ISSN: 0975-833X

Available online at http://www.journalcra.com

International Journal of Current Research
Vol. 9, Issue, 12, pp.62628-62632, December, 2017

INTERNATIONAL JOURNAL OF CURRENT RESEARCH

CASE REPORT

ESTHETIC REHABILITATION OF STRUCTURALLY COMPROMISED ANTERIOR TOOTH USING FIBRE REINFORCED COMPOSITE

***Dr. Renita Soares and Dr. Ida de Noronha de Ataide**

Department of Conservative dentistry and Endodontics, Goa Dental College and Hospital, Bambolim, Goa- India 403202

ARTICLE INFO

Article History:
Received 13th September, 2017
Received in revised form
17th October, 2017
Accepted 20th November, 2017
Published online 27th December, 2017

Key words:
Fibre Reinforced Composite,
Fibre post, MTA,
Reinforcement.

ABSTRACT

The reconstruction of structurally compromised posterior teeth is a rather challenging procedure. The tendency of endodontically treated teeth (ETT) to fracture is significantly higher than vital teeth.Fibre reinforced composites (FRC's), are polymeric materials embedded with short E glass fibres and are designed to replace dentin. This incorporation of short fibres provides fracture toughness greater than dentin and almost double that of conventional composites. The following case report presents a novel technique of rehabilitating an endodontically compromised tooth with associated aesthetic and prosthetic challenges using fibre reinforced composite.

Citation: Dr. Renita Soares and Dr. Ida de Noronha de Ataide, 2017. "Esthetic Rehabilitation of Structurally Compromised Anterior Tooth Using Fibre Reinforced Composite", *International Journal of Current Research*, 9, (12), 62628-62632.

INTRODUCTION

Restoration of endodontically treated teeth is a clinically challenging task. Endodontically treated teeth (ETT) may be weakened due to decreased or altered tooth structure which may be attributed to:

- caries and/or previous restorations
- fracture or trauma
- endodontic access and instrumentation (Rocca *et al*., 2013)

Research has established that the resistance of a tooth to fracture is directly related to the amount of remaining tooth structure. Therefore it may very well be understood that a structurally weakened root compromises the overall long term prognosis of successful restoration of the tooth (Kaur *et al*., 2010). Numerous studies evaluating the static, dynamic and fracture resistance patterns in ETT have emphasized that loss of dentin is primarily responsible for their increased fracture susceptibility (Kishen *et al*., 2004).Thus an understanding of this basic concept, can greatly help in meticulously planning out the treatment of teeth with compromised tooth structure. When a considerable amount of coronal tooth structure is lost, the use of a post seems mandatory.

Corresponding author: **Renita Soares,**
Department of Conservative dentistry and Endodontics, Goa Dental College and Hospital, Bambolim, Goa- India 403202.

The post primarily functions to restructure and retain the core, which eventually provides the foundation to support the crown (Singh *et al*., 2016).With increasing advances in material sciences, the trend is slowly shifting from traditional rigid metal posts to the more flexible tooth coloured fibre posts. The ability of these fibre posts to bond adhesively to the dentin and thereby create a monoblock, makes them highly favourable. Clinicians may often be faced with the dilemma of treating anterior teeth with flared root canals. Management of such flared canals (resulting from carious extension, pulpal pathology or endodontic access) can be extremely tricky due to the considerable loss of dentinal structure. Intra-radicular rehabilitation of such teeth prior to post placement significantly increases the overall clinical success (Kaur *et al*., 2010). Saupe *et al*. (1996) recommended the use of dentin bonded resin composite for intra-radicular reinforcement to aid in strengthening the weakened root. The introduction of Fibre reinforced composites (FRC's) has revolutionised restorative dentistry. It consists of a combination of a resin matrix, randomly oriented E-glass fibres and inorganic particulate fillers. *In vitro* studies have revealed substantial improvements in the load-bearing capacity, flexural strength, fracture toughness, and control of polymerization shrinkage stress of composites reinforced with short E-glass fibres in comparison with conventional particulate filler restorative composite resin, thus making FRC's a suitable option as a reinforcing material (Garoushi *et al*., 2012; Garoushi *et al*., 2013).

The following case report highlights an innovative technique of rehabilitating an endodontically compromised tooth with associated aesthetic and prosthetic challenges using fibre reinforced composite.

CASE REPORT

A 32 year old female patient presented to the Department of Conservative dentistry and Endodontics with a chief complaint of unaesthetic, ill-fitting mobile crown in relation to maxillary left central incisor (Figure 1).

Figure 1. Preoperative intraoral view

Figure 2. Preoperative Radiograph

Past dental history revealed endodontic treatment followed by post and core in the same tooth. Radiographic analysis revealed presence of guttapercha at the apical third of the root and a short fibre post in place (Figure 2). Since the crown was mobile it was removed to reveal the remaining tooth structure. Upon clinical examination, extensive destruction of the coronal tooth structure upto the cervical area was noted (Figure 3). Furthermore, upon closer clinical inspection, it was observed that the root was perforated on the buccal and mesial aspect. Taking into account the compromised tooth structure and overall prognosis, the patient was presented the option of having the tooth extracted followed by a single tooth implant

Figure 3. Preoperative intraoral view following crown removal

or full partial denture spanning #11 to #22. However the patient expressed her desire to retain and restore the tooth conservatively owing to the cost factor. Managing this case without extraction, but conservatively was not just tricky but challenging as well. The primary goal was to ensure minimal removal of remaining tooth structure and provide intra-radicular reinforcement.

The treatment plan outlined was

- Root perforation repair with Mineral Trioxide Aggregate (MTA)
- Root reinforcement with FRC and Fibre post
- Core build up with FRC
- Full crown in #21

Management

Phase I

At the first appointment, pre-treatment photographs were recorded. Isolation was achieved with the help of rubber dam to provide a controlled operating field. Since the tooth was fractured at the cervical area, the tooth was further isolated with a rubber base impression material in order to prevent moisture contamination (Figure 4).The canal was thoroughly cleaned using copious amount of 3.5 % sodium hypochlorite solution to successfully disinfect the canal. The canal was then dried with paper points. MTA (Angelus, Londrina, PR, Brazil) was mixed according to the manufacturer's instructions and placed with the help of MTA carrier. The MTA was condensed into place with a plugger to seal off the perforation (Figure 5). The entire procedure was carried out with the aid of 3.2x surgical loupes with fibreoptic light source that permitted magnification, better illumination and improved visualization of the working field. A damp cotton pellet was placed over the orifice and the tooth was sealed with an interim restoration.

Figure 4. Rubber dam and rubber base impression material isolation

Figure 5. Perforation repair with MTA

Figure 6. Placement of FRC and fibre post

Phase II

Since the inner root dentin was considerably compromised in thickness, it was elected to restore the same with fibre reinforced composite. EverX Posterior (GC Dental Products Corp., Aichi, Japan) was selected for the procedure. The tooth was isolated using the same method as described above and the adhesive protocol was followed, which included etching with 36% phosphoric acid (Conditioner 36, Dentsply DeTrey) for 10 seconds, thorough washing with water and brief blot drying. Two coats of the total etch bonding agent (Prime and Bond NT, Dentsply Caulk, Milford, DE, USA) was applied with the applicator tip, lightly air-dried for 10 seconds, and light-cured for 10 seconds. Following this, the FRC was extruded from the compoule and compacted into the root circumferentially in order to rebuild the lost dentin and restore the root close to its original form. Each increment was light-cured for 20 seconds. A glass fibre-reinforced composite post of a suitable size was intermittently placed in the canal to adapt the FRC to the walls of the root and also ensure adequate space for the post placement.

Once the inner dentinal wall of the root was satisfactorily rehabilitated, the fibre post was cemented using self-adhesive resin cement (RelyX U200; 3 M ESPE, Seefeld, Germany), as per manufacturer's recommendations (Figure 6).

Phase III

Two coats of the total etch bonding agent (Prime and Bond NT, Dentsply Caulk, Milford, DE, USA) were applied to the extruded part of the fibre post with the applicator tip, air-dried for 10 seconds, and light-cured for 10 seconds. FRC was then extruded from the compoule and layered around the post sequentially in 2 mm increments to form the core.

Phase III

The final phase of the treatment included the prosthetic rehabilitation. Tooth preparation was carried out for #21 with a circumferential 2mm shoulder finish line to receive a full ceramic zirconia crown (Figure 7).

Figure 7. Core build up and crown preparation

Figure 8. Following crown cementation

Figure 9. 3 year follow up

Prior to the impression making, gingival retraction was done with the aid of gingival retraction cord (Ultrapak 000, Ultradent, USA).

Impression was made with addition silicone impression material (Aquasil, Dentsply, Germany). Provisional crown was fabricated with autopolymerising resin (Visalys Temp, Kettenbach, Germany) and cemented with non eugenol luting cement (Rely X Temp NE, 3M ESPE, Germany). Once the zirconia coping was fabricated, try-in was carried out to assess the marginal fit. There after the crown was fabricated and tried intraorally for marginal fit, adaptation, occlusion and shade. The prosthesis was then finished, glazed and cementation was carried out with dual cure resin cement (RelyX U200, 3M ESPE, Germany) (Figure 8) Figure 9 shows the clinical appearance of the tooth after a gap of 3 years. The patient had no complaints and the tooth appeared to be functioning suitably well.

DISCUSSION

The longevity of ETT has been greatly enhanced owing to advances in endodontic therapy and in the field of restorative dentistry. It is a well-established fact that ETT tend to be weaker primarily due to the loss of tooth structure either due to caries, trauma or the operative procedure. And this very loss of dentin contributes to an increase in the likelihood of fracture of the treated tooth during function. Hence restoration of such ETT should aim to increase the resistance of the tooth to fracture with emphasis on preservation of remaining tooth structure (Fernandes, 2001). The introduction of Fibre reinforced composites has added a whole new dimension to achieving restorative excellence. FRC's have myriad desirable properties, both functionally and aesthetically. They allow easy handling and owing to their metal free nature provide aesthetic benefits as well. FRCs constitute a polymer matrix impregnated with fibres and can thus be adhesively bonded to tooth structures.The fibres serve the function of crack stoppers or stress breakers. These fibres allow the stresses to be distributed evenly throughout the restoration and thereby impart strength and reinforcement by improving the fracture toughness (Ilday, 2011; Soares *et al*., 2016).

Anil Kishen *et al.* in 2004 evaluated the stress strain response in structural dentin and concluded that the inner dentin is less mineralized and has more collagen (which is a highly resilient biological material), and therefore possesses a low modulus of elasticity.Thus from a clinical standpoint it would be evident that conservation of as much of the inner dentin as possible, is critical to the fracture resistance of the tooth. The authors further recommended the use of well planned and designed posts that curtail disproportionate removal of inner dentin and adhesively bonded dental restorations that would re-establish the tooth to its 'original' form and function. Intra-radicular rehabilitation in cases of flared canals increases the chance for clinical success and survival of the tooth (Kaur et al., 2010). As recommended by Saupe *et al.* (1996) and other researchers, adhesively bonded restorations which provide a monobloc effect and reinforce the tooth in order would serve as ideal materials for the rehabilitation of root canals. In the present case, it was essential to reinforce the tooth the tooth in order to compensate for the lost dentin. Keeping in mind the favourable and reinforcing qualities of FRC's, it was elected to build up the inner wall of the canal using this material to provide intra radicular strengthening and protect the tooth against fracture. The mechanical advantages provided by FRCs are their flexural strength, fatigue strength, elastic modulus, and bond strength (Soares *et al*., 2016).

Tooth-coloured fibre reinforced posts (FRPs) offer the distinct advantage of being aesthetic over metal posts, making them a favourable choice in the restoration of anterior teeth. Additionally, FRPs show low peak stresses inside the root, inducing a stress field quite similar to that of the natural teeth (Schmitter *et al*., 2006). Their elastic modulus closely matches that of the tooth dentin which permits uniform stress distribution throughout the restored tooth, resulting in lowered core-dentin interface stress and failure rates. Therefore in the present case, once the lost dentin was reconstructed using FRC, a fibre post was bonded in place to retain the core. Ayna *et al*. (2009) carried out a three-year clinical evaluation of endodontically treated anterior teeth restored with a fibre-reinforced composite. The authors concluded that based on the clinical parameters assessed i.e. marginal irregularity, marginal discolouration, surface texture, wear ⁄ anatomic form, fracture and retention, radiographic appearance, or debonding, the FRC restorations functioned well and suggested their utilisation as an alternative to traditional treatment strategies.

Conclusion

Innovations in material sciences and adhesive dentistry have greatly helped in achieving predictable results in the restorative field. Management of ETT with compromised structure require careful consideration during the stages of treatment planning as well as execution, taking into consideration function, esthetics, cost factor and most importantly the long term prognosis and success of such procedures. In this case, the extensive loss of coronal and intraradicular structure warranted the use of FRC as a reinforcing material, precluding the need to resort to radical measures such as extraction and prosthetic replacement.

REFERENCES

Ayna, B., Celenk, S., Atakul, F., Uysal. E 2009. Three-year clinical evaluation of endodontically treated anterior teeth restored with a polyethylene fibre-reinforced composite. *Aust Dent J.,* 54: 136–140.

Fernandes AS, Sardessai G. 2001. Factors affecting the fracture resistance of post-core reconstructed teeth. A Review. *IntJ Prosthodont.,* 4:355-63.

Garoushi S, Mangoush E, Vallittu M, Lassila L. 2013. Shortfibre reinforced composite: a new alternative for directonlay restorations. *Open Dent J.,* 7:181-185.

Garoushi S, Tanner J, Vallittu P, Lassila L. 2012. Preliminaryclinical evaluation of short fibre-reinforced compositeresin in posterior teeth: 12-months report. *Open Dent J.,* 6:41-45.

Ilday, N., Seven. N. 2011. The influence of different fiber-reinforcedcomposites on shear bond strengths when bondedto enamel and dentin structures. *J Dent Sci.,* 6:107-115.

Kaur A, Meena N, Shubhashini N, Kumari A, Shetty A. A comparative study of intra canal stress pattern inendodontically treated teeth with average sized canal diameter and reinforced wide canals with three different post systems using finite element analysis. *J Conserv Dent* 2010;13:28-33.

Kishen A, Kumar GV, Chen NN. 2004. Stress-strain response in human dentin: Rethinking fracture predilection in postcore restored teeth. *Dent Traumatol.,* 20:90-100.

Rocca GT, Rizcalla N, Krejci I. Fibre-reinforced resin coating for endocrown preparations: a technical report. *Oper Dent* 2013;38:242-248.

Saupe WA, Gluskin AH, Radke RA Jr. 1996. A comparative study of fracture resistance between morphologic dowelcores and resin - reinforced dowel system in the intraradicular restoration of structurally compromised roots.*Quintessence Int.,* 27: 483-91.

Schmitter M, Huy C, Ohlmann B, Gabbert O, Gilde H, Rammelsberg P. 2006. Fracture resistance of upper and lower incisors restored with glass fiber reinforced posts. *J Endod.,* 32(4):328-30.

Singh S, Nagpal R, Singh P, Singh UP and Manuja N. Esthetic and Functional Rehabilitation of Maxillary Anterior Tooth by Polyethylene Fibre Post. *Austin J Clin Case Rep* 2016; 3(3): 1094.

Soares R, Noronha de Ataide I, Fernandes M, Lambor R. 2016. Fibre reinforcement in a structurally compromised endodontically treated molar: a case report. *Restor Dent Endod* May; 41(2): 143–147.

****