

Soft Liners In Prosthodontics:A Review

Abstract

Denture relining is a well known reparatory prosthetic procedure which provides an intimate contact between the denture base and the supporting tissues. Though they don't fulfill all the clinical requirement, their chemical composition and physical properties are similar to denture base material. The aim of this article is to provide an update on temporary and permanent soft materials and to give guidance on their indications and limitations of use, together with advice on their maintenance.

Key Words

Viscoelastic, Soft Liners, Poly-ethylmethacrylate, Candida Albicans

Soft linings are compliant, viscoelastic materials used to form all or part of the fit surface of a denture. Their complete function is debatable, but they serve to distribute the forces of mastication more evenly and to absorb energy. Soft lining materials can be defined as soft, resilient, elastic materials which form a cushioned layer between the hard denture base and the oral mucosa. They are broadly divided in to two groups of materials. The first group includes the tissue conditioners and temporary soft lining materials typically based on polyethyl methacrylate, an aromatic ester and ethyl alcohol. The second group includes the permanent soft lining materials based on silicone rubber or acrylic resin.^[5]

History

The earliest soft lining material "velum" was used by Twitchell in 1869. However this material had high water absorption and it became foul smelling and ill fitting after a period of time.^[2]

In 1945 Matthews^[2] used poly (vinyl chloride) powder with a liquid di-n-butyl phthalate plasticizer in the form of a paste as a facial prosthetic material and soft lining for patients with chronic mucosal tenderness.

Lammie and Storer^[2] described the use of poly (vinyl chloride) plasticized with dibutyl^[1] phthalate and found it to be a very unsatisfactory material because of it's high water absorption, hardening and cracking.

In the late 1940s Nelson^[2] used butyl phthalate, butyl glycolate as a plasticizer for vinyl chloracetate because he believed that this plasticizer improved the adhesion b/w the lining and the poly

(methyl methacrylate) denture base. Wichterle and Lim^[2] in 1961 used "softdent" softlining material but it changed its volume when immersed in water. Later in 1958 silicone rubber materials based on poly (dimethyl siloxane) have been used as soft lining material.

Currently Available Materials:

During last 20 years available materials can be divided into 5 groups.

- Heat polymerized acrylic resin.
- Auto polymerized acrylic resin.
- Heat polymerized silicones.
- Auto polymerized silicones.
- Treatment liners (Tissue conditioners)

Both heat processed and Auto polymerizing acrylic resin soft lining material consist of powder and liquid components^[20]

Composition of 2 acrylic resin soft lining materials

Vertex soft

- Powder---poly (ethyl methacrylate)
- Monomer---acetyl tributyl citrate+ methyl methacrylate
- Powder-- poly (ethyl methacrylate)
- Monomer--Di-n-butyl phthalate + benzyl salicylate + ethyl alcohol

The chemical composition of acrylic resin soft lining is similar to that of the acrylic resin denture base material thus no adhesive is required to form bond.

Composition of two silicone soft lining material

Molloplast
Polymer-polydimethyl siloxane

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Monomer - Acryloxy alkyl silane, Benzoyl peroxide

Flexibase

Polymer-polydimethyl siloxane

Monomer-Triethoxysilanol, Dibutyl tin dilurate

Adhesive-methacryloxy propyl trimethoxysilane

The silicone liners remain soft for extended periods of time. However in some patients it has been observed that a yeast *Candida albicans*- may grow within the liner, resulting in a rough and hardened surface. Inhibitors have been proposed to eliminate this problem. These do not adhere as well to denture bases as plasticized acrylic resin does. Some silicone liners also have poor tear resistance, particularly after storage in water for extended period^[21].

Ideal properties

For maximum efficiency soft lining materials should display the following properties;

1. They should be easily processed using conventional laboratory equipment.
2. They should exhibit minimal

dimensional change during processing and such change should be the same as that of the denture base materials.^[3]

3. Water absorption should be minimal^[4]. Ideally, the total water absorption should be close to that of the acrylic resin denture base polymers, reported as 2.2%.^[14]
4. The materials should have minimal solubility in saliva^[4].
5. They should retain their resiliency. The degree of resilience will depend on the chemical composition of the material and the thickness of soft lining. Several authors^{[7], [13], [14]} suggest that a thickness of 2-3mm is most appropriate.
6. They should bond sufficiently well to poly (methylmethacrylate) to avoid separation during use which may lead to difficulty in cleaning.^[1]
7. Adequate tear resistance.
8. They should be easily cleaned and not affected by food, drink or tobacco. It is also important that the resilience and surface texture of the lining be unaffected by freely available denture cleansers of all types.
9. They should be nontoxic, odourless and tasteless to encourage long term wear of the denture by the patient.
10. They should be aesthetically acceptable and their color should match that of the denture base material.

Limitations of use

The use of soft lining material on the fit (impression) surface of the denture is limited by a number of factors. These include:

Reduction of the denture base strength:

When inter ridge distance is limited and the denture base thickness is minimal, the placement of a soft lining will further reduce the overall strength of the denture and inevitably increase the tendency of the denture base to fracture.

1. Loss of softness and resiliency:

Some of the soft linings are not stable in an aqueous environment such as the oral cavity. This is true of those materials using a plasticizer to increase softness or resiliency. Since the plasticizer will leach out and cause the lining to harden and limit its usefulness. Thermal effects from the ingestion of hot and cold food and drinks may also have a deleterious effect.

1. Colonization by *Candida albicans*:

Manipulation

Density	Ratio(P:L)	Powder	Liquid	Applications
Softest	2:1	8cc	4cc	- Post Surgical Prosthesis - Cushion For Sensitive Tissue
Standard Lining	2.5:1	10cc	4cc	- Complete Denture Liners - Partial Denture Stabilization. - Overdenture Retainer Healing Caps.
Firm	3:1	12cc	4cc	- Overdenture Retained By Ball Abutments, Bar Connectors Or Teeth

It has been suggested that the porosity of soft linings allows water absorption and the diffusion of nutrient material, which can easily become colonized by *Candida* organisms.

1. Difficulty in keeping soft linings clean using the normal denture cleaning methods: The use of conventional denture cleansers may cause bleaching and the surface may become bubbled if an oxygenating cleaner is used.^[2]

2. Dimensional instability:

Some soft lining loses their plasticizer with time and most of them absorb water.^{[3], [5], [14]} These factors may cause dimensional changes.

1. Failure of adhesion:

A common problem of soft lined dentures is the failure of adhesion between the soft lining and the denture base. This can be predicted from laboratory studies.^[1]

1. Difficulties in finishing and polishing. Difficult to trim, finish and polish. If excessive force is used, they may overheat or tear, leading to poor surface finish.

Clinical uses:

1. Ridge Atrophy or Resorption
2. Knife edged mandibular ridges
3. useful in areas where bone and skin grafts are used to improve the edentulous ridges
4. used for the cleft palate patient, or an acquired oral defect related to trauma, to improve the retention of the denture by engaging the undercuts.
5. Salivary gland disturbances or degenerative changes result in a reduced salivary flow-which can result in loose dentures as well as discomfort and soreness—a soft lining may be indicated to reduce load transmission and so limit the effect of poor lubrication.
6. Hyperemic and traumatized oral mucosa often associated with ill fitting poorly occluding dentures
7. Patients with avitaminosis.
8. Temporary obturators
9. Stabilizers of base plate and surgical splints or stents

10. Adjunct in the impression making procedure or as a final impression material

11. Restoration of congenital and acquired oral defects

12. Post irradiation- to prevent excessive irritation.

13. Systemic and local factors causing tissue soreness

Laboratory Technique For Acrylic Soft Liners

Preparation:

Prepare the denture base for the soft liner by relieving the acrylic tissue-bearing surface by 2mm or more. Eliminate severe undercuts. Gently scrub the upper half of the flask (denture half) and rinse with hot water. Apply separator to stone or plaster.

Measuring & Mixing: take the measured quantity of powder and liquid in mixing cup; Stir very slowly until all of the powder particles are totally moistened. The mixture instantly turns “sticky” and “honey-like.” consistency

Curing:

In a flask: Place flask in a curing unit filled with boiling water (212°F/100°C) for 15 minutes.

In a jig: Place jig in a curing unit or in a pressure pot at (20psi/1.4bar) in steaming hot water (between 125°F/50°C to 165°F/74°C) for 10 minutes.

Finishing:

Remove cured denture from flask or jig; chill it a few minutes in an ice water bath to temporarily harden the soft liner for easy trimming. Remove excess flash with sharp scissors, scalpel or suitable rotary instrument (i.e. acrylic bur, rubber point or finishing stone). If desired, finish with a wet rag wheel and pumice to further smooth the surface. Do not high-shine the liner using a buff wheel.

Sealing: Dry the liner surface using air blower to remove all surface moisture. Apply a generous coat of Sealer over the totally dry soft liner and air dry for more than 2 minutes. Repeat procedure adding

a second coating. A third coat of Sealer can be applied on non-retentive fitting surfaces.

Chair Side Technique

Preparation: Prepare the denture base for the soft liner by relieving the acrylic tissue-bearing surface by 2mm or more. Eliminate severe undercuts Clean and dry the areas where the soft liner is to be applied. Use petroleum jelly or a water soluble substitute to coat the interproximal surfaces that are not meant to be lined. This will ease finishing.

Measuring & Mixing: same like laboratory technique.

Curing: Place the denture in steaming hot water (between 125°F/50°C to 165°F/74°C) and cure for 10 min using pressure pot.

Finishing & Sealing: Same like laboratory technique

Patient Delivery: Give patient a Patient Care Card to instruct him/her on care and cleaning of the soft liner. Soak only 10 min. in denture cleaner. Warn patient not to scrub the soft liner with a hard - bristle brush; and Request annual re-sealing of soft liner and dental examination to assure proper fit.

Disinfection: Silicone Elastomers are affected by the metabolites produced by *Candida albicans* and other microorganisms present in the oral environment. This problem has been alleviated by the effective use of a solution of alkyl Di methyl benzyl ammonium chloride (Zephiran) in 1:750 concentration, in which the liners is soaked daily for 15 minutes after brushing with water.

Conclusion

The philosophy as presented here, as it must be for all dentistry, is that of conditioning and rejuvenation of

traumatized tissue and maintenance and conservation of the healthy tissue. The applications of Elastomers in the prevention and treatment of chronic tissue irritation from dentures is an excellent alternative to the use of hard polymer resins and it is useful for preserving the health of the remaining denture supporting tissues. Wider applications will be found in the future, once the present shortcomings of the available materials are overcome, whether by improving these materials or by developing new ones. So research must be continued in both existing and new materials in the hope- that the dental profession will see the development of clinically ideal soft denture lining material.

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