

A Clinical Study of Improved Nitrile Butadiene Rubber Soft Lining Material and Acrylic Denture Base

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ABSTRACT

Relining of a complete denture essentially involves the recording of an impression within its support surface so as to correct the deficiency that has arisen as a result of tissues changes. Relining can be done simply, accurately and inexpensively by using lining material. In relining, a new thin layer of lining material is added to the existing denture base. Due to residual ridge resorption and irreversible changes in the tissues supporting, the prosthesis become loose and patient may complaint of frequent pain and ulceration. Relining can be done in such patients by using lining material. A soft denture liner which is placed in a denture base that contacts tissues provides comfort. Resilient denture liners because of their viscoelastic properties act as shock absorber and reduce and distribute the stress on the denture bearing tissues. However, there is an increased probability of fungal growth on soft lining materials. Adherence of *Candida* to solid surface, such as denture resin or lining material has been thought to be the first step in successful colonization, subsequent plaque formation and development of pathogenesis. This study is done to find the adherence of *Candida albicans* to nitrile butadiene rubber (NBR) soft lining material and safe duration of its clinical usage.

Keywords: Acrylic denture, *Candida albicans*, Denture sore mouth, Nitrile butadiene rubber, Relining soft denture liner.

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INTRODUCTION

Commonly used nonmetallic denture base material is heat cure acrylic resin. This is hard and thermoplastic material. Denture base is seated on the denture bearing, denture stabilizing and peripheral limiting areas of the

underlying tissues. These biological supporting tissues and the denture materials are vulnerable to the time dependent changes. Due to residual ridge resorption and irreversible changes in the tissues supporting, the prosthesis become loose and patient may complaint of frequent pain and ulceration. Relining can be done in such patients by using lining material.

Relining of a complete denture essentially involves the recording of an impression within its support surface so as to correct the deficiency that has arisen as a result of tissues changes. Relining can be done simply, accurately and inexpensively by using lining material. In relining, a new thin layer of lining material is added to the existing denture base.¹

Relining is defined as a procedure used to resurface the tissue side of a removable dental prosthesis with new base material, thus producing an accurate adaptation to the denture foundation area.²

A soft denture liner which is placed in a denture base that contacts tissues provides comfort for those persons experiencing considerable pain while wearing a denture. Some patient's may have a low threshold for pain, and the gum tissues that overlay jawbone are usually thinner than normal, and hence do not resist pressure well. When such tissues are compressed between jawbone and hard acrylic plastic denture base, pain is easily elicited and sometimes may cause ulcerations. Replacing one of these hard interfaces with a soft denture liner helps eliminate or reduce this painful tissue compression.

The indications for use of a resilient liner are existence of thin, non-resilient mucosal coverage of the residual ridge, poor ridge morphology, persistent denture-sore mouth and acquired or congenital oral defects.

Resilient denture liners because of their viscoelastic properties act as shock absorber and reduce and distribute the stress on the denture bearing tissues.³ Stoner stated that the rational for using a soft lining material is that part of the energy transferred from it to the denture which aids in deforming the denture elastically and consequently reduces the direct load of mastication on the atrophied area. Soft lining produces an equal amount of pressure over the bone of the residual ridge, and thereby avoids resistance from the prominent spicules to a larger amount of applied force.

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Soft lining materials are used as liners and they continue to have a place in clinical removable prosthodontics. However, there is an increased probability of fungal growth on soft lining materials. Adherence of *Candida* to solid surface, such as denture resin or lining material has been thought to be the first step in successful colonization, subsequent plaque formation and development of pathogenesis.^{3,4} Colonization of denture soft lining materials by *C. albicans* can result in clinical problems.⁵ Here a newly manufactured improved nitrile butadiene rubber (NBR), (MP Sai Enterprises, Mumbai) was clinically tested for its adherence with *C. albicans* a fungal growth.

MATERIALS AND METHODS

Purpose of the study was to study the adherence of *C. albicans* to NBR soft lining material and to find the safe duration of its clinical usage.

Advantages of Soft Denture Liners

Soft denture liners are gentle and due to viscoelastic property act as shock absorber, thereby reducing the stresses on the denture bearing areas. The soft denture liner tends to compress and conform to a constantly changing jawbone surface. While this helps to prevent pain from a moderately unbalanced bite resulting from jawbone shrinkage and so is not a long-term substitute for regular adjustments to balance a denture bite.

Disadvantages of Soft Denture Liners

There is colonization and infection by *C. albicans* and related species of material surface of the soft denture liners. They continually deteriorate and collect microorganisms easily and, therefore, they generally are to be replaced on a short-term basis. As soft denture, liners help to reduce pain from an uneven bite, patients may get a false sense of security, thinking their denture is adequately functioning while the bite continues to deteriorate. Soft denture liners are not a long-term substitute for regular adjustments to balance a denture bite. Routine dental check-ups are a necessity. Generally, soft-tissue liners are more expensive than a conventional hard denture liner.

INCLUSION CRITERIA

- Thirty denture wearing subjects with dry mouth having diminished salivary secretion.
- Subjects having pain during mastication with dentures.
- Subjects with unhealthy mucosal conditions like inflammation, redness, etc.

- Mentally sound subjects who can follow proper oral hygiene protocol.

Nitrile butadiene rubber soft liner (MP Sai Enterprises, Mumbai), carbide trimming bur, heat cure acrylic old dentures, pressure pot, silicone mixing jar, culture media, stereomicroscope.

All 30 dentures of the subjects were selected as per inclusion and exclusion criteria. Trimming about 1.5 mm from fitting surface or impression surface was done with help of depth orientation grooves. Then the dentures were chair side relined by NBR soft lining material (MP Sai Enterprises, Mumbai). After 1 and 2 months duration, a sample of it was scraped from denture fitting surface and sent to the Department of Microbiology, Rural Medical College (RMC), Loni for incubation in reinforced clostridial medium (RCM) culture media where it was examined for fungal growth. The changes in colony forming units per mm after each month's time were measured and marked.

Soft liners should not be cleaned by scrubbing with a hard denture brush in order to prevent tearing of the material. The use of soft denture brush under running water was recommended.

RESULTS

Statistical analysis was performed by a statistician in the department of medical informatics and statistics by using an independent paired Student's t-test. After 1 month's duration, 24 samples out of 30 tested were reported sterile as seen in (Fig. 1) and remaining six showed colonies of *C. albicans* and *Staphylococcus aureus*. While after 2 months duration, 28 out of 30 samples became positive with *C. albicans* and *S. aureus* colonies and aerobic spore bearing units as seen in (Fig. 2).



Fig. 1: Sample after 1 month

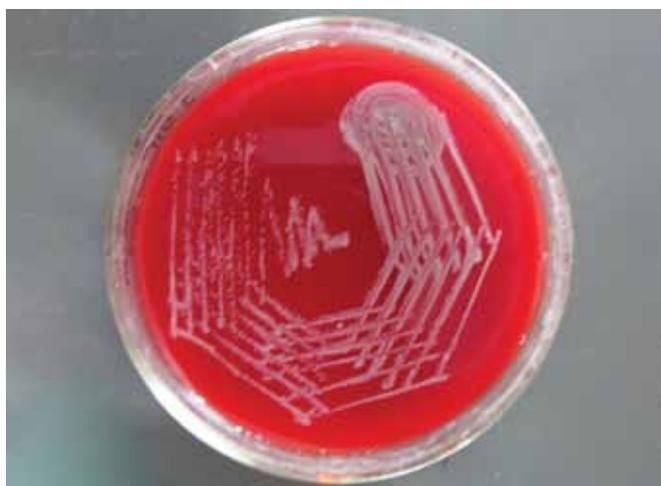


Fig. 2: Colony after 2 months

DISCUSSION

Denture liners are usually fabricated from special medical grade rubber or silicone-type compounds. The silicone materials are generally softer and compressible. Resilient liners because of viscoelastic property act as shock absorber, and thus reduce and distribute the stresses on the denture bearing areas.⁶ In order for these materials to function adequately, they must be reasonably thick. Therefore, the amount of plastic that needs to be removed from the impression surface of a denture to allow room for these liners may sometimes weaken the denture. There are several steps involved in installing a soft denture liner, such as resurfacing by impressions and various laboratory procedures.

Soft denture liners tend to continually harden, though a patient may not be aware of this happening because the process is gradual. Patient may continue to use the relined dentures without reporting to a dentist. Adherence of *Candida* to the solid surface of denture resin or liner material has been thought to be the first step in colonization, subsequent plaque formation and development of pathogenesis. They eventually will begin to have increasing problems until a new soft denture liner is placed. Denture liners are soft but porous in nature, and this porosity contributes to the deterioration and collection of microorganisms.^{7,8}

Soft liner materials in oral cavity environments are easily colonized both by fungi and dental plaque. These factors are the cause of mucosal infections. The microorganism that most frequently colonizes soft liner materials is *C. albicans*.⁹ Colonization occurs on the surface of materials and within materials.¹⁰

If a soft denture liner becomes contaminated with disease-causing microorganisms (a fungus for example), it may not be possible to decontaminate the denture without having to replace the denture liner. Persons with dry mouth usually have difficulty in wearing dentures due

to pain and irritation caused by the hard denture surface rubbing against underlying tissues that are not lubricated with adequate saliva. While soft denture liners would appear to be ideal for such individuals, they are generally much more difficult to maintain. Because impaired saliva production allows a very significant collection of microorganisms to build-up in the mouth, this usually results in unacceptable contamination of porous soft denture liners unless meticulous hygiene is maintained. While denture liners generally will last longer than a year, they should be replaced. The frequency of replacement depends on each situation and the patient's oral hygiene. The greatest virtue of soft liners lies in their versatility and ease of use. Their biggest flaw is that they are so easily misused. Because the relined 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 tissues, thereby producing the very situation that their use is intended to prevent or correct. Their longevity in wear is very limited. They harden and roughen within 4 to 8 weeks because of loss of the plasticizer. This requires close observation of the patient by the dentist.

Soft lining materials continue to have a place in clinical removable prosthodontics. However, there is an increased probability of fungal growth on soft lining materials. Colonization of denture soft lining materials by *C. albicans* can result in clinical problems. Here, a newly manufactured improved NBR was clinically tested for its adherence with fungal growth.

CONCLUSION

Nitrile butadiene rubber soft liner material was sterile till 1 month of clinical usage so, it can be prescribed as a safe soft lining material till 1 month of clinical usage in a controlled environment of oral hygiene with scope of further research.

The greatest virtue of soft liners lies in their versatility and ease of use as they provide immediate relief and comfort. There is a danger that the patient will wear them too long and so cause trauma to the supporting tissues, thereby producing the very situation that their use is intended to prevent or correct. Their longevity in wear is limited as they harden and roughen within 4 to 8 weeks due to loss of the plasticizer. This requires close observation of the patient by the dentist.

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