

Esthetic Rehabilitation of Badly Broken Down Teeth with Fibre Posts: A Case Series.

¹Dr. M Rajesh Karthik, ²Dr Varna R,

¹M.D.S, Reader, Educare Institute of Dental Sciences, Chattipparamba, Malappuram.

²Asst Dental Surgeon, Govt. District Hospital, Nilambur.

*Corresponding Author: ¹Dr. M Rajesh Karthik

ABSTRACT:- Tooth trauma is common occurrence that every dental professional encounters in day to day clinical practice. He should be well equipped to assess and treat a trauma related to tooth as and when it occurs. The esthetic rehabilitation of a badly broken tooth presents a diagnostic and treatment dilemma to the clinician. Restoration of broken down anterior teeth is a dilemma to the dentist both diagnosis and treatment wise. Since esthetics of the anterior teeth is extremely important, the treatment plan comprises of a combined effort from the endodontic and periodontal specialties.

This paper discusses 4 cases which reported to our department with the same clinical picture of Ellis class III fracture treated in 4 different ways with fibre posts. The treatment options of Orthodontic extrusion, Reattachment and Composite reinforcement of the root canal walls restored with fibre posts is presented in the case reports.

I. INTRODUCTION

The management of oral trauma in the permanent dentition can present a significant problem for the dental practitioner. The most common causes for crown fracture injuries are falls, automobile accidents, altercations and athletic activities. All fractures of the tooth structure must be considered as dental emergencies , that is the patient must be attended to as soon as possible after injuries.

The clinical examination of a crown fractured tooth should include a thorough cleaning of the injured tooth with water spray, followed by an assessment of the extent of damage by noting the amount of exposed dentin or pulpal tissue. Radiographic information obtained as soon as possible after the traumatic injury is also extremely important.

CLASSIFICATION

Crown fracture injuries are classified as follows

1. Infraction – an incomplete fracture of the tooth without actual loss of tooth substance
2. Uncomplicated crown fracture –a crown fracture that involves the enamel or enamel and dentin without exposure of the dental pulp.
3. Complicated crown fracture-an injury in which the fracture line perforates the pulp chamber .
4. Crown-root fracture - an injury in which the fracture line involves the hard tissues in both the coronal and radicular portions of the tooth.

CHARACTERISTICS OF ENDODONTICALLY TREATED TEETH

1. Tooth structure loss by:
 - i. Caries, trauma, erosion, abrasion, attrition.
 - ii. Previous restorations and recurrent caries under restorations.
 - iii. Endodontic treatment; due to removal of coronal and intraradicular Dentine during access and root canal preparation. Root canal procedures reduce tooth stiffness by 5%, whereas an MOD(mesio-occluso-distal)preparation reduces tooth stiffness by 60%.^{6,9,11.}
 2. Micro cracks in remaining tooth structure produced by endodontic procedures.
 3. Weakened collagen intermolecular cross-links of Dentine → lower shear strength.
 4. Dehydration; non-vital teeth have less moisture content than vital teeth.
 5. Esthetics; biochemically altered Dentine modifies light refraction through the tooth and modifies its appearance.
- The combined result of these changes are: increased fracture susceptibility and decreased translucency.

TREATMENT PLANNING FOR NON-VITAL TEETH

Anatomic and biologic factors to be kept in mind while restoring endodontically treated teeth⁸

1. Pretreatment Evaluation:

i. **Quality of the endodontic treatment:**

- The endodontic treatment should be properly done.
- Retreatment should be considered if tooth exhibits any clinical signs of inflammation, a periapical pathology exists, or inappropriate endodontic filling material was used (silver pointes).

ii. **Periodontal condition:**

- This is important for long-term success of teeth.
- Weak teeth should be extracted.
- A mutilated tooth in which the restorative treatment would violate the junctional epithelium or the attachment level should be considered for crown- lengthening surgery or orthodontic extrusion.

iii. **Restorative evaluation:**

• **Strategic importance:**

How important is to retain this tooth in the final restorative outcome of the patient? Are the adjacent teeth reliable? What about an implant ?

Anatomic position of the tooth:

Anterior teeth:

They receive mainly angular forces → reinforcement effect of posts is doubtful.

If the tooth is intact except for the endodontic access opening → etched resin in the access is sufficient.

A post and core is only indicated when the tooth is weakened by the presence of large or multiple coronal restorations or they require form or/and color changes that cannot be otherwise treated with bleaching, laminate veneers or resin bonding.

Mandibular incisors and maxillary lateral incisors → usually require a post.

Maxillary central incisors and canines → crown preparation, the remaining tooth structure, is accomplished before deciding a post should be placed. **Posterior teeth:**

They receive mainly vertical forces.

When there is sufficient tooth structure to retain a core and crown → posts are not needed.^{5,6}

Teeth which have interdigitation with opposing teeth → full coverage crowns or onlays should be used as occlusal forces push the cusps apart.

Maxillary premolars are subjected to angular and vertical forces → if the clinical crown length > its cervical width a post may be indicated.

a. The amount of remaining coronal tooth structure:

More than half → conservative treatment with coronal restorations without posts.
minimal → post, core, and definitive restoration.

b. The functional load on the tooth:

The post, core, and crown system is indicated, when more extensive protective and retentive features are required in the restoration:

- Bruxism and heavy occlusion.
- Abutment teeth for long-span fixed bridges.
- Abutment teeth for free end removable partial denture.

esthetic evaluation:

Esthetic zone requires:

- Careful selection of restorative materials.
- Careful handling of the tissues.
- Timely endodontic intervention to prevent darkening of the root as it loses vitality.

TREATMENT PLAN: (POST AND CORE)

The post provides retention to the core; it does not strengthen the endodontically treated teeth. If the walls of the root are thin owing to removal of internal root caries or over-instrumentation during post preparation then a post may strengthen the tooth.

Reinforcement of a tooth by a post means: moving the fulcrum from the gingival margin of the crown some distance up the root towards the root apex.

Type of post:

According to type of material:

- Metallic.
- Non-metallic
- Types of Non Metal Posts: Fiber- Reinforced & Ceramic

Fiber- Reinforced posts can be separated into three groups:³

- Carbon Fiber
- Glass Fiber
- Quartz Fiber

Ceramic posts are zirconia Based

Carbon fibre posts have stiffness similar to dentin. They are black and opaque. They have a higher strength than other fiber posts and are the easiest to remove.⁹

Glass fiber posts also have stiffness similar t dentin but are white, either translucent or opaque.

The translucent posts allow light transmission.¹⁰

Quartz Fiber posts are stronger than glass fiber posts. The translucent posts also allow for light transmission.

Ceramic posts are zirconia-based posts. They have high strength and stiffness. Ceramic posts have good esthetic properties and are bio compatible. They must be sandblasted to improve the bonding but can be difficult to remove.^{1,4}

II. CASE REPORTS

CASE 1 ESTHETIC REHABILITATION OF A BROKEN TOOTH



Try-in the post and adjust the length

Apply primer to post and canal, Dry and Light-cure



Etch canal*, rinse and remove excess water with paper point

Cement post, light-cure or allow to set



Apply core build-up resin light-cure or allow to set. Trim and contour core build-up

Post operative view

A 35 year old male patient reported to the dental OPD for replacement of un aesthetic maxillary incisors. upon crown removal, it was noticed that the remaining tooth structure was structurally weakened. An all ceramic restoration was planned for the upper maxillary incisors. The previous root canal treatment was found to be satisfactory. Hence it was decided to restore the tooth with fibre reinforced composite post system. After post space preparation, an initial try-in was done for the composite post. The primer was applied to the post and the canal interior and dried and light cured. Post was cemented in the canal ,core build up was done with light cure composite. Trimming and contouring was done. The teeth were restored with an all ceramic restoration system.

CASE2 ORTHODONTIC EXTRUSION OF 11 FRACTURED CLOSE TO THE GINGIVAL MARGIN

A 30 year old patient reported to the clinic with fractured 11, which was separated from the apical segment. The coronal fragment was extracted and it was noticed that the remaining crown length is too small to have a restoration with healthy periodontal margin. Orthodontic extrusion followed by gingivectomy and permanent restoration was planned.



Pre operative view

Pre operative IOPA

Root canal treatment was completed. Post space preparation was done and a temporary J hook was luted to aid in orthodontic extrusion.



Working length >14mm

Post obturation radiograph

After post space preparation

Orthodontic extrusion was started to bring the crown atleast 3-4mm above the gingival margin. The tooth was stabilized for 6 weeks.



After the completion of orthodontic extrusion.
Note the difference in gingival levels of 11 and 21.

After removal of the extrusion appliance, gingivectomy was performed to contour the gingival to the same height as the adjacent central incisor.



After gingivectomy and crown preparation

Crown preparation was done and metal ceramic restoration was cemented.



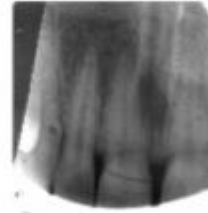
Post operative view.

CASE 3 REATTACHMENT OF FRACTURED CORONAL FRAGMENT

18 year old patient reported with fractured 11. The fractured coronal fragment was attached to the remaining portion of the tooth. Immediate splinting was done to stabilize the coronal fragment. Root canal treatment was started. Working length was established and sectional filling of the apical 3rd of the root canal was done with thermoplastized gutta-percha.



Pretreatment picture showing cervical 3rd fracture of 11



Diagnostic IOPAR showing cervical 3rd fracture of 11



Splinting of upper anteriors palatally to stabilise 11



Working length IOPAR



Single visit endodontic treatment of 11 done



Sectional filling with Obtura



Reattachment of 11 done with fiberoptic post & resin cement



Posttreatment IOPAR

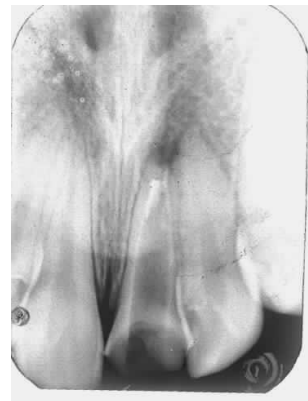
After sectional filling, minimal post space preparation was carried out and fibre post was luted with resin cement. The edges of the coronal fragment were slightly beveled and attached to the apical fragment with flowable composite.



Posttreatment picture showing reattached 11

CASE 4 REINFORCEMENT OF THE FLARED ROOT CANAL WITH FIBRE POST AND FLOWABLE COMPOSITE.

14 year old patient reported to our clinic with the complaint of dislodged crown. IOPA revealed a partially filled large root canal .any attempt to restore the tooth with cast post might result in inadvertent root fracture. Hence the treatment plan of reinforcing the root canl with fibre post and flowable composite was decided.



After cleaning and very minimal shaping of the root canal , 21 was obturated. After retaining apical 5 mm of gutta percha, the inside of the canal walls were etched with 37% phosphoric acid gel. Bonding agent was applied to the canal interiors as well as the post . Flowable composite was injected inside the root canal. The fibre post was coated with glycerine and placed inside the canal to create the pots space. After reinforcement of the root canal walls with composite , the fibre post was luted with resin cement, composite core build up was done and metal ceramic crown was cemented.



After cleaning and shaping



After obturation



After retaining apical gutta-percha



After root canal reinforcement



Application of etchant



Application of bonding agent



21 restored with metal ceramic crown

Non-Metal Post Benefits

- Glass and quartz fiber-reinforced resin and ceramic posts provide improved esthetics.
- Fiber reinforced posts have a stiffness closer to dentin, minimizing the chances of root fractures.
- Fiber-Posts can be bonded to dentin and a composite core, creating better stress distribution.
- Easy to remove during retreatment.

III. CONCLUSION

Fibre posts provide an easier and faster restoration of endodontically treated teeth. This case presentation covers 4 different clinical cases treated by esthetic posts. The function of a post is to hold the core (and crown) onto a damaged tooth. Posts do not strengthen the teeth, but they also should not harm the tooth.^{13,14.}

An ideal post should have optimal combination of stiffness, resilience and strength. It should be resilient enough to cushion the masticatory impact by stretching elastically. Also it should return to normal on release of the impact without permanent deformation.

An ideal post should be stiff enough not to structurally fail under masticatory forces. Finally, it should have adequate strength not to fail under a narrow-diameter structure such as a root canal.

Post selection for structurally weak teeth post challenge to the clinician.

Focus is on

1. Protection against root fracture.
2. Protection against microleakage and caries.
3. Maintenance of core and crown integrity.
4. Preservation of esthetics.

Marginal integrity is more with rigid post as they don't flex under force.^{2,7} In the absence of a crown, in extracted teeth with minimal remaining tooth structure, rigid posts have a higher rate of root fracture than non-rigid posts. The primary benefit of resilient posts with a lower modulus of elasticity is protection of the root from fracture through reduction of transfer of forces through the post to the root.^{10,12}

Hence, depending upon each clinical scenario, proper post selection should be done for the tooth to enact its role as a functional component in the masticatory system.

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***Corresponding Author: ¹Dr. M Rajesh Karthik**

¹M.D.S, Reader, Educare Institute of Dental Sciences, Chattipparamba, Malappuram.