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Case Report

# A Novel FRC Splint of Periodontally Treated Anterior Mandibular Teeth using Translucent Rigid Special Tray Technique (A Case Report)

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**Abstract**

Direct splinting of periodontal treated teeth is sometimes complicated with the current splinting techniques and materials. Splinting of mobile teeth has always been a challenge to clinicians. The development of Fiber Reinforced Composites (FRCs) has opened up new possibilities of chairside treatment options to manage these types of clinical situations. This paper describes novel direct-indirect teeth Fiber Reinforced Composite (FRC) splinting method-using Translucent Rigid Special Tray Technique (TRSTT) to allow for a single visit, chair side, durable and more accurate splinting of mobile mandibular periodontal treated anterior teeth.

**Clinical significance:** The combination of Fiber Reinforced Composite (FRC) and Translucent Rigid Special Tray Technique (TRSTT) can provide minimally invasive and a more durable, accurate and functional treatment option for splinting of mobile teeth. The completed splint provided tooth stability, improved function, and fulfilled the patient's aesthetic expectations and satisfaction.

**Keywords:** Dental Fixed Splint; Fiber Reinforced Composite; Rigid Tray

## Case Report

A 60-year-old patient with the chief complaint of discomfort while functioning on the mandibular anterior teeth with a mobility of 2 according to the Miller's Index as a result of secondary occlusal trauma of the mandibular incisors was referred to the clinic through his periodontist in order to teeth splinting.

### The clinical steps were as follows:

**Scaling and root planning:** Initially, the teeth were scaled and root-planed to assure that all calculus and stain was removed from the tooth surfaces. The teeth were cleansed on the facial and lingual surfaces using a prophylaxis cup with a non-fluoridated fine-sized pumice paste. After the teeth were thoroughly rinsed and dried, the interproximal surfaces of the teeth were cleansed and prepared with a gapped, fine-grit diamond finishing strip (Gateway Vision strips, Brasseler). Where the teeth have large interproximal spaces, a fine diamond bur can be carefully used to clean the interproximal surfaces. To minimize the thickness of the splint on the aesthetic interproximal aspect of the facial surfaces, a thin, round-end, chamfer diamond (Revelation, No. 854-016, SS White Burs,) was used to barrel into the interproximal areas.

**Temporary fixation:** Before taking impression, temporary fixation was done by a flowable resin composite (GRADIA® Direct Flo, GC Corporation, Tokyo, Japan) in order to create primary stabilization for mobile teeth while taking impression.

**Alginate impression and making the study/master casts:** Two full-arch alginate impressions (GC Aroma Fine DF III, GC Corporation, Tokyo, Japan) were taken from the upper and lower arches. After that, the alginate impressions were poured with dental stone (Moldano, Bayer, and Leverkusen, Germany) to make the study/master casts (Figure 1).

**Figure 1:** Alginate impressions.

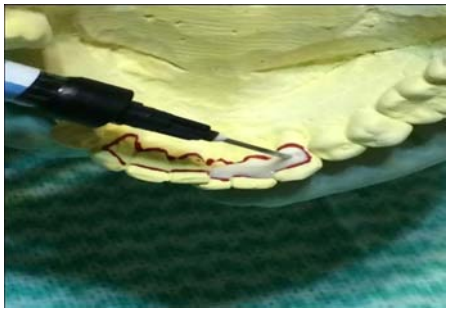

**Figure 2:** Determining the outline and making required space using flowable resin composite.




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**Figure 3:** Fabricating the translucent rigid special tray.

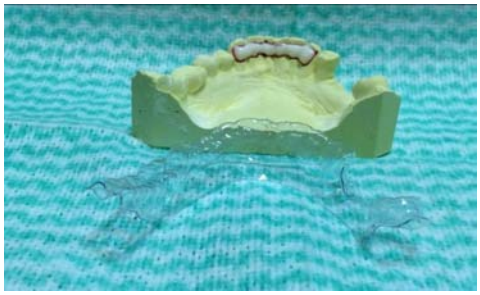

**Figure 4:** TRST can be try-in on the mandibular arch.

**Determining the required space:** Using a flowable resin composite (GRADIA® Direct Flo, GC Corporation, Tokyo, Japan) with a thickness of 1.0 mm and a width of 3.0 mm the required space for the splinting materials (FRC and composite) was prepared on the lingual aspect of lower cast exposure to curing light beam (Astralis 10, IvoclarVivadent AG, Liechtenstein) was then applied 5 seconds for each tooth (Figure 2).

**Fabricating the translucent rigid special tray (TRST):** By a thermoplastic 0.9 mm thick (Rigid-Tray® Sheets, Ultradent Products. Inc., UTAH, and USA) rigid tray was fabricated over the study/master cast using a vacuum press machine (T&S Dental & Plastic Co. USA). The special tray was trimmed off using a #12 scalpel blade (Wuxi X.D. Medical Device Co. LTD, China) 3-5 mm apical to the gingival margin. A pair of small curved scissors can be used to remove the rough edges if necessary. The fit was checked by matching the tray with the study/master cast (Figure 3). At this stage the special tray can be try-in on the mandibular arch. (Figure 4).

**Measuring the FRC:** To measure the length of FRC needed, a piece of aluminum foil folded strip was placed on the lingual surfaces of the teeth following the lingual embrasures, extending from the midpoint of the left mandibular canine to the midpoint of the right mandibular canine (Figure 5). The actual length of the required FRC strip (Interlig Impregnated Glass Fiber, Angelus Industria de Produtos Odontolgicos S/A, Londrina, Brazil) was measured and cut to the required length within its packaging. It was again wrapped in a piece of aluminum foil as a light protection barrier to prevent a premature cure by the surrounding light (Figure 6).

**Figure 5:** Measuring the length of FRC needed by using a piece of aluminum foil folded strip placed on the lingual surfaces of the teeth.


**Figure 6:** Measuring the actual length of the required FRC strip and cutting to the required length within its packaging.

**Figure 7:** Etching the cut targeted enamel surfaces and 1.0 mm beyond.

**Tooth preparation:** The targeted lingual enamel surfaces on all teeth for splinting were roughened with a # 504 pre-grinding diamond bur (Meisinger, Meisinger USA. L.L.C., Centennial, Colorado, USA), rinsed and dried with an oil-free syringe. The teeth were isolated with cotton rolls. The cut targeted enamel surfaces and 1.0 mm beyond were etched (Ultra-Etch® Ultradent Products. Inc., UTAH, USA) for 15 seconds, rinsed with water for another 15 seconds and air-dried (Figure 7). Being certain that etchant was placed on the targeted lingual surfaces and that it flowed between all the teeth included in the splint. The etchant was kept away from all exposed root surfaces to avoid increasing root sensitivity. In the next step, an unfilled resin

**Figure 8:** A very thin layer of flowable resin composite and a thin layer of composite was applied over the bonded areas on the lingual surface.

**Figure 9:** Preparing TRST including FRC band. The FRC placed in the tray was covered with a thin layer of the flowable composite.

**Figure 10:** Placing the TRST including the FRC strip coated with flowable composite over the patient's lover teeth/arch.

**Figure 11:** Removing the tray after initial curing. If there is a heavy undercut, it cut by a sculpture and then removed.

**Figure 12:** Occlusal adjusment.

(Margin Bond®, Coltène AG, Swiss) was applied and cured with the curing light beam as instructed by the manufacturer. A very thin layer of flowable resin composite A1(GRADIA® Direct Flo, GC Corporation, 76-1 Hasunduma-Cho, Itabashi-Ku, Tokyo, Japan) was applied over the bonded areas on the lingual surfaces of the mandibular anterior teeth, Then a thin layer of composite A1(GRADIA® Direct, GC Corporation, 76-1 Hasunduma-Cho, Itabashi-Ku, Tokyo, Japan) proportionate to the prepared space was placed over the flowable one in a way that no excess composite remained in the locations after the rigid tray (including FRC band) placement. The interproximal spaces between the marginal ridges were closed and interim light curing was applied. (Figure 8).

**Preparing TRST including FRC band:** The FRC placed in the tray was covered with a thin layer of the flowable composite. The FRC strip was well positioned and adapted to its seat in the tray. The strip was coated with a very thin layer of the flowable resin composite. (Figure 9).

**Placing the TRST:** The prepared customized special rigid tray, including the FRC strip coated with flowable composite, was as accurately as possible placed in its proper position with even pressure over the patient's lover teeth/arch (Figure 10). It was immediately exposed to the curing light beam in the scanned form for 80 seconds through the rigid tray using IOP mode (Astralis 10, IvoclarVivadent AG, Bendererstrasse 2, 9494 Schaan, Principality of Liechtenstein).

**Removing the tray:** After initial curing the special tray was easily removed. If there is a heavy undercut, it can be cut by a sculpture and then removed. FRC strip and flowable resin composite do not bond to the plastic rigid tray. (Figure 11).

**Post curing:** Following the special tray removal, post curing was done for approximately 320 more seconds (40 seconds per tooth) using line scan and HIP mode (Astralis 10, IvoclarVivadent AG,Bendererstrasse 2, 9494 Schaan, Principality of Liechtenstein).

**Occlusal adjustment:** The occlusion was checked for probable premature centric and eccentric contacts with articulating paper. It should then be adjusted if needed. (Figure 12).

**Finishing and polishing:** Finishing was conducted using an extra fine # 504 prefinishing diamond bur and a #12 scalpel blade (Figure 13). The splinting was examined to ensure that the interproximal spaces could be cleaned. Polishing was performed with polishing cup and strap. (Astropol, IvoclarVivadent AG, Schaan, and Principality of Liechtenstein) (Figure 14). Oral hygiene procedures were demonstrated, and the importance of proper oral hygiene was emphasized. The patient was shown how to clean the embrasure spaces with interproximal brushes (GUM® Proxabrush®, Sunstar Americas, Inc., Chicago, USA) (Figure 15).

**Potential problems:** The only potential problem is availability of vacuum former and rigid sheets needed for making the rigid special tray.

## Discussion

Tooth mobility has been described as an important clinical parameter for predicting the prognosis of periodontally compromised teeth. Moreover, in order to improved patient comfort and increase masticatory function, splinting has been recommended as a treatment to stabilize mobile teeth [1,2]. In the past, splinting was accomplished with directly placed restorative resins with embedded wires, pins, and meshes. These materials could only lock mechanically around the resin restorative and were not chemically integrated within the splint [3-7]. The interface created between the composite resin or acrylic resin and wire, pins, or grid mesh had the potential of creating

**Figure 13:** Finishing the embrasures using ultra fine flam shaped diamond bur.

**Figure 14:** Polishing the embrasures using fine strap.

shear planes and stress concentrations that would lead to premature failure [5]. If the splint fails, the clinical problems that can result include traumatic occlusion, progression of periodontal disease, and recurrent caries.

The development of FRC has allowed clinicians to expand the possibilities for conservative tooth replacement and tooth stabilization. Long-term, chairside tooth replacement and stabilization are possible with the mechanical properties provided by FRC used with current bonding techniques [8,9].

This article described an innovative technique using a thin, bondable, ribbon-splinting material by combining rigid special tray as accurate occlusion and stable guidance for reinforcing dental resins. By combining the chemical adhesive and esthetic characteristics of composite resin and fiber-reinforced composite with the translucence and accurate rigid tray, dentists can provide patients with restorations and splints that will resist the load-bearing forces of occlusion and mastication.

As it is an easy single-visit treatment, which brings about the satisfaction of the patient, TRSTT is practical and efficient. Since TRSTT has minimal laboratory procedures, it is a time-saving method. It is also a repeatable technique that can be repeated several times if the practitioner saves the master cast. Additional costs for laboratory procedures that can be considered as a disadvantage for the technique will be offset with decreased clinical time and increased accuracy of the FRC placement. Other disadvantages of TRSTT are the same as the ones addressed for the potential problems.

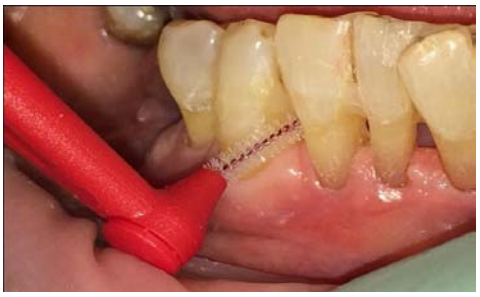

**Figure 15:** The patient was shown how to clean the embrasure spaces with suitable size interproximal brushes.

## Conclusion

The novel TRSTT may sometimes be considered the only accurate, time-saving, and practical way to splint the priodontally treated anterior teeth in some patients. Performing a part of procedure in laboratory in patients' absence will reduce the clinic time for both patient and practitioner and clinician's physical stresses to the half, while increasing the accuracy and quality of the service into several times.

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