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Original Article

Comparative evaluation of retentive properties of acid etched resin bonded fixed partial dentures

Lt Gen Vimal Arora, VSM[**a,*], *Col M.C. Sharma, (Retd)*[b], *Ravi Dwivedi*[c]

[a] *DGDS & Col Commandant, AD Corps, 'L' Block, IHQ of MoD (Army), New Delhi 110 001, India*
[b] *Prof & Head, (Prosthodontics), Maitri Dental College & Research Centre, Anjora, Durg, Chattisgarh, India*
[c] *Prof & Head, (Prosthodontics), BBD College of Dental Sciences, BBD University Campus, Faizabad Road, Lucknow, India*

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ABSTRACT

Background: Little consensus exist in suitable tooth preparation design and alloy pre-treatment methods for improving the retention of resin bonded fixed partial dentures (RBFPDs).

Methods: An in-vitro experiment was done with four designs. Group A: standard form, B: wings and proximal slices, C: wings, proximal slice and grooves, D: wings, proximal slice, grooves and occlusal coverage. Alloys were subjected to pre-treatment procedures like Group I: control, II: sand blasting, III: electro etching, IV: tin plating. Debonding forces of the castings were recorded in a universal testing machine and results were analyzed by student's 't' test.

Results: Group B, C and D showed higher debonding forces compared to A. However, there were no significant differences in mean force values among Groups B, C and D. Group II, III and IV with different alloy pre-treatment methods demonstrated higher values against control. Inter group variations among Group II, III and IV were not significant.

Conclusion: Tooth preparation with adequate surface extensions and pre-treatment procedures of casting alloys are two parameters that play important role in determining the retentive features of RBFPDs. Different types of tooth preparation designs and alloy pre-treatment methods exert almost similar influence in increasing the retention of acid etched RBFPDs.

Introduction

Rehabilitation of edentulous spans in dental arches is accomplished by replacing missing teeth by means of removable/fixed partial dentures or implant supported prosthesis. In patients where implants are not feasible or where retention of the prosthesis can be achieved with minimal preparation of the abutment teeth, resin bonded fixed partial dentures (RBFPD) offer a favourable option for restoring missing teeth. Earliest attempt to make a RBFPD to periodontally compromised anterior teeth was made by Rochette in 1973.[1] Later in 1977, Howe and Denehy[2] applied this method to fabricate interim

* *Corresponding author*. Tel.: +91 011 23094764.
E-mail address: vimalaroravsm@gmail.com (V. Arora).
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partial dentures. Conservative reduction of abutment teeth was an appealing concept and thus started the era of RBFPDs.

Resin bonded partial dentures, thereafter have undergone tremendous changes in terms of materials and designs. 'Cast perforated resin bonded dentures' are based on 'mechanical retention' where retention of metal casting to tooth preparation is improved by perforations. 'Virginia bridges' are another type which make use of 'macroscopic mechanical retention' mechanisms that create large undercut areas for retention.[3] 'Etched cast resin bonded dentures' (Maryland bridges) employs 'micromechanical retention' and for this, electrolytic etching of alloy surface is done. 'Adhesion bridges' make use of adhesives with provision for chemical bonding to metal. In addition to all these designs, several *pre-treatment methods* like sand blasting, electrolytic etching or metal plating may be applied to the fitting surface of the casting to enhance bonding of RBFPDs.[4] Since metallic alloys are integral parts of RBFPDs, bonding of casting to tooth preparation is achieved through the use of adhesives like BIS-GMA resins or composite luting cements which have glass fillers and adhesion promoters. Few of the products have even fluoride releasing mechanisms to reduce enamel decalcification around tooth preparation.[5] Currently, '*etched cast resin bonded fixed partial dentures*' enjoys wider acceptance and popularity due to their relative ease of fabrication and predictable results.[6]

The success of etched cast RBFPDs is largely dependent on *tooth preparation*. Different designs have been proposed by various authors, with varying claims for enhancing retention and resistance form. The standard preparations have wings and occlusal rests on the abutment teeth, while other patterns reported have proximal slices, grooves and extended coverages on occlusal surfaces.[6] Nonetheless, there is little agreement among clinicians, either on the 'appropriate design for tooth preparation' or for the 'alloy surface pre-treatment'.[7] In this context, it is imperative to evaluate the effectiveness of different types of tooth preparation/designs and metal pre-treatment procedures so as to determine the suitable combinations for enhancing the retention and clinical longevity of etched cast RBFPDs. The retentive properties between metal casting and tooth preparation are usually assessed in standard testing equipments by determining its debonding forces.

The aim of this study was therefore to compare the retentive properties of etched cast RBPDs using various modifications in the tooth preparation designs on abutment teeth and different pre-treatment procedures on the fitting surfaces of castings in an in-vitro simulated clinical set up. The objective was to find out the most appropriate abutment design and surface pre-treatment method for casting alloys.

Material and methods

Lower first pre-molar and molar Ivorine teeth were used for the study (Columbia Dentoform Corp, NY). Teeth were mounted upright on acrylic blocks of 5 × 8 × 2.5 cm dimensions, replicating a partially edentulous clinical situation (missing lower second pre-molar). Four such master models were prepared with identical morphology. Each model was surveyed using Ney's surveyor (Dentsply, Milford) and undercut areas were marked. Four types of tooth preparation designs (Figs. 1–4) and four types of casting alloy pre-treatment methods: sand blasting, electro etching and tin plating were used. Samples were thus grouped into 4; (Groups A to D) based on their design preparations and as per the surface pre-treatment methods carried out on the fitting surface of castings alloys, they were categorized into Group I to IV. The study frame work thus formed a total of 80 samples as shown in Table 1.

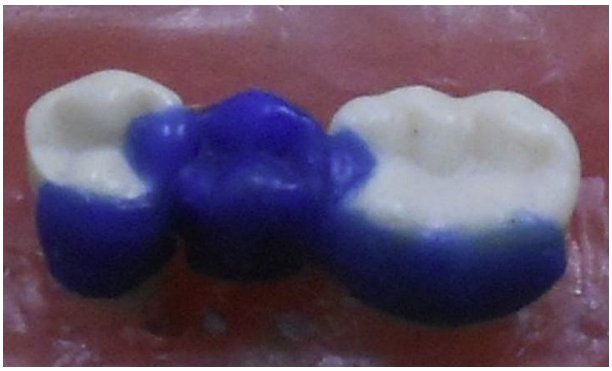

Fig. 1 – Standard tooth preparation with wings and occlusal rest (Group A).

Impressions were made of each master block using Polyvinyl siloxane® (Reprosil, De Trey, Dentsply, Milford) using specially constructed trays, from which wax patterns were

Fig. 2 – Tooth preparation with proximal slice (Group B).

Fig. 3 – Tooth preparation with wings, proximal slice and grooves (Group C).