Repair of fractured lingual plate with a cast splinting device and metal conditioners: A clinical report

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This article describes a repair procedure which allowed a removable partial denture with a fractured lingual plate to be used as an interim prosthesis while a new one was fabricated. A groove was prepared continuously on the fractured lingual plate and denture base resin of the reassembled denture. A staple-shaped splint was cast and embedded in the groove with an adhesive resin. The resin around the splint was ground and a finish line was prepared. Autopolymerizing repair resin was applied to the space. In this situation, the patient used the repaired partial denture as an interim denture for 52 days until the new denture was completed. The present procedure using a cast splint and metal adhesive system may be a meaningful contribution to repair a removable partial denture with a fractured major connector without a dental solder with torch, electric or laser soldering technique. However, this procedure should be restricted to situations requiring interim treatment during completion of a new denture. **(Int Chin J Dent 2006; 6: 79-81.)**

Key Words: adhesive system, fracture, interim denture, major connector, repair.

Introduction

When a metal major connector of a removable partial denture fractures, many clinicians immediately start to fabricate a new denture without repairing the old denture or making an interim prosthesis. This practice is inconvenient and stressful for patients who must do without serviceable dentures for an indefinite period of time until the new denture is made. The laser welding technique[1-4] is a versatile option for the repair of a dental metal prosthesis, including the metal components of a removable partial denture. However, the laser welding technique has not come into wide use yet due to the high price of the laser processing apparatus. The procedure described in this report will allow patients to retain the function of their existing dentures until new dentures are fabricated for them.

Clinical Report

A 42-year-old man presented with the chief complaint of masticatory disturbance due to the fracture of the mandibular removable partial denture where the metal lingual plate had fractured along the external finish line (Fig. 1). The metal framework of the denture had been fabricated with cast cobalt-chromium alloy (Cobaltan, Shofu Inc., Kyoto, Japan). The maxillary dentition was natural teeth; none were missing. The thickness of the framework was sufficient at the fracture site, and no porosity was seen. When the patient was interviewed, he indicated that his hobby was fishing, and the denture fracture must have occurred when he bit on a particularly tough metal fishing wire. One treatment option was to make a new denture without repair of the existing one, but the patient adamantly requested that the denture be repaired on the same day. Although the success of such a repair was not guaranteed, it was determined that the fractured denture could be repaired for use as an interim denture.

To determine accurate fit, the denture was held together with sticky wax (New sticky wax, GC Corp., Tokyo, Japan) and small wooden sticks. Dental plaster (Plus-1, San-Esu Gypsum Co., Ltd., Osaka, Japan) was poured into the mucosal surface of the reassembled denture. After the plaster hardened, a continuous groove was prepared on the lingual plate and denture base resin (Fig. 2). A staple-shaped wax pattern (Violet Inlay Wax,

GC Corp.) of the groove was taken directly, invested (Cristobalite micro, GC Corp.), burned out and cast in a silver-palladium-copper-gold alloy (Castwell M.C. 12, GC Corp.) using a conventional spring-driven centrifugal casting machine. This casting is termed the "splint" in this article. The splint was subjected to hardening heat treatment, then its intaglio surface was airborne particle-abraded with 50 μm grain-sized alumina powder (Aluminous Powder WA 360, Pana Heraeus Dental Inc., Osaka, Japan) using an airborne particle abrasion unit (Micro Blaster, Comco Inc., Burbank, CA, USA) and primed with a metal conditioner (V-Primer, Sun Medical Co., Ltd., Moriyama, Japan).[5-8] The bonding area of the lingual plate was also airborne particle abraded and primed with another metal conditioner (Cesead II Opaque Primer, Kuraray Co., Ltd., Osaka, Japan).[9,10] The splint was then embedded in the groove with an adhesive luting resin (Super-Bond C&B ivory, Sun Medical Co., Ltd.) (Fig. 3). After 24 hours, the resin around the splint was ground, and a definite finish line for the splint was prepared by means of grinding the distal half of the splint. The new finish line was not considered to be consistent with the original finish lines of the lingual plate. Next, the above-mentioned surface preparation of the metal was performed again (Fig. 4). Autopolymerizing denture repair resin (Unifast II, GC Corp.) was applied to the space. The repair surface was polished, and the entire repair procedure was finished (Fig. 5). The fabrication of the new denture began immediately. The patient wore the repaired denture as an interim prosthesis until the splint on the temporary denture fractured along the newly prepared finish line after 52 days. The day after the interim prosthesis broke, the new denture was completed.

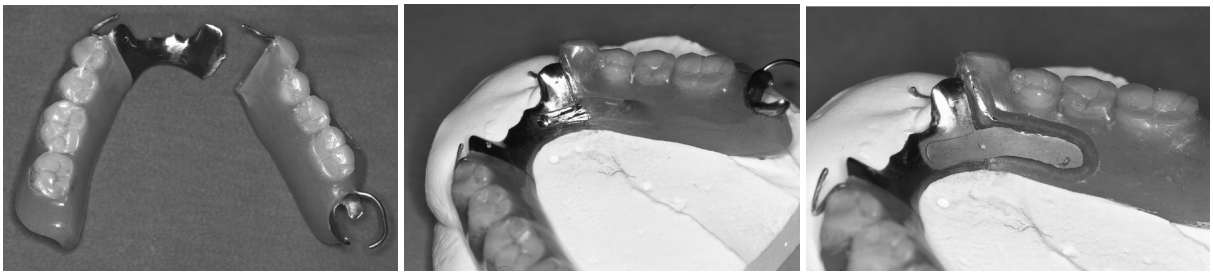

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Fig. 1. Mandibular removable partial denture with fractured metal lingual plate.
Fig. 2. Staple-shaped preparation for cast metal splint.
Fig. 3. Bonded cast metal splint.
Fig. 4. Preparations around repair area and new finish line.
Fig. 5. Completed repair.

Discussion

The denture repair described in this article is used only for the purpose of providing an interim denture while a new one is being fabricated. The bond strength of dental alloy to adhesive luting cements or to denture base resin is much lower than the tensile strength of removable partial denture alloys.[11] Two metal adhesive conditioners were chosen for the current situation. V-Primer is a conditioner for noble alloys that contains VBATDT. V-Primer and 4-META/MMA-TBB opaque resin effectively bonded light-cured composite and a silver-palladium-copper-gold alloy.[5] Cesead II Opaque Primer contains a phosphoric acid derivative (MDP) for bonding to a base metal alloy. The efficiency of MDP was reported with regard to the bonding of cast

cobalt-chromium alloy.[9]

A staple-shaped cast splint with a finish line was used because a sufficient thickness of the denture base resin around the splint seemed to be essential. However, the second denture fracture occurred when the splint broke along the new finish line. Since the thickness of the metal is drastically different at the finish line, the probability of denture fracture increases because of the excessive stress concentrations. The finish line was considered to be unnecessary because the repaired denture had been used as an interim prosthesis until the completion of the new one. The splint should be very rigid and also bond well to the resin. A silver-palladium-copper-gold alloy was used as the cast splint material because it was easy to handle. Examination of the secondary fracture indicated that the cause was not weak bonding between the metal and resin but the inferior strength of the splint. Based on our experience, the use of a cobalt-chromium alloy instead of a silver-palladium-copper-gold alloy should extend the lifetime of the repaired denture.

In summary, a procedure to repair a removable partial denture with a fractured metal lingual plate, which allows the repaired denture to be worn temporarily using a cast splint and metal adhesive system was described. The staple-shaped casting made from a silver-palladium-copper-gold alloy was airborne-particle abraded with alumina and primed with V-Primer. Half of the casting was bonded using Super-Bond C&B to the fractured cobalt-chromium alloy connector primed with Cesead II Opaque Primer; the remainder of the casting was embedded using an autopolymerizing acrylic repair resin. This repaired interim denture functioned well until it fractured 52 days after repair. This procedure should be restricted to situations requiring interim treatment during completion of a new denture.

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