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Original article

Clinical evaluation of the fiber post and direct composite resin restoration for fixed single crowns on endodontically treated teeth



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ABSTRACT

Background: The restoration of an endodontically treated fractured tooth has been a challenge for restorative dentists for decades. The performance of fiber posts when used in conjunction with direct composite resin restorations have been largely unreported. This study was conducted with the aim of evaluating the survival rate of endodontically treated teeth restored with adhesive bonded fiber reinforced resin posts and direct composite core with additional crown coverage.

Methods: Sixty patients who required endodontic treatment with post core crown were selected from outpatient department of Air Force Institute of Dental Sciences, Bangalore. Sixty-four teeth were endodontically treated and restored with fiber post and direct resin composite core restoration. Patients were evaluated immediately after restoration and reevaluated at the end of first, second and third months. After 3 months of clinical evaluation, if teeth were asymptomatic they were restored with complete coverage porcelain fused to metal restorations and evaluated immediately, and again reevaluated at the end of first, third, and sixth months.

Results: After 3 months of clinical evaluation, only two teeth exhibited periapical lesion with clinical symptoms and three teeth without any clinical symptoms. Five teeth exhibited slight marginal staining, three teeth showed partial loss of restoration, and two teeth exhibited complete loss of restoration with the fracture of the post. At the end of sixth month after restoration with full coverage crown, two teeth had dislodged restoration due to fracture of post and two teeth exhibited displacement of the post.

Conclusion: Fiber posts are the best alternative for restoration of fractured endodontically treated teeth. Fiber posts and direct composite resin core materials are strongly recommended for restoration of endodontically treated mutilated teeth among the dental establishments of Armed Forces.

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Introduction

The restoration of an endodontically treated fractured tooth has been a challenge for restorative dentists for decades. The traditional and accepted method is to restore the tooth with a post and core restoration that may be covered with a crown. Until the mid-1980s, the cast metal post, made indirectly in the laboratory, was considered the safest way to restore an endodontically treated tooth.^{1,2}

Performing the treatment directly in patient's mouth with prefabricated metal posts is common as it is less time consuming and economical.³ But these metal posts are rigid which induce stress and cause root fracture. The need for favorable esthetic requirements combined with these failures was predisposing factors for development of new post materials.

In the 1990s, fiber-reinforced composites (FRC) posts were introduced as an alternative to traditional custom made cast post and prefabricated metal posts. The early versions were constructed of carbon fiber embedded in a resin matrix and these posts when compared to metal posts possessed different physical properties. Unfortunately, their use met with some resistance as they were black in color, leading to poor aesthetics under all-ceramic restorations. Subsequently, more esthetic quartz and glass fiber reinforced composite posts were introduced as an esthetic alternative to carbon posts.

Fiber-reinforced composite posts along with composite resin core material have become more popular in restoring endodontically treated mutilated teeth because of properties like modulus of elasticity resembling dentin, high retention, better translucency, better transmission of forces with reinforcement of restoration & excellent esthetics.

The need for full coverage restoration of the tooth after root canal treatment is still conjectural and no recent clinical study is available to confirm the indications given in the literature⁴ and has been routinely recommended as a protective measure in clinical practice.⁵ Although retrospective studies reported good clinical performance when a complete crown was given after tooth buildup, the performance of fiber posts when used in conjunction with direct composite resin restorations as tooth buildup remains largely unreported. Hence, this study was conducted with the aim of evaluating the survival rate of endodontically treated teeth restored with adhesive bonded fiber reinforced resin posts, with direct composite core and additional crown coverage.

Materials and methods

Sixty patients (35 men and 25 women) were randomly selected for the study from outpatient department of Air Force Institute of Dental Sciences, Bangalore. They required endodontic treatment and restorations on 42 anterior teeth and 22 posterior teeth (12 premolars and 10 molars) ($n = 64$ teeth overall). The mean age of the patients was 33.36 years (range 19–52 years). Inclusion criteria were the clinical and radiographic confirmation of the need for root canal treatment and availability of sufficient tooth structure for restoration.

The endodontic procedure was performed using a crown-down technique. A portable endodontic motor was used with speed and torque adjusted according to manufacturer's instructions. A chelating agent EDTA (Largal Ultra) and 2.5% sodium hypochlorite were used to clean the pulp chamber at the beginning of instrumentation. All teeth were instrumented with rotary (protaper) instruments up to the working length as indicated by apex locator. The prepared canals were obturated with gutta-percha points using root canal sealant (endomethasone) and lateral condensation using hand pluggers.

Once the teeth were clinically and radiologically asymptomatic, the Gates Gladen drill was used to remove root canal filling material leaving minimum 5 mm of apical seal. Biomechanical preparation was done with a low speed bur creating the post space to 9–10 mm.

The root canal walls were etched with 37% phosphoric acid for 15 s, washed with water spray and then gently air dried. The excess water was removed using paper points. Part A and Part B of the adhesive bonding agent were mixed in equal proportions and two coats were applied to root canal walls with a micro brush and gently air dried. Translucent glass fiber posts were cemented with dual cure resin cement. Both catalyst and base paste of the dual cure resin cement was mixed on mixing pad, coated to the post. Excess resin cement was removed with clean micro brush and the cement was light cured for 40 s. Building up of the tooth was done with direct resin composite restoration using layering technique. Finishing and polishing of the core was done with fine diamond burs and multi laminated carbide burs. Final polishing was done with aluminum oxide points and silicone brush.

Patients were recalled at the end of first, second and third month subsequently for clinical and radiographic evaluation like presence or absence of periapical lesion, marginal leakage and integrity, color stability, surface staining and loss of retention due to fracture of the post or composite buildup material. The restorations were evaluated by two operators who were not involved with the restorations and who were not revealed at the time of recall (single-blind trial).

After 3 months of clinical evaluation, the asymptomatic teeth were taken up for complete coverage porcelain fused to metal restorations. Out of 64 teeth involved in the study 60 were selected for further restorations. The teeth were prepared for full coverage crowns in the conventional way, impressions were made with rubber base impression material, individual dies were prepared and porcelain fused to metal (PFM) crowns were fabricated in the lab. These crowns were luted to the prepared teeth using dual cure adhesive resin as per manufacturer's instructions.

These teeth restored with PFM crowns were evaluated clinically and radiographically for any periapical lesion and loss of retention after a further period of 1, 3 and 6 months.

Results

Tables 1–4 show the recall data obtained at the end of 1, 2, and 3 months after restoration with fiber post and direct

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