

Original Article

A Comparative Analysis Of Retentive Qualities Of Hard Chairside Relining Materials On Maxillary Denture Base - An In Vivo Study

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Abstract

Background: The present study was to compare the retentive qualities of two hard chair side relining materials on maxillary denture base, and compare the retention of relined and un-relined denture. **Material and method:** Twenty healthy subjects with edentulous maxillary ridge and good oral hygiene and a complaint of loose denture were selected as a part of this study. After using the old denture as denture base, three new denture bases were fabricated for each subject and then these denture bases were relined using materials B and C. A specially designed retention apparatus consisting compact force gauge was used to measure the retention values of denture bases before and after relining with three hard chair side relining materials. **Results:** There was a statistically significant increase in retention of denture bases after relining with material B, C as compared to the retention of old denture base (A). Among all the relining materials, material (C) has shown best results. **Conclusion:** Relining the denture bases with hard reliners significantly improved the retention of the denture base. Further studies with time based functional analysis on clinical performance of hard relining agents especially as related to colour stability, resistance to fracture and surface condition are required.

Keywords: Basal surface, Denture base, Hard Reliner, Retention,

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INTRODUCTION

The complete loss of natural teeth can present a considerable personal tragedy and social stigma for the patient. A removable complete denture is the only proven non-invasive treatment modality that is readily available to an edentulous patient and should be made in such a manner that these feel at home in the mouth of the individual.^{1,2} All dentures which depend on edentulous ridge areas for all or part of their support must be accepted as temporary dental restorations. This is because edentulous ridge areas continue to decrease in size throughout the life of the patient. All denture wearers should be advised of the importance of regular dental examinations and any necessary servicing if they are to obtain a maximum period of efficient service from such restorations.³ To maintain the prosthesis-tissue relationship, reline or rebase procedures are commonly required.

Relining is the procedure in which the tissue side of the denture is resurfaced with new base material where as in rebasing entire denture base material is replaced with a new base material.⁴ The aim of this in-vivo study was to compare retention of maxillary denture bases before and after relining with different hard relining materials.

MATERIALS AND METHODS

The present study was conducted on twenty edentulous subjects, both males and females who reported in the Department of Prosthodontics, H.P Government Dental College, Shimla, Himachal Pradesh. The study was carried out in the following manner:

1. Evaluation of the patient
2. Fabrication of denture base from old denture.
3. Fabrication of cast from old denture
4. Duplication of cast

5. Fabrication of heat cured denture base on duplicated cast
6. Relining with materials
7. Immersion of relined denture base in water bath
8. Measurement of retention before and after relining
9. Analysis of data

Evaluation of the patient

Twenty healthy edentulous subjects were evaluated for the following inclusion and exclusion criteria:

Inclusion Criteria:

1. Healthy subjects with completely edentulous maxillary ridge.
2. These patients should have worn denture for varying periods of time, with marginal adaptation and retention with complaint of loose or "falling" denture.
3. Patients without any systemic diseases or controlled systemic diseases.
4. Maxillary ridge with no severe undercuts so as to delimit the effect of undercut on retention.

Exclusion Criteria:

1. Patients with major osseous surgery or any congenital or acquired osseous abnormality found in the mouth.
2. Patients with flabby ridges.
3. Patients with history of allergy to dental materials.
4. Patient with any pathology of oral mucosa.

Fabrication of denture base from old denture

Old dentures of the patients were taken and all the teeth and the material were trimmed to appropriate thickness of around 3mm so that the old denture acts as denture base and were designated as A (Fig. 1).

Fabrication of cast from old denture base

The old denture which was converted to denture base was poured in Dental stone (Type III) and a cast was fabricated (Fig. 2).

Duplication of cast

The maxillary cast was indexed with four triangular notches in the land area on the lines joining canine eminences and hamular notches for identical reference positions. The indices on canine eminences were marked as A and B, and those on hamular notches as C and D. The indexed cast was duplicated using reversible hydrocolloid impression material (agar-agar). Total two casts were fabricated in Dental Stone (Type III) and were designated as B and C.

Fabrication of two heat cured denture base on duplicated cast

The test bases were fabricated on the two duplicated casts using heat cure acrylic resin and

processed according to the manufacturer's directions. The two test bases were designated as B and C, as per the cast on which they were fabricated (Fig. 3). The test bases were finished and polished using acrylic trimming burs and sandpapers, and a wire loop of 19 gauge orthodontic wire was placed on the centre of the vault, following intersection of the indices on the cast i.e. at a point of intersection of lines joining canine eminence and hamular notch (lines joining indices A to C and B to D). The loop was secured in position with the help of auto-polymerizing acrylic resin material (Fig. 4).

Relining with materials

Before starting the relining the denture bases were prepared. Each denture base was roughened on the tissue surface and trimmed along the borders to create space for relining material (Fig. 5).

- Group A were the original denture of the patient and were tested for its retention.
- Group-B were relined using auto polymerizing resin (DPI-RR cold cure).
- Group-C were relined using Ufi Gel hard (VOCO) according to the manufacturer instructions. Conditioner was applied with enclosed brush on all surfaces to be relined and let dry in the air (approx. 10 s).

Immersion in water bath

Groups B and C relined with materials B (DPI-RR cold cure) and C (UFI gel Hard VOCO) were placed in a waterbath at $55 \pm 1^\circ \text{C}$ for 60 minutes.

Measurement of retention of denture bases

Retention apparatus A specially designed apparatus consisting of a metallic stand and a digital force gauge was used to measure retention values. Stand consisted of a base, a vertical arm and a movable T-shaped assembly having two pulleys. Nylon thread was passed over these pulleys which were attached to denture base at one end and force gauge at other end. A rectangular metal tube with adjustable L-shaped extension having chin rest was attached horizontally to vertical tube which can move up and down with the help of screws. Digital force gauge (Lutron FG 5000 A) with 3 types of display units: gram, Newton and ounce was used. It had a measure capacity of 5000 g/176.40 oz. /49.03 Newton and overload capacity of 7000 g, high resolution, high accuracy, and peakhold.

Testing procedure

The patient was seated upright in front of the testing device in a comfortable position. The chin of the patient was placed quite firmly in the chin

rest. The test denture base attached to nylon thread was rinsed thoroughly with water prior to insertion in the patient's mouth to minimize the variable factors of retention which could be influenced by a change of salivary content and firmly seated on the foundation. Force gauge attached to other end of the nylon thread was slowly pulled down in vertical direction until the denture base was dislodged and peak value was recorded (in grams) for all the four denture bases (denture bases A, B, and C)(Fig. 7).

Analysis of data

The dislodging forces for the four denture bases (A, B, and C) of each subject were recorded (in grams) and the collected data was subjected to statistical analysis. Following statistical methods were applied in this study:

1. Analysis of variance – One way (one-way ANOVA)

Decision criterion:

P-value < 0.05 indicates a significant difference between the groups. The denture bases of each patient were designated as

- For group-A: retention forces were measured without relining.
- For group-B: retention forces were measured after relining with material B (DPI-RR cold cure).
- For group-C: retention forces were measured after relining with material C (Ufi Gel hard- VOCO).

RESULTS

Table I showed the mean values of retention of denture bases obtained before and after relining with material B, and C with range of means 733 gms-1911.16 gms, 1303.66 gms -2506.66 gms, and 1860.00 gms-3035.00gms. One way ANOVA was used to compare the retention forces of test bases (Table II).



Figure 1: Old denture base



Figure 3: Heat cure denture base (B and C respectively)



Figure 2: Cast

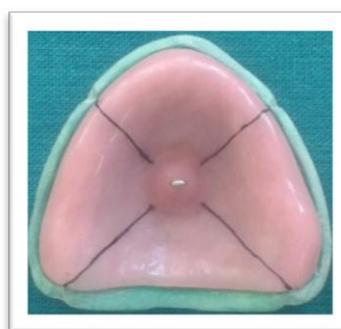


Figure 4: Indexed cast



Figure 5: Relined denture base(B and C respectively)



Fig-6: Testing procedure

TABLE I: Shows mean forces (in grams) for denture bases A,B, and C

Patient No.	(GROUP-A)	(GROUP-B)	(GROUP-C)
1.	1506.66	2206.33	2796.66
2.	776.66	1412.33	2000.00
3.	1911.66	2422.33	2909.33
4.	1597.66	2411.66	2906.00
5.	1711	2404.66	2899.00
6.	1816.66	2503.66	3035.00
7.	733	1402.00	2000.00
8.	765	1491.00	1995.66
9.	1551.66	2005.66	2605.00
10.	1513	2162.00	2607.00
11.	781.66	1306.66	1928.66
12.	775.66	1464.00	1904.00
13.	875.66	1510.33	2011.00
14.	873.33	1477.66	1860.00
15.	1209.33	1802.66	1914.33
16.	1710	2306.00	2880.66
17.	1757.33	2354.33	2830.66
18.	1878.66	2408.33	2993.66
19.	897.33	1405.00	1988.66
20.	1196.66	1782.00	2428.33

TABLE II: Shows statistical analysis of retention of maxillary complete denture bases using “one-way ANOVA test”

Method	No. of Cas	Mean ± S.D.	df	p value	Sig (2 tailed)
Without relining group (A)	20	1291.9290±443.025			
With relining with material group (B)	20	1911.9300±444.146	76	0.000	Sig
With relining with material group(C)	20	2424.6805±456.941			

DISCUSSION

The present in-vivo study was planned to evaluate and compare the retentive qualities of hard chair side relining materials on maxillary denture base. The objective was to evaluate the effect of relining on retention of denture bases and compare the retention of the denture bases before and after relining. The comparisons were made based on the statistical analysis using the 0.05 level of significance. It was observed that the difference in retention values before and after relining was significant. The retention of a complete maxillary denture is adequate when first fitted, but decreases as resorptive processes continue. Literature suggests this occurs due to loss of intimate tissue contact, thus relining of old denture will provide close adaptation of the denture base to the underlying soft tissues, further increasing the retention of denture base. Another objective of the study was to compare the retentive properties of two hard chairside relining materials. Here, the significant increase in retention values is attributed to the composition of relining materials. Literature suggests material (B) is non-crossed linked whereas material (C) is cross-linked which affects the impact strength, flexure strength, tensile strength, modulus of elasticity, water sorption and solubility of the cured polymer.^{5,6,7} In cross-linked materials, water sorption is less resulting in decreased detrimental effects on the physical and mechanical properties. In water sorption, water interacts with the polymer chains producing effects like loosening of the structure, solvation or reversible rupture of inter-chain bonds and irreversible disruption of polymer matrix. Thus, non-cross-linked materials have increased water sorption thereby reducing the cohesive properties of the material. Forces of cohesion are responsible for adequate retention of the relined denture base thereby explaining the decreased retention in non-cross linked relining materials.^{6, 8} These findings suggest that relining the denture surface with hard liners will result in a significant improve in their retention. Also there is an increase in retention as the crosslinking of the materials improved and as well as when the residual monomer content decreased.^{5- 9, 14- 16} In this study, time based functional analysis on clinical performance of hard relining agents especially as related to colour stability, resistance to fracture and surface condition was not conducted. Further time dependent assessment and longer investigations together with check up on oral health status of each patient are important in this type of treatment.

Relining in complete dentures might be beneficial for improving the retention but care should be taken regarding the hypersensitivity and long term durability of relining materials.^{9, 11, 12}

CONCLUSION

On the basis of results and conditions of this study, following conclusions were drawn:

- There was a statistically significant increase in retention of denture bases after relining with material B, and C as compared to the retention of old denture base (A)
- Among all the relining materials, material C (UFI Gel Hard) has shown best results.

Although the results of this study show significant improvement in retention of denture bases after relining, further studies with time based functional analysis on clinical performance of hard relining agents especially as related to colour stability, resistance to fracture and surface condition should be conducted. Further time dependent assessment and longer investigations together with check up on oral health status of each patient are important in this type of treatment.

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