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Resin-bonded Cast Splints for Loosened Abutment Teeth to Anchor a Removable Partial Denture: A Case Report

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Abstract - *This case report describes a technique to stabilize loosened abutment teeth by seating resin-bonded cast splints with rest seats and surveyed guide planes to anchor a removable partial denture. This technique can achieve sufficient stability of the abutment teeth and proper support and bracing of the removable partial denture with minimal intervention.*

KEY WORDS: abutment teeth, minimal intervention, removable partial denture, resin-bonded splints

INTRODUCTION

In removable prosthodontics, resin-bonded cast restorations with a cingulum rest seat or a guide plane[1-5] have been proposed as an alternative to conventional restorations when appropriate. One of the problems of removable partial dentures associated with periodontal diseases is the mobility of loosened abutment teeth. The most reliable treatment for loosened teeth is the seating of splints consisting of continuous multiple full coverage restorations. However, a great amount of tooth reduction is required for this procedure, to the point of sacrificing the dental pulp, if necessary. In such cases, a resin-bonded cast splint[6,7] may be effective. In our previous report[8], stabilization by splinting an endodontically treated tooth and a minimally reduced vital tooth with a resin-bonded cast retainer was presented.

The present case report describes a technique to stabilize loosened intact abutment teeth by seating resin-bonded cast splints with rest seats and surveyed guide planes. This technique requires minimal intervention and achieves sufficient stability of the abutment teeth and proper support and bracing of the removable partial dentures.

CASE REPORT

A 72-year-old man visited the clinic with the chief complaint of masticatory disturbance and a poor aesthetic appearance associated with several missing mandibular anterior and posterior teeth. The mandibular left canine and first premolar had been restored with continuous ceramic-fused-to-metal crowns seated by his previous family dentist. The crown of the first premolar had a mesial occlusal rest seat and a distal guide plane. Examination revealed moderate tooth mobility of the right first premolar and the left central and lateral incisors, which were the nearest teeth to the missing area. The bone supports of the right second premolar and the left canine seemed to be sufficient to receive the applied occlusal force. The patient preferred conservative treatment without further tooth extraction, other surgical treatments or removal of any existing restorations, mainly because of his generally poor health. Before a mandibular removable partial denture was fabricated, a splinting technique with minimal reduction of the vital teeth and a partial veneer preparation of the metal surface of the ceramic-fused-to-metal crown was proposed, and he agreed.

After completion of initial periodontal therapy, the prosthetic treatment was started. A cavity for the right resin-bonded splint was prepared on the mesial and lingual surfaces of the first and second premolars, which were both vital. A mesioocclusal rest seat on the first premolar, a distoocclusal rest seat on the second premolar, as well as an intermediate occlusal rest seat that crossed the marginal ridges of the two teeth in the manner of an embrasure clasp, were cut. A cavity on the left resin-bonded splint was prepared on the mesial and lingual surfaces of the central and lateral incisors and the canine. Horizontal grooves[9,10] on the cingulum region and an intermediate incisal rest seat were prepared for the two incisors. A vertical groove at the mesial surface of the central incisor and a pinhole[11] in the cingulum region of the canine were made for mechanical retention. An impression was then taken using a reversible hydrocolloid (Aromaloid), and a working cast was formed using a high-strength plaster stone (Fujirock) (Fig. 1). The wax patterns of the resin-bonded splints were taken, invested, burned out conventionally, and then cast in a silver-palladium-copper-gold alloy (Castwell M.C.12) using a centrifugal casting machine. The casting was then polished (Figs. 1, 2).

At the next visit, the splints were tried-in, adjusted and the intaglio surfaces of the splints to be bonded were airborne-particle abraded with 50 μm grain-sized aluminum oxide particles (Aluminous Powder WA 360) using a grit blaster (Micro Blaster MB102). The enamel bonding surfaces of the abutments were cleaned with pumice and acid-etched with 37% phosphoric acid, thoroughly washed with water, and air-dried. The prepared metal surface of the ceramic-

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Figure 1. *Master cast showing tooth preparations and intaglio surfaces of resin-bonded cast splints.*

Figure 2. *Completed resin-bonded cast splints on master cast.*

Figure 3. *Seated resin-bonded cast splints in oral cavity.*

fused-to-metal crown of the left canine was air-abraded with 50 µm aluminum oxide using a portable intraoral sandblaster (Micro-etcher ERC), and a metal conditioner (Alloy Primer) was applied. Immediately before insertion, the same metal conditioner was applied to the freshly abraded intaglio surfaces. The splints were seated with an adhesive luting agent (Super-Bond C&B ivory), and then the mouth preparations for the removable partial denture were completed (Fig. 3).

A removable partial denture was constructed, and the new distal extension denture was finally placed (Fig. 4). The patient was satisfied with the fixation of the loosened teeth by the splints as well as the solution to the masticatory disturbance. However, the aesthetic problem of the exposed metal remained (Fig. 5).

DISCUSSION

It is widely known that the mobility of the abutment teeth is one of the crucial prognostic factors for the success of resin-bonded fixed partial dentures[12]. In the present situation, the intermediate occlusal rest seat between the right premolars and the incisal rest seat between the left incisors, as well as the retentive pin structure of the canine, had a determining role in keeping a tight grasp of these teeth. These rests extended onto the buccal or labial surfaces in order to prevent the mobile teeth from being forced to move in that direction, in opposition to the repetitive functional force from the antagonistic teeth, which is likely to debond the teeth gradually from the castings. However, the disadvantage of this design is its unaesthetic appearance because of the metallic color.

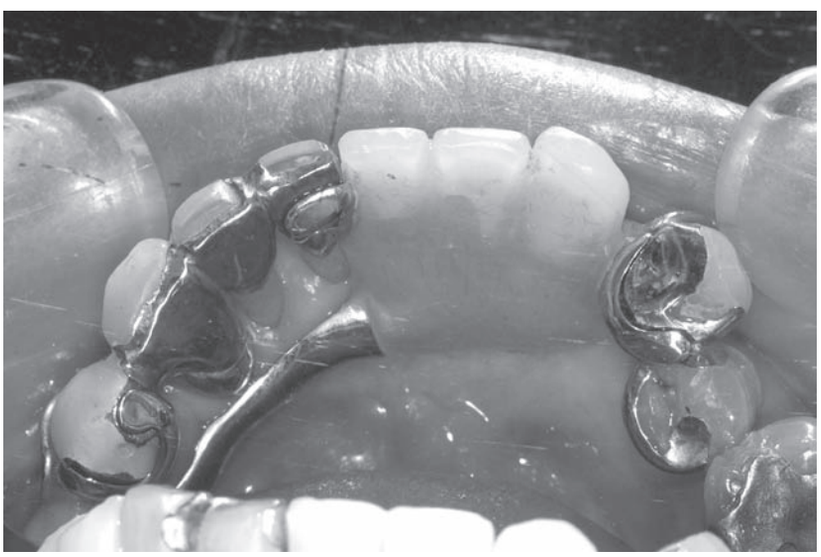

Figure 4. *Inserted removable partial denture blended well.*

Figure 5. *Frontal view after treatment.*

It was not clear from what kind of alloy the ceramic-fused-to-metal crowns had been fabricated, whereas the splints were made of a silver-palladium-copper-gold alloy. Alloy Primer is designed for both noble and base metal alloys and contains the thione monomer[13] and the hydrophobic phosphate monomer[14]. Therefore, the choice of this metal conditioner was reasonable because it is applicable regardless of the dental alloy.

The abutment teeth selection is one of the most definitive factors in prosthodontic treatment and is directly associated with the success of removable partial dentures. A study on the stress distribution on the oral mucosa by a removable partial denture reported that the saddle movement was influenced by the abutment selection on the tooth-supported side[15]. The rest location is a matter of great importance, as is the proper placement of guiding planes on the selected abutment teeth. One clinical factor to consider with regard to the rest location is dentinal exposure resulting from the rest seat preparations, which should be avoided. The rest seat preparations should not be overextended into the dentinal tissue and also should be sufficiently deep to receive the rests. From this viewpoint, the intermediate occlusal rest seat of the right premolars was designed in the cast splint in order to allow room for the proper thickness of the metal casting without dentinal exposure. The partial coverage of the mesiooccusal surface of the right first premolar with metal provided sound occlusal function in contact with the antagonistic teeth at the intercuspal position.

In summary, this case report describes a technique to stabilize loosened teeth by fixation using resin-bonded cast splints with rest seats and surveyed guide planes. The splints made from a silver-palladium-copper-gold alloy were airborne particle-abraded with alumina, primed with a metal conditioner, and bonded to the etched abutments or appropriately prepared undercasting with an adhesive luting agent. This technique can achieve sufficient stability of the abutment teeth and proper support and bracing of the removable partial dentures with minimal intervention. However, aesthetic improvement is needed to establish this technique as a valuable treatment option. A new method using glass fiber-reinforced composite[16, 17] instead of a cast metal framework may be an aesthetic alternative.

MANUFACTURERS' DETAILS

- Aromaloid, GC Corp., Tokyo, Japan
- Fujirock, GC Corp., Tokyo, Japan
- Castwell M.C.12, GC Corp., Tokyo, Japan
- Aluminous Powder WA 360, Pana Heraeus Dental Inc., Osaka, Japan
- Micro Blaster MB102, Comco Inc., Burbank, CA, USA
- Micro-etcher ERC, Danville Engineering, San Ramon, Calif., USA
- Alloy Primer, Kuraray Medical Inc., Tokyo, Japan
- Super-Bond C&B ivory, Sun Medical Co., Ltd., Moriyama, Japan

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