WJD

10.5005/jp-journals-10015-1035

CLINICAL ARTICLE

Natural Tooth Pontic using Fiber-reinforced Composite for Immediate Tooth Replacement

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ABSTRACT

For patients who require removal of anterior teeth due to periodontal problems there are a multitude of treatment considerations. Using the natural tooth as a pontic offers the benefits of being the right size, shape and color. This paper describes the immediate replacement of an anterior tooth using a preimpregnated fiber-reinforced composite with the natural tooth as the pontic. The abutment teeth can be preserved with minimal or no preparation, thus keeping the technique reversible, and can be completed at the chair side thereby avoiding laboratory costs. It can be used as an interim measure or as a definitive prosthesis.

Keywords: Immediate restoration, Natural tooth pontic, Fiber-reinforced composite, Fixed partial denture.

INTRODUCTION

For a person who requires removal of an anterior tooth, the primary concern is generally the restoration of an esthetic appearance immediately. Whether the tooth is removed surgically or lost due to trauma the dentist should consider an immediate means to satisfy the patient's cosmetic requirements. Using the natural tooth as pontic offers the benefits of using the right size, shape and color.[1]

Fiber-reinforced materials have been used for a number of years in the aircraft and boat industries. This concept was first applied to denture acrylics in the early 1960s[2] to improve fracture resistance and more recently has been used with composite resins to overcome the problems of low resilience, fracture resistance and toughness.[3] The principle of fiber reinforcement involves incorporation of thin filaments of a foreign material into a base resin. These filaments impart increased flexural strength, fracture resistance, and increased tensile strength by bonding into the structure and preventing crack propagation through the structure

Currently are two types of fiber bundles manufactured:

- Preimpregnated with resin
- Nonimpregnated

In preimpregnated fiber-reinforced composite fiber bundles are prewetted with a low viscosity resin in the laboratory in a controlled manufacturing process. The fibers used in these materials are continuous, long and have higher flexural properties dues to their high fiber content.[4,5]

This article describes the immediate replacement of a periodontally involved maxillary left lateral incisor using the preimpregnated fiber-reinforced composite SPLINT-IT (Jenerin/pentron). The framework is composed of both unidirectional and woven preimpregnated glass fibers in a Bis-GMA resin matrix.

CASE REPORT

A 31-year-old male patient with a mobile tooth number 12 (maxillary right lateral incisor) reported to the department of periodontics, SDM college of dental sciences, Dharwad (Fig. 1).

Fig. 1: Preoperative photograph

Fig. 2: Clinical examination: Labial view—gingival recession extending up to the apical-third of the tooth

Fig. 3: Clinical examination: Palatal view

He complained of mobility, discomfort and poor esthetics with 12. There was severe gingival recession on the labial side which extended up to the apical third of the root (Figs 2 and 3). The periodontal prognosis of the tooth was very poor and the tooth was advised for extraction.

TREATMENT PLAN

It was planned to extract the lateral incisor and replace it immediately as a natural tooth pontic using preimpregnated fiber-reinforced composite as a retainer. The patient was explained about the procedure and the patient readily agreed. Preimpregnated fiber-reinforced composite was chosen as the retainer. The procedure was explained to the patient and the interocclusal space was assessed and occlusion checked. Adequate space was available interocclusally, and hence no preparation of the abutment teeth was indicated. The lateral incisor was originally slightly rotated and it was decided to correct this irregularity. Pre-extraction impression was taken and a study model was prepared. The length of the clinical crown was marked on the cast (Fig. 4).

The procedure was explained to the patient about removal of lateral incisor and immediately replaced. It was a natural pontic using preimpregnated fiber-reinforced composite as a retainer.

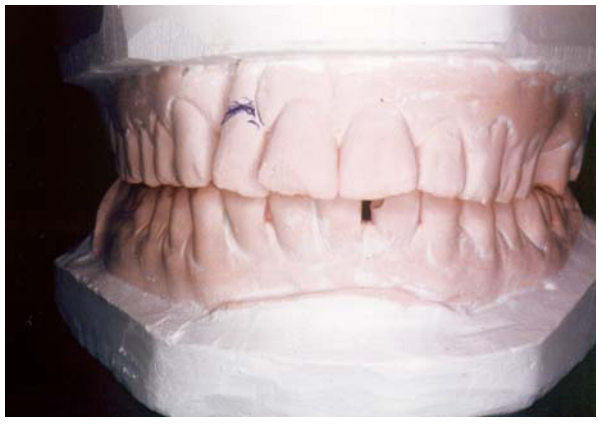


Fig. 4: Study model: Pre-extraction cast of the patient was made and the length of the crown was marked

Treatment

The tooth was atraumatically extracted under local anesthesia and hemostasis was achieved (Fig. 5). The extracted tooth was sectioned at the root to the length, which was previously marked on the study models, allowing for postextraction resorption and tissue shrinkage (Fig. 6). The newly prepared pontic was tried in and shown to the patient to ensure that he was satisfied with the appearance. Originally, pre-extraction, the tooth was slightly rotated, which was corrected in the pontic and the patient was more than satisfied. An index with the tooth in this position was made with silicone putty. The access to the pulp chamber was gained from the lingual aspect and the pulpal contents in the pulp chamber and the canal were removed and thoroughly cleaned. The pulp chamber was then dried and the resulting cavity was restored with composite resin (Figs 7A to D).

Cementing the Pontic

- The abutment teeth were isolated with rubber dam, cleaned with pumice, washed and dried.

Fig. 5: Postextraction view: Atraumatic extraction was done under local anesthesia

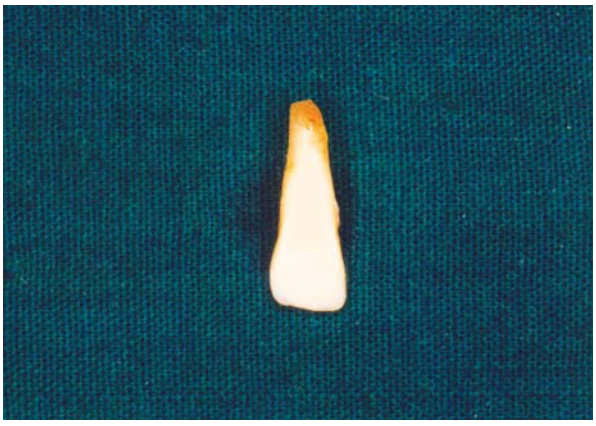


Fig. 6: Extracted tooth

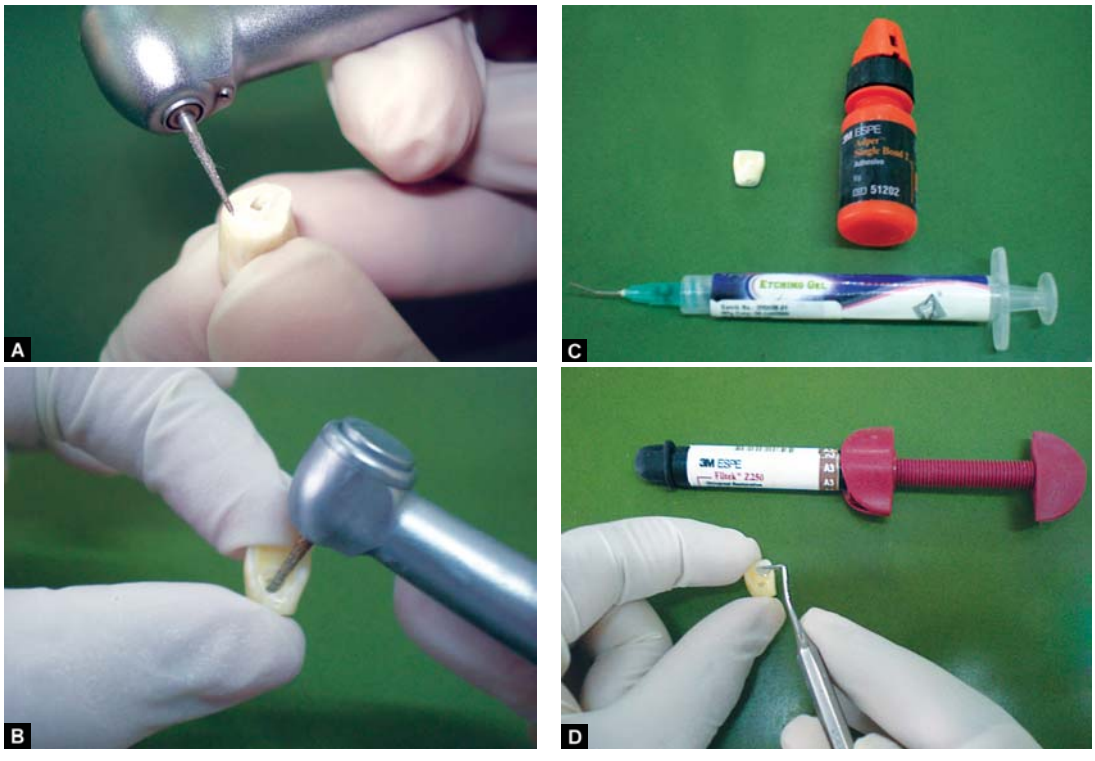
- The pontic was also cleaned with pumice, washed and dried, and then placed in the mouth to the required position using the index prepared earlier.
- Dental floss was used to measure the length of fiber required (mesial surface of one to the distal surface of three) and cut. Care was taken not to handle the fiber with gloves to avoid contamination.
- The abutment teeth and pontic were then etched with 40% phosphoric acid for 30 seconds, washed and dried (Fig. 8A).
- Wooden wedges were then placed interdentally to maintain the embrasure spaces. Dentin boding agent (Kerr XR, Kerr, MI, USA) was applied to the etched enamel but not cured. The precut fiber was placed on the bonding agent and both were cured simultaneously (Fig. 8B).
- A layer of hybrid composite was placed on the fiber completely to give a smooth feel and cured. Excess composite was removed and the occlusion was checked in protrusion and lateral excursions (Figs 8C and D).
- The patient was satisfied with the result (Fig. 9A). A 1-year evaluation showed the bridge intact with good esthetic and no problems (Fig. 9B). The patient will be kept under yearly evaluation.

DISCUSSION

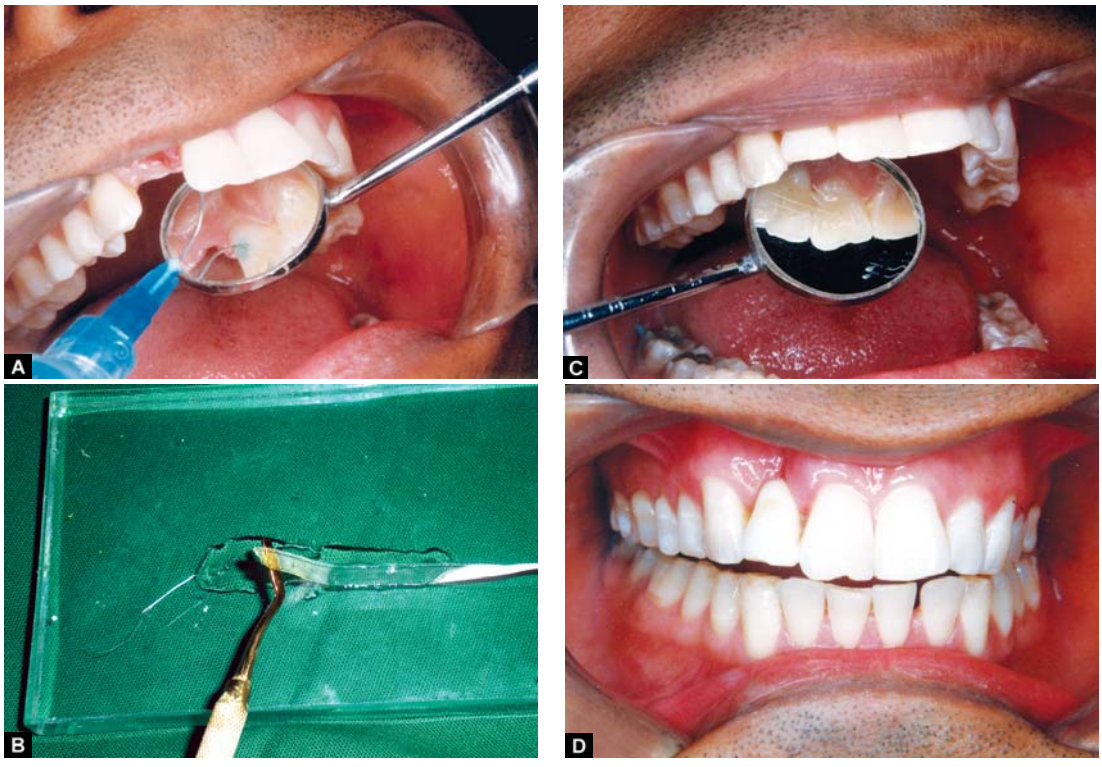
Although composites have been used extensively for esthetic replacement of teeth, the biggest drawback with these materials has been their low fracture resistance and resilience. Previously these properties have been improved by reinforcing the composite with wire or fiber mesh.[6] It was necessary to use the material in bulk and failure commonly occurred at the composite/strengthner interface providing limited success.

Fiber-reinforcement has helped to overcome this problem by creating a chemical bond between the strengthening fiber and composite resin.[7] Tests have shown that the fiber-reinforced composites demonstrate rigidity and flexural strength 7 times that of particulate composite alone.[8]

Although there is no need of tooth preparation on the abutment teeth, the restoration will be bulky palatally so minimal preparation was advocated.[9,10]



Figs 7A to D: Pontic preparation phase: (A) The crown was sectioned at the previously measured length (B) Access opening was done palatally. The pulpal remnants were removed and the pulp chamber was thoroughly cleaned and dried (C) The pulp chamber was acid etched and dentin bonding agent was applied. (D) The access opening was restored with composite resin



Figs 8A to D: Chairside insertion phase: (A) Acid etching was done on both the abutment teeth proximally and palatally. Dentin bonding agent was applied but not cured. (B) The predetermined length of preimpregnated fiber-reinforced composite was carefully placed on the abutment teeth and pontic in place. (C) Both were cured simultaneously. The palatal tilt on the mesial side of tooth which was present before extraction was corrected during cementation. Hybrid composite was applied over the entire fiber-reinforced composite (D) View after cementation

Fig. 9A: Post-treatment photograph

Fig. 9B: Patient was recalled periodically and was re-evaluated after one year

CONCLUSION

The key advantages of this technique are excellent esthetics, preservation of tooth structure and reduced patient cost. Immediate tooth replacement can be done as there is no lab work involved. This technique is reversible, and thus allows other restorative option to be evaluated if the need arises. It can be used as an interim or definitive prosthesis. The drawbacks are not significant, which include increased chair side time and technical expertise.

Long-term follow-up of preimpregnated fiber-reinforced composite will be required to prove their success.

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