International Journal of Research in Health and Allied Sciences
Journal home page: www.ijrhas.com
Official Publication of "Society for Scientific Research and Studies" [Regd.]
ISSN: 2455-7803

ORIGINAL RESEARCH

Effect of sandblasting and monomer pretreatment of denture base resin on tensile bond strength of two long term resilient liners

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ABSTRACT
Background: Resilient lining materials are soft polymers with good flexibility and softness properties. The present study was conducted to evaluate the effect of sandblasting and monomer pretreatment of denture base resin on tensile bond strength of two long term resilient liners such as Super-Soft, and Molloplast-B. **Materials & Methods:** The present in vitro study was conducted on two resilient liners Super-Soft and Molloplast-B. Ninety acrylic resin (Trevalon) specimens with cross sectional area of 12×14 mm were prepared and divided into two groups of 45 specimens each. Each group was surface treated (n = 15) by sandblasting (250 μalumina particles) (Group I), monomer treatment (for 180 sec) (Group II) and control (no surface treatment) (Group III). Tensile strength was determined. **Results:** mean TBS with super- soft material was 2.5 MPa and with Molloplast-B was 1.6 MPa in group I, 1.4 MPa with super- soft material and 0.98 with Molloplast-B group II, 4.1 MPa and 2.3 MPa with super- soft material and Molloplast-B respectively. The difference was significant (P< 0.05). **Conclusion:** Authors found that surface pretreatment of the acrylic resin with monomer prior to resilient liner application are an effective method to increase bond strength between the base and soft liner.
Key words: Bond strength, Liner, denture base resin

Received: 10 Jan, 2020 Revised: 28 Jan, 2020 Accepted: 30 Jan, 2020

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This article may be cited as: Agrawal A, Jain G, Singla I, Pandey N, Singhai V, Bagaria A. Effect of sandblasting and monomer pretreatment of denture base resin on tensile bond strength of two long term resilient liners. Int J Res Health Allied Sci 2020; 6(1):68-71

INTRODUCTION

Resilient lining materials are soft polymers with good flexibility and softness properties.[1] They are applied to the tissue surfaces of complete and partial removable dental prostheses to equally distribute the force exerted on the dental prostheses and to reduce the force distributed to atrophic areas on the residual ridge crest. Resilient lining materials are used in situations where

the alveolar mucosa is sensitive.[2] These liners may be classified as either room-temperature or heat-temperature vulcanized liners. They can also be divided into 4 groups according to their chemical structure: plasticized acrylic resins (either chemical- or heat-polymerized), vinyl resins, polyurethane, and polyphosphazine and silicone rubbers.[3]

A soft liner would distribute the functional and parafunctional stresses more evenly and thus have a dampening effect due to their elastic behavior, thus acting like a "shock absorber". Because of their ability to restore health to inflamed and distorted mucosal tissues, soft liners are used in the management of frail and chronically irritated tissues, thin and non resilient mucosal tissues, etc.[4] Plasticized acrylic resins, silicones, vinyl resins, polyurethane and polyphosphazines have been tried as soft liners, of which the first two were selected for this study since they have a long term successful record of clinical application. One of the most common problems encountered with the soft liners is the failure of adhesion between the liner and the denture base.[5]

Mechanical roughening by sandblasting or lasers, treatment with denture base monomer are among various methods to improve bond strength. The present study was conducted to evaluate the effect of sandblasting and monomer pretreatment of denture base resin on tensile bond strength of two long term resilient liners such as Super-Soft, and Molloplast-B.

MATERIALS & METHODS

The present in vitro study was conducted in the department of Prosthodontics. The study was approved from institutional ethical committee.

Two resilient liners Super-Soft and Molloplast-B were selected. Ninety acrylic resin (Trevalon) specimens with cross sectional area of 12×14 mm were prepared and divided into two groups of 45 specimens each. Each group was surface treated (n = 15) by sandblasting (250 μalumina particles) (Group I), monomer treatment (for 180 sec) (Group II) and control (no surface treatment) (Group III). Resilient liners were processed between 2 poly (methyl methacrylate) surfaces, in the dimensions of 12×10×4 mm. Tensile strength was determined with Instron Universal testing machine, at a crosshead speed of 5 mm/min; and the modes of failure were recorded. Results were tabulated and subjected to statistical analysis. P value less than 0.05 was considered significant.

RESULTS

Table I Distribution of groups

Groups	Group I	Group II	Group III
Surface treatment	Sandblasting	Monomer treatment	Control
Number	15	15	15

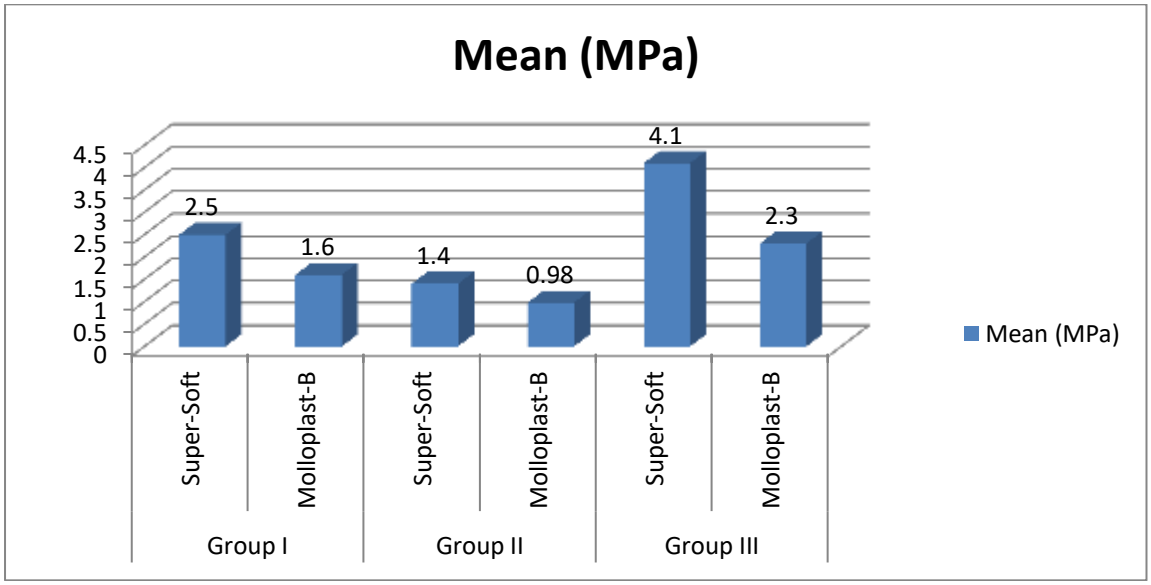
Table I shows that group I specimens were surface treated by sandblasting, group II with monomer treatment and group III act as control (no surface treatment). Each group had 15 specimens.

Table II Assessment of tensile bond strength

Groups	Materials	Mean (MPa)	P value
Group I	Super-Soft	2.5	0.02
	Molloplast-B	1.6	
Group II	Super-Soft	1.4	0.04
	Molloplast-B	0.98	
Group III	Super-Soft	4.1	0.01
	Molloplast-B	2.3	

Table II, graph I shows that mean TBS with super- soft material was 2.5 MPa and with Molloplast-B was 1.6 MPa in group I, 1.4 MPa with super- soft material and 0.98 with Molloplast-B group II, 4.1 MPa and 2.3 MPa with super-soft material and Molloplast-B respectively. The difference was significant (P< 0.05).

Graph I Assessment of tensile bond strength



DISCUSSION

One of the most significant problems is the loss of adhesion between the resilient lining material and the denture base material. The interface between the resilient lining material and the denture base material has been examined with scanning electron microscopy (SEM) and certain parameters have been reported that affect the adhesion between the resilient lining material and the denture base material. Staner[6] reported that modifying the acrylic resin denture base surface with airborne-particle abrasion with aluminum oxide before applying a resilient lining material produced rough surfaces that facilitated the mechanical locking of resilient lining materials. The present study was conducted to evaluate the effect of sandblasting and monomer pretreatment of denture base resin on tensile bond strength of two long term resilient liners such as Super-Soft, and Molloplast-B.

In this study, group I specimens were surface treated by sandblasting, group II with monomer treatment and group III act as control (no surface treatment). Each group had 15 specimens. Amin et al[7] reported that airborne-particle abrasion with aluminum oxide to roughen the acrylic resin base preceding resilient liner application weakened the bond. In addition, Atsü and Keskın[8] reported that airborne-particle abrasion with 50-mm Al_2O_3 and 30-mm Al_2O_3 modified by silica did not improve the bond strength of resilient lining material to heat-polymerized acrylic resin. Laser devices have been used in dentistry for soft tissue surgery and root end sealing and sterilization and for altering enamel and dentin surfaces to increase resistance to decay or to facilitate the bonding of composite resins. Laser application is a relatively safe and easy method to use in surface treatments, and several studies have investigated the bond strength between resilient lining and denture base materials by using an Er:YAG laser.

We found that mean TBS with super- soft material was 2.5 MPa and with Molloplast-B was 1.6 MPa in group I, 1.4 MPa with super- soft material and 0.98 with Molloplast-B group II, 4.1 MPa and 2.3 MPa with super- soft material and Molloplast-B respectively. Kulkarni et al[9] evaluated effect of two surface treatments, sandblasting and monomer treatment, on tensile bond strength between two long term resilient liners and poly (methyl methacrylate) denture base resin. Monomer pretreatment of acrylic resin produced significantly higher bond strengths when compared to sandblasting and control for both resilient liners ($P< .001$). Sandblasting significantly decreased the bond strength for both the liners when compared to monomer pretreatment and control ($P< 0.001$). Mean bond strength of Super-Soft lined specimens was significantly higher than Molloplast-B in various surface treatment groups ($P< 0.05$).

The bond failures were classified as adhesive, cohesive and mixed, and were considered together for both materials. Adhesive failures occurred when tensile strength of the soft liner was greater than its bond strength to PMMA and were mainly exhibited by sandblasted specimens. Cohesive failures occurred when tensile strength of the soft liner was less than bond strength and were mainly exhibited by monomer treated specimens. Control group mainly showed mixed type of failure indicating that the bond strength of the liner was nearly equal to the tensile strength of the liner. Results of this testing must be interpreted with caution

as there are numerous factors which affect test results e.g. liner thickness, duration of application of monomer, strain rate, test methods, etc.[10]

CONCLUSION

Authors found that surface pretreatment of the acrylic resin with monomer prior to resilient liner application are an effective method to increase bond strength between the base and soft liner.

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