Liquid-Supported Denture & Neutral Zone for Atrophic Residual Ridges: A Case Report

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Abstract:

Liquid supported denture can be a permanent solution in edentulous patients with diabetes, xerostomia and atrophied ridge. A liquid-supported denture was planned for maxillary arch and neutral zone concept for fabrication of contour of the polished surfaces of mandibular denture. Liquid-supported dentures will have optimal stress distribution during masticatory function. The neutral zone technique provides muscular harmony over the denture stability. Liquid supported denture will act as a continuous reliner for the denture and thus has an advantage over the conventional denture. Neutral zone technique is an alternative approach for the construction of mandibular dentures where there is atrophic ridge and a history of denture instability.

Key Words: Low Fusing Compound, Neutral Zone, Liquid Supported Denture, Glycerin.

Introduction:

The co-ordination of complete dentures with the neuromuscular function is the foundation of successful, stable dentures (Boere et al, 1990). The success of the prosthesis may be adversely affected by Incorrect tooth placement and arbitrary shaping of the polished surfaces. This is particularly true for patients with reduced mandibular residual ridges, yielding flat or concave foundations due to severe bone resorption (Davidson & Boere, 1990).

Case report:

A female patient aged about 68 years reported to the Department of Prosthodontics Crown, Bridge and Implantology, Dayanand Sagar College of Dental sciences, Bangalore, with a completely edentulous and atrophic residual ridges (Fig Ia & Ib). In the mandibular arch, the resorption had progressed to such an extent that the patient had a dull aching pain on palpation due to close approximation of superficial fibres of the mental nerve and dehiscent inferior alveolar canal. Hence, a liquid-supported denture was planned for maxillary arch for even distribution of load and neutral zone concept for fabrication of the polished surfaces of mandibular denture relined with permanent soft liner for this particular patient.

A preliminary impression of the maxillary and mandibular arches was made with impression compound (DPI, Pinnacle) and impressions were poured with dental plaster and the primary casts were retrieved. It was followed by Border molding with low fusing compound (Green Stick Compound KERR) and final impression with Zinc oxide Eugenol impression paste; (Fig. II). Tentative jaw relation was recorded and a face bow transfer was done to a semi-adjustable articulator (Wide Vue Hanau). For the mandibular arch,
a new record base was fabricated incorporating stainless steel wire spurs in the posterior region keeping anterior rim to provide esthetic support. Neutral zone was recorded by functional method using low-fusing compound (Fig. III).

Putty (polyvinyl siloxane) was used to form an index around the neutral zone (Fig. VI). The pink baseplate wax was slowly melted and poured into the index to duplicate the low fusing compound. The wax trial dentures were tried intraorally to check the appearance and occlusion.

**Laboratory Procedure:**

**Stage 1:**

At the time of packing, a 1 mm thick, soft, flexible polyethylene sheet was incorporated in the maxillary denture which was 2mm short of the borders (Fig. V).

This sheet was adapted over the master cast with the help of a vacuum heat-pressed machine. Now the foil was heat cured with a heat-cure denture base resin (leucitone, Dentsply) to facilitate sealing. 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 asked to use the denture for two weeks till she got adjusted to the new dentures.

**Stage 2:**

The maxillary denture was now ready to be converted into a liquid-supported denture. A putty (polyvinyl siloxane) impression of the tissue surface of the maxillary denture was obtained to get the junction of the temporary sheet and the denture base resin (Fig. VI). The impression was poured with dental stone, and
the positive replica of the denture was obtained with the junction marked over it.

A new polyethylene sheet of 0.5mm thickness was adapted on this stone replica, again heat-pressed at 6 atmospheres pressure (atm) and cut into the desired shape as on the stone replica to form the ultimate denture base. This sheet was a permanent one of 0.5mm thickness as compared to the temporary one which was of 1mm thickness. This difference in space was occupied by liquid in the final prosthesis (Fig. VII).

The temporary 1mm thick sheet/spacer embedded in the denture was replaced with the new 0.55mm thick permanent sheet in the final denture. Two inlets were made in the denture buccally in the molar region. The permanent polyethylene sheet was then incorporated in the denture base with cyanoacrylate adhesive and sealed with light-cured dental varnish (Perez et al, 2000). The seal was checked properly. In areas of leakage, it was resealed till a perfect seal was obtained at the junction (Fig. VIII).

A viscous liquid, i.e, glycerin was filled through the inlets (Fig. IX) 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 (Fig. Xa & Xb).

In this particular patient, it was technically challenging to convert the mandibular denture into a liquid-supported one, due to the fact that very little residual ridge was left. So the mandibular denture was acrylised in the conventional method.

Discussion:

The principle of this design was that a liquid-supported denture is flexible and continuously 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 close-fitting flexible foil to keep a thin film of liquid in its place. This design will act as
a continuous reliner for the denture and thus has an advantage over the existing denture designs. 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. This helps in long-term preservation of bone and soft tissues. Apart from the combined benefits of tissue conditioners and soft liners, load from biting forces and even bruxism, will be distributed over a larger surface (Chase, 1961). For a liquid cushion, glycerine was used which is clear, colorless, odourless with a good pharmaceutical placation.

The aim of the neutral zone technique is to construct a denture in muscle balance. In the highly atrophic mandible, muscular control over the denture is the main retentive and stabilizing factor during function (Beresin & Schiesser, 1976; Fahmi, 1992).

**Conclusion:**

A complete denture will not have a good prognosis if it violates the foundation on which it rests. Liquid-supported dentures eliminate the main disadvantages encountered due to rigid denture base materials thereby providing proper retention, stability, support & comfort to the patient. This technique in combination with neutral zone allows continued adaptation of the denture to the mucosa in the resting & functional states. For this patient, a periodic recall checkup was scheduled at a regular interval of 3, 6, 9 & 12 months to check for any rupture of polyethylene sheet and seal. In case of liquid leak, the denture was refilled. The patient is happy with the prosthesis because of great comfort due to the smooth flexible surfaces.

**Bibliography:**


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