Alternative Fabrication Method for Chairside Fiber-Reinforced Composite Resin Provisional Fixed Partial Dentures

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A high level of clinical skill is required for fabricating a provisional fixed partial denture with fiber-reinforced composite resin (FRC) using either the direct or chairside technique. The freehand approach to restoring missing teeth represents a challenge to the clinician, particularly when shaping and finishing a hygienic pontic. This technical report describes a simplified method for chairside fabrication of a fixed dental prosthesis with FRC. It is based on using a translucent template to guide the buildup procedure and to ensure optimal anatomy and function. *Int J Prosthodont 2011;24:453–456.*

Fiber-reinforced composite resins (FRCs) are currently used in several fields of dentistry, particularly for fabricating a fixed partial denture (FPD). In 2001, Vallittu[1] proposed that FRC technology might reduce the amount of posterior tooth structure needed for an FPD retainer. Additionally, it was proposed that an FPD could be fabricated with FRC directly in situ.

FRCs offer dental professionals the potential of fabricating adhesive, metal-free tooth replacements and opens new possibilities for direct chairside approaches to replacing missing teeth.

Clinical studies have demonstrated that FRC prostheses made with preimpregnated fibers have greater than 90% 5-year survival rates.[2,3] However, a successful chairside approach relies on the ability of the clinician to properly construct the framework of the FPD with strips of FRC. Manipulating the FRC material and designing the framework must be performed correctly for a successful chairside procedure. Moreover, patients with poor oral hygiene may be prone to plaque accumulation and gingival irritation around the pontic of a chairside fixed dental prosthesis made with FRC.[4]

The rationale for indirect laboratory fabrication of FRC prostheses is that it facilitates proper shaping and finishing of the composite resin restoration, particularly under the pontic, which is not easily accomplished with the direct technique (Fig 1). However, the advantages of the direct technique are the chairside control of the pontic shade and the high bond strength of the FRC framework.

This technical report describes a novel technique for using a wax cast–based template for the construction of chairside FRC fixed dental prostheses. This technique facilitates establishment of the ideal position, contouring, hygiene, and esthetics of the pontic.

Materials and Methods

First, an accurate impression of the edentulous region was made with alginate. It is usually unnecessary to make a full-arch impression because the opposing cast is not needed. A stone master cast was made from the impression and used to establish the tooth contours and tooth position according to the clinical situation. The stone cast was also used for the fabrication of a wax crown substitute for the edentulous space.

A template was constructed by loading polyvinyl siloxane into a syringe and applying it around the

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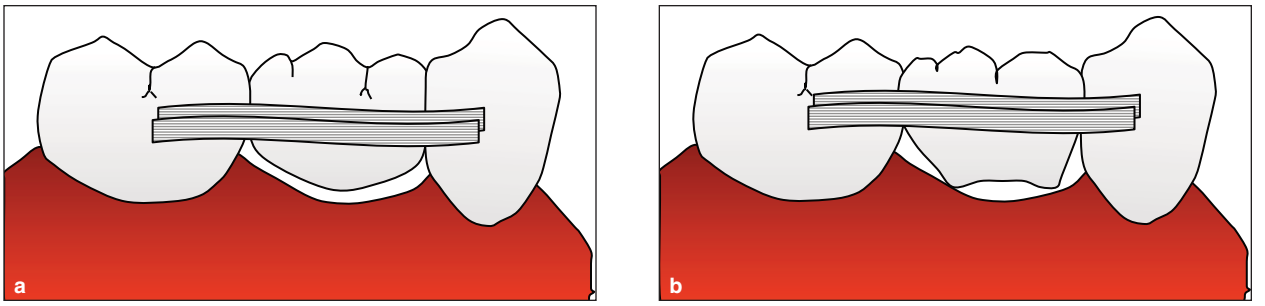

Fig 1 Schematic diagrams illustrating a fixed dental prosthesis fabricated from FRC. **(a)** A hygienic pontic with the crestal surface aligned with the underlying gingiva; **(b)** an unhygienic pontic with an irregular crestal surface.

Fig 2a A stone master cast *(beige)* was prepared from an alginate impression, and a wax crown *(blue)* was prepared to fill the edentulous space in the stone cast.

Fig 2b Transparent polyvinyl siloxane was applied with a syringe.

Fig 2c The polyvinyl siloxane template reached its final hardness within 5 minutes of initial mixing.

Fig 2d The hardened template was separated from the stone cast by cutting along the occlusal aspect, and the wax crown was removed. The template *(lower section)* was then ready for transfer into the patient's mouth.

wax tooth substitute on the master cast (Figs 2a to 2c). A transparent template is essential because the clear matrix allows the light to reach the resin to initiate polymerization. After polymerization was completed, the template was separated from the cast by carefully excising the occlusal aspect with a surgical knife and removing the wax crown. Then, the template was ready for transfer to the patient's mouth (Fig 2d).

Next, the necessary cavities were prepared by either removing old fillings or preparing new cavities. The template was transferred to the patient's mouth and positioned correctly. Glass ever-Stick fibers (Stick Tech) should extend from one end of the cavity to the other. This length can be determined by directly measuring the span with a metal foil cord. Next, the prepared cavities were etched, and dentin adhesive was spread throughout the bonding area. A thin layer of flowable composite resin was applied, and the fiber bundle was pressed into place and light cured for 10 seconds (Fig 3).

Fig 3 Step-by-step demonstration of the construction of the fiber framework.

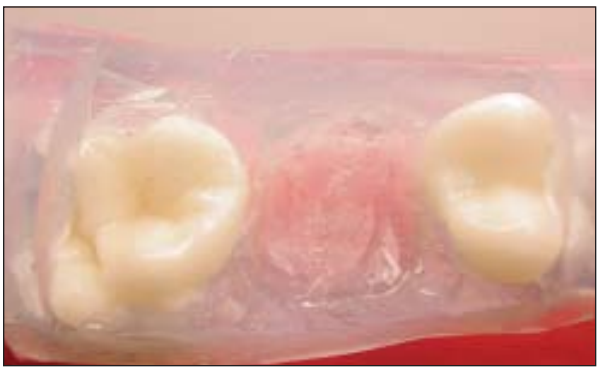

Fig 3a Template positioned in the patient's mouth.

Fig 3b The enamel was etched and metal foil was used to measure the length of the fiber sticks.

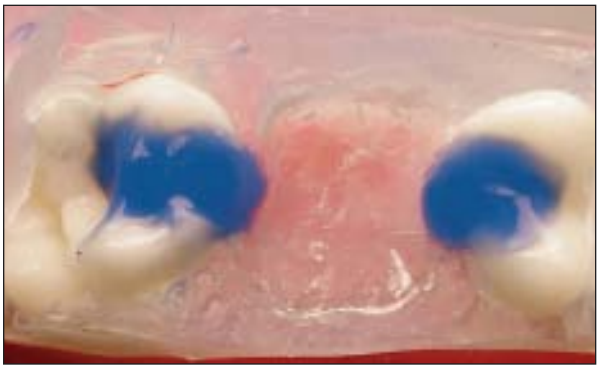

Fig 3c A bonding agent and flowable composite resin was applied.

Fig 3d Fiber pressed into place with hand instruments.

Fig 3e The fibers were light cured.

Fig 3f Occlusal view showing the FRC framework in place.

The pontic construction was initiated by laying down a thin layer of enamel for the underlying wall. Then, a deposition area of the template was built up. Next, a reinforced dentin core was constructed between the fibers. The pontic was then coated with enamel and the template was removed. Finally, the pontic was finished and polished.

Discussion

The direct chairside treatment option places high demands on the dental practitioner. In contrast to working with a dental laboratory, the chairside approach requires the practitioner to manage the final result independently. The entire procedure must be completed in a single treatment session and in a manner that is both esthetically and functionally correct (Fig 4).

Fig 4 Clinical example of the step-by-step laboratory and clinical procedures involved in restoring missing teeth. In this patient, a recently extracted second premolar was restored with a provisional FPD composed of FRC.

Fig 4a Master cast fit with a wax molar to fill the edentulous space.

Fig 4b Transparent template after curing and removal of the occlusal surface and crown.

Figs 4c and 4d **(c)** The edentulous space to be filled must be prepared by **(d)** removing the filling and etching a cavity to hold the FRC framework.

Fig 4e The template was positioned, and the FRC framework was created.

Fig 4f Pontic prepared and polymerized with exposure to light.

Fig 4g The template was removed.

Fig 4h Final finishing and polishing was completed.

Conclusion

A novel technique that provides a high degree of reliability was described in this report. This controlled procedure permits a predictable result, even in situations previously considered problematic for direct restoration. The concept of using a template in the direct technique allows accurate construction by providing a specific outline for the pontic.[5] This ensures that good oral hygiene can be maintained around and under the pontic with dental floss and interproximal brushes.

References

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