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Original Article

Comparative evaluation of the tensile bond strength of two silicone based denture liners with denture base resins

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ABSTRACT

Background: To evaluate and compare tensile bond strength of two silicone based liners with heat cure and heat cure high impact denture base resin at baseline and after storage in artificial saliva for 30 and 60 days.

Method: Heat cure conventional and high impact acrylic blocks (120 blocks each) prepared with final test specimen of two blocks of each resin with a liner. The baseline samples and those tested after 30 and 60 days interval stored in artificial saliva in thermal incubator, all were pulled apart in UTM at 20 mm/min. The tensile bond strength and mode of failure (adhesive/cohesive) were assessed. Mean, SD determined and analysis using one way ANOVA and paired 't' test.

Results: The highest mean tensile bond strength (1.028 MPa) and the least i.e. 0.289 MPa was observed with Permaflex silicone liner against heat cure PMMA after storage in artificial saliva at $37 \pm 1\,^{\circ}C$.

Conclusion: The study rejected the null hypothesis because storage time in artificial saliva affected the bond strength of the resilient liners examined. The results revealed a statistically significant difference ($p < 0.05$) of artificial saliva storage on the bond strength of both the liners. After storage in artificial saliva for 30 days and 60 days at $37 \pm 1\,^{\circ}C$, all the specimens showed a significant reduction in the tensile bond strength.

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Introduction

Complete denture bases are fabricated commonly from rigid denture base materials like acrylic, vinyl and other resin polymers. The success of complete or partial dentures depends on esthetics, comfort and function.[1] The fit of the denture base to the alveolar ridge progressively declines as the alveolar ridge resorbs, which affects denture stability, support

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and retention thus jeopardizing denture success. In various clinical conditions like atrophic or resorbed ridges, xerostomia, dentures opposing natural dentition, bony undercuts, relining is indicated to recapture the fit of the denture base, especially when the denture still retains proper vertical dimension, occlusal relationship and esthetics.[2,3]. (Tables 1 and 2).

These resilient materials partially absorb force, equally distribute functional and non functional stresses, reduce localized pressure to the underlying basal seat and provide relief for prominent mid-palatine raphe, anterior nasal spine etc.[2] They have evolved as a vital treatment modality for geriatrics patients with heavy bruxing, clenching habits leading to considerable damage to the supporting tissues in the form of chronic soreness, pathologic changes and bone loss. Also used in oral cancer patients with postoperative defects requiring obturation and to modify transitional prosthesis after stage I and II implant surgery.[4]

Denture liners have been used in dentistry for more than a century. One of the first synthetic rubbers developed in 1945, as a denture liner was a plasticized polyvinyl resin. This was followed by introduction of silicones in 1958.[4,5] Permanent soft lining materials like epoxy, acrylic, urethane or silicone polymers, replace the fitting surface of a hard plastic denture. Commonly used silicone liners can be RTV and heat cured.[6]

Soft liners have several problems like loss or varying degree of softness, colonization with Candida albicans, staining, porosity, poor tear strength and lack of color stability.[7] One of the serious problems is the failure of adhesion between the soft liner and the denture base. This creates a potential for bacterial growth, plaque, food debris and calculus accumulation.[13] Therefore, frequent clinical evaluation and periodic replacement of the soft denture liner is essential.[7] Serviceability of lining material varies from 6 months to 5 years.

Dentures relined with silicones can only be successful if a satisfactory bond exists with denture base acrylic resin. In use, they are constantly bathed in saliva, when out of the mouth, they are usually stored in either denture cleansers or water. In these situations, water or saliva gets absorbed into the material, and plasticizers of the soft liner leach.[8] When the material swells, stress builds up between the bonding surfaces and the visco-elastic properties of resilient denture change.

Moist environment of the oral cavity may affect the bonding of the soft liner with the denture base. So this study was undertaken as there is dearth of clinical data about the effectiveness of such bonding.

To evaluate and compare tensile bond strength of two silicone liners with heat cure and heat cure high impact denture base resin at baseline and after storage in artificial saliva for 30 and 60 days.

Materials and methods

1. A preformed rectangular brass test specimen of dimensions 10 mm × 10 mm × 40 mm was taken.
2. The base and catalyst of silicone duplicating rubber (Elite Double 32, Zhermack) were measured and mixed in 1:1 ratio in a vacuum mixer for 30 s and slowly poured in a conventional brass flask and the brass test specimen was placed horizontally in the centre of the mix after the initial preset. The brass specimen was retrieved after the final set of the mix (approx 20 min) to obtain the mould.
3. Wax blocks were prepared from the metal mould after applying oil to facilitate easy removal. The baseplate wax was melted on a Bunsen flame and poured into the silicone mould. The lid of the flask was replaced and any

Table 1 – Comparison of paired subsubgroups of Group 1 and Group 2.

		Mean	Standard deviation	't' value	p value
Pair 1	Group 1 A (I) – Group 1 A (II)	0.2940	0.27126	3.427	0.008 Significant
Pair 2	Group 1 A (I) – Group 1 A (III)	0.4090	0.28085	4.605	0.001 Significant
Pair 3	Group 1 A (II) – Group 1 A(III)	0.1150	0.20387	1.784	0.108 Non significant
Pair 4	Group 1 B (I) – Group 1 B (II)	0.2610	0.23568	3.502	0.007 Significant
Pair 5	Group 1 B (I) – Group 1 B (III)	0.3220	0.28224	3.608	0.006 Significant
Pair 6	Group 1 B (II) – Group 1 B(III)	0.0610	0.14700	1.312	0.222 Non significant
Pair 7	Group 2 A (I) – Group 2 A (II)	0.23700	0.18921	3.961	0.003 Significant
Pair 8	Group 2 A (I) – Group 2 A (III)	0.52900	0.27819	6.013	0.000 Significant
Pair 9	Group 2 A (II) – Group 2 A (III)	0.29200	0.27776	3.324	0.009 Significant
Pair10	Group 2 B (I) – Group 2 B (II)	0.14400	0.15981	2.850	0.019 Significant
Pair11	Group 2 B (I) – Group 2 B (III)	0.16900	0.30777	1.736	0.116 Non significant
Pair12	Group 2 B (II) – Group 2 B (III)	0.02500	0.26647	0.297	0.773 Non significant

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