International Journal of Psychosocial Rehabilitation, Vol. 24, Issue 01, 2020
ISSN: 1475-7192

RESILIENT LINERS IN DENTISTRY –A REVIEW

Priyadarsini T, Dhanraj Ganapathy

ABSTRACT:
To review the composition, classification and other functions of resilient liners .Relining is the procedure used to resurface the tissue side of the removable dental prosthesis with a new base material, thus; producing an accurate adaptations the denture foundation area.
The viscoelastic and elastic property of tissue conditioners result in an even distribution of load on the underlying mucosa and the cushioning of the cyclic forces of mastication.
Denture soft lining materials liner materials have been used to provide cushion between the denture base and the supporting tissues and allow for more uniform distribution of stresses at the mucosa/tissues interface, as well as it help in better distribution of the occlusal forces.

KEYWORDS:*Resilient liners, mucoelasticity, soft liners, dental prosthesis, plastcizer, adhesion.*

I. INTRODUCTION:

A resilient lining material may be defined as an elastic or viscoelastic material applied to the fitting surface of a denture for the purpose of reducing and even distribution of occlusal loads on the underlying oral tissues. [1,2] It is designed to act as a cushion between the hard denture base and soft tissues in order to reduce the masticatory forces transmitted by prostheses to the underlying tissues. [1] In contrast , natural teeth are attached by a periodontal ligament to the bone of the jaw and the masticatory loads successfully bypass the oral mucosa and is transmitted to bone. [2] Resilient liners may be regarded as analogues of the periodontal ligament and compressible healthy mucoperiosteum in dentate and edentulous patients respectively. [3]

Some complete denture wearers suffer prolonged discomfort under their lower dentures despite all possible prosthetic adjustments. This may be because of poor tolerance, low pain threshold, a thin mucosa or irregular bony contour. Tissue underneath the lower denture usually receives more masticatory pressure per unit area than the tissue underneath the upper denture.[4]

Resilient lining materials are mainly used for patients who cannot tolerate these pressures. The resilient liner acts as shock absorber and may process some degree of viscoelasticity. These liners may be classified as provisional or definitive, room temperature or heat-temperature vulcanised [5-7]. They are also divided into four groups according to chemical structure: plasticised acrylic resins either chemical- or heat polymerised, vinyl resins, polyurethane, polyphosphazene and silicone rubbers [8]. Clinical experience indicates almost universal tissue tolerance of soft liners and acceptable patient reactions. However, currently the materials have to be considered as temporary expedients because of problems during clinical use including loss of resilience, water sorption, support of bacteria, colour change, and loss of adhesion between the liner and denture base resin requiring replacement at short intervals, which is time-consuming and costly for both the dentist and patient.

II. COMPOSITION AND CHARACTERISTICS:

Resilient liners can be divided into two main types: plasticized acrylic resins and silicone elastomers [9]. Both material types are available in auto-and heat-polymerized forms [8]. Tissue conditioners or short term soft liners are uncross-linked (formed by polymer chain entanglements but not cross-linked), amorphous polymers, formed in situ from the mixture of a polymer powder and a liquid plasticizer [10, 11]. The polymer powder generally consists of polyethyl methacrylate (PEMA) of molecular weights ranging between 1.79 9 105 and 3.25 9 105 with no initiator [10, 11,12]. The liquid consists of an ester-based plasticizer and 4–50 wt% ethyl alcohol (EtOH) [13] and contains no monomer [10, 13]. The plasticizers (except dibutyl sebacate, which is aliphatic) are aromatic esters such as dibutyl phthalate, butyl phthalyl butyl glycolate, butyl benzyl phthalate, and benzyl benzoate [13]. Plasticizers are liquids that have low molecular weights and that lower polymer glass transition temperature and soften the rigid polymer [8]. Heat polymerized forms also generally consist of powder and liquid components [8]. The composition of the powder and

Undergraduate Student, Department of Prosthodontics, Saveetha Dental College, Saveetha Institute of Medical and Technical Sciences, Chennai, IndiaProfessor&Head, Department of Prosthodontics Saveetha Dental College, Saveetha Institute of Medical and Technical Sciences, Chennai, IndiaCorresponding Author: ***Dhanraj Ganapathy****, Professor&Head, Department of Prosthodontics Saveetha Dental College, Saveetha Institute of Medical and Technical Sciences, Chennai, India Email: dhanrajmganapathy@yahoo.co.in*

Received: 10 Nov 2019 | Revised: 20 Dec 2019 | Accepted: 02 Jan 2020

liquid are not well known, but are generally thought to be acrylic polymers and copolymers along with a liquid containing an acrylic monomer and plasticizers (EtOH and/or ethyl acetate) [8, 14, 15]. Silicone resilient lining materials are similar in composition to silicone impression materials. Both are dimethylsiloxane polymers [16]. Polydimethylsiloxane is a viscous liquid that can be cross-linked to form a rubber with good elastic properties [16]. No plasticizer is necessary to produce a softening effect [16]and they retain their resilience throughout their working life.

Ethanol, a highly polar constituent, facilitates penetration of plasticizers into the polymerized denture base. It is essential to the PEMA based system because ethanol rapidly swells the polymer particles and accelerates penetration of plasticizer into polymer [17].In contrast, polymethyl methacrylate (PMMA) is not a suitable polymer because its solubility parameters for the strongly bonded solvent is zero and it is not dissolved by ethanol [17]. Plasticizers containing no ethanol do not produce clinically acceptable gelation time because polymer particles are penetrated very slowly by large plasticizer molecules [10, 11].

While gelation time decreased exponentially with increase in ethanol content, a higher molecular weight polymer powder and a higher powder liquid ratio produced a shorter gelation time.Although the effect of plasticizers was small, gelation times were found to be independent of the solubility parameters and molecular weight of these plasticizers, rather higher molar volume plasticizers (which expresses effect of molecular size) tended to lead to a longer gelation time. This finding is in contrast with reported findings of Jones et al.[12], explained by the fact that previous studies evaluated the viscoelastic properties using a reciprocating rheometer which only provide a comparative evaluation among materials, but do not measure absolute values of elasticity and viscoelasticity.

III. SURFACE SEALED RESILIENT LINERS:

Resilient denture liners have several problems associated with their use, such as loss of softness, change of permanent deformation characteristics, water absorption, colonization by Candida albicans, bond failure between the liner and denture base requiring frequent clinical evaluations and periodic replacement [9, 18-23]. Surface-sealed resilient denture liners may provide an extended period of resiliency and longer life under clinical conditions. The rationale in using surface-coated tissue conditioners was that they retained their softness longer, which may be attributed to reduced leaching out of the plasticizer, as well as the penetrant (alcohol). However, Braden [10] suggests that a more likely cause is the continuing solution of the polymer into the plasticizer. It is also possible that surface-coated tissue conditioners prevent the absorption of salivary inorganic salts, which may be a contributing factor to the hardening process [23]. One product proposed to improve the life-span of tissue conditioners is monopoly, a PMMA syrup made of 1 part clear polymer powder to 10 parts heat-polymerized monomer [24]. Although it may be a cost-effective method of extending the longevity of a tissue conditioner, monopoly is not yet commercially available, perhaps because it is made of materials that most dentists have available for other purposes.

IV. CLINICAL PERFORMANCE OF VARIOUS RESILIENT LINERS:

Within the scope of the present review on the clinical performance of different resilient liners, following observations were made[25]:

- Soft lining heat cure silicon materials have lasted acrylic teeth in many cases and occlusal wear was a common reason cited for the need to replace the complete denture.
- The silicon lining materials are more resistant to colour change and hardness than the acrylic type soft liners.
- The improvement in the masticatory function was found to be in the order: acrylic permanent materials>silicon>acrylic temporary materials.
- The serviceability of Molloplast-b- linings was significantly greater than that of heat cured plasticized acrylic. Denture fracture was the most common cause of lining failure for Molloplast-b and occurs more frequently than with plasticized acrylic.
- The sicone based silicon showed excellent shock absorption.
- The silicon based resilientliners, retain implant overdenture better than plasticized acrylic.
- The growth of C.albicans to soft lining materials was significantly less than that for an acrylic resin denture base. The silicone rubbers when properly used may be the most appropriate of the various types available now.

V. USES OF RESILIENT LINERS:

The uses of resilient liners include its role in[26]:

1. **Ridge atrophy or resorption:**

   A resilient liner can be used when a patient has an atrophic mandibular ridge with bilateral dehiscent mental foramina or mandibular canals. Excessive pressure by the denture on the mandibular and the mental nerves and blood vessels should be avoided since parasthesia of lower lip and chin region and

Received: 10 Nov 2019 | Revised: 20 Dec 2019 | Accepted: 02 Jan 2020

irritation of oral mucosa may result. Knife edged mandibular ridges resulting from excessive resorption may also be included.

2. **Contraindicated surgeries:**

   Flexible materials may be used in instances in which surgical correction of tissue undercuts is contraindicated. When bilateral opposing undercuts as in retromylohyoid region or maxillary tuberosity exists, the treatment of choice may be surgical reduction. However many patients cannot afford such treatment , or may not permit such a procedure. A flexible material in the region of undercut may solve a problem.

3. **Relief areas:**
   Resilient liners have also been used to prevent irritation and relieve pressure on median palatal raphae. A layer of soft material is placed in the region of raphe to provide relief. Thus , a relief chamber on the maxillary denture and the possibility of development of hyperplastic tissue can be avoided.

4. **Restoration of congenital or acquired oral defects**
   Flexible materials are used in the fabrication of prosthetic restoration for congenital or acquired oral defects. Soft materials afford maximal retention by permitting the use of deep undercut regions without the irritating or traumatising the soft and sensitive tissues.

5. **Post irradiation:**
   As means of preventing excessive irritation, soft plastics can be used in dentures for patients who have received irradiation.

6. **Bruxism:**
   The constant idle grinding, clenching and rubbing of occlusal surfaces of the denture transmit an intermittent shearing stresses to the basal seat which results In mucosal irritation and subsequent bone loss. These habits seem to be quite common in highly tense and anxious patients. The use of resilient liner is to protect the supporting tissues from excessive stress.

7. **Xerostomia:**
   In patients with dry mouth due to a systemic disease such as diabetes, it is particularly important to protect the oral tissues from chronic soreness and osteoradionecrosis.

VI. RECENT DEVELOPMENT:

Since it appears that the ideal material does not currently exist, further research and development are needed to develop improved materials that meet the previously mentioned requirements. From the standpoint of gelation and manipulation after mixing, ethanol is considered to be an essential additive of these materials. Since the deterioration of tissue conditioners is a function of leaching of the low weight plasticizer and especially ethanol, tissue conditioners which contain less or no alcohol should be developed or alternatively PEMA with higher molecular weight should be used,or a new type of polymer should be developed.The physical properties of these new materials must be clinically investigated to predict which materials will provide the best clinical service[27].

VII. CONCLUSION:

Clinical experience indicates almost universal tissue tolerance of soft liners and acceptable patient reaction.However currently the materials have to be considered as temporary expedients because none of the advocated permanent liners have a life expectancy comparable to that of the resin denture base. Improved strength, permanent resiliency, improved adhesion to the denture bases, the ability to inhibit growth of microorganisms, and chemical stability continue to be the main focus of ongoing research. These attempts include surface coatings of liners with sealants such as fluorinated copolymers and integration with antifungal components. The ideal resilient denture liners would possess higher elasticity during mastication and then behave viscously to designate the functional and nonfunctional forces and relieve the pain. In addition, their durability in the oral environment is necessary over long periods. Acrylic resin which shows viscoelastic behavior and higher levels of cushioning effect, may best meet the requirements for the resilient denture liners from the point of view of the inherent viscoelastic properties. However, from the standpoint of durability, the silicone would be better. Selection of a particular liner cannot be based on any single property. Material selection is influenced not only by the properties available but also by the particular clinical situation. Laboratory studies simulate an oral environment; however, no simulation is entirely accurate. The most

Received: 10 Nov 2019 | Revised: 20 Dec 2019 | Accepted: 02 Jan 2020

appropriate testing environment is intra oral; consequently, clinical studies should be performed on the materials tested.

VIII. REFERENCE:

[1] Wright,PS composition and properties of soft lining materials for acrylic dentures ;JDent,1981;9:210-223.
[2] Mack,PJ,Dentur soft lining materials: Clinical indications;AustDentJ,1989,34:454-458.
[3] KyddWL,MandleyJ , the stiffness of palatal mucoperiosteum; JprosthoDent,1967;18:116-121.
[4] MakilaE, soft lining to relieve soreness beneath dentures , JOralRehabil,1976;3:145-150.
[5] Aydin AK, Terzioglu H, Akinay AE, Ulubayram K, Hasirci N (1999) Bond strength and failure analysis of lining materials to denture resin. Dent Mater 15:211–218
[6] Sinobad D, Murphy WM, Huggett R, Brooks S (1992) Bond strength and rupture properties of some soft denture liners. J Oral Rehabil 19:151–160
[7] Wright PS (1981) Composition and properties of soft lining materials for acrylic dentures. J Dent 9:210–223
[8] Anusavice KJ, Phillip RW (2003) Phillip’s science of dental materials, 11th ed, Elsevier, St. Louis p 269–71,751–753
[9] Polyzois GL, Frangou MJ (2001) Influence of curing method, sealer, and water storage on the hardness of a soft lining material over time. J Prosthodont 10:42–45 .
[10] Braden M (1970) Tissue conditioners. I. Composition and structure. J Dent Res 49:145–148.
[11] Parker S, Braden M (1990) Formulation of tissue conditioners. Biomaterials 11:579–584.
[12] Jones DW, Hall GC, Sutow EJ, Langman MF, Robertson KN (1991) Chemical and molecular weight analyses of prosthodontic soft polymers. J Dent Res 70:874–879
[13] Jones DW, Sutow EJ, Hall GC, Tobin WM, Graham BS (1988) Dental soft polymers: plasticizer composite and leachability. Dent Mater 4:1–7
[14] Murata H, Kawamura M, Hamada T, Saleh S, Kresnoadi U, Toki K (2001) Dimensional stability and weight changes of tissue conditioners. J Oral Rehabil 28:918–923
[15] Murata H, Hamada T, Harshini, Toki K, Nikawa H (2001) Effect of addition of ethyl alcohol on gelation and viscoelasticity of tissue conditioners. J Oral Rehabil 28:48–54
[16] Qudah S, Huggett R, Harrison A (1991) The effect of thermocycling on the hardness of soft lining materials. Quintessence Int 22:575–580
[17] Murata H, Chimori T, Hamada T, McCabe JP (2005) Viscoelasticity of dental tissue conditioners during the sol gel transition. J Dent Res 84:376–381
[18] Kawano F, Dootz ER, Koran A 3rd, Craig RG (1992) Comparison of bond strength of six soft denture liners to denture base resin. J Prosthet Dent 68:368–371
[19] Pinto JR, Mesquita MF, Henriques GE, de Arruda No´bilo MA (2002) Effect of thermocycling on bond strength and elasticity of 4 long-term soft denture liners. J Prosthet Dent 88:516–521
[20] McCabe JF, Carrick TE, Kamohara H (2002) Adhesive bond strength and compliance for denture soft lining materials. Biomaterials 23:1347–1352
[21] Mc Mordie R, King GE (1989) Evaluation of primers used for bonding silicone to denture base materials. J Prosthet Dent 61:636–639
[22] Price C, Waters MG, Williams DW, Lewis MA, Stickler D (2002) Surface modification of an experimental silicone rubber aimed at reducing initial candidal adhesion. J Biomed Mater Res 63:122–128
[23] Wilson J (1992) In vitro loss of alcohol from tissue conditioners. Int J Prosthodont 5:17–21
[24] Gardner LK, Parr GR (1988) Extending the longevity of temporary soft liners with a mono-poly coating. J Prosthet Dent 59:71–72
[25] Banerjee KL , Shetty P . Clinical Performance of Various Resilient Liners . Int J Oral Health Med Res 2015;2(1): 7477 .
[26] Kaur ,et al : Resilient liners a review. Healtalk ,oct2011, vol04-1
[27] Rodrigues S, Shenoy V, Shetty T ,J Indian Prosthodont Soc (July-Sept 2013) 13(3):155–164