

# Rehabilitation of traumatized anterior teeth with different types of post and core- Case Series

Dr. Tanu Rajain<sup>1</sup>, Dr. Kesang Tsomu<sup>2</sup>, Dr. Ishika Garg<sup>3</sup>, Dr. Saurabh Narang<sup>4</sup>,  
Dr. Ritu Namdev<sup>5</sup>

<sup>1</sup>Post Graduate Trainee 3<sup>rd</sup> year, Department of Pedodontics and Preventive Dentistry, PGIDS, Rohtak, Haryana

<sup>2</sup>MDS, Department of Pedodontics and Preventive Dentistry, PGIDS, Rohtak, Haryana

<sup>3</sup>Post Graduate Trainee 3<sup>rd</sup> year, Department of Pedodontics and Preventive Dentistry, PGIDS, Rohtak, Haryana

<sup>4</sup>Post Graduate Trainee 2<sup>nd</sup> year, Department of Pedodontics and Preventive Dentistry, PGIDS, Rohtak, Haryana

<sup>5</sup>Senior Professor and Head, Department of Pedodontics and Preventive Dentistry, PGIDS, Rohtak, Haryana

---

## ABSTRACT

**In young adolescent patient dental trauma to the anterior dentition is common. Majority of dental trauma occur in permanent maxillary incisors owing to their location in the dental arch. If there is substantial damage to the tooth structure the successful treatment depends not only on the good endodontic treatment but also on immediate post endodontic restoration of the tooth. If large amount of tooth structure is lost then a custom cast post and core is indicated. In this case report two cases have been discussed where both fibre post and core and custom cast post and core are given depending on the remaining amount of tooth structure.**

**Key-words: complicated crown fracture, glass fibre post, custom cast post, ferrule, anterior teeth, RCT.**

---

## INTRODUCTION

The most common type of trauma to occur in the maxillofacial region is the injuries to primary and permanent dentition. The causes for traumatic tooth injuries in children are most frequently due to an accidental fall, although they may also occur as a result of a traffic accident, impact sports or play. Maxillary incisors are the teeth most commonly involved in dental trauma because of their exposed position in the dental arch, and in most cases, damage occurs to the crown. The most frequently involved teeth in traumatic injuries are maxillary incisors followed by upper and lower lateral incisors and the upper canines, however, the rate of traumatic injury is significantly higher for maxillary incisors than for other teeth<sup>1</sup>.

In cases of complicated crown fracture various treatment options are available like fragment removal and immediate restoration, restoration after gingivectomy or osteotomy, forced orthodontic extrusion, forced surgical extrusion, vital root submergence, and extraction of the root. The fracture that occur at the cemento-enamel junction can be easily diagnosed clinically and radiographically. Treatment options are available based on the fracture line, if the fracture line is above the alveolar bone, the fractured part is usually removed and a post core and crown restoration is carried out following root canal therapy. Various factors need to be considered when selecting the treatment i.e. esthetics, function, and the patient's expectations<sup>2</sup>.

If there is more than 50% tooth structure loss in anterior teeth then post and core followed by full coverage restoration is mandatory<sup>3</sup>. Post and core as a single unit or in combination of the individual units is a restorative procedure wherein a post can be defined as a rigid extension placed in the root canal space of an endodontically treated tooth so as to provide retention and stabilize a weakened tooth by providing support to the core and a core can be defined as a restorative material used for replacement foundation of extensively damaged endodontically treated tooth, that is built up on the remaining tooth structure or is in-cooperated into the post to provide an anchorage to the crown meant for final restoration<sup>4</sup>.

Among several techniques, posts, and materials for cementation and core build-up reported in the literature cast post and core has been traditionally used due to its high mechanical strength and desirable fit in the root canal<sup>5</sup>. Cast posts with integral cast cores can compensate for disparities between the angulation of the root and the planned crown. Cast posts with

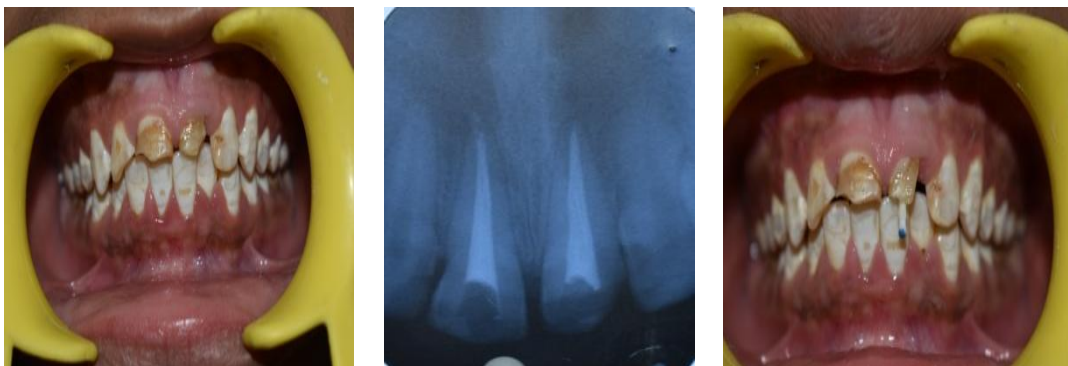
cores do not have the potential for separation or breakdown that may occur between prefabricated posts and their cores. Stud attachments may more readily be joined to cast posts. Cast metals have greater strength in thin section than the composite adjacent to fibre posts. This allows the production of ferrules, or diaphragms<sup>[6]</sup>. However, teeth restored by such systems may show more frequent oblique/horizontal fractures in the middle third of the root, or vertical root fractures caused by both increased stress concentration in the apical region of the post and a difference in the Young's modulus between dentin and metal<sup>[5]</sup>. Removal of a long metal post can be difficult, if not impossible, and may result in root fracture. Non-precious metals show corrosion within the root. Using amalgam as a core in combination with a prefabricated post may set up galvanic currents and promote further corrosion. The corrosion products can pass through the dentine of the root and have also been implicated as a cause of root fracture<sup>6</sup>.

An ideal core and post improves the biomechanical stability of an abutment tooth preventing debonding and root fracture or fracture of the abutment. Therefore, over the last decades, prefabricated glass fiber posts have been used as an alternative for custom metallic posts. Due to improvements in adhesive techniques, resin composites cores and glass fiber posts have become increasingly prevalent<sup>5</sup>. A major advantage of fibre posts is that the technique for removing them (with rotary instruments) in the event of fracture or need for endodontic retreatment is much simpler than that needed to remove metal posts. With glass-fibre posts there is also an aesthetic advantage. In comparison with non-precious posts, non-metal systems undergo no corrosion and are more biocompatible. A possible goal of using dentinebonding agents to cement a post would be to unite the encircling dentine with the post and thereby reinforce the root. This would be particularly advantageous where no dentine remains supragingivally around which to place a conventional ferrule<sup>6</sup>.

This case series addresses the management of traumatized maxillary central incisors with complicated crown fractures requiring root canal treatment and post and core treatment. Both cast metal and fibre post have been used to restore the fractures teeth followed by porcelain fused to metal (PFM) crowns.

### CASE 1

A 11 year old boy reported with the chief complaint of trauma to the both the permanent maxillary central incisors 5 days back (fig 1). The patient was conscious and there was no evidence of head or neck trauma. Extra oral examination revealed no significant abnormalities, and intra oral examination revealed neither laceration nor evidence of alveolar bone fracture. Clinical examination showed Ellis class 3 fracture of both the permanent maxillary central incisors with normal mobility. Access cavity was prepared and the pulp chamber of both the central incisors was exposed, and the necrotic parts of the pulp chamber were excavated. A confirmatory vitality test carried out revealed no response, and it was concluded that the pulp of both teeth had become necrotic as a result of trauma. A radiograph indicated complete root formation and a closed apex and did not show any other fracture or injury on the adjacent tooth. A treatment plan was decided, that comprised immediate endodontic treatment of both fractured maxillary central incisors (fig 2). Following cleaning, the root canals were filled with sealer and gutta-percha using the vertical condensation technique in both the central incisors. As there was more tooth structure loss in permanent maxillary left central incisor post and core treatment was planned in it (fig 3). The gutta-percha was then partially removed, leaving the apical 4 mm of the filling to maintain a good seal and a glass-fibre-reinforced composite root canal post was placed in the canal of tooth 21 (fig 4). This was followed by placement of PFM crown on both the maxillary central incisors (fig 5,6).



**Fig 1: Preoperative Intraoral View    Fig 2: Iopa Showing Obturation    Fig 3: Fibre Post Given**



**Fig 4: Crown Preparation Done Fig 5: Iopa Showing Fibre Post and Crown Fig 6: Pfm Crown Given**

### CASE 2

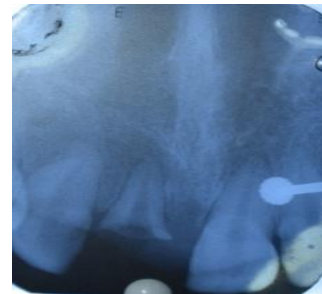
A 13 year old female reported with the chief complaint of trauma to the permanent maxillary right central incisor one month back. On extraoral examination no laceration or bleeding was seen. Intra –oral examination revealed severely traumatized permanent maxillary right central incisor with Ellis class 8 fracture (fig 1,2). Access cavity was prepared and biomechanical preparation was done using hand files in a step back technique and intracanal medicament of calcium hydroxide was placed in relation to tooth 11 for 1 week. Obturation was completed using gutta percha by lateral compaction technique(fig 4) . Owing to the amount of tooth structure lost and presence of non-uniform ferrule, crown lengthening was done(fig 5) . Custom post was prepared using acrylic resin(fig 6,7). Custom metal cast post was fabricated (fig 8). PFM crowns was given(fig 9,10).\



**Fig 1. Preoperative Intraoral View**



**Fig 2**



**Fig 3. Preoperative Iopa**



**Fig 4: Iopa Showing Obturation**



**Fig 5: Crown Lengthening Done**



**Fig 6: Acrylic Post Given**



**Fig 7: Acrylic Post**



**Fig 8: Metal Post Given**



**Fig 9: Pfm Crown Given**



**Fig 10: Iopa Showing Post and Core and PFM Crown Given**

### DISCUSSION

Crown fracture is the most common type of traumatic injury affecting the permanent dentition . anterior teeth are most commonly involved in majority of the dental injuries, especially the maxillary central incisors<sup>2</sup>. Various treatment options are there for cases of crown fracture, each with their own advantages and disadvantages . For a fractured or extremely broken young permanent tooth in the anterior area extraction should not be the first treatment option , because it leads to loss of bone in the area, future implant placement could be compromised. If extraction were performed , an uncomfortable removable appliance would have to be worn until the patient is 18 years old. The adjacent teeth could be at caries risk due to associated potential for plaque retention. Therefore alternative treatment modalities have been considered <sup>7</sup> .

If the tooth has been diagnosed as non-vital , proper endodontic management is done to eliminate bacteria from the root canal followed by placement of suitable root filling to achieve an optimal coronal and apical seal<sup>8</sup>. Conservative treatment should be done for restoration for an endodontically treated tooth so that it does not increase horizontal and vertical forces on tooth. So far, metal alloys have been available to the dentist for this procedure. These metals which are hard and unyielding , have to be cast in the precise shape of the prepared canals and cemented into place. They can wedge the root If too tight and can usually come out if too loose <sup>12</sup> .

If due to endodontic therapy, trauma, decay, and resulting preparation for restorative procedures, a large amount of tooth structure has been removed<sup>9</sup>. Under these circumstances, complete crown often require the additional support by post-retained core<sup>10</sup>. Thus whether a post is needed or not depend on how much natural tooth substance remains<sup>11</sup>. In 2003, the National Authority for Health (HAS) in France published recommendations regarding restoration of endodontically-treated teeth with a post and core system (HAS 2003)<sup>13</sup> .

Healing of periapical inflammation in 91.4% of the teeth occurs with a good post endodontic restoration along with good endodontic treatment, whereas absence of periradicular inflammation by only 18.1% occurs with poor restorations and poor endodontic treatment . Furthermore, success rate is 67.6% with poor endodontic treatment followed by good permanent restoration. This clearly showed that success of endodontically treated teeth depended significantly more on the post endodontic restoration rather than quality of endodontic treatment as suggested by Trope and Ray. Keeping in mind, the wide array of post systems available in the market and the shift in clinical practice from traditional custom cast posts to prefabricated posts, it is necessary to weigh the advantages and disadvantages of both during treatment planning<sup>3</sup> .

Custom fabricated cast post and core are still considered to be the gold standard for restoring extensively damaged endodontically treated teeth, they can be used in all types of canal configurations- oval or elliptical. Also, according to Gomez Polo et al, cast metal posts have shown higher survival rates over 10 years<sup>3</sup>. However it poses risk of root fracture due to its shape and rigidity. The rigidity of post should be equal or almost equal to that of dentin so as to distribute functional forces evenly along the length of the root. More recently new materials have been introduced including fibre-reinforced post. Their biomechanical properties are close to that of dentin<sup>10</sup>. It has been suggested that the use of a long, thin fiber post is effective for reducing the tensile stress that can lead to tooth root fractures of the anterior teeth with endodontic treatments<sup>14</sup> .

Several factors are related to the rehabilitation of root-filled teeth such as amount and location of dentinal walls, post length and post cementation length, presence of ferrule and final restoration<sup>15</sup>. A systematic review showed that with the absence of a ferrule or only one coronal wall the success /survival rate of endodontically treated teeth crowns ranged between 0% and 97% while with three and four wall group there was high success or survival rate with lower variation ie.

66.7% and 100%<sup>16</sup>. Ferrule is the circumferential ring of tooth structure that is enveloped by the cervical portion of the crown. It provides a bracing action to improve the integrity of root canal treated tooth. It allows the crown and root to function as an integrated and transmits the occlusal forces to the periodontium physiologically. According to Santos-Filho PC et al, the fracture resistance of the endodontically treated incisors have been increased with a 2mm ferrule, irrespective of crown, core or post type. This may be attributed to an improved stress distribution to the root. The level of stress concentration in dentin for different metal and non-metal post systems is reduced with a 2 mm ferrule in teeth restored with metal crowns. Thus, as long as sufficient dentin remained stiffness of the post and core materials did not appear to significantly influence the strain values and fracture resistance. Also, according to Santos Filho PC et al, it has been reported that fracture resistance of anterior teeth is enhanced with the presence of a 2mm crown ferrule surrounding remaining tooth structure which were restored with a cast post and core and metal ceramic crowns<sup>3</sup>.

In case 1 sufficient amount of tooth structure was present and adequate amount of ferrule surrounding the tooth structure has been achieved so a fibre post has been placed in this case.

The Case 2 presented with less peri-cervical tooth structure, cast posts were opted for post endodontic restoration followed by full coverage restoration. According to a systematic review by Rafael Sarkis Onofre et al, posts with high modulus of elasticity performed better. In the absence of a ferrule, cast posts with higher modulus of elasticity are preferred, since the amount of tooth structure available for bonding is less and there are no long-term studies on fiber posts to prove the same. Fracture resistance of restored teeth and the mode of failure are the result of interaction between multiple mechanical properties and not just the material of the post. However, in certain clinical situations such as in teeth that lack cervical stiffness or in tooth with extensive destruction, with no ferrule or unable to obtain ferrule- cast posts are preferred<sup>[3]</sup>. Having a good palatal ferrule is as effective as having a complete `continuous 360 degree ferrule` in maxillary incisors, as nonaxial load from the palatal side from mandibular incisor challenges the post core /root junction. Hence a labial access was planned in relation to 11 as against the palatal to retain sufficient palatal tooth structure. As insufficient ferrule was present hence crown lengthening has been done in relation to permanent maxillary right central incisor to obtain a ferrule. The choice of crowns in this case would be either an all ceramic crown with a zirconia coping to mask the discolouration or a porcelain fused to metal crown. Keeping the patient's affordability in mind, PFM crowns were chosen as the final restoration.

## REFERENCES

- [1]. Altun C, Guven G. Combined technique with glass- fibre- reinforced composite post and original fragment in restoration of traumatized anterior teeth—a case report. *Dental Traumatology*. 2008 Dec;24(6):e76-80.
- [2]. Durkan RK, Özel MB, Celik D, Bağış B. The restoration of a maxillary central incisor fracture with the original crown fragment using a glass fiber- reinforced post: a clinical report. *Dental Traumatology*. 2008 Dec;24(6):e71-5.
- [3]. Akhtar A, Godla N, Vedavathi B, Nadiq RR. Custom cast posts-A diminishing reality?-A case report. *IJADS*. 2018;4(3):01-04
- [4]. Singh SV, Chandra A, Pandit IK. A new classification of post and core. *Ind J Rest Dent*. 2015;4(3):56-8.
- [5]. Reis JM, Oliveira CR, Reis EG, Mascaro BA, Abi-Rached FD. One- step fiber post cementation and core build- up in endodontically treated tooth: A clinical case report. *Journal of Esthetic and Restorative Dentistry*. 2020 Jan;32(1):5-11.
- [6]. Stewardson DA. Non-metal post systems. *Dental update*. 2001 Sep 2;28(7):326-36.
- [7]. Dede DÖ, Tunç EŞ, Güler AU, Yazicioğlu S. Multidisciplinary approach to a subgingivally fractured incisor tooth: A case report. *Journal of Dental Sciences*. 2017 Jun 1;12(2):190-4.
- [8]. Phillips JM, Srinivasan V. The management of non-vital immature permanent incisors. *Dental Update*. 2014 Sep 2;41(7):596-604.
- [9]. Pontius O, Hutter JW. Survival rate and fracture strength of incisors restored with different post and core systems and endodontically treated incisors without coronoradicular reinforcement. *Journal of Endodontics*. 2002 Oct 1;28(10):710-5.
- [10]. Signore A, Benedicenti S, Kaitsas V, Barone M, Angiero F, Ravera G. Long-term survival of endodontically treated, maxillary anterior teeth restored with either tapered or parallel-sided glass-fiber posts and full-ceramic crown coverage. *Journal of Dentistry*. 2009 Feb 1;37(2):115-21.
- [11]. Cheung W. A review of the management of endodontically treated teeth: Post, core and the final restoration. *The Journal of the American Dental Association*. 2005 May 1;136(5):611-9.
- [12]. Acharya S, Tandon S. Fibre Reinforced Composite: Post and Core Material in a Pediatric Patient-An Alternative to Usual. *Journal of clinical and diagnostic research: JCDR*. 2014 Nov;8(11):ZD29.
- [13]. Bolla M, Muller-Bolla M, Borg C, Lupi-Pegurier L, Laplanche O, Leforestier E. WITHDRAWN: Root canal posts for the restoration of root filled teeth. *The Cochrane database of systematic reviews*. 2016 Nov;11:CD004623-.
- [14]. Kulkarni VK, Sharma DS, Banda NR, Solanki M, Khandelwal V, Airen P. Clinical management of a complicated crown-root fracture using autogenous tooth fragment: A biological restorative approach. *Contemporary clinical dentistry*. 2013 Jan;4(1):84.
- [15]. Santos-Filho PC, Veríssimo C, Soares PV, Saltarello RC, Soares CJ, Martins LR. Influence of ferrule, post system, and length on biomechanical behavior of endodontically treated anterior teeth. *Journal of Endodontics*. 2014 Jan 1;40(1):119-23.
- [16]. Wang X, Shu X, Zhang Y, Yang B, Jian Y, Zhao K. Evaluation of fiber posts vs metal posts for restoring severely damaged endodontically treated teeth: a systematic review and meta-analysis. *Quintessence International*. 2019 Jan 1;50(1).