical factors. Special techniques are particularly important for resorbed mandibular ridges, which often require modified approaches to accurately capture load-bearing areas without distortion. Techniques such as the admixed functional and cocktail methods, and those focused on constructing dentures within the neutral zone, aim to enhance stability, especially for highly atrophic ridges. This study explores the construction of dentures within the neutral zone, employing suggested techniques for resorbed mandibular ridges and utilizing Atwood's categorization of ridge forms as a guiding framework.

KEYWORDS : Complete denture, resorted ridge, neutral zone.

INTRODUCTION

Complete denture prosthodontics is a vital aspect of dental practice and education, aiming to address tooth loss and its associated disabilities. The efficacy of complete dentures hinges on precise impression techniques and materials. Historical methods, such as carving wood or ivory blocks, have evolved into more sophisticated techniques driven by a deeper understanding of oral tissues.¹

These dentures consist primarily of artificial teeth and a denture base, serving to restore appearance, occlusion, and oral function. The denture base provides support and distributes biting force to oral tissues and bone. Effective impression-making is crucial for ensuring denture functionality, retention, and oral health.⁵

Impression techniques vary based on factors like material type and patient needs. Successful impressions must encompass the entire denture-bearing surface, considering both biological and anatomical factors. Special attention is required for resorbed mandibular ridges, often necessitating modified impression techniques.²

Various methods, like admixed functional and cocktail techniques, aim to accurately capture load-bearing areas without distortion. Residual ridge resorption, a common consequence of tooth extraction, underscores the importance of meticulous impression procedures. Techniques for constructing dentures within the neutral zone aim to improve stability, particularly for highly atrophic ridges.³

In this study, dentures will be constructed within the neutral zone using suggested techniques for resorbed mandibular ridges. Atwood's categorization of ridge forms provides a framework for understanding anatomical variations influencing impression procedures

Aims and Objectives:

This study aims to compare (the retention of heat cure

complete denture bases) made by using different final impression techniques, keeping the neutral zone as the standard in all cases for managing resorbed mandibular ridge.

Its main objective is to-

To evaluate retention and stability in the resorbed mandibular arch by functional impression technique, conventional impression technique, all green or admixed technique and cocktail impression technique.⁴

MATERIALS AND METHODS

This study focused on edentulous patients with significant mandibular ridge resorption. Primary impressions of the mandibular arch were taken using impression compound in appropriately sized stock trays, followed by pouring in dental plaster to create primary casts. Custom trays were then fabricated using autopolymerizing acrylic resin for each patient, incorporating spacers (J.J. Sharry's design) for the selective pressure technique. These trays were adjusted to ensure proper fit and extension, particularly at the distal end beyond the vibrating line and encompassing the hamular notches.⁷

Border molding of the mandibular arch was performed using green stick low fusing impression compound, followed by final impressions using four different techniques:

1. Conventional method with zinc oxide eugenol.
2. Functional impression technique with light body addition silicone material/tissue conditioner using a closed mouth technique.
3. McCord and Tyson's admixed technique.
4. Cocktail impression technique.

These techniques were chosen based on border molding observations and final impression materials used, categorized into four groups. Maxillary impressions were also made using zinc oxide eugenol impression material. Subsequently, maxillary and mandibular master casts were

obtained by pouring type III dental stone onto the final impressions.

The occlusal rims were constructed, and jaw relations were recorded to establish vertical and centric relations. Neutral zone recording was performed to ensure muscle balance in denture construction. This involved fabricating a new set of record rims on duplicate master casts.

Following jaw relation records, plaster indices were created around the green stick impression compound, later replaced by wax for teeth arrangement. A wax try-in was conducted to assess stability, aesthetics, and intraoral occlusion. Subsequently, dentures were processed using heat-cure acrylic resin, followed by finishing and polishing.

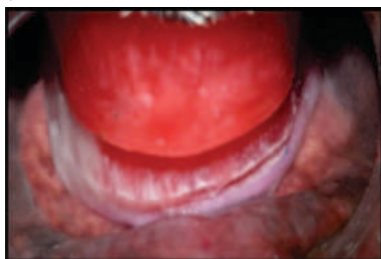
The inserted dentures were evaluated for retention, stability, support, and occlusion. Retention was assessed using a force measurement gauge, with readings recorded for each technique. Additionally, clinical evaluation and patient feedback on retention were gathered.

In summary, this methodology outlines the comprehensive process of impression-making and denture fabrication, incorporating various techniques tailored to address mandibular ridge resorption and optimize denture performance and patient satisfaction

In Group A, the Conventional Technique with Zinc Oxide Eugenol was employed. Border molding was performed using low-fusing impression compound, followed by a secondary impression with zinc oxide eugenol wash after border molding with green stick compound in an open mouth position. This method focused on traditional materials and techniques for impression-making.



Group B utilized the Functional Impression Technique with Light Body Addition Silicone Material/Tissue Conditioner with Closed Mouth Technique. After fabricating denture bases with occlusal rims on primary casts, tissue conditioning material was applied to the mandibular denture base, and the patient was instructed to perform various functional movements with a closed mouth. Final impression was then made with light body addition silicone material, emphasizing functional adaptation.



In Group C, McCord and Tyson's Admixed Technique were employed for flat mandibular ridges. This technique involved mixing impression compound and green tracing stick compound, followed by mandibular secondary impression with the admixed material. Tongue movements were utilized during impression-making to ensure accurate capture of ridge contours.



Group D utilized the Cocktail Impression Technique, combining various methods to obtain a definitive impression. Customized trays with wax spacers and cylindrical mandibular rests were fabricated, followed by functional impression using light body addition silicone material. The combination of techniques aimed to optimize denture fit and retention, particularly for atrophic mandibular ridges.



Overall, each group employed distinct approaches to mandibular impression-making, emphasizing traditional methods, functional adaptation, ridge contour capture, and a combination of techniques to achieve optimal denture retention and stability

The statistical analysis was done using Statistical Package for the Social Sciences (SPSS for Windows, Version 19.0). Descriptive statistics were calculated as mean and standard deviation. The comparison of retention between two groups was carried out using the student's independent samples t-test, while comparison between two or more groups was done using analysis of variance (ANOVA) followed by Tukey's post-hoc test. The level of significance for the present study was fixed at a p-value of less than 0.05

Table 1. Comparison Of Retention Among Study Group

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Min.	Max.
					Lower Bound	Upper Bound		
Group A	24	.0083	.00637	.00130	.0056	.0110	.00	.02
Group B	24	.3158	.40352	.08237	.1454	.4862	.08	1.00
Group C	24	.0717	.00816	.00167	.0682	.0751	.06	.09
Group D	24	.0363	.00495	.00101	.0342	.0383	.03	.04
Total	96	.1080	.23347	.02383	.0607	.1553	.00	1.00

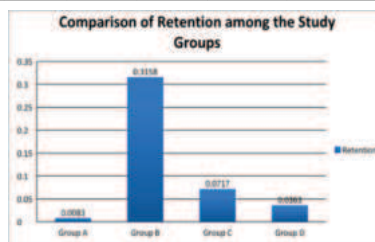


Figure 2. Mean Of Retention Values Present In Each Group

Statistical analysis revealed significant differences in retention between groups. Group B exhibited significantly higher retention than Group A ($p < 0.001$), while no significant differences were found between Group A and either Group C ($p = 0.698$) or Group D ($p = 0.964$). Additionally, Group B showed significantly higher retention than both Group C

($p < 0.001$) and Group D ($p < 0.001$). However, no significant difference in retention was noted between Groups C and D ($p = 0.929$)

SUMMARY AND CONCLUSION

The study aimed to compare and assess four secondary impression techniques for resorbed mandibular ridges, focusing on retention using a digital force gauge. Ninety-two completely edentulous patients were selected, and border moulding on mandibular arches was performed using green stick compound. The secondary impressions were made using different techniques, categorized as follows:

1. Group A: Conventional Technique with Zinc Oxide Eugenol
2. Group B: Functional Impression Technique with Light Body Addition Silicone Material/Tissue Conditioner with Closed Mouth Technique
3. Group C: McCord and Tyson's Admixed Technique
4. Group D: Cocktail Impression Technique

Mandibular occlusal rims were constructed using the neutral zone technique to prevent interference from muscular fibers and the tongue. Denture bases were fabricated for each cast, and retention was recorded using a digital force gauge. Statistical analysis showed that Group B, utilizing the functional impression technique, exhibited the highest mean retention value, followed by Group C (McCord and Tyson's admixed technique). Group A, using the conventional technique with zinc oxide eugenol, showed the lowest retention.

The study results align with previous findings by Drago,⁴ emphasizing that denture bases constructed using closed mouth techniques tend to be more retentive than those made with open mouth techniques. However, the closed mouth functional technique has drawbacks, such as limited control over patient movement, potentially resulting in under- or overextended borders and altered lingual anatomy due to restricted tongue movement.

Elastomeric impression materials offer advantages like single-step border moulding and accurate recording of minute details during final impressions.⁵ Studies by various authors recommend the use of elastomeric impression materials for border moulding and final impressions due to their efficiency and patient comfort. Techniques utilizing polyether impression materials have been found to require less time and exhibit less operator variability compared to other materials like modeling plastic.

In conclusion, the study highlights the following key points:

1. Two out of the four techniques demonstrated significant retention in mandibular heat cure denture resins.
2. The functional impression technique with light body addition silicone material/tissue conditioner with closed mouth technique provided superior retention to the mandibular denture base.
3. Elastomeric materials, such as light body addition silicone and polyether, offered the best retention for the mandibular denture base.
4. McCord and Tyson's admixed technique provided the advantage of recording the functional position of muscles in a single step.
5. Zinc oxide eugenol impression paste, when used as a secondary impression material with conventional techniques, yielded the least retention for the mandibular denture base.

Overall, these findings provide valuable insights into the selection of impression techniques and materials for achieving optimal retention in mandibular dentures, despite the study's limitations.

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