

Unconventional Prosthesis: Liquid Supported Denture

Abstract

Conventional complete denture lacks retention and stability in cases with flabby tissue. The ideal properties of a denture are adequate rigidity of polished surface to bear masticatory forces and at the same time, flexibility and softness for better stress distribution. A liquid supported denture can be a solution for this problem. This article describes the design of a denture in which the characteristics of plasticity and elastic recovery can be combined using a liquid supported denture; in a patient with completely edentulous maxillary arch with flabby tissue in anterior region. It allows uniform stress distribution due to its flexible tissue surface and improves the patient's acceptance.

Key Words

Complete denture; glycerine; denture retention

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INTRODUCTION

An unconventional approach to best meet our patient's needs has been a characteristic feature of evergrowing prosthodontic branch. 'Fibrous' or 'flabby' ridge is a superficial area of mobile soft tissue affecting the maxillary or mandibular alveolar ridges. It can be developed when hyperplastic soft tissue replaces the alveolar bone and is a common finding, particularly in long term denture wearers.^[1] Such ridges are reported to be caused due to trauma from denture bases.^[2] Major problems encountered in these patients are loss of stability and inadequate retention of the dentures. These problems occur because of the easily distorted flabby tissue during impression making. This article describes the design of a denture in which the characteristics of plasticity and elastic recovery can be combined using a liquid supported denture; in a patient with completely edentulous maxillary arch with flabby tissue in anterior region opposing an edentulous mandibular arch.

CASE REPORT

A 70 year old male patient reported to the Department of Prosthodontics, with the chief complaint of difficulty in chewing food due to ill-fitting dentures. Patient gave a history of edentulousness for past 15 years and had a single set of dentures that were ill fitting. He was using a

denture adhesive and wore dentures even at night. Dental history revealed mandibular anterior teeth were extracted last. Intraoral examination revealed completely edentulous maxillary and mandibular arches. Maxillary anterior region revealed flabby tissue on palpation (Fig. 1a). It was decided to fabricate a conventional mandibular complete denture opposing a liquid-supported maxillary denture for even distribution of load. Primary impressions were made using irreversible hydrocolloid (Algitek, DPI, Mumbai, India). Maxillary final impression was made using 'window technique' providing relief to the flabby tissue (Fig. 1b). Conventional mandibular final impression was made using low fusing compound (DPI, Mumbai, Maharashtra, India) and zinc oxide eugenol impression paste (DPI, Mumbai, Maharashtra, India) (Fig. 1b). Face bow transfer (Hanau Springbow, Whipmix, Louisville, KY USA) was done to a semi-adjustable articulator (Whipmix, Louisville, KY USA). Jaw relation was recorded and try-in was carried out. Vacuum heat-pressed polyethylene sheet (1 mm thick) was adapted on the cast; and cut 2 mm short of sulcus and posterior palatal seal (Fig. 2a). This sheet was adapted over the master cast with the help of a vacuum heat-pressed machine (Ashvac Vacuum Moulding Machine, Jaypee General Agencies, Kerala, India).



Fig. 1: a) Flabby maxillary edentulous ridge; b) Final impressions



Fig. 3: a) Putty index of tissue surface of denture; b) 0.5 mm thick sheet incorporated in denture and sealed with light cured dental varnish



Fig. 5: Denture insertion

It was incorporated during the packing stage of denture processing (Fig. 2b). Laboratory remount was carried out. Denture with the sheet was finished, polished and inserted into patient's mouth to check retention, stability, support, esthetics and occlusion. The patient was asked to use the denture for two weeks till he got adjusted to the new dentures. The maxillary denture was now ready to be converted into a liquid-supported denture. Putty impression (Affinis, Coltene Whaledent, Switzerland) of the tissue surface of denture was made to get the junction of temporary sheet and denture base resin (Fig. 3a). Cast was poured in type III dental stone (Dutt stone, Dutt industries, Mumbai, India) and positive replica of denture with junction marked over it was obtained. A new polyethylene sheet of 0.5 mm thickness was heated



Fig. 2: a) Vacuum heat-pressed polyethylene sheet (1 mm thick); b) Denture with incorporated polyethylene sheet



Fig. 4: a) Denture with polyethylene sheet being filled with glycerine; b) Final denture

and adapted on the stone replica and cut into desired shape to form final denture base. The temporary 1 mm thick sheet in the denture was replaced with the new 0.5 mm thick permanent sheet. This difference in space was occupied by liquid in the final prosthesis. Permanent polyethylene sheet was incorporated in the denture base with the aid of cyanoacrylate adhesive and sealed with light-cured dental varnish (Fig. 3b). Inlet was made in the denture; buccally in molar region. Glycerine was filled through the inlet and then sealed with self-cure acrylic resin (Fig. 4a). Final denture (Fig. 4b) was evaluated for retention, stability, support, esthetics, phonetics, vertical dimension and occlusion (Fig. 5). Mandibular denture was acrylised in the conventional manner. In this case, polyethylene thermoplastic clear sheet was used because of its softness, flexibility and biocompatibility. Glycerine was used because it is colourless, odourless, viscous and biocompatible.^[3] The adhesive used is n-butyle-2 cyanoacrylate, which is used in surgery as an alternative to suturing and as a protective covering over ulcers etc. A periodic recall was scheduled at a regular interval of 3, 6, 9, 12 months and 3 years to check for any rupture of polyethylene sheet and seal. In case of liquid leak, the denture was refilled. The patient was happy with the prosthesis because of great comfort due to the smooth flexible surfaces.

DISCUSSION

Kelly in 1972 coined the term “combination syndrome” and described changes in maxilla caused by remaining mandibular anterior teeth.^[4] Patient’s dental history revealed presence of mandibular anterior teeth which were extracted last which could possibly have contributed to the trauma. Major problems associated with this case were unfavourable distribution of forces causing unfavourable tissue changes. These problems were solved by modifying the impression procedures and by fabricating upper liquid supported denture and conventional lower complete denture. Watson described the 'window' impression technique where a custom tray is made with a window or opening over the (usually anterior) flabby tissues. An impression is first made of the normal tissues using the custom tray with zinc-oxide and eugenol. A low viscosity mix of 'plaster of Paris' is then painted onto the flabby tissues through the window.^[5] An ideal denture base would continuously adapt to the mucosa and thus should be flexible. However, it also has to support the teeth during function and thus should be rigid. Obviously, these properties cannot be combined in one material. Yet, with combinations of materials, the base can be rigid where it needs to be strong and flexible when in contact with the soft tissues.^[6] A liquid supported denture can hence be a solution for this problem. 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.^[6] There will also be optimal stress distribution of masticatory forces over a larger area which reduces tissue overloading.^[6] Thus, liquid-supported denture provides benefits of both tissue conditioners and soft liners. This helps in long-term the preservation of bone and soft tissues. Apart from the combined benefits of tissue conditioners and soft liners, the load from biting forces and even bruxism will be distributed over a larger surface.^[7] Advantages of liquid supported denture:^[8]

- Preservation of residual ridge by optimal distribution of forces.
- Better retention, stability, support and comfort due to close adaptation.

- Optimized atmospheric pressure, adhesion, cohesion and mechanical interlocking in undercuts.
- Improved patient tolerance because of great comfort due to smooth flexible surfaces.
- Prevention of chronic soreness from rigid denture bases.

However, precautions need to be taken like thickness of denture base should be atleast 2mm, seal should be perfect and should be checked for micro leakage, denture care instructions should be given to the patients and in case of leakage, the patient should report to the dentist and the denture should be refilled.^[6] To prevent the liquid from leaking, a dense foil must be used. This dense surface texture has another advantage because it protects the denture from contamination of *Candida albicans* and other microorganisms, thus protecting the mucosa from bacterial or biochemical irritation, often observed with the existing materials.^[9] The problem faced in fabrication of this denture is the difficulty in achieving complete seal at the junction of polyethylene sheet and denture base. The main drawback is the relining procedure, which is not possible with the liquid supported denture.^[10]

CONCLUSION

Liquid supported denture has proved to have advantages over the 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”. It exhibits characteristics of plasticity and elastic recovery and provides good retention, stability, support and patient comfort.

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