

## Going Beyond the Conventional Approach - Liquid Supported Denture: A Case Report

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### ABSTRACT

**Background:** The concept of conditioning oral mucosa has gained momentum over the last few years. Different tissue conditioning materials and soft liners have been used for this purpose. But the limitations of these materials has led to the introduction of liquid-supported dentures, which is a newer alternative to conventional complete denture prosthesis in cases with inflamed tissues, atrophic and severely resorbed edentulous ridges. Liquid supported Denture consists of a base which is covered with a preshaped close fitting flexible foil containing a thin film of high viscosity liquid which cushions the underlying tissues. This case report describes fabrication of liquid-supported dentures for patients with compromised tissues.

**Keywords:** Atrophy, Alveolar Ridge, Glycerol, Dentures.

### INTRODUCTION

Loss of teeth causes remodelling and progressive resorption of the alveolar bone, eventually leading to atrophic, flabby and unemployed edentulous ridges. Such patients are known to experience complications, such as soreness in the denture-bearing area and displacement of the dentures, when treated with conventional complete dentures<sup>1</sup>. The ideal properties of a complete denture are adequate rigidity on the "polished surface" to bear masticatory forces and at the same time, flexibility and softness on the "tissue surface" for proper and even distribution of the masticatory forces. The problem with a conventional denture is that on its tissue surface, the denture is rigid leading to uneven distribution of load. This drawback even worsens in the case of flabby, atrophic and unemployed

ridges with excessive bone resorption.

In 1961, Chase<sup>1</sup> introduced the use of elastic impression material to relieve traumatized tissue. But this can be only a temporary provision. Moreover, it might easily facilitate candidal growth. In the edentulous patient, it is found more commonly in the anterior region<sup>2</sup>.

Various techniques and treatment strategies were proposed to manage such ridges using metal denture bases, implant-supported dental prostheses, and vestibuloplasty and ridge augmentation. An additional technique is being used which uses controlled-pressure techniques for impression-making. The complete denture with this technique is designed so that the base is covered with a preshaped, closed fitting, flexible foil. This technique allows continued adaptation of the denture to the mucosa in the resting and functional state.



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**CASE REPORT**

A 78 year old male patient reported to Karnavati School of Dentistry for replacement of missing teeth. The patient had a history of wearing maxillary and mandibular complete dentures for 20 years. His chief complaint was the poor fit of the denture and that it felt loose while eating. He was also using denture adhesive. A suction disc was incorporated in the maxillary denture [Figure 1] due to which hyperplasia had developed on the palate [Figure 2]. Patient was asked to discontinue the denture and a gum massage was prescribed for the same. After the lesion was resolved the procedure was carried out for the fabrication of the denture [Figure 3]. Radiographic examination (Ortho-pantomogram) revealed reduced bone support in the maxilla.

The patient was then presented with various treatment options, such as vestibuloplasty, ridge augmentation and implant – supported dental prostheses during the counselling stage. However, due to unwillingness to undergo surgery and financial constraints, conventional dentures with modifications were considered as the treatment of choice. The patient was advised tongue and jaw exercises to improve tongue movements and was requested to discontinue wearing the previous dentures as they were faulty considering the present tissue foundation. Preliminary impressions were made with a mucostatic impression technique [Figure 4]. Then the final impression was made with a selective pressure technique [Figure 5]. Master casts were fabricated with the help of dental stone. Maxillomandibular relations were recorded and final try-in was done in the conventional manner. Fabrication of liquid-supported denture is divided in the following two stages:

**Stage I:** Vacuum-formed thermoplastic sheets (Bioplast, 1.0 mm in thickness, Scheu- Dental, Iserlohn, Germany) were adapted to the master casts [Figure 6]. These adapted sheets were cut 2-3 mm short of the sulcus and incorporated in the processed dentures [Figure 7]. The denture was then finished, polished and inserted into the patient's mouth to check for retention, stability, support and border extension. The patient was requested to wear these dentures for 2-3 weeks before the further conversion process. This is done

to ensure that the patient is comfortable with the dentures.

**Stage II:** Putty impressions (Aquasil) of the intaglio surface of the dentures were made to obtain a stone cast [Figure 8]. Thermoplastic vacuum-formed sheets (Copyplast, 0.5 mm in thickness, Scheu-Dental, Iserlohn, Germany) were adapted to the obtained cast. This forms the ultimate denture base. The temporary sheets were removed [Figure 9, 10] and two vent holes were made through the polished surface of the dentures in the tuberosity region of the maxillary denture [Figure 11]. This facilitates the injection of glycerine into the space (0.5 mm) created between the permanent sheet and the rigid denture base. Then, the permanent sheets were fixed to the dentures using a single component ethyl-cyanoacrylate adhesive<sup>3</sup>(FeviQuik) [Figure 12]. The seal was checked properly. In areas of leakage, it was resealed till a perfect seal was obtained at the junction. A viscous liquid, i.e., glycerine was filled through the inlets and one inlet was sealed with cold cured acrylic resin. The occlusal vertical dimension was adjusted by fitting the denture in the patient's mouth. The denture was now ready to be used by the patient [Figure 13].

**DISCUSSION**

Generally the resorption of mandibular bone is four times greater than maxilla. But here in this case the resorption of maxilla was greater than mandible due to presence of suction disc in the maxillary denture. Thus, the foundation is poor for maxilla as compared to mandible. Therefore, it was planned to modify the conventional denture to a liquid supported denture for the maxilla.

The principle of this design was that a liquid supported denture is flexible and continuously adapts itself to the mucosa. This design will act as a continuous reliner for the denture and thus has an advantage over the existing denture designs. This design is based on Pascal's law. When no forces are applied, the foil remains in the resting position, acting as a soft liner and when the dentures are in use, vertically directed loads are distributed in all directions by the liquid resulting in optimal stress distribution [Figure 14]. This helps in



**Fig 1:** Previous denture with suction disc.



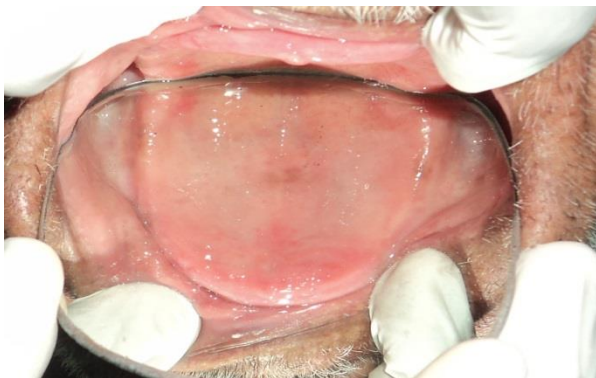
**Fig 5:** Final impression made with selective pressure technique.



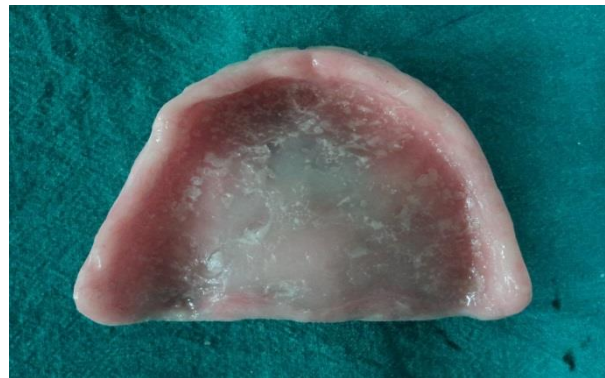
**Fig 2:** Suction disc hyperplasia induced by previous denture.



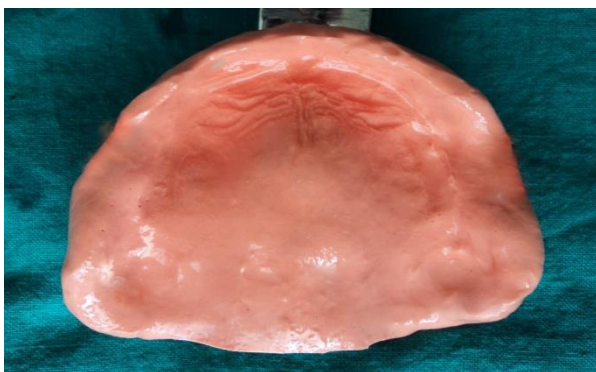
**Fig 6:** Master cast on which 1 mm thick sheet is adapted.



**Fig 3:** Severely resorbed maxillary ridge.



**Fig 7:** Processed maxillary denture with temporary sheet (1 mm thick) which is 2 mm short of the borders.



**Fig 4:** Primary impression made with mucostatic impression material.



**Fig 8:** Putty index of tissue surface of denture.



**Fig 9:** Temporary sheet (1 mm thick) removed from the denture.



**Fig 10:** Intaglio surface of denture without 1 mm thick sheet.



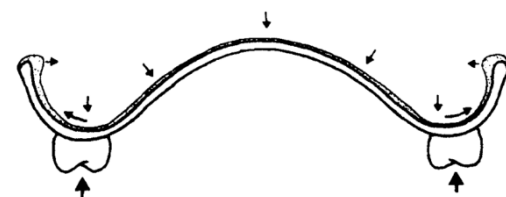
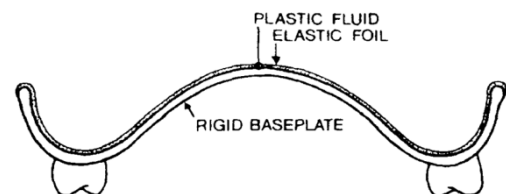
**Fig 11:** Holes made in denture for injecting liquid.



**Fig 12:** New sheet (0.5 mm thick) incorporated in denture with adhesive and sealed with Ethyl-cyanoacrylate adhesive.



**Fig 13:** Patient with denture in the oral cavity.



**Fig 14:** Unidirectional loading of the denture resulting in multidirectional distribution of Hydrodynamic pressure throughout fluid and clasp pressure at its borders (Cross section)

long-term preservation of bone and soft tissues. For a liquid cushion, glycerine was used which is clear, colorless, odourless with good pharmaceutical properties<sup>2,3</sup>.

Liquid supported denture is based on the theory that when the force applied on the denture is absent, the base assumes its preshaped form that is the one during processing. But under masticatory load, the base adapts to the modified form of mucosa due to hydrodynamics of the liquid improving support, retention and stability. There will also be optimal stress distribution of masticatory forces over a larger area which reduces tissue overloading.

#### Indications<sup>4,5</sup>

1. Severely resorbed maxillary and mandibular ridges.
2. Inflamed or flabby tissues.
3. Vesiculobullous lesions like pemphigus, pemphigoid, erythema multiforme, OLP, etc.
4. Patient with systemic disorders like diabetes mellitus.

#### Precautions<sup>4</sup>

1. Thickness of denture base should be atleast 2mm.
2. Seal should be perfect and should be checked for micro leakage.
3. Denture care instructions should be given to the patients.
4. In case of leakage, the patient should report to the dentist and the denture should be refilled.

#### Advantages<sup>4,5</sup>

1. Preservation of residual ridge by optimal distribution of masticatory forces over larger surface area.
2. Better retention, stability, support and comfort due to close adaptation.
3. Optimised atmospheric pressure, adhesion, cohesion and mechanical interlocking in undercuts.
4. Improved patient tolerance because of great comfort due to smooth flexible surfaces.
5. Hygienic and improves denture appearance.
6. Protects mucosa from bacterial or biochemical irritation.
7. Prevents chronic soreness which occurs from rigid denture surface as the cyanoacrylate used

is the one which is commonly used as a protective covering over ulcers.

8. Has a cushioning effect.

#### CONCLUSION

Days and nights change, so do men, so do tissues, so do treatment plans. Liquid supported denture adds series of attributes to conventional complete denture prosthesis and helps to fulfil the DeVan's dictum "Preservation of What Remains is of utmost important rather Than Meticulous Replacement of What Has Been Lost". Liquid-supported dentures eliminate the main disadvantages encountered due to rigid denture base materials thereby providing proper retention, stability, support and comfort to the patient. In contrast to the traditional tissue conditioners and soft liners, the foil remains elastic and preserves the plasticity of the liquid.

#### CONFLICT OF INTEREST

No potential conflict of interest relevant to this article was reported.

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