



## A Modified Conservative Posterior Resin-Bonded Fixed Partial Denture – Report of a Case.

### KEYWORDS

Resin bonded fixed partial denture (RBFDP), minimally invasive treatment.

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**ABSTRACT** *The introduction of adhesive resin restorations preceded and permitted the resin-bonded fixed partial denture (RBFDP) to become a viable alternative to conventional removable partial dentures (RPDs) in pediatric patients. This article describes the use of resin-bonded fixed partial denture with a modified design as a conservative minimally invasive treatment option for the replacement of maxillary first molar.*

### Introduction:

The resin-bonded fixed partial denture (RB FPD) is a treatment alternative for replacement of missing teeth when tooth substance-conserving preparation is needed.<sup>[1]</sup> Since the description of macro mechanical retention of cast metal alloy to tooth by Rochette in 1973, there has been an evolution toward simpler methods of alloy preparation to produce micromechanical retention.<sup>[2]</sup> Resin bonding of FPDs has become an important technique in the provision of dental health care. Resin-bonded prostheses (RBPs) are relatively uncomplicated clinically because tooth preparation does not involve extensive removal of sound tooth structure.<sup>[3]</sup> Tay has suggested that the success of RBPs depends on patient selection and design of retainers<sup>[4]</sup>. Treatment planning is also critical because patients with evidence of parafunction, short teeth, or sparse enamel are a poor risk for RBPs. Thompson et al reported that the success rate of resin-bonded fixed partial dentures (RBF-PDs) was directly related to the adhesive system and the configuration of tooth preparations for retention, resistance to stress, and control of resinous cement fatigue. The contribution of retention/resistance form to individual crowns and FPDs has been well documented<sup>[5]</sup>. Shillingburg et al reported that resistance form prevented dislodgment of restorations by forces in oblique directions and prevented movement of restorations by occlusal forces<sup>[6]</sup>. Verzijden et al discovered that mechanical retention of RBFDPs was required to resist complex stress because of potential rotation of the retainer that surrounded the occlusal rest axis<sup>[7]</sup>. They also reported that RBFDPs were more retentive in the maxilla than in the mandible with superior survival times. The incorporation of tooth preparation modifications such as cingulum rests, grooves, and extensive wrap-arounds has been advocated to improve resistance of the prosthesis to debonding. Lankford and Christensen stated that modifications in teeth, such as grooves or slots, were required to provide adequate resistance form<sup>[8]</sup>. Potts et al showed that the addition of grooves resulted in a marked increase in resistance form<sup>[9]</sup>. Placement of opposing grooves at line angles combined with occlusal coverage has been shown to enhance resistance.<sup>[10]</sup> A definite path of insertion has been recommended for posterior RBPs to provide resistance to displacement in any direction, but there have been minimal data on the effect of configuration design for retainers of posterior teeth.<sup>[11]</sup> Thus this article presents the case report of modified design of posterior resin Bonded Fixed Partial Denture with a Modified Design.

### Case Report:

A 14 year old male patient on clinical examination had initially missing upper permanent left first molar (figure 1) with good periodontal health and a stable intercuspal position, normal vertical and horizontal overlap, and canine guidance in lateral excursions.



**Figure 1: Pre op Photograph**

Removable partial denture and RBFDPs were presented as possible treatment options for the replacement of his missing teeth. The patient selected RBFDPs as he preferred fixed interim prosthesis compared to removable prosthesis.

**Frame work design:** A modified resin bonded fixed partial denture design was used and it is described as follows

**Occlusal Rest:** A spoon spaced occlusal rest seat is placed in the proximal marginal ridge area of the abutment tooth adjacent to the edentulous space. The size of the occlusal rest seat is

**Groove:** The grooves is placed proximal and palatal surfaces of abutment teeth using chamfer diamond bur (878014F; NTIKahla, Kahla, Germany) 1mm depth , 2mm length , 1mm width .

**Metal Frame:** A minimum 180-degree encirclement of the tooth was prepared using chamfer diamond bur (878014F; NTIKahla, Kahla, Germany). This encirclement provides resistance to palatal dislodgment of the retainer.<sup>[12]</sup>

After tooth preparation, impressions were made by means of the double impression technique using a standard perforated rim lock tray and heavy and light viscosity vi-

nyl-polysiloxane (Aquasil; Dentsply, Milford, Del.). Shade selection was then made. RB FPD was fabricated in the laboratory. The preparation was cleaned, and the restoration fit was evaluated with an explorer. The occlusion was evaluated with articulating paper and it was satisfactory. Then the prosthesis is luted with resin cement (figure 2).



**Figure 2: Post Op Photograph**

#### Discussion:

Resin-bonded fixed partial dentures (RBFDP) have been accepted as a significant means of replacing missing teeth in Prosthodontic since Rochette introduced this concept in 1973<sup>1</sup> and have now been extended from anterior teeth to the posterior regions of the jaw, with their heavier occlusal demands.<sup>113</sup> The advantages of resin-bonded retainers include infrequent need for an esthetic, possible maintenance of existing occlusal relationship, presence of supragingival margins, minimal tooth preparation, and possibly reduced cost. Suggested disadvantages include the inability to correct shape or color discrepancies in the abutment or substantially modify occlusal relationships, and difficult provisionalization when required or requested.<sup>114</sup>

#### Success rate of RBFDP:

Behr et al reported a 95% survival rate for RBFDPs after 10 years using a strict preparation protocol.<sup>115</sup> Besimo et al found a 94% 5-year success rate for RBFDPs when a strict fabrication and bonding protocol was used.<sup>116</sup> Samama reported an 83% 10-year survival rate for RBFDPs that replaced 1 or 2 teeth.<sup>117</sup> Creugers et al reported a 75% survival rate for anterior RBFDPs after 7.5 years.<sup>118</sup> Romberg et al performed a biologic evaluation of RBFDPs of 136 patients who were recalled periodically, and after 10 years, only limited impact on periodontal health was reported. They found no effect on the gingival index but an increase in the plaque index. Probing depths increased on the lingual (1.54 to 1.78 mm) and mesiolingual (2.12 to 2.33 mm) surfaces. However, the long-term periodontal response was found to be favorable.<sup>119</sup> De Kanter et al focused on the posterior RBP and reported that the survival rate was 65% for maxillary prosthesis and 40% for Mandibular prosthesis. From these studies, the resin-bonded prosthesis used in the posterior mandibular region suffered from a higher risk of failure due to posterior heavier occlusal demands.<sup>120</sup>

Although interface de-bonding between metal and abutment teeth was purposed as one of the major failure modes of the RBFDP system, proper design of prostheses and teeth preparation might arise as predominant contributors to unpredictable clinical retention when bonding technology has reached an acceptable level. The modified preparation design used here contributed for the better success in this patient, where occlusal rest seat is placed

for resistance to gingival displacement. The groove placed on proximal and palatal surfaces of an abutment tooth serve two main functions: to define the path of insertion and to provide retention and resistance form to the retainer against dislodging forces acting on the pontic.<sup>121</sup> When designed with mesial and distal occlusal rests alone, the pontic may rotate along an axis formed by the two rest seats when occlusal force acts on the occlusal incline of the pontic.<sup>122</sup> The palatal framework (plate) or the retainer is essentially responsible for the retention of RBFDP. It is advantageous to have a large area of enamel to aid in bonding the plate to the abutment tooth. A 180 degree encirclement prepared enables the restoration to resist lateral loading by engaging the underlying tooth structure.

Kern and Wegner evaluated different adhesion methods and durability after long-term storage (150 days) and repeated thermal cycling, based on which Panavia 21, and provided a long-term durable resin bond. As this material is recommended as a luting agent for RBFDPs.<sup>123</sup> The same was used to cement the RBFDP described in this report.

The 15 months follow-up indicated excellent serviceability and a well satisfied patient. Thus RBFDP as presented is a minimally invasive prosthesis. In light of this clinical application, it is suggested that clinical use of RBFDPs is promising. Further studies are needed to evaluate the long-term clinical performance of RBFDPs.

#### Summary:

The resin-bonded fixed partial denture (RBFDP) is a treatment alternative for replacement of missing teeth when conservation of tooth structure is needed. This modified design is a conservative and esthetic approach to RBFDP.

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