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Case Report

A gentle alternative: Managing flabby ridges with a liquid-supported denture

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Abstract

An ideal complete denture must achieve a delicate balance between rigidity and resilience. The polished surface should possess adequate strength to resist masticatory loads, while the tissue-bearing surface should provide cushioning and flexibility to ensure uniform stress distribution. Conventional acrylic dentures, being entirely rigid, frequently transmit occlusal loads unevenly, resulting in mucosal trauma, discomfort, and progressive alveolar bone resorption. This problem is accentuated in patients with flabby or atrophic ridges, where mobile fibrous tissue distorts under pressure, compromising denture stability and retention.

The liquid-supported denture concept offers a biologically compatible solution that integrates a rigid acrylic base with a flexible, fluid-filled interface capable of dynamic adaptation to functional stresses. By incorporating a thin polyethylene sheet and a viscous liquid such as glycerin, the system enables equalized stress transmission, reduced mucosal distortion, and enhanced comfort.

This report describes the clinical and laboratory procedures involved in fabricating a liquid-supported complete denture for a 72-year-old male patient presenting with a flabby anterior maxillary ridge. The steps—from impression making and spacer adaptation to final sealing and patient evaluation—are explained in detail. The outcome demonstrated improved retention, stability, and patient satisfaction. The liquid-supported denture thus represents a conservative yet effective alternative for prosthodontic rehabilitation of compromised ridges where surgical or implant options are unsuitable.

Keywords: Flabby ridge, Liquid-supported denture, Complete denture, Ridge resorption, Prosthodontic rehabilitation.

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1. Introduction

Residual ridge resorption is a continuous, irreversible, and multifactorial process that profoundly influences the success and longevity of removable prosthodontic therapy.[1] The rate and pattern of resorption vary among individuals and are influenced by systemic factors such as age, nutrition, hormonal balance, and metabolic disorders, as well as local factors including denture design, occlusal load distribution, and mucosal health. In certain edentulous patients, the resorbed alveolar bone is replaced by displaceable fibrous connective tissue, leading to the development of a flabby ridge or fibrous ridge.[2,3] These tissues are easily distorted during impression making and functional loading, which results in loss of adaptation, poor retention, and compromised denture stability.

Traditional heat-cured acrylic dentures tend to exert concentrated pressure on unsupported areas. The rigid tissue-contact surface cannot compensate for the inherent mobility of flabby tissue, leading to localized ischemia, mucosal soreness, and progressive bone resorption. To address these difficulties, several impression techniques have been proposed to capture the flabby tissues in an undistorted state. Osborne (1964) introduced the window technique, which selectively records the flabby area under minimal pressure,[4] while Watson (1970) described a two-part impression method that minimized distortion during recording.[5] Later, Lynch and Allen (2006) emphasized the advantages of modern elastomeric impression materials in achieving superior accuracy and dimensional stability.[6]

Although these methods improve the accuracy of tissue recording, they fail to overcome the fundamental limitation

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of a rigid denture base against a resilient mucosal foundation. To provide cushioning, soft liners and tissue conditioners have been incorporated as intermediate layers, but their long-term effectiveness remains questionable due to plasticizer leaching, water absorption, microbial colonization, and frequent need for replacement.[7,8] These materials also undergo physical degradation, leading to odor and discoloration over time.

In 1990, Davidson and Boere introduced the liquid-supported denture concept,[9] combining the structural rigidity of acrylic resin with the adaptive flexibility of a viscous fluid interface. The enclosed liquid medium—typically glycerin—transmits masticatory forces evenly while allowing controlled micro-movement of the mucosa during function, thereby minimizing localized stress concentrations and enhancing comfort. This approach integrates biomechanical principles of load distribution with clinical practicality, offering a promising alternative for managing compromised ridges.

The present clinical report describes the step-by-step fabrication of a liquid-supported denture for a patient with a flabby maxillary ridge, highlighting the procedural details, clinical rationale, and post-insertion evaluation of prosthesis performance during follow-up.

2. Case Presentation

A 72-year-old male patient reported to the Department of Prosthodontics and Crown and Bridge, Tertiary Care Hospital, Mumbai, for replacement of missing teeth. The patient had been a complete denture wearer for the past 15 years. His chief complaint was the poor fit of the maxillary denture, which felt loose while eating. He was also using denture adhesive for retention. On intraoral examination, a completely edentulous maxillary arch with flabby tissue in the anterior region was observed, along with a completely edentulous mandibular arch (**Figure 1,2**).

Two treatment options were considered: an implant-retained prosthesis or a conventional prosthodontic rehabilitation without surgical intervention. Taking into account the challenges of the case, the patient's needs, and financial considerations, it was decided to fabricate a maxillary liquid-supported complete denture opposing a mandibular conventional complete denture.

Figure 1: Flabby maxillary edentulous ridge

Figure 2: Mandibular edentulous ridge

Figure 3: Polyethylene sheet vacuum pressed over master cast

Figure 4: Polyethylene sheet 1.5 mm thick incorporated at the at time of packing

Figure 5: Processed maxillary denture with 1.5-mm-thick polyethylene sheet

Figure 6: A 1.5-mm-thick polyethylene sheet removed for 0.5 mm thick sheet

Figure 7: Holes made for glycerin insertion

Figure 8: Denture insertion frontal view

For the maxillary and mandibular dentures, conventional clinical procedures were followed. While making the secondary impression, special care was taken to record the flabby tissue in its undisturbed, rest position. The maxillary cast was duplicated using agar reversible hydrocolloid impression material. The mandibular denture was processed in a conventional manner.

1. A 1.5 mm thick polyethylene sheet was vacuum heat-pressed onto the master cast, adapted to extend 2 mm short of the sulcus in the maxillary anterior flabby ridge region, and subsequently incorporated into the denture during the packing procedure." (**Figure 3,4**).
2. The maxillary complete denture containing the 1.5 mm sheet in the anterior flabby region and the mandibular conventional denture were delivered, and the patient was reviewed after two weeks to evaluate comfort and initiate conversion (**Figure 5**).
3. At the follow-up visit, the 1.5 mm sheet that was used as a spacer was taken out from the denture. Removing the sheet left small grooves along the edges of the denture. These grooves helped in fitting a thinner sheet later. An impression of the inner surface of the denture was made with addition silicone putty, and a cast was prepared from it to mark the exact joint between the sheet and the denture. On this cast, a 0.5 mm polyethylene sheet was vacuum-pressed and used in place of the 1.5 mm sheet, which created a space of 1 mm (**Figure 6**).
4. The borders of the 0.5 mm sheet were adapted into the grooves left after removal of the 1.5 mm sheet. The margins were then sealed with autopolymerizing acrylic resin to ensure proper closure and prevent leakage of the liquid.
5. The space generated by replacement of the 1.5 mm sheet with the 0.5 mm sheet was filled with glycerin using a syringe through an inlet prepared on buccal flanges of the maxillary denture surface under controlled pressure, ensuring that the vertical dimension and occlusal balance the appropriate fluid volume and tissue adaptation were clinically verified, the inlet holes were sealed using autopolymerizing acrylic resin (**Figure 7**).
6. The prosthesis was finished and polished, and subsequently assessed for retention, stability, support, esthetics, phonetics, vertical dimension, and occlusion (**Figure 8**).

Post-insertion instructions emphasized careful cleaning of the tissue surface using a soft cloth. The patient was recalled at 1 day, 1 week, 1 month, and 3 months, during which the denture was functioning satisfactorily and comfort was maintained.

3. Discussion

Management of flabby ridges remains one of the most demanding aspects of complete-denture therapy. The displacement of mobile tissue during functional loading results in a loss of peripheral seal, compromised retention, and patient dissatisfaction.[3] While specialized impression techniques such as Osborne's window technique, Watson's dual impression, and elastomeric recording methods can capture the tissues in a static, undisplaced position, they cannot replicate the physiologic resilience of the mucosa under masticatory stresses.[4-6]

The liquid-supported denture addresses this limitation by introducing a dynamic, adaptive tissue interface. The thin polyethylene membrane behaves elastically at rest; under occlusal pressure, the enclosed glycerin redistributes the load uniformly, simulating the cushioning and proprioceptive function of the periodontal ligament in natural teeth.[9,10] This mechanism minimizes localized stress concentration, prevents mucosal trauma, and promotes a more even transmission of forces to the underlying bone, potentially slowing further resorption and improving long-term ridge preservation.

Biomechanically, the hydrodynamic cushion converts vertical compressive forces into tangential flow within the viscous medium, thereby dissipating energy across a broader area. Laboratory investigations have demonstrated that liquid-supported dentures significantly reduce peak pressure values on the supporting tissues compared with conventional acrylic bases.[11] Clinical reports have corroborated these findings, documenting enhanced patient comfort, improved denture stability, and better adaptation to the mucosal contours.

Compared to resilient liners or viscoelastic tissue conditioners, the liquid-supported system maintains its cushioning capacity over extended periods without undergoing hardening, discoloration, or microbial degradation. Furthermore, because the viscosity of glycerin remains stable under oral temperature fluctuations, the prosthesis exhibits consistent mechanical behavior during

function. Beyond flabby ridges, indications for liquid-supported dentures include severely resorbed ridges, chronically inflamed mucosa, and systemic conditions where tissue fragility or poor healing potential is a concern—such as diabetes mellitus, pemphigus, pemphigoid, and lichen planus.[12] Their use has also been explored in patients with xerostomia, where the fluid interface compensates for reduced salivary lubrication, improving comfort during speech and mastication.

Nevertheless, the technique requires meticulous attention during fabrication and sealing to prevent fluid leakage, bacterial contamination, or alteration in occlusal vertical dimension. Relining or rebasing these dentures can be technically demanding due to the presence of the internal fluid chamber, necessitating replacement rather than modification. Despite these challenges, proper case selection, precision in laboratory work, and periodic clinical maintenance can ensure long-term clinical success.

From a patient-care perspective, the adaptation period for a liquid-supported denture is often shorter because of its cushioning effect, superior retention, and reduced incidence of pressure spots. Patients frequently report a more natural "tissue feel" and confidence while eating or speaking. In addition, this design can serve as a valuable transitional prosthesis for medically compromised or elderly patients who are unable to undergo implant or surgical ridge correction procedures. Future research directions may focus on exploring alternative biocompatible fluids with controlled viscosity, advanced thermoplastic membranes, and simplified chairside conversion techniques to enhance durability, reduce fabrication time, and make this approach more widely accessible in clinical practice.

4. Conclusion

Flabby ridges compromise denture performance by altering tissue dynamics, impairing load distribution, and diminishing prosthesis stability. The liquid-supported denture provides a conservative, non-invasive, and biomechanically balanced solution to these challenges. By combining the rigidity of an acrylic base with the adaptability of a viscous fluid interface, this design allows the denture base to respond physiologically to masticatory forces, ensuring more uniform stress distribution, reduced mucosal trauma, and improved patient comfort and satisfaction.

Although the fabrication process requires precision and careful follow-up, the clinical advantages—such as enhanced retention, improved comfort, and protection of delicate mucosa—make it a valuable alternative for patients in whom surgical or implant-based interventions are contraindicated. Continued refinement of materials and digital integration, such as CAD-CAM processing of the base and membrane, may further improve precision and long-term reliability. In summary, the liquid-supported denture represents a patient-centered, functional, and durable option in prosthodontic rehabilitation, bridging the gap between conventional removable prostheses and advanced implant therapy.

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None.

6. Conflict of Interest

None.

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