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Review Article

Beginners Guide for Resilient Tissue Conditioners-A Review

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Abstract

The incorporation of a resilient tissue conditioner underneath the intaglio surface of the complete denture in the clinical scenario of resorbed ridges, deep bilateral undercut ridges, distorted and inflamed tissues etc enhances the retention, comfort and prevents the frequent traumatisation of the denture bearing tissues. Due to their excellent higher elastic property with addition of alcohol type plasticizers or by co-polymerization with the monomer unit, it dissipates the functional and non-functional forces and relieves the pain. Recently, the use of resilient tissue conditioner is considered as temporary, because it tends to wear, harden and discolour with time when used. Even then these resilient tissue conditioners provide cushioning effect below these dentures and provide utmost comfort to the patients. This article briefly summarizes the basic literature available on resilient tissue conditioners.

Keywords: *Tissue Conditioners; Plasticizer; Resorbed Ridges; Bonding*

Introduction

Advancements in the field of medicine and dental research in the contemporary days has increased the life expectancy, social awareness, esthetical and functional needs of the geriatric patients. In prosthetic dentistry, geriatric patients who are accustomed in wearing the dentures for longer period of time than the actual need and giving minimum rest to the denture bearing tissues, the underneath lining soft tissues undergoes irritation and deprived of blood supply leading to underlying bone resorption resulting in the looseness of the denture, prevention of chronic soreness, discomfort and irritation thereby demanding the use of resilient tissue conditioners [1]. The resilient tissue conditioners which are elastomeric polymers are heat processed to resin denture base and patients are allowed to use it along with the definitive prosthesis.

This article briefly reviews the basic literature on resilient tissue conditioners.

Composition

Resilient liner materials are a type of vinyl and vinyl-acrylic polymers, velum rubber, silicone and polyurethane [2]. These can be classified into two main types: plasticized acrylic resins and silicone elastomers [3].

Vinyl and acrylic polymers are made into resilient by adding oily or alcohol type plasticizers or by copolymerization with units of monomer [2]. Powder of self-cure acrylic based material composed of polyethyl methacrylate/copolymer, Polymethyl methacrylate/co-

polymer, benzoyl peroxide, phthalyl butyl glycolate, pigments, fillers [4]. Liquid is composed of methyl methacrylate, ethylene glycol dimethacrylate, ester plasticizer mixture like dibutyl phthalate, butyl phthalyl butylglycolate, benzyl butyl phthalate, dibutylsebacate, ethyl alcohol [5-7].

Heat cure liquid has additional benzoyl peroxide initiator. Reliners used in home is composed of polyvinyl acetate, ethyl alcohol, calcium carbonate, polypropylene glycol, white bees wax and alkyl methacrylate copolymers. Polypropylene glycol and wax allows easy peeling of conditioners from dentures, along with alkyl methacrylate copolymer prevents adhesion to fingers. Polypropylene glycol also reduces the needed grip to squeeze liner from tube. Also White bees wax acts as plasticizer [8]. Calcium carbonate increases the elasticity in polymer. Liquid consists of acrylic, triacetyl citrate, trismethoxyethoxyvinyl silane.

Silica consists of MDX (silastic MDX-4210) RTV silicone [9], fumed silica with high surface area, hexamethyldisilazane surface treatment to repel water, vinyl terminated polydimethylsiloxane, adhesive like 3-methacryloxypropyl trimethoxysilane and silicic acid [10]. Light cured material is composed of urethane acrylate oligomers, camphorquinone, benzoyl peroxide. Silicone resilient lining materials and silicone impression materials are similar in composition. Both have dimethylsiloxane polymers. Polydimethylsiloxane is a liquid which is viscous that can be cross-linked to form a rubber with good elastic properties. No plasticizer is required to produce a softening effect and throughout their resilience they retain their resilience [11].

When the polymer and monomer is mixed, the plasticizer dissolves the polymer to form polymer chain entanglement and coherent gel which is characterized by viscoelastic behaviour, which is appropriate in clinical use [12-14]. As the monomer is not present, it is made of non- cross linked amorphous polymer [15].

Bond strength of resilient liners

The effects of oral environment on tissue conditioner's physical properties will lead to replacement of material frequently [15]. The wet oral cavity allows the ethanol and ester plasticizers to be leached into the saliva and then water is absorbed by polymeric phase of the gel [13,16-18]. Loss of plasticizer and Ethanol OH alters the bonding surface or viscoelastic properties of resilient materials which becomes brittle changing their properties of bond strength [19]. When the material is swollen, the stress is builded between bonding surfaces and thereby there is a change in the viscoelastic properties of the resilient liners [20]. The material becomes brittle and transfers external loads to the area of bonding [21]. Wright [22] stated that the common reason for failure of a denture with soft liner was the adhesion failure between the denture base and the soft liner [23]. Bonding between the denture base resin and silicone based liner material depend completely on the adhesive, which dissolves the denture base resin surface, such as acrylic resin monomer.

Bond failure between the liner and denture creates an interface for plaque, calculus and microleakage [3]. A roughened surface is advocated by Craig and Gibbons, to improve the adhesive bond. Before placing a resilient liner material Storer sandblasted the acrylic resin surface and concluded that a slightly irregular surface provides mechanical locking for the soft material, thereby increasing the bond strength. Other means of improving the bond strength includes airborne particle abrasion (APA), laser treatment of denture base before placing the resilient liner providing a surface which is irregular and which has mechanical retention [19]. Wetting the PMMA surface with MMA monomer was more effective than either airborne-particle abrasion with Al_2O_3 particles or application of resilient liner application without any surface treatment and only application of adhesive was advocated by Sarac., *et al* [19,24]. Adhesive of silicone resilient liners contain butanone and methacrylates, so using adhesive and monomer together effectively increase the dissolution of the PMMA surface before applying the resilient liner. Further treating the denture base acrylic resin surface with chemical etchants like methyl methacrylate, methylene chloride, and acetone for 15 - 30s before applying adhesive reduced the microleakage and increased the bond strength while using silicone-based resilient liners. However, the chemical treatment reduced the flexural strength of the acrylic resin [19]. Akin., *et al.* stated that there is an increase in bond strength of silicone based liners to a UDMA base followed by laser application [25]. Urethane acrylate oligomers- based photo polymerized soft liners, has no significant difference in adhesion was observed after 1 day or 12 months of storage in water at 37°C [26].

Uses of resilient tissue conditioner

Resilient tissue conditioners restore the health of distorted and inflamed denture supporting tissues, make dynamic impressions and to restore traumatic oral mucosa to a healthy state. They are also used as provisional liners in maintaining fit of the dentures, to prevent trauma and for trial evaluation of border extension. It is also used to modify the transitional prosthesis after stage I and stage II implant surgery and to rehabilitate cancer patients who require obturation. The viscoelastic property and dimensional stability which makes them suitable for various purposes are different from material to material. Thus, single type of resilient tissue conditioners may not be capable of fulfilling all the required uses equally well [19]. The resilient denture liners which are ideal possess higher elasticity during mastication and behave viscously to designate the functional and non-functional forces and relieve the pain [27]. Resilient liners are also useful to retain over denture bar attachments, to retain extra oral prosthesis, helpful in distributing the occlusal forces, to increase life span of prosthesis, to relieve pain of mucosa under hard dentures, improves the rhythm of chewing strokes, it compensates the volumetric shrinkage of acrylic resin [28-31].

Indications for tissue conditioners

1. Resorbed residual ridge, thin atrophied mucosa under hard denture base.
2. Patients with chronic bruxism, in presence of deep anatomical undercuts.
3. Congenital or acquired defects which require obturator, in presence of bony protuberances, for retention of implant retained overdentures [32,33].
4. Can be used with immediate dentures
5. As a functional impression material
6. Diagnostic relining procedures
7. Patients with compromised systemic health

Antimicrobial effect in tissue conditioners

There is no change in the resin liner bonding regarding immersion time or use of sodium perborate as stated by Pisani., *et al.* and they indicated that they do not affect the dissolution of the material. Alcantara., *et al.* stated that by adding miconazole, ketoconazole, nystatin, or chlorhexidine diacetate in various measurements had no effect on liner's adhesion to the prosthesis [25].

Processing of silicone resilient liner

Earlier the conventional compression molding procedure which is used for acrylic resin processing was suggested for processing a silicone liner. Although it produced some acceptable results, but it had some serious problems too. Once the silicone material is out of the tube, it has no flow control and it is impossible to trial pack. At various amount the flash is appeared at the acrylic margin and when the flash was removed an edge that slightly protruded beyond the acrylic surface often remained causing soreness in the mouth. In presence of severe undercuts in edentulous cast which requires a split pack procedure, the silicone material would escape into the junction of the two acrylic halves would weaken or interfere with their bond. The solution for this problem as stated by Laney is injecting the silicone material into the flask once the denture has trial packed and it produced satisfactory silicone liners for more than 15 years [2].

Properties of resilient liners

1. Due to water sorption there is reduction in bond strength at the interface of resilient liner and denture base [28]. Silane treated silica when used in liners show less water sorption [1]. Water sorption can be decreased by applying sealer as a mechanical barrier [34].

2. Toluene based adhesives are weaker than ethyl acetate solvent based adhesive [1].

3. Polyisoprene elastomer liner which is a light cure material show moderate softness, compared to other varieties show less water sorption, adequate working time, better stain resistance and has advanced shear bond strength to denture base resins [31].

4. Gamma-methacryloxypropyltrimethoxysilane type heat polymerized silicone rubbers like Molloplast-B showed prolonged service as liners.

5. Bond strength of liners and acrylics was improved by introduction of roughened acrylic interface with the help of lasers, abrasion with alumina, chemical etch (chemical etchants such as MMA, acetone, or methylene chloride are used to increase the bond strength of repair material to PMMA), acrylic burs, chemical primers, reinforcement of the acrylic surfaces with net woven fibers of glass and Oxygen plasma treatment.

6. After long-term use, there is discoloration of denture base materials.

7. Incorporation of anti-fungal can be done to the resilient liner. The feature of drug delivery depends on certain factors like particle size, distribution and concentration within the matrix, dissolution diffusion properties, molecular weight, porosity, permeability and matrix drug interactions [1].

Summary and Conclusion

This article helps the dentists to understand the basic points to be followed during the usage of resilient tissue conditioners. Bonding is one of the problems with the resilient liners and the bond can be enhanced by modifying the resin denture base surface there by increasing the mechanical locking and also the surface area. Even though the usage of resilient liners are considered as temporary but if used in appropriate conditions it can be a very useful tool in giving better clinical care to patients.

As reported by investigators, the duration of use of these materials has ranged from six months to five years, based on type of material used such as vinyl or acrylic resin, velum rubber, silicone or polyurethane. Actually, there is a controversy exists whether these materials are temporary or permanent. Currently available materials not meet all the requirements for an ideal material to accomplish, so they are considered temporary for immediately solving the concern denture problem [2].

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