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A Beginners guide for soft liners- Mini review

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Abstract

Prosthetic rehabilitation of complete edentulous patients with fabrication of complete dentures is considered as a challenging procedure and without an adequate skill and knowledge a successful prosthesis cannot be delivered to the patient. These complete denture prosthesis always better fits in the satisfied patient's oral cavity. For this, Comfortable denture wearing experience is what a complete denture patient expects from a dentist. Thin and friable mucosa of the edentulous ridges makes it difficult for these elderly patients to wear a denture. Soft liners are that material which acts as a cushion below these dentures and provide utmost comfort to the patients. This articles briefly discusses about the history various properties and indications of soft liners, different types of soft liners available in the market today and some important considerations to be remembered while utilizing these materials.

Keywords: soft liners, acrylics, ulcers, complete dentures, comfort.

INTRODUCTION

The frequent post insertion clinical scenario of hard acrylic complete dentures during functioning in stomatognathic systems under occlusal forces may lead to some common problems such as denture stomatitis, irritation from the dentures, traumatic ulcers etc. causing severe discomfort in wearing this prosthesis. In such situations, alternate solution is the application of soft liners underneath the tissue surface of dentures and thereby increasing the comfort of wearing the dentures.

A soft liner or also called as resilient liner may be soft elastic and resilient material forming all or part of the impression surface of a denture. It usually acts as a cushion between the hard acrylic and the soft tissue surface thus providing comfort to the tissues. Elasticity ensures that the material will regain its original shape following deformation, while resilience is also important because it determines the rate of recovery. This has led some to label these materials as resilient, but soft lining material is more correct, as it is the softness or ease of deformation that particularly separates them from other denture base materials. Soft liners are used to treat abused tissues and also used in long term basis for complete denture bases for patient who cannot tolerate stresses induced by dentures.

Soft liners are polymers with a glass transition temperature below the mouth temperature (i.e., the polymer does not change from liquid to solid completely at mouth temperature) thus the material is semisolid at mouth temperature and therefore the softness

Even though soft liner have shown many disadvantages like loss of its resiliency or softness, water sorption, its support fungal growth ,it doesn't bond chemically to the resin so it gets separated from the acrylic denture frequently leading to replacement of soft liners in short intervals which is costly and time consuming to the dentist and the patient. But studies have shown that 26 out of 30 patient preferred soft liners over hard conventional acrylic[1]. And 1-6% of all mandibular dentures have soft liners incorporated in them. Soft liners have universal patient acceptance because of its comfort that it provides to the patient and also the tissue tolerance by these material is far better than the acrylic material.

History of soft liners:-

Soft liners have been in used for a long period of time and its usage dates back to as early as 1869 by a person called Twitchell[2]. From the 18th century when its usage began until now, many changes have taken place in the composition of the material, newer types of soft liners are introduced into the market daily. Velum rubber was the first soft liner material that was used. The first soft lining material was introduced to treat abused tissues or tissue treatment these were called as tissue conditioners, it was also used for lining surgical splints, for stabilizing a record base, and as a functional impression material, but these material lasted only for a short period of time ranging from days to a few weeks. One of the first synthetic soft lining material was polyvinyl chloride introduced by Mathews in 1945 in which a plasticizer di-n-butyl phthalate plasticizer was used for the first time[3]. Poly(vinyl chloride) was used as a soft lining for patients with chronic mucosal tenderness. It was found to eliminate the soreness under complete dentures in some selected patients. Lammie and Storer described the use of poly(vinyl chloride) plasticized with di-butyl phthalate and found it to be a very unsatisfactory material[4]. It hardened in a short period of time (6 to 12 months) because the plasticizer leached out. Dioctyl phthalate was considered a better plasticizer for poly(vinyl chloride) because the lining remained soft longer. Other types of plasticizers introduced were butyl glycolate with vinyl chloracetate, butylester etc like this many plasticizers were introduced but each of this had its own disadvantages and never became successful. By late 1960s, more durable, resilient soft liners was introduced which were made of silicone rubber materials based on poly dimethyl siloxane. One of the main defects in these soft liners that they have poor adhesion to the denture bases.

Classification of soft liners:-

Soft liners are basically classified as short term soft liner and long term soft liners based on duration of use.

1. Short term denture liners are also called tissue conditioners.
2. Long term tissue conditioner are further classified into four group based on chemical structure:

a. Plasticized Acrylic Resins Either Heat Cured Or Chemical Cured,
b. Vinyl Resins
c. Polyurethane,
d. Polyphosphazene And
e. Silicon Rubbers.

Currently ISO has given two international standard to soft liners ISO 10139- 1:1991, Part 1; - short term soft liners and materials for removable dentures[5], Part 2:- materials for long term use[6]. According to ISO short term short liners are used for a period of 30 days. And a long terms soft liner is one that can maintain its softness for a period of more than 30 days. Some authors classify soft liner that can be used for unto 6 months are called as intermediate liners and long term is one that maintains its softness for a period of 1 year and more.

Based on the type of curing type used they can be classified into:-

1. Heat polymerized soft liners
2. Auto polymerized soft liners

Composition of soft liners:-

Short term soft liners usually consist of powder liquid system but preformed sheets of acrylic gel is also available. The powder contains a polymer uncross linked (not cross linked), polymethylmethacrylate(PEMA) or its copolymer and the liquid consist of a mixture of ethyl alcohol(solvent) and an aromatic ester(dibutyl phthalate), which acts as a plasticizer that lowers the glass transition temperature(T_g) of the polymer thus rendering it as a soft gel[7]. It is devoid of any monomer in it. The reaction of the short term liners is physical process and doesn't have a chemical reaction taking place. There are about 5 types of long term soft liners but most commonly and currently used material is plasticized acrylics and silicone rubber, which are chemically or heat activated. Heat activated plasticized acrylics are available in two forms sheets or in a powder liquid form. The powder consists of PEMA and benzoyl peroxide as initiator. Liquid consists of higher methacrylate monomer together with plasticizer, commonly phthalate ester. Chemically activated consist of peroxide tertiary amine system as activator these are used as chair side reliner but they have inferior properties than heat activated because of presence of free monomer content. Silicone soft liners are provided as heat activated and room temperature vulcanization (RTV). Heat activated is supplied as a single paste system which consist of poly dimethyl siloxane and silica as filler, benzoyl peroxide as initiator. An adhesive is usually required in order to enhance the adhesion between the liner and denture base. On the other hand RTV also is supplied in form of powder and liquid and reaction takes place because of activator present, very less amount of cross linking takes place than compared to the heat cured ones so compromising its properties and usage time.

Currently available soft liners:-

In today's market there are numerous soft liners available both in acrylic type and silicone type which can be heat cured or self-cure. Many products are sold in the market for patients self-use. Below are some of the materials that are available in the markets.

Products by GC India:-

1. GC RELINE soft - Vinyl polysiloxane self-curing denture reline, can be used for 6-12 months(available in both soft and extra soft consistency)
2. GC Soft-Liner – Acrylic based self-curing tissue conditioner can be used for 3-4 weeks also can be used as functional impression material.
3. GC Coe Soft - Acrylic self-curing temporary relining material to buffer masticatory pressure, for long time temporary relining 3-6 month
4. GC COE-COMFORT - Self-curing, chair side edentulous tissue conditioner, also can be used as functional impression material.
5. GC KOOLINER - hard, chair side reliner used to extend denture borders and posterior palatal seal, improves the fit of the denture.

Dentsply:-

1. Permasoft – Acrylic soft denture reline material that can be used chairside for relining.
2. Luci-Sof - silicone-based long-term heat cured soft denture liner

Other products are:-

1. Molloplast B - Permanent soft relining heat curing silicone material
2. Sofreliner Tough - addition-cured silicone material, can be used upto 24 months
3. Verex soft – heat cured acrylic soft liner.

Of these materials acrylic based are;-

1. GC Soft-Liner
2. GC Coe Soft
3. GC COE-COMFORT
4. GC KOOLINER
5. Permasoft

And silicon based are:-

1. Luci-Sof
2. Molloplast B
3. Sofreliner Tough

Things to be considered before using a soft liner:-

Relining of complete dentures is one of the most difficult and trying procedures in prosthodontics, however, it can be effective if the denture was made correctly during the initial fabrication and if a precise technique is performed with meticulous attention to every detail. Before a soft liner is used, the prosthesis must be evaluated and deemed clinically acceptable; the liner material should not be used to compensate for a poorly made, ill-fitting prosthesis. A liner, whether hard or soft, should be used as a simple tool to improve a clinically acceptable prosthesis. If the existing prosthesis is poorly made or does not fit well, the existing soft tissue problems can be exacerbated with a relining procedure, regardless of material quality. So it is important that a soft liner should be used only in well fabricated well-fitting denture.

Ideal Properties

For maximum efficacy, 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.[4]
3. Water absorption should be minimal.
4. The materials should have minimal solubility in saliva. Ideally, the plasticizer (used in some materials) should not leach out with time; however, if leaching does occur, it should be minimal.
5. They should retain their resilience. The degree of resilience will depend on the chemical composition of the material and the thickness of the soft lining. Several authors suggest that a thickness of 2 to 3 mm is most appropriate.[8,9,10]
6. They should bond sufficiently well to poly (methyl methacrylate) to avoid separation during use. If the strength of the bond between the two materials is weak, separation takes place during use and such localized areas of separation rapidly become unhygienic because of the difficulty of cleaning.[11]
7. Adequate tear resistance is of practical importance to resist rupture during normal use. This is because the propagation of a crack or small tear at the periphery of the soft lining could lead to failure and detachment of the material.
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 colour should match that of the denture base material.

Indications of soft liners:-

1. Diagnostic relining:- A diagnostic relining is indicated in several clinical scenarios. It may be used in conjunction with a diagnostic acrylic resin removable partial denture, also referred to as a temporary or transitional prosthesis. Diagnostic removable prostheses can be used to evaluate the patient's occlusal vertical dimension, to re-establish esthetics, or to ascertain whether a perspective patient can tolerate and accept a removable prosthesis.
2. Impression material:- A number of dentists use tissue conditioner as a border-molding material and as an impression material for edentulous and partially edentulous patients[12]. Also as functional impression materials [13].
3. Used in adjunctive to complete dentures in cases where patients are unable bear the hard acrylic dentures bases without which the patient can suffer from mucosal discomfort and ulcerations chronically. The most common patients that suffer from this conditions are patients with very old age where the keratinization of epithelium is reduced leading to thin epithelium, in patients with bony irregularities, also in post-menopausal women who suffer from atrophied mucosa [14]. To be effective, a permanent soft lining should be about 2 to 3 mm thick. The lining acts to absorb part of the force of occlusion, releasing the stored energy as elastic recoil.
4. Can be used with immediate dentures [15]. There is usually a tendency to reline the dentures too soon at the request of the patient. A hard clinical relining is usually indicated 6 months to 1 year after extractions. A soft liner may be used as soon as the surgical and prostheses insertion appointment or as late as 2 months before the hard relining process.
5. Used in patients with abnormal or irregular bony contours like bilateral undercuts, in knife edge ridges, it can also be used when the ridges are severely resorbed which usually causes the mental nerve to lie on the surface of ridge so a soft liner would comfortable to the patient as it reduces the pressure falling on the nerve.
6. Soft lining material could be used for the cleft palate patient[16], or an acquired oral defect related to trauma, to improve retention of the dentures by engaging undercuts. Can be used for obturators[17].
7. Those patients who are in poor general health, have nutritional deficiencies, or are psychologically disturbed are more likely to have a low pain threshold[18]. They may complain of generalised discomfort or pain in the tissues of the entire denture-bearing area.
8. Can be used in patients suffering from Xerostomia or diminished salivary flow as the lack of saliva can lead to increased soreness, discomfort and also cause decreased retention of the dentures so a soft liner would be advantageous[19].
9. Soft liners can be used in distal extension removal partial dentures to improve the retention by engaging the undercut of the retromylohyoid fossa.
10. It can be used following surgery as temporary soft liners are used to meet functional needs. Using a soft relining material improves adaptation to the prosthesis because the material helps reduce edema and control postsurgical bleeding, much like a pressure bandage.
11. Soft liners can also be used after implant therapy as to minimize the forces falling over the tissue covering the implant site.
12. Finally it can also be used in complete dentures opposing natural dentition.

Methods of cleaning soft relined dentures:-

Denture plaque control using mechanical and chemical methods is essential for maintenance of good oral hygiene of denture wearers. However, mechanical cleansing (brushing) is not advisable for soft denture liners since it can damage the resilient lining[20]. Chemical cleansing by denture cleansers is the first choice for denture plaque control of tissue conditioners[21]. The solutions used for denture cleaning can be divided according to their

chemical composition: alkaline peroxide, alkaline hypochlorites, acids, disinfectants and enzymes. Peroxide cleansers are the most commonly used denture cleansers[22]. They are dispensed in powder or tablets forms, which become alkaline solutions of hydrogen peroxide when dissolved in water[7]. Hypochlorites are useful as denture cleansers because they remove stains, dissolve mucin and other organic substances and are bactericidal and fungicidal. Silicone-based soft denture liners performed significantly better in all cleansing treatments than acrylic-based soft denture liners Silicone-based soft liners showed better compatibility with cleansing solutions and maintained their resiliency better thereby, proving to be more promising for long term usage. But all these chemical can react with these liners so use of soft cloth with cold water is the best method to clean the soft liner surface

SUMMARY AND CONCLUSION:-

This article can help clinicians to understand the basic properties, indications and precautions to be followed while using soft liners. Of all the soft liners silicone based soft liners have shown promising outcomes. They can be used for longer periods of time and doesn't lose their resiliency, softness so easily and when compared to acrylic based soft liners silicone based have shown less cytotoxic effect on the tissues. Although soft liners have several disadvantages but if used in appropriate situation it can be a valuable tool in providing excellent clinical care to patients.

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