A COMPARATIVE STUDY ON THE BONDING STRENTH BETWEEN THE DENTURE BASE AND THE RELINING MATERIALS

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SUMMARY:

This study reports data and observations obtained while evaluating the surface preparations; the chemical structure and the way of relining (chairside method or laboratory).

PMMA and silicone resilient lining materials were applied to these surfaces and the bonding strength was estimated with the help of the so called "peeling adhesion " test.

Key words: chairside, peeling adhesion

INTRODUCTION

Lots of materials have been used as resilent liners since the introduction of velum rubber, but with different kind of success. Limitations still exist in the sphere of cleansability, hardness, volumetric behaviour due to water absorption and abrasion resistance.The major problemwas and still is the adhesive failure between the denture base and the liner.The importance of this bonding strengthwas recognised when Wright concluded that the most common reason for failure is the lack of adhesion between the denture base and the liner.

Craig and Gibbons suggest a roughened surface in order to improve the adhesion.Storer sandblasted the acrylic resin surface and then place the resilent liner. But some authors such as Amin et al. stated the opposite effect of roughening.

Nowadays the research is towards finding some other ways of icreasing the bonding strength, such as different kind of primers, even lasers etc.

PURPOSE

The main purposes of this study are:

1. To estemate the the bonding strength between the the denture base and the lining material.

2. The effect of sandblasting and primer upon this strength.

3. The influence of relining type (chairside method or laboratory) upon the bonding strength.

METHOD AND MATERIALS

Two types of relinig materials were used:"Elite Soft"(Zhermack) on vynil-polysiloxane (VPS) base and "Ever Soft"(Austenal) on PMMA base. Eight complete dentures from acrylic resin were made and relined afterwords (table 1).

Table 1.

Eight Complete Dentures	
Elite Soft (VPS)	***Ever Soft (PMMA)***
1. Control	5. Control
2. By sandblasting	6. By sandblasting
3. Chairside method and primer	7. Chairside method and monomer
4. Laboratory method	8. Laboratory method

Sandblasting device "Krupp Dental" was used. Pic 1.

Pic. 1

The dentures were held in light contact with the nozzle and were treated with 250 microns aluminum oxide particles at a pressure of 0.6 MPa for 30 secunds. Each specimen was viewed under a microscopeto locate any eventual

untreated areas. If found such areas were treated for another 10 sec. After that all speciemens were placed in ultrasonic cleaner for 10 min. to remove any remaining residue.

After being relined the dentures were put to a stand one by one and to the relined area plates with different weight were attached in order to estemate the so called "peeling test".

RESULTS

The results are shawn on Fig. 1.

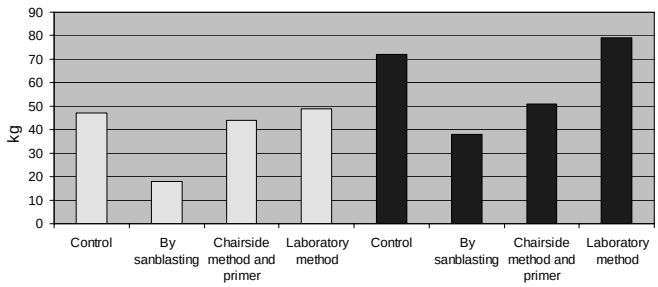

Figure 1

It is obvious from the data that the major strength is achieved between PMMA-PMMA in the laboratory method of relining, while the lowest is betwwen VPS-PMMA without using a primer.

The nature of the bond failure can be categorized into one of the following types:

1. Cohesive failure. The the liner ruptured within itself.

2. Initial adhesive fracture, followed by cohesive one.

3. Peripheral cohesive failure with central adhesive ad the same time.

DISCUSSION

The bond failure between the denture base and the soft lining material for along period of time has been the main reason for their limited use. To solve this problem many authors suggest to roughen the contact area in order to icrease the border zone and by that way to create the so called "mechanical locks".Nevertheless such roughening not always leads to increasing the bond strength, even just the opposite.

Amin et al. suggest that the lower bond strength in such cases is due to the surface tension between the two materials.

The size of the roughenings made by sandblaster could be another possible reason.Probably they are not big enough the relining material to enter them.

And yet another explanation is the ability of the liner to penetrate into the irregularities of the acrylic resin. K= a.cos b / 2c , where K is the penetration coefficient, a- the surface tension, b- the contact angle, c -is the viscosity of the material.

By this same logic the higher the viscosity is, the lower the penetration is.This could explane to some extent the lower peel strenghts observed in this study.

As far as the chemical origin of the two relining materials is concerned, one must state that the peel strenght on the PMMA-PMMA contact area is higher than: PMMA-VPS. This is due to the similar chemical staff in the first case and the totally different ithe second one.In the first case both materials make the so called co-polymers during polymerization process. The bond becomes even stronger if the denture base is covered with monomer beforehand.

On the PMMA-VPS border no chemical bond occurs. It is the primer, that plays the role of a mediator between to totally different materials.

The explanation of the fact that during the laboratory methods, higher strenght is achieved is that besides all that mentioned before in the laboratory the denture is is placed in hot water under pressure (1.5 bar for 15 min). That is way we strongly recommend always when the relining can be postponed, to take an impresion with the denture and to send to the laboratory.

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