

Comparison of Different Final Impression Techniques and Occlusal Schemes for Management of Resorbed Mandibular Ridge: A Case Report

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Abstract: *Gross mandibular atrophy has been described as a ‘multifactorial biomechanical disease’ resulting from a combination of anatomic, metabolic and mechanical determinants varying with time from patient to patient in an infinite number of combinations. The history of complete denture impression procedures has been influenced largely by the development of impression materials from which new techniques and ideas arose. The purpose of this study was to compare the retention of complete dentures made by using two different impression techniques like all green and functional techniques and further comparison of two different occlusal schemes i.e. lingualized balanced occlusion and monoplane occlusion scheme. The results showed that there was significant difference in retention between the two techniques where functional technique showed the highest mean value of retention followed by all green. However, on clinical examination, the retention produced by both the techniques was satisfactory. Patient experienced better chewing efficiency and comfort with lingualized balanced occlusion denture.*

Keywords: Resorbed mandibular ridge, impression, lingualized balanced occlusion, monoplane occlusion.

1. Introduction

Fish¹ stated that complete dentures are made up of 3 surfaces; the impression or intaglio surface, the polished surface, and the occlusal surface. The retention, stability, and support of the dentures are governed by the design of these 3 surfaces.²⁻⁴ When the maxillary and mandibular denture teeth come into contact, unfavourable displacing forces may overwhelm the retention and stability of the dentures, resulting in discomfort from trauma to the supporting mucosa.⁵ If the intaglio and polished surfaces are ideal, it is assumed that the form of the occlusal surfaces and the nature of their contacts become critical for successful complete denture function.⁶

Mandibular residual ridges with adequate bone support can usually be precisely recorded with conventional impression techniques using materials such as zinc oxide eugenol (ZOE) or elastomeric impression materials because of the inherent accuracy of these materials and their propensity to distribute pressure equally. As the residual ridges resorb, the tissues become unsupported and displaceable; the use of conventional impression techniques will result in a distorted impression. Therefore, the impression technique needs to be modified.⁷

A number of modified impression techniques for resorbed mandibular ridge have been suggested by various authors such as admixed, functional, all green, and cocktail technique. All these techniques capture the primary and secondary load-bearing areas without distortion of the residual ridge. The use of these impression techniques has the following advantages: (1) they can be easily controlled to gain maximum coverage; (2) they can be corrected readily; (3) they can be used to accurately determine the extent of the mucobuccal reflections; and (4) they can be used to direct pressure towards the load-bearing areas, specifically, the buccal shelf and the slopes of residual ridges in the mandible. In this article the comparison between two impression techniques is done i.e. all green technique and the functional impression technique based on the clinical evaluation and the patients perception.⁷

Many types of occlusal forms and posterior tooth arrangements have been used in complete dentures for almost 200 years. The search continues for a posterior tooth form that will satisfy patients’ expectations regarding (1) esthetic requirements, (2) comfort, and (3) masticatory efficiency. The three major groups of occlusal forms available are (1) anatomic: 33- or 30- degree cusps; (2) semi-anatomic: 20-degree cusps; and (3) non-anatomic or cusplless: O- degree cusps.⁸

Becker et al. described the use of a “lingualized occlusion,” a combination of anatomic teeth for the maxillary denture and modified non-anatomic teeth for the mandibular denture, in “an attempt to maintain the esthetic and food-penetrating advantages of the anatomic teeth while maintaining the mechanical freedom of the non-anatomic form.”⁸

In this present study two non-interfering occlusal schemes were compared: (1) the lingualized balanced occlusion, and (2) monoplane occlusion where non-anatomic (O-degree) teeth were used for both the maxillary and mandibular dentures. The comparison was made by fabricating two sets of dentures for the same patient, allowing the patient to wear both, and then asking the patient to report a preference and give reasons for the choice.

2. Case Report

A 62-year-old female patient presented with the chief complaint of difficulty in mastication, loosening of upper and lower dentures and poor esthetics for the past 4-5 years. Patient was wearing same set of complete dentures since past 20 years (figure 2). On intraoral examination, mandibular ridge was completely resorbed (Figure 1). There was no hyper mobile tissue on palpation. A radiographic examination revealed a very atrophic mandible. The patient was informed of all the possible treatment modalities available; she could not go for implant treatment as the resorption of complete alveolar bone proper had taken place leaving only 8mm of mandibular basal bone height which was not supportive for implant placement. Patient did not

want to go for any extensive surgical procedures for correction of ridge defect.

The patient was apparently in good general health and did not report any systemic disease. The patient was informed about the study and an informed consent was taken. Preliminary impression of the edentulous arch was made using irreversible hydrocolloid impression material (Vignette Chromatic, Dentsply, Gurgaon, India) in a metal stock tray. Impression was poured in type III dental stone (Stone Plaster, Neelkanth Minechem, Rajasthan, India). Custom trays were fabricated on the preliminary cast using self-cure acrylic resin (Rapid Repair, Dentsply, Gurgaon, India) tray material. Border extensions of the trays were adjusted to be at least 2mm short of the vestibules on the preliminary cast. Maxillary border moulding was done using low fusing impression compound (green stick) (DPI Pinnacle Tracing Sticks, the Bombay Burmah Trading Corporation, Mumbai, India) and final impression was made using zinc oxide eugenol impression material (DPI Impression Paste, the Bombay Burmah Trading Corporation, Mumbai). Mandibular border moulding and final impressions were made using two different techniques. In the first technique, mandibular secondary impression was made by using Green stick compound, which was kneaded to a homogenous mass

and was loaded on the special tray and border movements were done. Final impression was made using light bodied elastomer.

Second technique used was closed mouth functional impression technique by Winkler [7]. In this technique, denture bases with occlusal rims were fabricated on primary cast. Tentative Jaw relations was recorded to judge appropriate horizontal and vertical dimensions and fabricate a temporary denture. Tissue conditioning material was applied on the tissue surface of mandibular denture base and patient was asked to close the mouth in the pre- recorded vertical dimension and do various functional movements such as puffing, blowing, whistling, and smiling (Figure 5). Three applications of tissue conditioner material were done at an interval of 8–10 minutes and functional movements were made by the patient. The tray was given to the patient for two days with proper instructions to perform all the functional movements. The patient was instructed not to remove the tray at night. The retention of mandibular dentures was also evaluated clinically, and the patient was requested to comment on the retention of each mandibular denture.



Figure 1: Pre-operative photographs showing resorbed mandibular ridge and maxillary ridge.



Figure 2: Patients previous complete dentures.



Figure 3: Final impression made using all green technique and light body addition silicone



Figure 4: Auto-polymerising acrylic denture base fabricated over the primary cast



Figure 5: Temporary denture made using tooth moulding acrylic and lined by 3 layers of tissue conditioner for making the functional impression at raised vertical dimension



Figure 6: Master casts obtained, peach die stone – functional impression technique; yellow die stone – all green technique

After the master casts were obtained the temporary denture bases were fabricated using auto- polymerising acrylic resin followed by construction of occlusal rims using the modelling wax. The vertical dimension at rest was measured to be 55mm and the vertical dimension at occlusion (VDO) of existing dentures were measured to be 47.5 mm., a 4.5

mm of vertical height was raised in the new jaw relations to improve the function and esthetics of the patient. Hence, the vertical dimension of new dentures was estimated to be 51mm.

The facebow transfer was then done and the casts were mounted on the semi adjustable hanau articulator. A monoplane occlusal scheme was used for functional impression technique and a lingualized balanced occlusal scheme was used for the all green technique. After the teeth arrangement was completed a try in was done in patient's

mouth. The final processing of dentures was then done. The patient was at first given the monoplane occlusal scheme dentures and observed for a period of 1 month followed by insertion of lingualized occlusal scheme denture and again observed for a period of 1 month.



Figure 8: Facebow transfer



Figure 7: Recording maxilla-mandibular jaw relations of the patient



Figure 9: lingualized balanced occlusion



Figure 10: Monoplane occlusal arrangement



Figure 11: Try in for monoplane occlusal scheme



Figure 12: Try in for lingualized balanced occlusal scheme



Figure 13: Lateral and protrusive excursive movements checked



Figure 14: Processed dentures and final insertion of monoplane occlusal scheme dentures.



Figure 15: Processed lingualized balanced occlusal scheme dentures

3. Discussion

The degree of muscular activity and the region to which the denture can be extended without displacement are important aspects of any impression technique. For individuals with an accentuated bone resorption, it is difficult to obtain good

retention and stability of the complete denture due to the presence of muscular insertions near the ridge crest or border, which might cause muscular-induced displacement of the denture. In these cases, functional technique is highly recommended and as per the results in the present study mandibular denture fabricated using functional technique⁹ showed greater retention. The results of the study are in accordance with the study conducted by Yadav et al⁷ and Drago¹⁰ which concluded that mandibular denture bases constructed from closed mouth technique were more retentive than the open mouth techniques. The closed mouth functional technique by Winkler has certain advantages; since it is time saving, interference due to tray handling is eliminated; also there are less chances of under- or overextensions as movements are performed by the patient and pressure applied by the patient during impression making is the same as the pressure applied while occluding. However, there are certain disadvantages of this technique such as the fact that the dentist has no control over patient movement which may result in under- or overextended

borders and also tongue is restricted to move anteriorly which may alter the anatomy of lingual border.⁷

A basic knowledge of the anatomy, the possession of a thorough and definitive concept of the physiology of mastication, and some degree of familiarity with the techniques presently employed and advocated would better enable the operator to make a more intelligent evaluation of the problem. With that as a background, a decision on a pattern of occlusion z sacrificing any of the factors vital to denture retention and stability, and with due regard for the preservation of the health of the supporting structures.¹¹

J ones¹² DeVan¹³ and others have discussed the relation of non anatomic teeth to the preservation of structures of the basal seat, while Bascom¹⁴ has shown that non anatomic teeth are as efficient as other occlusal forms.¹⁵

Lingualized posterior occlusal forms were significantly superior in terms of reduced pain in the mouth, reduced incidence of sore spots, ability to eat, and meal interruptions, compared with 0-degree posterior occlusal forms. Anatomic posterior occlusal forms were significantly better in terms of masticatory function compared with 0-degree posterior occlusal forms.

4. Conclusion

The results showed that there was difference in retention between the two techniques where functional technique showed greater retention than, all green technique. Retention of both the mandibular dentures was found to be satisfactory and acceptable. However, the patients comfort level and chewing efficiency were better with lingualized balanced occlusal scheme as compared to monoplane occlusal scheme. Patient was most satisfied with the denture made from all green impression technique with lingualized balanced occlusion.

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