

Case Series

Lightening the Load of Maxillary Atrophic Ridges: A Hollow Denture (Case Series)

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ABSTRACT

The core tenets of complete denture treatment are retention, stability, and support with acceptable aesthetics and good speech. For patients with specific anatomical traits such as highly resorbed ridges, long lip length, and increased interridge distance, the principles are often compromised with conventional dentures. The maxillary denture fabricated in such patients are bulky in nature which further compromise its retention. Such clinical situations necessitate the fabrication of a hollow complete denture to reduce the weight of the prosthesis and increase retention. Moreover, the reduced material volume contributes to more life-like usage of the maxillary complete denture with improved patient satisfaction. This article presents several ways of crafting hollow dentures with the aim of preserving the underlying tissues, enhancing denture performance, and minimizing bone resorption.

KEYWORDS: Hollow denture, Inter ridge distance, Light weight denture, Residual ridge resorption

INTRODUCTION

Rehabilitation of completely edentulous maxillary and mandibular arches comprise several treatment strategies. A patient's age, systemic disorders, financial situation, and other variables are taken into consideration when determining those treatment plans. For edentulous maxillary and mandibular ridges, a complete denture is one such alternative. When dentures meet these requirements, function and appearance are restored while also ensuring patient comfort. A complete denture must be fabricated in a number of processes in order to get the intended outcomes. "No step-in denture construction should be stopped short of perfection yet many dentures are worn, which have

imperfections built into them, provided they have peripheral seal sufficient to hold them in place"^{1,2}.

After teeth are extracted, a complex biophysical process known as residual ridge resorption frequently occurs. Ridge atrophy is most dramatic during the 1st year after tooth loss followed by a slower but more progressive rate of resorption thereafter. Increase interridge space may result in a heavy maxillary complete denture that may compound the poor denture-bearing ability of the tissues and lead to decreased retention and stability. Therefore, by making a hollow cavity inside the maxillary complete denture, its weight can be decreased in patients with significant inter-ridge spaces. The rationale for choosing hollow dentures

are as they help in managing the existence of increased inter ridge distance and reduce the heaviness of the denture base. Numerous materials have been used to build a 3D hollow space within a denture such as dental stone, cellophane wrapped asbestos, silicone putty, modelling clay, thermocol, play dough, light-body coated gauge, salt, or glycerine soap during processing^{1,3,4}.

This case report describes three techniques for fabrication of a hollow maxillary complete denture in a patient with resorbed maxillary and mandibular ridges and increased interridge distance using glycerine soap, alkaline salt and absorbable gelatine sponge.

CASE REPORTS

A. Case 1: Hollow Denture Using Glycerine Soap

[Figure 1 a-i]

A 56-year-old male patient presented to the Department of Prosthodontics, Darshan Dental College and Hospital, Udaipur with a complaint of complete edentulism in both maxillary and mandibular arches. Patient was a denture wearer for the past 3 years and complained of looseness of maxillary denture. Past medical history was not significant. Thus, a conventional mandibular denture and maxillary hollow denture was fabricated.

- a) The maxillary denture was constructed up to the trial denture stage using conventional method.
- b) The waxed-up trial denture base was sealed to the master cast; duplicated using irreversible hydrocolloid (alginate) and then poured with dental stone.
- c) A 1 mm thick thermoplastic sheet was used to create a template of the duplicated trial denture using a vacuum heat-press machine onto the duplicated cast.
- d) The trial denture was then subsequently processed up to the wax burnout stage using conventional method.

- e) The denture processing was carried out using two denture flasks with interconvertible lids.
- f) To the master cast, two layers of baseplate wax were adapted in line with the peripheral extension of the cast. After that, it is transferred to the second flask and processed as usual.
- g) Following deflasking, the template was positioned on the master cast, creating an index in the land area of the cast to serve as a seating reference. An endodontic file with a rubber stopper is used to quantify the distance between the template and the treated base.
- h) The Polyvinylsiloxane putty was manipulated and shaped to conform the estimated configuration of the template, leaving 2–3 mm of space between the template and the spacer. Over the tooth portion of the denture, an extra 1 mm of clearance was kept.
- i) With the putty spacer as reference, soap replica was modelled using Le Cron carver and the exact measurement was verified with Vernier's caliper.
- j) The trial closure was performed using putty spacer, which was then removed from the flask. The mold space was visually inspected to ensure that the resin thickness was adequate around the entire hollow cavity.
- k) Final closure is done with soap spacer filled into the mold space and acrylized conventionally.
- l) After retrieval of the denture, two orifices were created on the distal aspect of the most posterior tooth in the denture base. Then, it is placed in the container of water for dissolution of soap. Devices such as cleaning brush and water spray were used to completely remove any remaining traces of soap. After being sealed with auto-polymerizing resin, the two orifices were evaluated for a water test.
- m) The maxillary and mandibular dentures were inserted to the patient after final finishing and polishing.

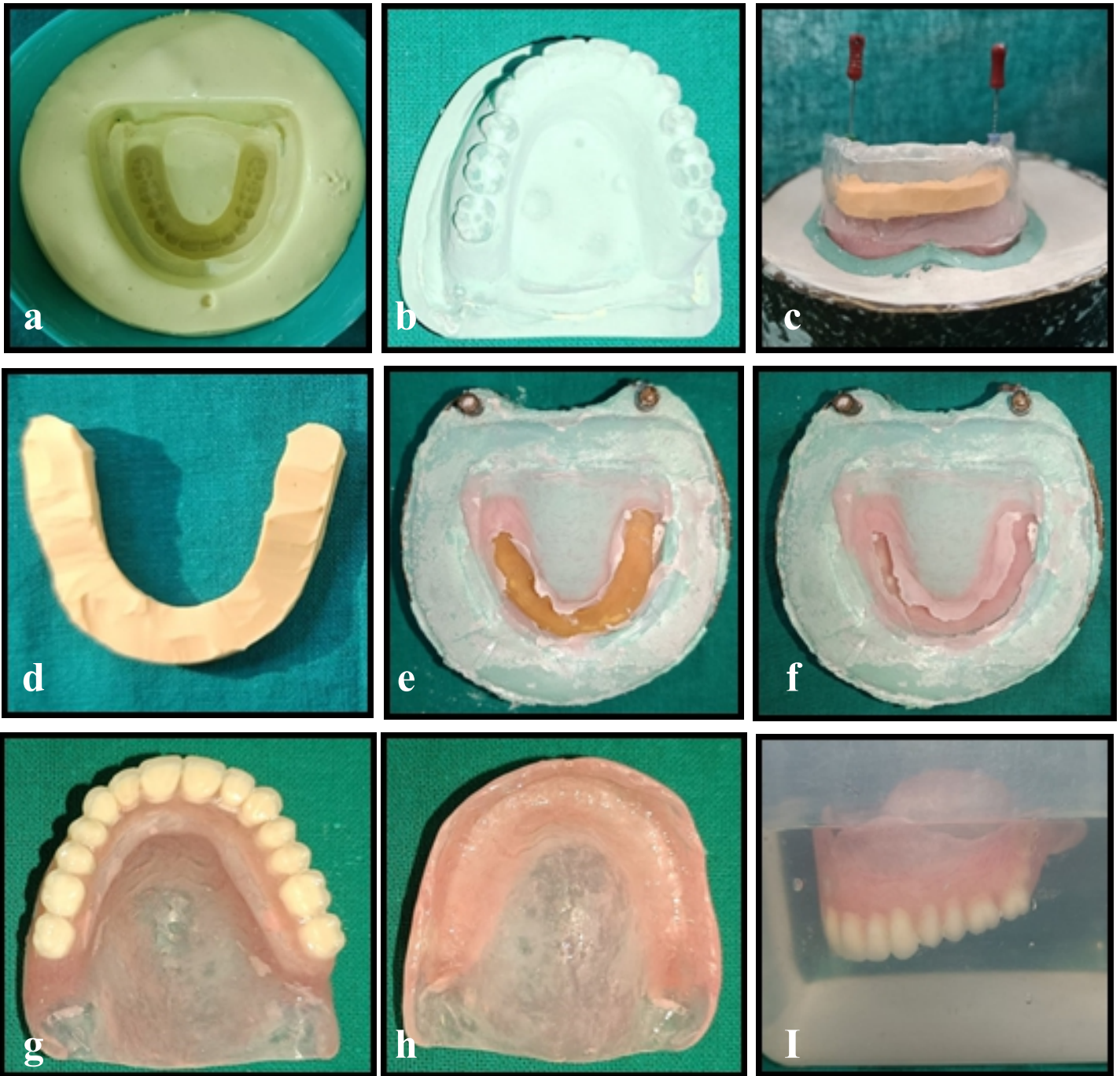


Figure 1: Hollow Denture Using Glycerine Soap

- (a) Duplication of waxed up denture;
- (b) 2mm thick polyethylene sheet pressed on the duplicate stone cast;
- (c) Measuring the distance between the putty spacer and polyethylene sheet using endodontic file with rubber stopper;
- (d) Putty spacer; (e) Space created with putty spacer;
- (f) Glycerine soap placed in the hollow cavity; (g) Cameo surface; (h) Intaglio surface; (i) Water test

B. Case 2: Hollow Denture Using Absorbable Gelatine Sponge [Figure 2 a-i]

A 56-year-old male patient presented to the Department of Prosthodontics, Darshan Dental College and Hospital, Udaipur with chief complaint of difficulty in chewing and poor aesthetics. Patient was a denture wearer for the past 5 years and complained of attrition of denture teeth. Extra oral examination revealed patient was having long upper lip with drooped corners of mouth. Intra oral examination revealed severely resorbed edentulous ridges with increased inter-ridge distance. Thus, the treatment of maxillary hollow dentures is planned with a conventionally fabricated mandibular denture.

- a) The maxillary denture was constructed similarly up to the preparation of the template of trial denture.
- b) Instead of putty spacer as a reference, plastic straw was used and absorbable gelatine sponge of 1cm thickness was modelled using Le Cron carver.

- c) The trial closure was achieved with a plastic straw and mold space was filled with gelatine sponge material in the final closure of the processing step.
- d) The absorbable gelatine sponge was left inside the mold space and acrylization was carried out conventionally.
- e) After retrieval of the denture, two orifices were created on the distal aspect of the most posterior tooth in the denture base. Then water spray was used to completely remove the gelatine sponge. After being sealed with auto-polymerizing resin, the two orifices were evaluated for a water test.
- f) The maxillary and mandibular dentures were inserted to the patient after final finishing and polishing.



Figure 2: Hollow Denture Using Absorbable Gelatine Sponge (a) Waxed up maxillary denture; (b) Flasking; (c) Absorbable gelatine sponge; (d) Space created with straw; (e) Gelatine sponge placed; (f) Cameo surface; (g) Intaglio surface; (h) Hollow denture; (i) Water test

C. Case 3: Hollow Denture Using Alkaline Powder (Papad Khar) [Figure 3a-i]

A 51-year-old male patient reported to the Department of Prosthodontics, Darshan Dental College and Hospital, Udaipur with a chief complaint of looseness of both upper and lower dentures and desired the replacement of the same. His history revealed that, he had been edentulous for 15 years and had been wearing dentures for 14 years. The intra-oral examination revealed a narrow and constricted U-shaped flat palatal vault and moderately resorbed maxillary and mandibular ridges. The treatment plan decided for the patient was the fabrication of a hollow maxillary complete for better stability and retention.

- a) The maxillary trial denture was flaked and dewaxed in the conventional manner.
- b) Half of the heat cure PMMA (Trevalon, Dentsply India Pvt. Ltd., Gurgaon, India) in dough stage was positioned accurately over the dewaxed mould and then alkaline powder crystals were placed over it.
- c) Above that, the remaining heat cure resin was packed and acrylization was carried out conventionally.
- d) Cured denture was retrieved and 2 holes were made in the thickest palatal area.
- e) All the alkaline powder crystals were removed by flushing water with the high-pressure syringe through the holes.
- f) After making sure that all the alkaline powder crystals have been removed, the escape holes were closed with auto polymerizing resin (Trevalon, Dentsply India Pvt. Ltd., Gurgaon, India).
- g) The hollow cavity seal was verified by immersing the denture in water, if no air bubbles are evident, an adequate seal is confirmed.
- h) The dentures were inserted in the patient's mouth and instructions regarding care, hygiene and maintenance were given.

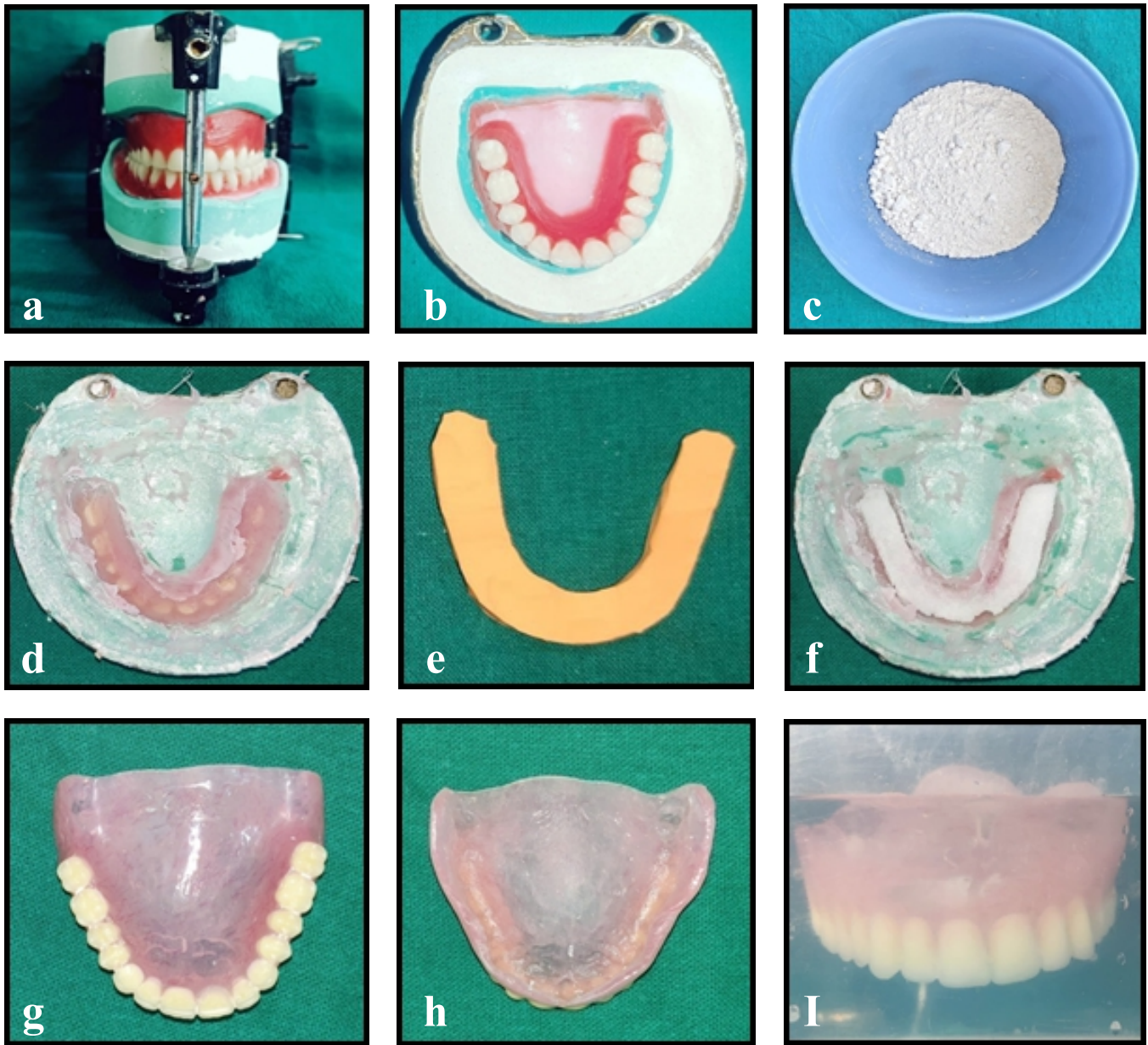


Figure 3: Hollow Denture Using Alkaline Powder (a) Waxed up denture; (b) Flasking; (c) Alkaline powder; (d) Space created with putty; (e) putty spacer; (f) Alkaline powder placed; (g) Cameo surface; (h) Intaglio surface; (i) Water test

DISCUSSION

The fundamental goal of prosthodontic rehabilitation is to restore the functional and aesthetic deficiencies. Tooth loss leads to residual ridge resorption which is a complex phenomenon driven by various anatomic, prosthetic, functional and metabolic factors. A reduced denture-bearing area with a significant inter-ridge void will result from extreme resorption of either ridge, which will impact the denture's overall stability, support, and retention. Hence, the best way is to rehabilitate them with reducing the weight of maxillary prosthesis which has been shown to be beneficial. This can be achieved by making the maxillary denture hollow^{5,6}.

Case 1 described in the presented case used a soap spacer with a high content of glycerine and other humectants in it, rendering it highly water-soluble compared to other soaps. According to previous studies, the primary benefits of employing glycerine soap spacer are its capacity to withstand high curing temperatures (glycerine has a boiling point of 290°C) and the fact that it doesn't obstruct the polymerization of heat-cured acrylic resin, leaving no residues inside the hollow cavity. Also, because the soap spacer is eventually removed leaving behind a clean hollow cavity, any concern regarding its biocompatibility in the oral cavity is dismissed. Fattore, Fine, and Edmonds⁷ used a double flask method to reduce denture weight. The use of the double flask technique was cumbersome and more time-consuming, with increased cost as well.

The qualities of absorbable gelatine sponge, such as its low weight, ease of adaptability to any space, commercial availability, and non-adherence to acrylic resin, led to its application. This material has advantages over previously used material. Absorbable gelatine being a lightweight & Gamma sterilized sponge makes it biocompatible to use. Other advantage is that it may withstand high temperature⁸.

Case 3 described has advantages over the previously described techniques. The alkaline powder being heat labile melt during the curing procedure and thorough flushing after curing results in no crystals remaining in the denture and preventing the time-consuming process of removing the spacer material, therefore preserving the denture's integrity. This technique of using alkaline powder crystals is simple to execute and utilizes a very cheap and easily available spacer material⁹.

In cases 2 and 3, single-flask techniques had additional advantages. The thickness of the resin can be controlled by adapting an even thickness of putty index all around after measuring it with verniers calliper. In the end, this will guarantee an even resin depth to stop seepage and distortion when the flask is closed under pressure. The benefits of hollow dentures include a decrease in the excessive weight of the

acrylic resin, which makes the prosthesis lighter and more pleasant for the patient⁶.

CONCLUSION

The ideal way to treat a patient with a severely resorbed ridge and lengthy lips is with a hollow maxillary denture. It not only lessens the denture's weight but also its leverage action. This ultimately results in increased retention and stability and up to some extent it is also possible to preserve the existing residual alveolar ridge. The need for two identical flasks and the additional step of creating a permanent record base are eliminated by the single flask technique. It is therefore a straightforward, cost-effective, time-saving, and reliable method.

CONFLICT OF INTEREST: None

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