



# ORIGINAL RESEARCH PAPER

## Prosthodontics

### INFUNDIBULAR DENTURE FOR HIGHLY RESORBED RIDGE – A CASE REPORT

**KEY WORDS:** Resorbed ridge management, Cocktail impression, Neutral zone, Hollow denture.

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#### ABSTRACT

The success of a complete denture relies on the principles of retention, stability and support. The prosthodontist skill lies in applying these principles efficiently in critical situations. Severely resorbed mandibular edentulous ridges that are narrow and constricted with increased inter ridge space provide decreased support, retention and stability. The consequent weight of the processed denture compromises them further. This article describes a case report of an edentulous patient with resorbed ridges where a simplified technique of fabricating a hollow mandibular complete denture using wax was used for preservation of denture bearing areas. The hollowing of the denture reduces the weight of the denture, thereby enhancing stability and retention, reducing the further resorption of the jaws.

#### INTRODUCTION:

Prosthetic rehabilitation of severely resorbed ridges has been a major problem in dentistry since ages. The resorbed or atrophied ridges pose a clinical challenge to the clinician to fabricate a successful prosthesis with optimal retention, stability and support. The success of a complete denture relies on the principles of retention, stability and support. The prosthodontist skill lies in applying these principles efficiently in critical situations [1]. Although the resorption process is generally a more serious clinical problem in the mandibular arch, significant loss of alveolar bone in the maxillae can prove equally problematic [2]. After dental extractions, the residual alveolar bone undergoes a period of accelerated resorption for about 10 weeks, followed by a slower, but progressive resorption [3]. Residual ridge resorption is a complex biophysical process affected by various anatomic, prosthetic, functional, and metabolic factors. The various problems posed by resorbed ridges are narrower, more constricted ridge as resorption progresses, decreased denture bearing area and in turn effecting retention, stability and support of the final denture. Apart from effecting these major requirements, excessive ridge resorption also results in a large restorative space between the residual ridges [4]. Restoration of lost vertical dimension results in fabrication of a heavy complete denture that may compound the poor denture bearing ability of the tissues and lead to decreased retention and resistance [5].

To increase the retention and stability of such a heavy prosthesis, various methods like use of undercuts, modifications in impression techniques [6], use of magnets [7], use of implants [8], use of intramucosal inserts [9,10] incorporation of suction disks [10] and fabrication of lightweight dentures [2,4,11,12] have been tried. Numerous methods and materials have been used to fabricate a lightweight denture, allowing for restoration of esthetics and function such as mastication, deglutition, and speech. Weight reduction approaches have been achieved using a solid 3D spacer, including dental stone, cellophane-wrapped asbestos [13] silicone putty [4,14] modeling clay, and thermocol [15], lost salt technique [16] during laboratory processing to exclude denture base material from the planned hollow cavity of the prosthesis. Alternately, fabrication of multiple and separate pieces of the prosthesis either individually or around a 3D spacer has also been described [1,4]

The present article is a case report of an edentulous female patient with severely resorbed mandibular ridge and increased inter-ridge space who has undergone resorbed ridge management since impression making for the fabrication of an optimal prosthesis.

#### CASE REPORT:

A 60 year old female patient (Fig:1A) walked into the Department of Prosthodontics, Lenora Institute of Dental Sciences with a chief complaint of looseness of both upper and lower dentures and desired the replacement of the same. Her history revealed that, she had been edentulous and had been wearing dentures for 25 years.

On examination, it was found that the maxillary edentulous ridge is well formed (Fig:1B) and the mandibular edentulous ridge is severely resorbed (Fig:1C). Patient's medical and dental histories were carefully evaluated, intraoral and extraoral examination was carefully made. After radiographic evaluation and based on patient's clinical conditions, various treatment options have been explained to the patient. The various treatments discussed with the patient were Conventional Complete dentures and Complete dentures with resorbed ridge management. The patient opted for the complete dentures with resorbed ridge management as she was explained that it would be more stable compared to conventional complete dentures.

As the mandibular ridge is severely resorbed, rather than conventional secondary impression with zoe paste, an impression is made in Cocktail impression technique. As a consequence of resorption, it had also been noticed an increased inter ridge space for which a hollow denture was planned for either of the arches or both based on the vertical height of the occlusal rim. To aid in more stability to the mandibular prosthesis, teeth arrangement in the neutral zone is planned.

#### TECHNIQUE:

1. A conventional primary impression of both the arches is made with impression comound(DPI).
2. Maxillary secondary impression is made in the standard technique with green stick border molding and zinc oxide eugenol paste impression. Mandibular ridge being severely atrophied had been recorded in Cocktail impression

technique. The special tray is fabricated with autopolymerising resin with borders 2mm short of sulcus with wax spacer. Then Mc Cord and Tyson's material had been used for impression making in dynamic impression technique. The wax spacer is removed. The material is placed in hot water bath at a temperature of 60°C, kneaded to a homogenous mass that provides a working time of about 90 s. This homogenous mass is loaded and patient is guided to close his mouth on the mandibular rests. For recording the functional state, patient is instructed to run his tongue along his lips, suck in his cheeks, pull in his lips and swallow by keeping his mouth closed, as in closed mouth impression technique, till the impression material hardens. On removal from the mouth, impression is chilled and reinserted to check the denture bearing area for pressure sensibility by applying heavy finger pressure on the impression to simulate functional loads. The operator should place the thumbs on the underside of the patients' mandible and squeeze. If the mucosa has been properly loaded, the only discomfort that the patient should report is where the thumbs press on the lower border of the mandible. Reheating the impression in whole or part, or adding more material to deficient areas should not be done as this will result in flow of material which in turn will result in differential loading of the tissues. The retrieved impression is visually inspected for surface irregularities, any over and under extensions(Fig:1D). If there are any such, the impression should be repeated, disinfected and poured. After fabrication of wax occlusal rims, Jaw relations are recorded in standard procedure(Fig:2A) sealed with staple pins and mounted in a mean value articulator.

3. After mounting in mean value articulator, lower wax occlusal rim is replaced with impression compound for carrying out the neutral zone recording.
4. Lower denture base with impression compound rim is placed in hot water bath and at a moldable stage, it is placed in the oral cavity and patient is asked to give various functional movements such as licking lips, sucking, swallowing, pronouncing some words, puckering, smiling, grinning, or combination of these for the material to get molded and positioned in the neutral zone (Fig:2B).
5. This denture base with neutral zone recording is placed in the previous mean value articulator and is trimmed to the predetermined vertical dimension of occlusion on the mounted articulator.
6. Now, a jig is prepared around the neutral zone record using a mix of plaster and pumice(Fig:2C).
7. Using the jig, the compound rim is removed and replaced with molten wax. Once the wax reaches the room temperature it is ready for setting teeth in the neutral zone.
8. During teeth arrangement, the positioning of lower teeth should be exactly within the jig and upper teeth are arranged accordingly.
9. Try – in procedure is carried out(Fig:2D). After the procedure of try – in, the lower trial denture having more vertical height, we planned to fabricate a hollow mandibular denture thus reducing the weight of the prosthesis which helps in reduced residual ridge resorption.
10. The hollow denture is fabricated in lost wax technique. But, rather than the baseplate wax as spacer, the wax used here is hard wax as it is more resistant to pressure during packing compared to modelling wax. Duplicate the trial denture in reversible hydrocolloid and pour the impression in dental stone. Make a clear template of the stone cast using a 0.5-mm thermoplastic Sheet(Fig:3A) which is used as guide later to determine the thickness of spacer material to be placed. Process the trial denture in the standard manner through the wax elimination stage. Adapt 2 layers of baseplate wax to the definitive cast in the lower compartment conforming to the

border extensions. Use a second interchangeable upper compartment to invest the baseplate wax and processed conventionally to obtain a heat cure denture base on the definitive cast(Fig:3B). Then, adequate thickness of hard wax was adapted on the processed record base leaving at least 2 mm of border area(Fig:3C) for the fusion of two halves of the denture using vacuform sheet as guide. The thickness of the adapted hard wax was adjusted accordingly and checked using endodontic files with a rubber stop to measure the space between the matrix and the processed resin(3D).

11. The thickness of the applied hard wax provided the hollow space in the mandibular denture. Above that, the remaining heat cure resin was packed and cured in short curing cycle.
12. Processed denture was retrieved and 2 windows were made on either side distal to second molar(Fig:4A) and were placed in hot water bath till the hard wax melts and traces were removed by flushing hot water with the high pressure syringe through the holes. After making sure that complete wax has been removed, the windows were closed with auto polymerizing resin plugs(Fig:4B). The hollow cavity seal was verified by immersing the denture in water. If no air bubbles are evident, an adequate seal is confirmed(Fig:4E).
13. Finishing and polishing done with pumice.(Fig:4C)
14. The dentures were inserted in the patient's mouth and post insertion instructions were given (Fig:4D,4F).

# DISCUSSION:

Extreme resorption of the ridge whether maxilla or mandible will lead to a reduced denture bearing area which in turn will affect retention, stability and support for the complete denture. Problems that are likely to be faced may be due to narrower and more constricted residual ridge as the resorption progresses, causing reduced supporting tissue with larger restorative space between maxillary and mandibular residual ridges [4].



FIGURE:1



FIGURE:2

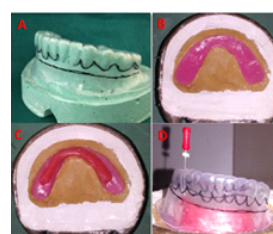


FIGURE:3



**FIGURE:4**

A number of clinicians recommend "weighted" mandibular dentures for severely resorbed lower ridges. A.H.Grunewald (1964) [17] recommended that gold base being heavy, helps in, retention of lower denture and has closest adaptation to the underlying tissues. J.L.Wormley et.al. (1974) [18] also described the advantages of weighted dentures apart from offering the advantages of a cast metal base along with the ease of adjustment and relining. However, studies have shown that weight may not contribute to the retention and stability of a lower denture [19]. Extra weight may, in fact, cause an accelerated resorption of the residual ridge. This may be due to the continuous pressure exerted on the residual ridge by the heavy denture even at rest. In order to avoid this problem, the presented cases were treated with a hollow mandibular complete denture, which resulted in approximately 25% of reduction in the weight of the denture in comparison with the conventional denture [20]. This may be applicable to situations where there is severe atrophy of the residual alveolar ridges and placement of implants is not a realistic option. However, the reduced weight also makes the patient feel comfortable with the prosthesis.

Severely resorbed ridges are mainly taken care by utilizing concept of broad area coverage within functional limits, decreased number of teeth, decreased buccolingual width of the teeth, improved tooth form, avoidance of inclined planes, provision for adequate tongue room, adequate interocclusal distance apart from a hollow denture base.

Considering the above factors, in the present case, we made a secondary impression using Cocktail impression technique i.e., McCord and Tyson's impression in dynamic technique. McCord's impression material i.e., Impression compound and green tracing stick in the ratio of 3:7 parts by weight has been used in functional impression method as in closed mouth impression technique. Combination of impression compound with green stick is used as recommended by McCord and Tyson for definitive impression, because this has better body, requires less chair side time and economical as compared to tissue conditioner or reline material. The working time of 90 s is sufficient to allow the patient to perform all the functional movements. During the entire procedure, custom tray is stabilized by mandibular rests to obtain an accurate, stable, single step, functional impression. After the cocktail impression, as a part of residual ridge management, the next procedure we followed is neutral zone recording for arranging teeth. Positioning artificial teeth in the neutral zone achieves two objectives. First, the teeth will not interfere with the normal muscle function, and second, the forces exerted by the musculature against the dentures are more favorable for stability and retention [21]. Finally, during the processing of final hollow denture, we used hard wax to create the hollow space. The procedure described for the fabrication of a mandibular hollow denture in this article incorporates the use of a clear, vacuum formed matrix of the trial denture external contours to facilitate the fabrication of a hollow cavity form, ensuring appropriate dimensions of both the denture base acrylic resin for structural integrity and the denture cavity for optimal weight reduction. Previously, vinylpolysiloxane (VPS) putty has been used for fabrication of hollow prostheses due to its stability and ability to be carved, and because it does not adhere to acrylic resin on setting. However, removing set putty from within the cavity, especially in the area between the canines, is difficult due to the curvature of the arch, making the procedure cumbersome and time

consuming. In the technique described in this article, Hard wax is used which is very easy for removal by placing in hot water bath and then flushing hot water with pressure. Previously, Hollow dentures were fabricated as two separate shells fused with autopolymerizing resin. The possible disadvantage associated with such a hollow dentures are that they are weak, prone to fracture because of a long sealed junction and undergo discoloration with time. Furthermore, this junction is a common site for postinsertion adjustment, thus increasing the risk of leakage. In the technique described in the article, there is no long junction to be sealed with autopolymerising resin except the two windows placed distal to the molars for removal of the spacer material which are later sealed by self-cure acrylic plugs thus potentially reducing the chances of leakage and also fracture of the denture. Also previously, salt and light body have been used as spacer. However, adjusting them to optimal thickness and height according to the vacuform sheet is difficult. In the present case, as we have used hard wax, trimming or carving the wax with a carver can simply be done. Hence, using hard wax as a spacer material made the cumbersome technique more simpler in all the ways. However, hard wax is not as stiff as PVS putty material to withstand the forces during packing.

### SUMMARY:

Rehabilitation of severely resorbed ridges is a challenge to the prosthodontist. Apart, from modifying the impression technique to get maximum denture bearing area, modifying the type of denture also may be better accepted by patients. Hence, less denture weight has advantage of reduction in excessive weight of the acrylic resin that may decrease the load on the compromised residual alveolar ridge and provides for healthy and comfortable living.

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