

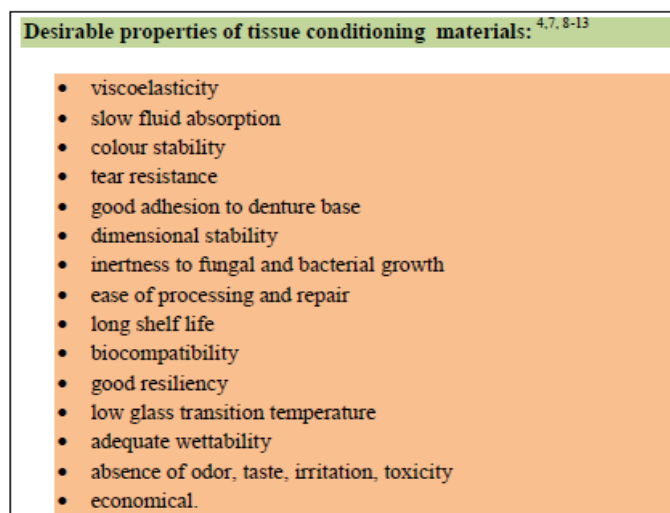
Tissue Conditioners: A Review

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I. Introduction

Although we make every effort to eliminate sources of dissatisfaction in denture construction, it is impossible to eliminate all possible sources. Treating problems with complete denture use requires patience on patients' part and patience, skill and experience on the part of dentist. The dentures are worn for a longer time with minimum rest to the denture-bearing tissues which leads to irritation of the soft tissues, depriving it from blood supply and also leading to resorption of the supporting bony foundation. Soft tissues beneath the dentures suffer deformation. Lytle¹ has established the difference between physiologically tolerable deformation and a pathologic one. The average displacement of soft tissues in areas of extreme abuse was found to be 0.050 to 0.030 inch². As a consequence, the dentures tend to loosen. The deformation of the mucosa ceases if the denture is removed from the mouth for a sufficient amount of time. In an ideal situation, the patient should keep the old dentures out of his mouth before and during the construction of new dentures. Unfortunately, few patients can do this. The so-called "tissue conditioning materials" offer an alternative solution. Many patients present with diseased tissues of the denture foundation areas secondary to ill fitting dentures. In other situations inaccurate centric relation records and underextended denture borders lead to instability of dentures. Tissue conditioning is an effort to restore the health of the tissues of the denture foundation area before master impressions are made by relining the dentures with temporary denture liners. Denture liner use in dentistry is not new and is known for many years. Resilient liners which were used previously, were natural rubbers. In the year 1945, the first synthetic resin made of plasticized poly vinyl resins were developed and the silicone rubbers followed in 1958³.

Tissue conditioners find several uses in the speciality of prosthodontics. They are used in treatment of abused tissues, improve the fit of ill fitting dentures, retain a temporary obturator, for base-plate stabilization, to diagnose the outcome of resilient liners, as liners in surgical splints, used in trial denture base and are also used as a functional impression material. It also compensates for the volumetric shrinkage of acrylic resin^{4,5,6,7}. The purpose of this article is to outline a review on tissue conditioners.



Composition:

- **Polymer (Powder):** polyethyl-methacrylate, Polymethyl methacrylate, Silicone rubber, Poly 'n' propyl-methacrylate, poly 'n' butyl methacrylate
- **Monomer (Liquid) :** a mixture of aromatic ester and ethyl alcohol.
- **Liquid plasticizer** (Flow control) Butylphthalyl butylglycolate

Heat cure liquid has in addition benzoyl peroxide as initiator. Home reliners consist of polyvinyl acetate, ethyl alcohol, calcium carbonate, polypropylene glycol, white bees wax and alkyl methacrylate copolymers. Polypropylene glycol and wax allows for easy peeling of conditioners from dentures; these along with alkyl methacrylate copolymer prevents adhesion to fingers. Polypropylene glycol also decreases the grip needed to squeeze liner from the tube. White bees²⁰ wax also acts as plasticizer. Calcium carbonate increases elasticity of polymer. Liquid consists of acrylic, triacetyl citrate, tri-methoxyethoxyvinylsilane. Light cured material consists of urethane acrylate oligomers, benzoylperoxide²¹ and camphoroquinone.

Gelation : Ethyl alcohol is having a greater affinity for the polymer. When the powder and liquid are mixed, polymer is dissolved by the plasticizer. This reaction is responsible for chain entanglement and thus the formation of gel. When tissue conditioners are in continuous contact with liquids such as oral fluids, the plasticizer and alcohol contents leach out and hence lose its resiliency. Where as silicone materials remain resilient for a longer time because they are devoid of plasticizers. In addition they have greater cross linking and higher bonding capacity to the fillers¹⁵.

Classification :¹⁴

Based on curing :	Self cure- Viscogel Heat cure- Supersoft, Molloplast B, Lucisofit, Permafex Light cure resins- Clearfit LC
Based on composition :	Silicone elastomers Soft acrylic compounds Pthalate ester free compounds Polyolefin liners Fluoride containing liners
Based on durability :	Temporary/Short term liners- Soft comfort Definitive/long term liners
Based on consistency:	Hard denture liners -Ufigel hard C Soft denture liners - a) Silicone based and resin based b) Auto cured and heat cured
Based on the availability :	Home reliners Tissue conditioners
Based on water sorption property :	Hydrophilic- Kooliner Hydrophobic- Elite soft

Properties of tissue conditioners				
Materials	Tensile strength (MPa)	Percentage elongation	Hardness Shore A	Tear resistance (N/cm)
Polymethylmethacrylate	0.8-8.3	150-300	30-95	29-260
Poly vinyl	2-3.6	250-280	35-55	49-110
Silicones	2.4-4.3	325-340	25-45	49-69
Polyphosphazines	3.6	240	50	88

How to use ?

The conditioning procedure should be repeated until the supporting tissues display an undistorted and healthy appearance. Literature cites 4-7 days as clinically acceptable for achieving better results. Usually 3-4 changes of the tissue conditioning material is required. If positive results are not seen within 3-4 weeks, one should suspect serious health issues and request physician consultation. The length of the denture base, followed by the occlusion should be checked and corrected if necessary¹⁹. The tissue surface of the denture also should be examined, and pressure areas eliminated.¹⁶ The occlusal vertical dimension must be re-established. The lining of the tissue conditioning material must be approximately 1.5 mm. thick.¹⁷ If the occlusal vertical dimension is too short, it will get corrected by the thickness of the lining material. However, if the occlusal vertical dimension is correct, we must avoid further increase of VD contributed by the thickness of the lining. This problem has three possible solutions

- (1) Remove 1.5 mm. from the tissue surface of the denture
- (2) Remove the same amount from the occlusal surface
- (3) When simultaneously treating both upper and lower ridges, it might be necessary to remake the lower denture, taking into consideration material on both dentures¹⁸

The tissue conditioning material is prepared according to the manufacturer's instructions. Mix the material to a smooth creamy mix avoiding incorporation of air bubbles and apply it on to the tissue surface of the denture. The patient is trained to close in the centric relation. This position is maintained for 5-7 minutes following which functional border molding is performed. Once the moulding is over, the denture is removed from the mouth, the excess material is trimmed and the tissue surface of the denture is examined. If the denture base shows through the tissue conditioner in some areas, it means that, at this point, an excessive amount of pressure is still being exerted. The pressure spots identified should be selectively trimmed to attain a relief of 1.5mm and a new lining must be placed to correct these errors¹⁹. The patient must be instructed not to brush the tissue surface of the denture, but only to rinse it with water. Patient is advised to take a soft-diet and should remove the dentures at night if possible. The patient is asked to return in three days. At the next appointment, the tissue surface of the denture as well as the residual ridge are examined. Any pressure spots should be identified and corrected. The mucosa must return to its normal pink color. An impression should be made and cast poured out of it during each visit. Form changes are evaluated through the comparison of plaster casts of the edentulous ridges. By comparing the most recent casts with the previous casts, we can determine how satisfactorily the treatments are progressing¹⁹.

II. Discussion

Tissue conditioners have seen great revolution in its composition over the years. There is advancement from hard acrylic liners to the newer silicone based liners. Materials like anti fungal agents were incorporated into the liners for prevention of fungal growth in the moist oral cavity. Now a days it's a trend to incorporate harmless herbal extracts into the liners to prevent the side effects and also to overcome development of resistance to the commercially available antifungal agents by the candidal species^{34,35,36,37}. Schneid³⁵ demonstrated that a sustained release delivery system that incorporated 4 antifungal agents (chlorhexidine, clotrimazole, fluconazole, and nystatin) into a tissue conditioner significantly inhibited *Candida albicans*, although its hardness increased. Biofilm development was overcome by applying a sealer onto the surface of the tissue conditioner. Denture cleansers used in the daily maintenance regimen of patients must be compatible with the denture lining agents in order to prevent the biofilm formation of fungi on such materials^{38,39}.

Bonding of the conditioning materials to denture base material is seen as a major problem in addition to staining and biofilm development. According to Wright³¹ the most common reason for failure of a soft-lined denture was the failure of adhesion between the liner and denture base. Bonding to the denture base surface is a significant problem especially for silicone-based products³². Bonding between the denture base resin and silicone-based lining material rely completely on the adhesive. Bond failure between the liner and denture creates a potential interface for micro leakage, plaque and calculus³³. Therefore, effective bonding is important for the longevity of tissue conditioners.

Limitations of tissue conditioners result from the effects of the oral environment on their properties which necessitate frequent replacement of the conditioning material²². The oral environment allows the plasticizers to be leached out into saliva, and water is then absorbed by the polymeric phase of the gel^{23,24,25,26}. Water absorption has been reported to range from 0.2 to 5.6 mg/cm²²⁷ and solubility to range from 0.03 to 0.40 mg/cm²^{28,29}. However, Graham et al.³⁰ showed that the percentage of plasticizer loss from a tissue conditioner at the end of 14 days of usage was 31.1 ± 12.4 %.

Researchers have proposed a product to improve the life-span of tissue conditioners called Monopoly, a PMMA syrup made of 1 part clear polymer powder to 10 parts heat-polymerized monomer⁴⁰. Although it may be a cost-effective method, monopoly is not yet commercially available, perhaps because it is made of materials that are available for other purposes. Gardner and Parr⁴⁰ reported that coating the surface of a tissue conditioner with monopoly increased the life of the material up to 1 year. The coating provided a clean and smooth surface for the denture, with reduced bacterial and fungal growth, and maintained its resilient characteristics for an extended period. Casey and Scheer⁴¹ found that surface treatment with monopoly resulted in an improved glassy surface that lasted for 30 days intraorally. Dominguez et al⁴² found that tissue conditioner coated with monopoly may have lost alcohol but did not absorb water in vitro.

III. Conclusion

The greatest virtue of tissue conditioners lies in their versatility and ease of use. Their biggest flaw is that they are so easily misused. Because the conditioner-lined dentures provide immediate relief and comfort, there is a danger that the patient will wear them too long and so cause trauma to the supporting tissue – thereby producing the very same situation, that their use is intended to prevent or correct. Their longevity in wear is very limited. They harden and roughen within four to eight weeks because of loss of the plasticizer. This requires close observation of the patient by the dentist. Whatever may be the limitations of tissue conditioners, there is no doubt that it is a healing magician to the abused tissues under the hard denture bases.

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