10.5005/jp-journals-10031-1220

CASE REPORT

Rehabilitation of Completely Edentulous Patient with Gel-supported Dentures

[1]Mitul Shah, [2]Rajesh Sethuraman, [3]Paranjay Prajapati, [4]Jayanti Patel

ABSTRACT

A completely edentulous patient reported to the Department of Prosthodontics for replacement of worn out dentures. Extensive resorption of lower ridge and fibrous anterior maxillary ridge was found. As the surgical intervention was refused by the patient, a gel-supported denture was planned. The prosthodontic science has seen a vast progress in techniques and material advances in complete denture planning. Yet there has been no solution to the age-old problem of soreness under a denture and continued ridge resorption. A complete denture must be adequately rigid to bear masticatory forces and, at the same time, exhibit flexibility and softness on the tissue surface for proper and even distribution of the masticatory forces. However, a conventional denture is rigid on all surfaces, leading to uneven distribution of load which often presents as soreness. Various methods and materials have been used to give a cushioning effect to the tissues when dentures are actually in use. A gel-supported denture is adequately rigid on the polished surface and equally resilient on the tissue surface. This technique allows continued adaptation of the denture to the mucosa in the resting and functional states.

Keywords: Completely edentulous arch, Gel-supported denture, Soft liner.

How to cite this article: Shah M, Sethuraman R, Prajapati P, Patel J. Rehabilitation of Completely Edentulous Patient with Gel-supported Dentures. J Contemp Dent 2018;8(1):39-44.

Source of support: Nil

Conflict of interest: None

INTRODUCTION

Edentulous patients cannot tolerate a conventional hard denture base due to the presence of a thin and relatively nonresilient mucosa or due to severe alveolar resorption. Residual ridge resorption is a continuous process that leaves the alveolar ridge in an unstable condition, vulnerable to the masticatory forces. Factors affecting resorption are grouped as anatomic, systemic, physical, and prosthetic. The fourth factor is the only factor that is partially within the control of the prosthodontist. However, a complete arrest of the resorption process can be done if the forces that are directed on the ridge are cushioned off or attenuated before being transmitted. This is made possible if a denture is flexible that also appears more comfortable. But on the contrary, an extremely flexible denture is deleterious to occlusion and does more harm than help to the ridge. Therefore, the need is to make a denture rigid on the polished surface and resilient on the tissue surface. These properties are difficult to combine in one material, but can be done by using a combination of materials and techniques. In 1961, Chase[1] reported the application of a tissue conditioner on the mucosal side of the rigid base to relieve the traumatized soft tissue. Another group of materials called soft liners has been used to relieve denture-sore mouths. They differ from tissue conditioners because they are plastic and flow continuously under masticatory pressures. The soft liners though are better in properties than tissue conditioners, they are not permanent as they deteriorate with time due to loss of constituent plasticizers and changes in viscoelasticity.

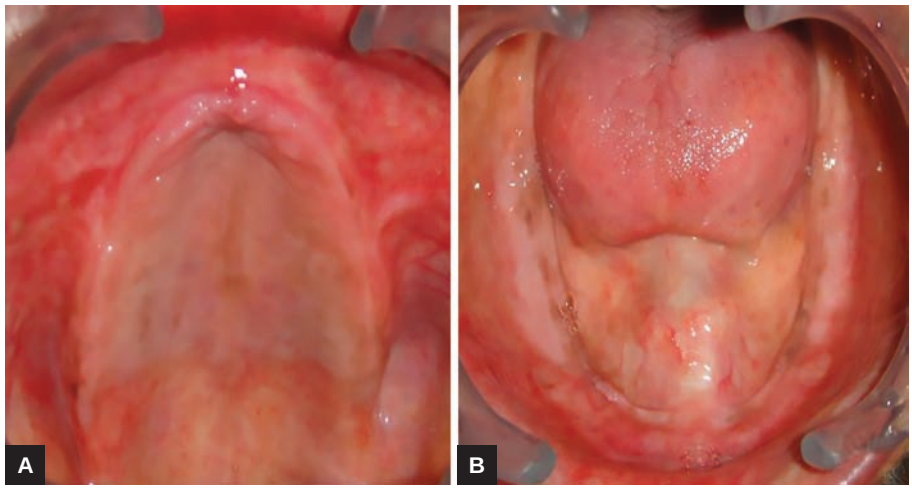
Reports have been made in the literature[2-4] for constructing a liquid-supported denture wherein a complete denture is designed so that the base is covered with a preshaped, close fitting, flexible foil containing a thin film of high-viscosity liquid. This technique allows continued adaptation and eliminates the disadvantages of denture designs based on the application of temporary tissue conditioners or soft liners. In contrast to the traditional tissue conditioners and soft liners, the foil remains elastic and preserves the plasticity of the liquid. Boere[5] conducted a preliminary study to evaluate the experiences and opinions of 11 denture patients who were given liquid-supported dentures. They concluded that it is possible to make a liquid-supported denture that in general fits and feels comfortable, has proper retention, a slightly diminished masticatory function, and that can provide a solution to some problematic prosthodontic situations. However, the glycerin interfaced between the rigid polished surface and a polyethylene sheet adapted over the ridge surface often may leach out creating a void between the two surfaces. This case report describes the fabrication

[1]Postgraduate Student, [2,4]Professor, [3]Reader

[1,3]Department of Prosthodontics and Crown and Bridge, K M Shah Dental College & Hospital, Sumandeep Vidyapeeth an Institution Deemed to be University,Vadodara, Gujarat, India

[2,4]Department of Prosthodontics, K M Shah Dental College & Hospital, Vadodara, Gujarat, India

Corresponding Author: Paranjay Prajapati, Reader Department of Prosthodontics and Crown and Bridge, K M Shah Dental College & Hospital, Sumandeep Vidyapeeth an Institution Deemed to be University, Vadodara, Gujarat, India Phone: +919725440155, e-mail: pgp2329@gmail.com



Figs 1A and B: Maxillary and mandibular edentulous residual ridge

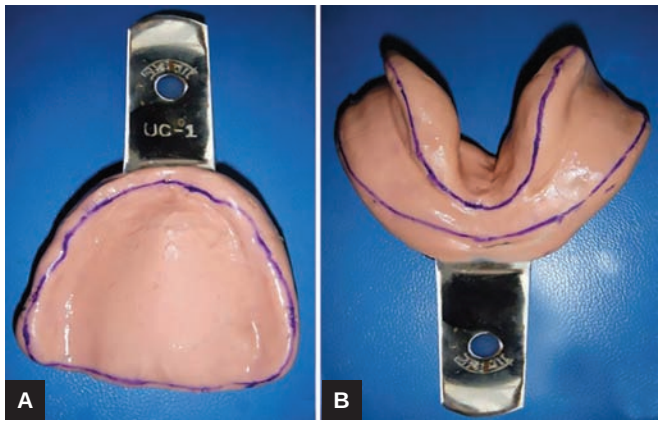
of a complete denture which is gel-supported and has the design characteristics of plastic and elastic recovery.

CASE REPORT

A 65-year-old male patient reported to the Department of Prosthodontics with a request to replace his dentures as he had difficulty in chewing with them due to food accumulation beneath the denture. No significant systemic history was recorded. The patient was edentulous for the last 50 years; teeth extracted for periodontal reasons. The patient was wearing the present denture for the last 7 years. Intraoral examination revealed the overlying mucosa was flabby in the maxillary anterior region and the mandibular ridge was atrophic and resorbed (Fig. 1). The genial tubercles were palpable due to extensive resorption of lower ridge. The dentures were nonretentive and unstable with reduced vertical dimension and attrited acrylic teeth. The patient was given an option for preprosthetic augmentation of the residual ridges followed by an implant-supported fixed or removable prosthesis. However, the patient refused these treatments due to economic concerns. A reline of the existing denture was deemed irrational as the teeth were worn and the denture age was about 7 years. In the light of the presented condition, it was planned to give an unconventional denture—a silicone, gel-supported complete denture.

Maxillary and mandibular residual ridge impressions were made in irreversible hydrocolloid (Fig. 2). Final impression for the maxillary arch was made using the composite impression technique for flabby ridges as advocated by Khan et al[6] (Figs 3A to C). The mandibular impression was made using the Admix technique as described by McCord and Tyson[7] (Fig. 3D).

Conventional techniques were followed for jaw relation procedure, and a wax-up with nonanatomic posterior

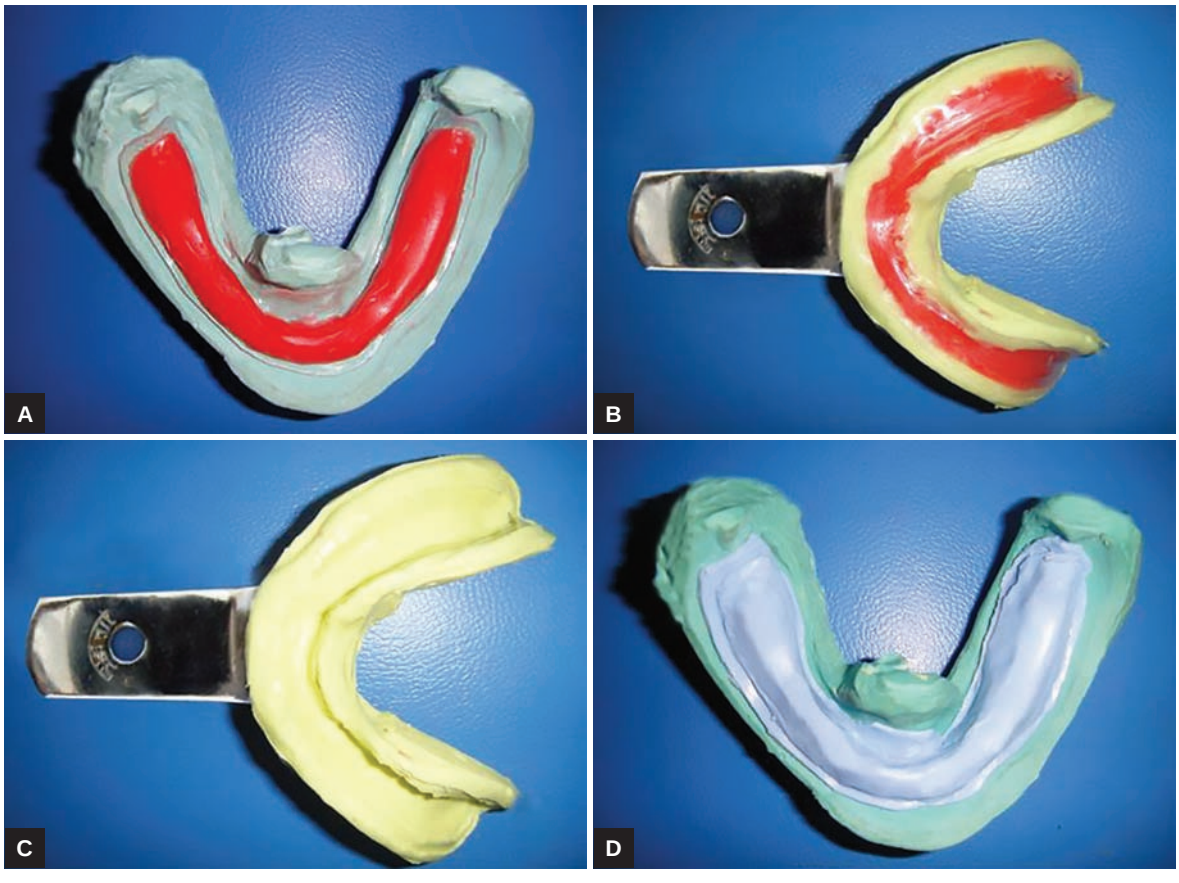


Figs 2A and B: Maxillary and mandibular primary impression made with irreversible hydrocolloid

teeth was tried in the patient's mouth. The mandibular cast was duplicated and 1 mm thick vacuum form sheet was adapted on the duplicated cast. The vacuum form sheet was kept 2 mm short of the sulcus. Modeling wax was shaped on the vacuum form sheet to a height of 3 and 2 mm short from the vacuum form sheet borders (Fig. 4A). An irreversible hydrocolloid impression was made of the cast with adapted vacuum form sheet and modeling wax on the cast (Fig. 4B). This formed a conformer for making the putty prototype (Fig. 4C). The vacuum form sheet and wax were removed from the impression and putty addition silicone was loaded in the trench of the hydrocolloid impression surface. Excess putty was removed and a putty prototype was obtained, which now resembled the vacuum formed sheet and modeling wax together in shape and size (Fig. 4D).

The waxed up maxillary denture was processed in heat-cured polymethylacrylate in conventional manner. The mandibular trial denture was flasked and dewaxed. After dewaxing the putty prototype was placed on the ridge of the mandibular cast and sealed with cyanoacrylate to

Figs 3A to D: Maxillary and mandibular final impression



Figs 4A to D: Fabrication of putty prototype

Figs 5A to D: Fabrication of hollow spaced denture

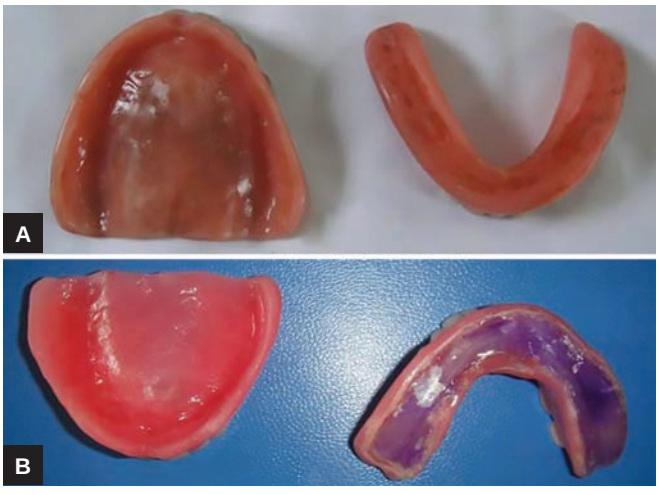
prevent the flow of acrylic resin below the surface of putty prototype. Separating medium was applied on the cast and the counter base. Heat cure acrylic resin was packed and cured. After curing, the denture with prototype was retrieved from the cast (Fig. 5A). Excess was trimmed and putty was removed from the denture base, thus creating a hollow space (Figs 5B and C). The vacuum form sheet which was initially adapted on the duplicated cast was placed on the tissue surface of the denture and the borders were sealed with cyanoacrylate resin. The hermetic seal was tested by immersing the denture in water (Fig. 5D). No seepage of water was noted. Three holes were made with no. 6 round bur on the buccal surface (1 anterior and 2 posterior) of the denture for injecting the viscous silicone (Versa-Soft, Sultan Health Care, NJ). Denture was reseated on the cast and secured firmly in position with the help of rubber bands (Fig. 6A).

A silicone-based denture soft liner was chosen to be placed inside the hollow chamber created. During extended function, it may be expected that there can be seepage of saliva and microbes into the soft liner. Hence, an antifungal clotrimazole was incorporated into the silicone. Clotrimazole was mixed in powder form in a 1.0% concentration by weight to silicone. The silicone was injected with the help of syringe. Material was injected from the posterior holes of denture until the material would flow out from the anterior hole (Fig. 6B). After injecting the inlets and outlet were sealed with autopolymerizing acrylic resin. The new dentures were better in extensions and support (Figs 7A and B). The denture was inserted in the patient's mouth and evaluated for retention, stability, support, and occlusion (Fig. 8). The patient was extremely comfortable after the final rehabilitation. He reported of no soreness and it to be of good function during future follow-up visits.

DISCUSSION

The patient was an old denture wearer with extreme resorption of the ridges. A composite impression[6] for the maxillary arch was planned to record the flabby ridges in static position using impression plaster and the remaining supporting areas under selective pressure. In the lower arch, the mandible was resorbed to an extent that the genial tubercles were prominently seen above and lingual to the ridge crest. The ideal treatment plan would be a genial tubercle reduction with a repositioning

Figs 6A and B: Injection of gel material



Figs 7A and B: Previous and new denture

Fig. 8: Final prosthesis (intraoral view)

of the muscles attached. However, the patient refused any surgical intervention. This actually poses a prosthodontic problem as establishment of a sublingual crescent seal in the complete denture becomes difficult. Extending the denture on the tubercles is painful to the patient. Hence, it is recommended to cover the genial tubercles to establish a positive seal with the anterolingual border and relieve the tubercles in the final denture. This achieves both adequate retention and does not impinge on the prominent genial tubercles.

The impression technique followed for the poor mandibular foundation was the Admix technique.[7] This technique used an admixture of low and medium fusing impression compound in a ratio of 7:3. This helps to record the details of the tissues and also has sufficient bulk to support itself. Nonanatomic teeth were chosen and arranged with minimal overbite to reduce the lateral forces on the residual ridge.

A soft cushion was felt necessary to further reduce the stresses borne by the ridge and hence, a gel-supported denture was planned. The principle of this design was that the gel-supported denture being flexible, continuously adapts itself to the mucosa. However, it is also rigid enough to support the teeth during actual function. Thus, the denture base is covered with a preshaped, close-fitting, flexible sheet to keep the viscous gel in its place. This design will act as a continuous reliner for the denture, and thus has an advantage over the existing conventional denture designs. An important requirement for retention is the close adaptation of the denture base to soft tissues which was fulfilled by the gel-supported dentures. When no force was applied, the foil remains in the resting position, which acts as a soft liner and when the denture is in use, vertically directed loads are distributed in all directions by the gel, resulting in optimal stress distribution. This may help in the long-term

preservation of bone and soft tissues. Thus pressure spots and overloading of supporting tissues may be nullified, as was evident in the recall appointments.

The polyethylene sheet used is biocompatible, has good physical and mechanical properties, and is recommended for use as bleaching trays or splints for bruxism patients. It is soft, flexible, and dense and protects the mucosa from bacterial and biomechanical irritation. The adhesive used was n-butyl-2 cyanoacrylate, which is used in surgery as an alternative to suturing and as a protective covering over ulcers.[8] In the originally reported literature,[2-4] glycerin has been used as a liquid cushion. However, glycerin may leak out if there is a breach of the adhesive between the acrylic and the polyethylene sheet. This in turn may lead to a void in the denture, a space where food and microbes can accumulate, resulting in collapse of the denture. This would lead to more damage than a help to the mucosa. In the present case, a silicone gel was chosen. Once set, the silicone remains in place and exerts its elastic properties for long periods of time. With time the properties may deteriorate but when it is not exposed to the oral environment the longevity will be prolonged. A break in the cyanoacrylate seal may also be expected in the present case. Therefore, to prevent any microbial colonization, clotrimazole was mixed with the silicon. Clotrimazole is a synthetic-substituted imidazole derivative, has a very stable chemical structure, and is not inactivated by heat, light, or acid. It was incorporated into the silicone liner as per the recommendations by Vojdani et al.[9] Clotrimazole is not water-soluble and does not leach out of the silicone into water in a significant amount; 1.0% concentration by weight has been advocated to be used in any clinical application, without endangering the mechanical and physical properties of silicone material.[10]

Any denture needs some precautions and aftercare. In a gel-supported denture, it is necessary to exercise some care with respect to a minimum thickness 3 mm of the denture base, a perfect hermetic seal tested for leakage, frequent follow-ups to evaluate the denture and mucosal condition, strict adherence to denture cleansing instructions, and immediate repair of the sheet in case of any tamper or rupture of the polyethylene sheet.

Clinical Relevance

A gel-supported denture provides an excellent alternative to the conventional acrylic resin denture as it has better retention, stability, and support due to closer adaptation and judicious use of undercuts. It also has better comfort due to the smooth flexible tissue surface, thus providing a solution to the age-old saga of mucosal soreness caused by complete dentures.

REFERENCES

1. Chase WW. Tissue conditioning using dynamic adaptive stress. J Prosthet Dent 1961;11:804-815.
2. Davidson CL, Boere C. Liquid supported dentures. Part I: theoretical and technical considerations. J Prosthet Dent 1990 Mar;63(3):303-306.
3. Kakade D, Athavale S, Shingote S, Dammani B. Liquid-supported denture: a gentle option. J Indian Prosthodont Soc 2007;7(1):353-359.
4. Keni NN, Aras MA, Chitre V. Management of flabby ridges using liquid supported denture: a case report. J Adv Prosthodont 2011 Mar;3(1):43-46.
5. Boere G. Liquid supported dentures. Part II: theoretical and technical considerations. J Prosthet Dent 1990;63:434-436.
6. Khan Z, Jaggers JH, Shay JS. Impressions of unsupported movable tissues. J Am Dent Assoc 1981 Oct;103(4):590-592.
7. McCord JF, Tyson KW. A conservative prosthodontic option for the treatment of edentulous patients with atrophic (flat) mandibular ridges. Br Dent J 1997 Jun;182(12):469-472.
8. Verna D, Tej Pal Singh A. Cyanoacrylate tissue adhesives in oral and maxillofacial surgery. J Indian Dent Assoc 2002;73:171-174.
9. Vojdani M, Zibaei M, Khaledi AAR, Zomorodian K, Ranjbarma MA, Boshehri S. In-vitro Study of the effect of clotrimazole incorporation into silicone soft liner on fungal colonization. Shiraz Univ Dent J 2009;9(Suppl 1):19-23.
10. Pigno MA, Goldschmidt MC, Lemon JC. The efficacy of antifungal agents incorporated into a facial prosthetic silicone elastomer. J Prosthet Dent 1994 Mar;71(3):295-300.