

Stabilization by splinting of an endodontically treated premolar and a minimally reduced vital canine with a resin-bonded cast retainer: A clinical report

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This clinical report describes a technique to stabilize a loosened tooth by splinting with a minimally reduced vital adjacent tooth using a cast retainer and a metal adhesive system. The retainer made from a silver-palladium-copper-gold alloy was air-abraded with alumina, primed with a metal conditioner (V-Primer), and bonded to the etched abutments with an adhesive resin (Super-Bond C&B). The retainer is functioning for more than five years, and the result indicates the effectiveness of the current technique.

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INTRODUCTION

Splinting is considered to be effective for stabilization of dentition with mobility caused by periodontal diseases and traumatic injury. Due to the relatively low dental caries activity of patients with chronic marginal periodontitis, clinicians are frequently requested to fix multiple intact teeth. One of the most reliable fixation techniques is placement of a cast splint device consisting of multiple full coverage restorations, although considerable tooth preparation is necessary with this procedure. The application of resin-bonded retainers with minimal tooth reduction, a method combining enamel etching and the use of unfilled resin adhesive, was reported thereafter.¹⁻³ Although bonding to enamel of bonding agents is currently established, the durability of bond to noble metal alloys of resin-based luting agent remains insufficient. A new metal conditioner capable of bonding noble metal alloys (V-Primer) was reported in the past decade. Both laboratory and clinical evaluation demonstrated the effectiveness of the primer.⁴⁻⁶ However, only limited information is available about the application of the new bonding system to tooth fixation.⁵ This clinical report describes a technique for splinting a mobile tooth adjacent to an intact tooth using a cast retainer and a noble metal adhesive system.

CLINICAL REPORT

A fifty-year-old female patient presented with a chief complaint of masticatory disturbance caused by missing left maxillary molars and mobility of the first premolar. Examination revealed moderate tooth mobility of the first premolar, and an X-ray photograph demonstrated considerable loss of bone support, especially in the distal area (Fig. 1). The premolar therefore seemed unable to serve as a clasped tooth in its current condition. Before starting periodontal and prosthodontic treatments, a splinting technique with minimal vital tooth reduction was proposed, and the patient's consent was obtained.



Fig. 1. Radiograph of a maxillary left first premolar with moderate mobility.

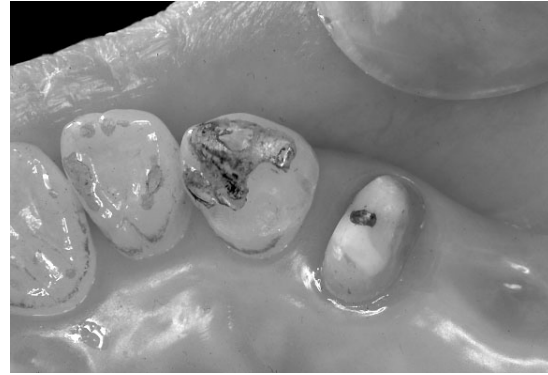


Fig. 2. Preparation of the first premolar to be used as a full cast restoration abutment. Occlusal color indicator demonstrates the cuspid protected articulation of the patient.

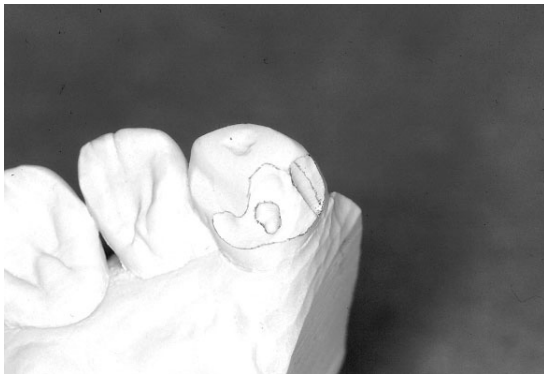


Fig. 3. Removable die of the maxillary canine. Preparation was limited only in the restricted area which should not contact the antagonistic tooth in any position of the mandible.

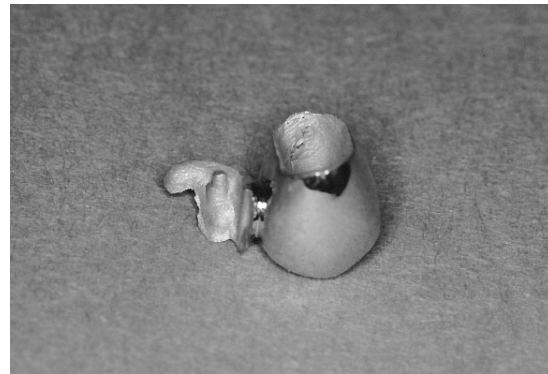


Fig. 4. Completed splinting device made from a silver-palladium alloy. Retentive structure is seen at the canine retainer.

After completion of periodontal therapy, prosthodontic treatment for the first premolar was started. Composite core build-up material combined with a prefabricated post was bonded to the root canal of the premolar. The abutment was prepared for a full cast restoration (Fig. 2). Next, a cavity was prepared on the linguodistal surface of the adjacent intact canine. The canine was vital, and the bone support was

sufficient to receive the applied occlusal force. Reduction was limited to the restricted area, which should not contact the antagonist in any position of the mandible. In addition, a vertical groove at the proximal plane and a pinhole in the lingual rest seat were sunk for mechanical retention (Fig. 3). An impression was made with a silicone elastomeric material and a working cast was prepared. A wax pattern for the two-unit splinting device was fabricated, sprued, and invested into a cristobalite mold material. A silver-palladium-copper-gold alloy (Castwell M.C. 12, G-C Corp., Tokyo, Japan) was cast in the mold by means of a centrifugal casting machine. The casting was adjusted and polished (Fig. 4).



Fig. 5. Occlusal view of the casting bonded with the V-Primer-Super Bond adhesive system (left).

Fig. 6. Occlusal view after five years of seating. Facial surface of the premolar has been modified using a resin-bonded overcasting.



Fig. 7. The premolar is also functioning as a clasped tooth.

Fig. 8. Radiograph five years after splinting. The level of the alveolar bone has recovered as compared with the pre-operative level.

The device was tried-in, and the surface to be bonded was air-abraded with 50 μ m grain-sized aluminum oxide (Aluminous Powder WA 360, Pana Heraeus Dental Inc., Osaka, Japan) using a grit blaster (Micro Blaster MB102, Comco Inc., Burbank, CA, USA). Shortly before insertion, a metal priming agent (V-Primer, Sun Medical Co., Ltd., Moriyama, Japan) was applied to the retainer with a sponge pellet. The abutment teeth were cleaned and etched with 37% phosphoric acid. The device was then seated with an

adhesive luting agent (Super-Bond C&B Ivory, Sun Medical Co., Ltd.; Fig. 5).

After insertion of the splinting device, the patient followed a regular check-up program. Although the facial surface of the premolar restoration was replaced with an overcasting in response to a request from the patient, the two-unit fixation casting is functioning for more than five years (Figs. 6 and 7). Fig. 8 shows a radiograph taken five years after splinting. The level of the alveolar bone has recovered considerably as compared to the pre-operative level.

DISCUSSION

A splinting technique for lower anterior teeth with no or minimal reduction was described by Rochette.¹ Improvement in adhesive techniques increased bond strengths between retainers and adhesive resin luting agents.⁶ A long-term follow-up study, however, indicated that mobility of the abutment teeth was one of the decisive prognostic factors for success of resin-bonded fixed partial dentures.² Furthermore, resin-bonded fixed partial denture without any retentive preparation form on each abutment tooth resulted in a significantly higher failure rate.³

Considering these results, application of a splinting device without tooth preparation seemed inadequate, although the concept of minimal intervention⁷ is important for the intact teeth. Retentive structures were reluctantly applied in the current case to extend both the life of the premolar abutment and the service period of the splinting device.

The advantages of the adhesively retained splinting technique are 1) higher probability of achieving an optimal result, 2) minimal tooth reduction, 3) low possibility of damage to the pulp, 4) simple technical procedure, and 5) preservation of the patient's innate occlusal function. One of the disadvantages of the technique has been insufficient bonding between resin-based luting agents and noble metal alloys, but this difficult problem seems to have been overcome by the development of thione primers.⁴⁻⁶ As shown in Figs. 6 through 8, the splinting device is satisfactorily functioning, and the premolar is surviving as the clasped tooth without any clinical problem. The clinical results indicate that this device has eliminated an enhanced rate of periodontal destruction, promoted remodeling of the alveolar bone, and maintained functional stability. This method is therefore suitable for construction of a fixed splinting device especially when proper stabilization must include an intact tooth.

CONCLUSION

A fixed splinting device with a unique abutment preparation design was reported. The longevity of the device was facilitated with the use of a noble metal adhesive system.

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