Liquid supported maxillary complete denture: A case report

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ABSTRACT

Patients with problematic situations like flabby tissues, diabetes, xerostomia, atrophied ridges, parafunctional habits, etc. pose significant problems in attaining basic objectives of getting a stable and retentive dental prosthesis. In the literature, several techniques have been mentioned, each having their own advantages and disadvantages, to achieve continued adaptation of dental prosthesis to the mucosa both at resting and functional state in such situations. This article presents a case report describing a technique of fabricating a liquid supported maxillary complete denture in which the characteristics of pliability and rigidity can be combined to achieve the objectives of proper retention, stability, support and comfort to the patient.

Keywords: *Liquid supported dentures, Polyethylene sheet, Resorbed ridges.*

Residual ridge resorption (RRR) is a term used for the diminishing quantity and quality of the residual ridge after teeth are removed [1]. It is a chronic, progressive, irrevocable and cumulative process [2]. It proceeds slowly over a long period of time, flowing from one stage imperceptibly to the next, leaving less and less residual ridge accompanied by mucosal changes like muscle dynamics or tissue irritation. Thus, due to continuous bone resorption and mucosal changes, the dimensions of the edentulous residual ridge are incessantly changing making a close adaptation of the complete denture to the adjacent mucosa arduous [2,3]. Therefore, fabrication of stable and retentive dental prosthesis becomes more challenging in patients with problematic situations like flabby tissues, diabetes, xerostomia, atrophied ridges, parafunctional habits, etc [4].

In 1955, Elder stated that the base plate should adapt to the basal seat area as the finished denture base and thus should be pliable as the changes in RRR is progressive and irrevocable. But at the same time, it should be sufficiently rigid to resist biting forces. However, these properties cannot be combined in one material, but are possible by using a combination of materials [5]. This article presents a case report describing a technique of fabricating a liquid supported maxillary complete denture in which the characteristics of pliability and rigidity can be combined.

CASE REPORT

A 62-years-old female patient reported to the Department of Prosthodontics for prosthodontic rehabilitation of the completely edentulous maxillary and mandibular arches. The patient was wearing a set of complete denture for last 8 years that was loose and ill-fitting. Medical history revealed that the patient had hypertension and was on medications for 10 years.

Intraoral examination revealed severely resorbed and completely edentulous maxillary and mandibular arches with flabby tissue in the maxillary anterior region. Keeping the various challenges associated with the case, clinical steps and treatment plan was modified according to the patient's condition. It was decided to give a liquid supported maxillary complete denture opposing mandibular complete denture relined with permanent soft reliner.

For the fabrication of denture, the maxillary and mandibular preliminary impressions were made with impression compound (Y-Dents Impression Composition, MDM, New Delhi, India) and poured with Type-II dental plaster and the primary cast were retrieved. For the maxillary arch, border molding and final impression were done by palatal splinting (two-part tray system) technique, while for the mandibular arch, McLean's technique was used and master casts were retrieved. Record bases of 3 mm and 2 mm thickness and occlusal rims were fabricated for

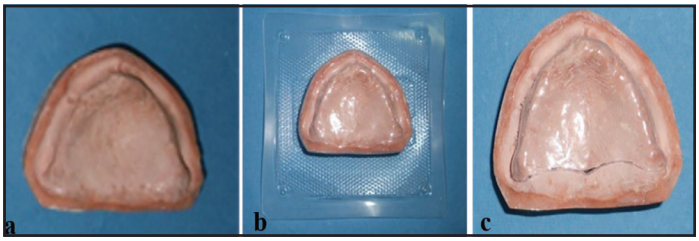

Figure 1: (a) 1 mm thick, soft, vacuum heat pressed polyethylene sheet and master cast; (b) polyethylene sheet adapted and heat pressed on master cast using vacuum forming machine; (c) polyethylene sheet customized into desired shape and made 2 mm short of the sulcus.

Figure 2: Maxillary complete denture with 1 mm thick, soft, vacuum heat pressed polyethylene sheet.

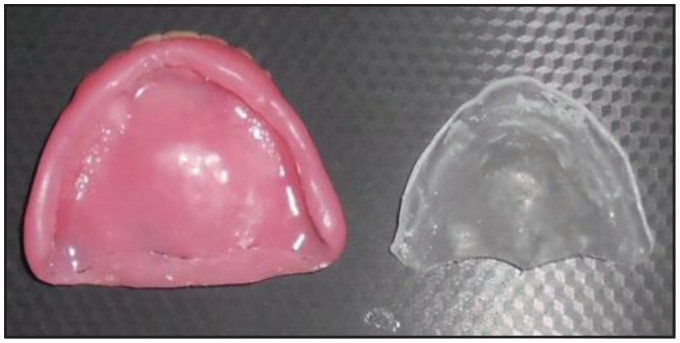

Figure 3: 1 mm thick, soft, vacuum heat pressed polyethylene sheet of maxillary complete denture was removed and replaced with 0.5 mm sheet.

maxillary and mandibular master casts, respectively. Tentative jaw relation was done, followed by the neutral zone recording. The teeth arrangement was carried within the limits of the neutral zone and the waxed-up trial record base was tried intraoral to check aesthetic and maxillo-mandibular relationships. The mandibular complete denture was relined with permanent soft denture reliner (Molloplast-B, Detaxgmbh & Co. KG, Ettlingen, Germany) and acrylized using compression molding technique.

Steps in the fabrication of Liquid supported maxillary complete denture are: (a) A 1 mm thick, soft, vacuum heat pressed polyethylene sheet (Biostar, Scheu-dental, Germany) (Fig. 1a) was adapted and heat pressed on the master cast using vacuum forming machine (Fig. 1b). (b) A customized sheetcut into the desired shape and made 2 mm short of the sulcus (Fig. 1c). Then it was acrylized together with the heat cure acrylic resin (DPI Heat Cure Denture Base Material, The Bombay Burmah Trading Corp. Ltd., Mumbai, India) in a mould using compression molding technique, followed by finishing and polishing. (c) Maxillary complete denture with 1 mm thick polyethylene sheet (Fig. 2) along with permanent relined mandibular complete denture was inserted into the patient's mouth to check retention, stability, support, border extension and occlusion. The patient was asked to use the dentures for 2 weeks till she gets adjusted to the new dentures.

(d) After 2 weeks, the patient was recalled to convert the maxillary complete denture with a 1 mm thick polyethylene sheet into a liquid supported maxillary complete denture. (e) Beading and boxing of the maxillary complete denture was done to retrieve master cast. On this cast, a 0.5 mm thick, soft vacuum heat pressed polyethylene sheet was adapted and heat pressed on the master cast using vacuum forming machine and cut into the desired shape and made 2 mm short of the sulcus. (f) Thereafter, 1 mm thick polyethylene sheet of maxillary complete denture was removed and replaced with a 0.5 mm thick polyethylene sheet (Fig. 3) and borders were sealed using n-butyl-2-cyanoacrylate and auto-polymerizing acrylic resin (DPI RR Cold Cure, The Bombay Burmah Trading Corp. Ltd., Mumbai, India) to prevent micro-leakage of liquid. (g) 2 holes were made on the buccal flange in the molar area of the maxillary denture by round bur. A viscous liquidie., glycerine was filled through the inlets in a space created due to replacing of 1 mm thick sheet with a 0.5 mm thick sheet in the final complete denture. After the filling was over, one of the inlets was sealed with auto-polymerizing acrylic resin. (h) The occlusal vertical dimension was adjusted by fitting the denture in the patient's mouth and the other hole was sealed, converting maxillary complete denture into liquid supported maxillary complete denture.

The liquid supported maxillary complete denture with mandibular complete denture relined with permanent soft liner (Fig. 4) was delivered to the patient, followed by postoperative instructions and regular follow-ups.

DISCUSSION

The basic reason for lack of comfort with most of the dentures is the problem of coordinating occlusion with mandibular movements and if correct techniques are not used, it will ultimately lead to irregular bone resorption and soft tissue changes leading to the ultimate failure of denture. Hence, the concept of tissue conditioning contains elements of stress distribution and occlusion. The incessant and simultaneous shaping of the denture basal seat and intaglio surface of the denture under the forces and motion applied to dentures is a helpful adjunct to the fabrication of more comfortable denture [4]. In the literature, several techniques have been tried on the intaglio surface of the denture. In 1961, Chase stated the concept of tissue conditioning and introduced the use of elastic impression material on the intaglio surface of the rigid denture base to relieve the traumatized soft tissue [4]. Since, then a variety of tissue conditioning materials has been introduced [6-9] but, it might easily derive candidal growth.

Another group of materials called soft liners has been used to relieve denture sore mouth problems. Although they are plastic in nature but lose their plasticity due to loss of plasticizer over a period of time [10]. Hence, the techniques mentioned above are all temporary and cannot be used for a long period of time. In this case report, we have used technique to fabricate liquid supported complete denture, which is pliable and incessantly adapts itself to the mucosa. However, it is also rigid enough to support the teeth during actual use. Thus, the denture base is covered with a pre-shaped, close-fitting flexible sheet to keep a thin film of liquid in its place. This design will act as an incessant reliner for the denture and thus has an advantage over the existing

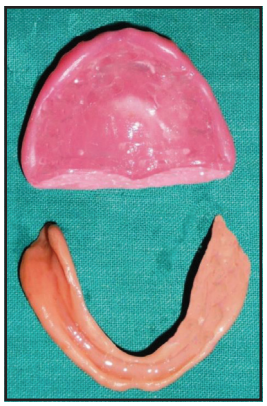

Figure 4: Liquid supported maxillary complete denture and mandibular complete denture relined with permanent soft liner.

denture designs, helping in achieving an important requirement for retention, that is a close adaptation of the denture base to soft tissues [3,11,12]

Thus, in a passive state, when no forces are applied, the sheet remains in the resting position, acting as a soft liner and in the active state, when denture is in use; masticatory loads are distributed evenly in all directions by the liquid resulting in optimal stress distribution. Apart from the combined benefits of tissue conditioner and soft liners, load from biting forces and even bruxism will be distributed over a large surface area, thus reducing pressure spots and overloading of remaining structures [3]. This helps in long term preservation of bone and soft tissues, ultimately holding DeVan's dictum true, "Our objective should be perpetual preservation of what remains, rather than meticulous reconstruction of what is lost" [13].

Palatal splinting using a two-part tray system was used for border molding and final impression making for completely edentulous maxillary residual ridge with anterior flabby tissue. This technique allows to maintain the contour of the easily displaceable tissue while the rest of the denture bearing area is recorded [14,15].

Vacuum heat pressed polyethylene clear, soft sheet was used because of its softness, flexibility, and biocompatibility with excellent physical and mechanical properties. Its soft, flexible and dense surface texture protects the denture from contamination of microorganism, thus protecting the mucosa from microbial and biochemical irritation and also prevents the liquid from leakage [16-18]. The adhesive used to seal the borders and prevent the escape of liquid is n-butyl-2-cyanoacrylate which is used in surgery as an alternative to suturing and as a protective covering over ulcers etc[19]. For the liquid cushion, glycerine was used which is colorless, odorless, viscous with a good pharmaceutical placation. It has good thermal stability, water repellence, low surface tension and vapour pressure along with proven in vivo safety. In the literature, dimethylpolysiloxane, a silicone liquid, has been used for liquid cushion [3,10,20].

Thus, the advantages of liquid supported maxillary complete denture over conventional complete denture includes - (i) preservation of residual alveolar ridge by optimal distribution of masticatory forces, (ii) improved retention, stability, support and comfort due to close adaptation of denture base, (iii) optimized atmospheric pressure, adhesion, cohesion and mechanical interlocking in undercuts, (iv) improved patient tolerance because of great comfort due to smooth flexible surfaces, (v) prevention of chronic soreness from rigid denture bases [3].

Some points should be kept in mind while fabricating liquid supported complete denture such as the thickness of the denture base should be at least 3 mm, the seal should be exemplary and should be checked for microleakage, instructions should be given to the patient for denture care and in case the liquid leaks out, the patient should inform the dentist and the denture should be refilled. Repair is possible if the sheet gets ruptured and can be replaced over preserved stone cast [10].

As mandibular residual alveolar ridge was severely resorbed, so it was technically challenging to convert mandibular complete denture into a liquid supported mandibular complete denture. So, the existing mandibular complete denture was relined with a permanent soft liner. In addition to it, the neutral zone technique and monoplane teeth were used to improve retention and stability. It also prevents the destruction of tissue and preserves the integrity of residual ridges.

CONCLUSION

Considering conventional prosthodontics, the use of liquid supported complete denture with combining properties of pliability and rigidity can further improve the patient's acceptance due to a more uniform distribution of forces and improved comfort level. Even it may stand as a better option to some problematic situations like flabby tissues, diabetes, xerostomia, atrophied ridges, parafunctional habits and so forth.

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