**International Journal of Medical Science and Clinical Inventions 4(5): 2957-2961, 2017**
**DOI:10.18535/ijmsci/v4i5.17** **ICV 2015: 52.82**
**e-ISSN:2348-991X, p-ISSN: 2454-9576**


**Case Report**

# Management of Blunderbuss Canal with a Single Visit Post-Core Buildup

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**ABSTRACT:**

**Background and overview.**

Apexification is induction of apical closure, the treatment of choice for necrotic teeth with immature root. Traditionally calcium hydroxide $Ca(OH)_2$ has been the material of choice for apexification, recently Mineral Trioxide Aggregate (MTA) has been proposed as a potential material for formation of hard tissue apical barrier. Use of custom made posts or prefabricated posts may result in vertical root fracture during post space preparation. Use of an anatomical post results in better prognosis of the present case. This article highlights a case report of immature permanent tooth with Apexification using MTA followed by anatomic post and core.

**Case Description.**

A 16-year-old male patient complains of fractured and discolored teeth in upper front teeth region. Past dental history of discontinued endodontic treatment 8-years back. Treatment includes two phases- endodontic phase and re-construction phase followed by full crown porcelain fused metal prosthesis.

**Clinical Implications.** Discussion focuses on reconstruction of endodontically treated tooth by selection of appropriate post and core from various materials available today. The present case report discusses about the custom made composite post and core in the management of endodontically treated tooth maxillary anterior tooth.

**KEYWORDS: Immature permanent tooth, apexification, endodontically treated tooth, custom made composite post and core.**

## Introduction

Traumatic injuries sustained before the closure of apex interrupts in the root development and results in immature apical closure. Due to the lack of an apical constriction endodontics becomes major problem as optimal seal is difficult to achieve, failure of which leads to apical leakage and extrusion of root filling materials into the periapical tissues. In such conditions apexification or root end closure becomes the treatment of choice [1]. *Apexification* is defined as "*a method of inducing a calcified barrier in a root with an open apex or the continued apical development of an incompletely formed root in teeth with necrotic pulp*" [2]. Traditionally calcium hydroxide was the material of choice for apexification. In recent times Mineral Trioxide Aggregate (MTA) has gained widespread popularity to induce apexification in young permanent tooth. MTA is available in the form powder which sets in the presence of moisture. It was introduced as an alternative to long term apexification due to the possibility to restore the tooth with a minimal delay, and thus to prevent the fracture of the root, avoids changes in the mechanical properties of dentine because of the prolonged use of calcium hydroxide and also non cytotoxic and good biological properties. This one visit apexification procedure benefits both patient and clinician with reduced clinical time and forms a good apical seal [3,4]

The restoration of endodontically treated tooth involves restorative procedures which are complicated further by various post and core systems. The treatment varies on the loss of tooth structure [5]. Prefabricated posts over custom made posts add advantage of reduced clinical time. But in cases with week fragile dentinal walls, custom made posts are preferred as they stimulate the root canal anatomy. So an improved option of application of chair side customized made fiber post provides increased retention and adaptation and also aesthetics [6].

## Historical Perspectives

Pierre Fauchard 1728, described the use of "tenons," which were metal posts screwed into the roots of teeth to retain bridges.

In the mid-1800s, wood replaced metal as the post material, and the "pivot crown," a wooden post fitted to an artificial

crown and to the canal of the root, was popular among dentists. As these wooden posts frequently cause root fractures as they absorb fluids and expand.

In the late 19th century, the "Richmond crown," a single-piece post-retained crown with porcelain facing, was engineered to function as a bridge retainer.

During the 1930s, the custom cast post-and-core was developed to replace the one-piece post crown which requires casting a post-and—core as a separate component from the crown. This 2-step technique improved marginal adaptation and allowed for variation in the path of insertion [3]

**Basic Principles in the Restoration of Endodontically Treated Teeth**

The preponderance of literature supports the following guiding principles:

i. Posterior teeth with root canal treatment should receive cuspal coverage. Bonded restorations, once thought to obviate the need for cuspal coverage, provide only short-term strengthening of the teeth, according to recent studies.

ii. Anterior teeth with minimal loss of tooth structure can be restored conservatively

with bonded restorations.

iii. Preservation of coronal and radicular tooth structure is desirable.

iv. The purpose of a post is to retain core buildup.

v. A ferrule is highly desirable when a post is used. An adequate ferrule is considered a minimum of 2 mm of vertical height and 1 mm of dentin thickness [7]

As an alternative to traditional cast or prefabricated metal posts various types of fiber reinforcement post are available for restoration of endodontically treated teeth. The advantage of using reinforces fiber as intracanal post include resin composite crown reinforcement, translucency and ease of manipulation. This paper presents a case report of 16-year old male with fractured and discolored maxillary anterior tooth with apexification by MTA followed by restoration with custom made composite post.

**Case Report**

A 16-year old male patient reported to the department of conservative dentistry and endodontics with chief complaint of discolored upper front tooth. Patient's medical history was noncontributory. History of trauma 9 years back with intermittent, dull throbbing localized pain. Dental history involves discontinued endodontic treatment 8 years back. Intraoral examination revealed ellis class IV fracture in tooth #8, ellis class II fracture #9 (Figure 1). Digital radiography revealed wide canal with immature apical closure and periapical radiolucency of tooth #8 (Figure 2).

Treatment plan included endodontic treatment with MTA apexification in tooth #8 and composite build up in tooth #9.

Figure 1: Elllis class IV fracture in tooth #8, Ellis class II Fracture 2 in tooth #9

Figure 2: Pre operative

Previous access opening was modified and working length determination was confirmed with digital radiography. As canal was bleeding, the canal was irrigated with 3% Sodium Hypochlorite (NaOCl) and normal saline. The canal was dried with sterile paper points followed by Calcium hydroxide for a week. After a week, the calcium hydroxide was removed with alternative irrigation with 3% NaOCl followed by 17% Ethylene Diamine Tetra Acetic Acid (EDTA) solution and final rinse with normal saline. Once the canal was dried with no exudates, the MTA (Angelus, Londrina, PR, Brazil) apical plug was prepared. MTA plug was placed and condensed with hand plugger with a thickness of 3-5mm as per manufacturer instructions (Figure 3). A sterile damp pellet of cotton was placed over the canal orifice and the access was sealed with Cavit $^{TM}$ G (3M ESPE). And placement of MTA was confirmed with RVG. After a week the canal was obturated with sectional obturation technique of 3-5 mm thickness, followed by composite post and core build up. (Figure 4). As per the canal anatomy after endodontic treatment no pre fabricated post could satisfactorily adapt to walls. Also the amount of residual dentin contraindicated further preparation for the adaptation of the post. Hence the decision was to prepare anatomic post for tooth #8. Peaso reamer of #3 was used to remove the undercuts of the canal wall. Direct wax pattern for post and core was made.

Figure 3: MTA apical plug in tooth #8

Figure 4: Sectional Obturation in tooth #8

A block was prepared with soft putty (Affinis Putty-Coltene Whaledent) in which direct fabricated wax pattern was secured so as to obtain the impression of the pattern in the block. Once the putty block was hardened, it was sectioned into two halves and the wax pattern which was removed. Incremental build up of composite was done (Ivoclar Vivadent Tetric N-Ceram) with curing time for 40 seconds to form the post. Once minimum thickness was prepared the post was placed in the canal and radiograph was taken to confirm the length of post (Figure 5). Further build up of post was done by applying a layer of composite and was placed in the canal to the record the canal space and step by step curing of the composite material. After adequate thickness of post, core build up was done with the same composite material used for post (Figure 6). Occlusal interferences in normal and paranormal mandibular moments were removed. The post and core was polished with Super Snap composite kit (Buff Mini-Disk – Shofu). The prepared post and core was then cemented with Para Core Automix (Coltene) (Figure 7 and 8). At the same time composite build-up of the adjacent tooth #9 was prepared (Figure 8).

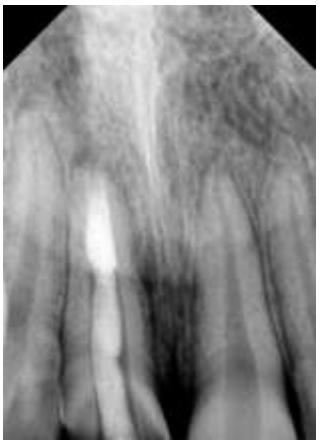


Figure 5: Try in of post in tooth #8

Figure 6: Composite post and core

Figure 7: Radiograph of cemented post and core in tooth #8

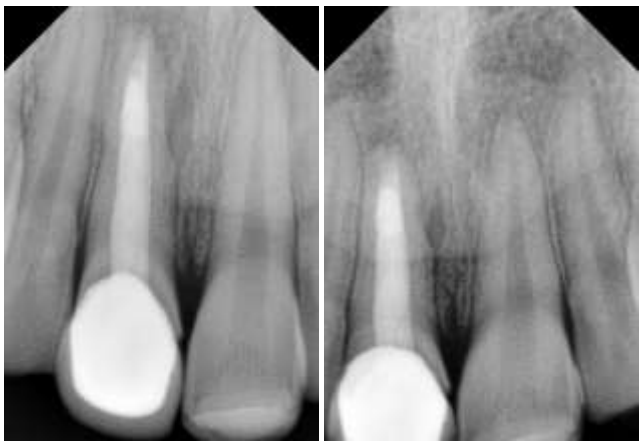
Figure 8: Cementation of composite post and core #8 and composite build up in #9

The tooth was then prepared for the Porcelain fused metal crown followed by temporary crown until PFM crown prepared. After 10 days temporary crown was removed and PFM crown was cemented (Figure 9 & 10).

Figure 9: Porcelain fused metal crown in tooth #8 with composite build up in tooth #9

Figure 10: Radiograph of prosthesis cementation in tooth #8

The case was further followed for next 6 months, 12months and 24 months. Reduced periapical radiolucency was noted in the first 6 months followed by complete healing of periapical tissues in24 months (Figure 11).



a) b) c)

Figure 11: Follow up radiographs. a) 6months; b) 1year; c) 2 years

**Discussion**

Apexification is a procedure to induce calcific barrier in a root with open apex which is mandatory to allow the compaction of root filling material. Traditionally calcium hydroxide has been the material of choice to create such barrier. Despite the popularity, calcium Hydroxide ($Ca(OH)_2$) therapy has some inherent disadvantages of repeated changes of the material for 5-20 months for induction of calcific barrier, unpredictable apical closure, high level patient compliance for lengthy course treatment, risk of re-infection of the coronal temporary restoration, and root fracture for extended periods of time changed in the shift of material used for apexification. Due to these reasons one visit apexification has been suggested by Morse et al. 1990. Combination of its biocompatibility and bacteriostatic makes it as a material of choice for apexification [8]. MTA has also been shown to have superior characteristics as a direct pulp-capping agent when compared with $Ca(OH)_2$ in animals and humans in the root canal, which would result in intracanal bone formation and arrest of root development. But the main disadvantage of MTA is its manipulation [9].

With the above discussed disadvantages of $Ca(OH)_2$, MTA was used as material for apexification procedure. Also MTA plug technique calcium hydroxide was used as inter appointment of dressing as to disinfect the canal. This is because chemo-mechanical preparation alone is not effective for complete elimination of microorganisms.

The most commonly used core materials are cast gold, amalgam, resin-based composite and glass ionomer cement (GIC). Certain desirable features for core material were described by Morgano and Brackett. They include adequate compressive strength to resist intraoral forces, biocompatibility, resistance to leakage of oral fluids at the core-to tooth interface, ease of manipulation, ability to bond to remaining tooth structure, thermal coefficient of expansion and contraction similar to tooth structure. Unfortunately, as the commonly used materials all exhibit certain pros and cons, no ideal core material exist [7].

For past many years metallic pre fabricated posts have

dominated for the restoration of endodontically treated teeth [10]. Yet, newer systems have evolved which focused on physical properties such as modulus of elasticity for reduction stress concentration and incidence of further fracture. Also the advantage of esthetics over metal posts lead to increase use of the composite and fiber re-inforced posts [11]. Endodontic posts however do not increase the stability of residual tooth structure after endodontic treatment. On the contrary, they result in weak tooth structure due to additional loss of tooth structure during post space preparation. Thus, a system should be selected that reduces the removal of residual dentin which minimizes the risk of root fracture [8]. In fact, in attempt to place a conventional fiber post in such a canal, one way is either forceful removal of root canal dentin with burs thus sacrificing considerable amount of residual tissue, or the other way is to apply a thick layer of cement to fill the space between the loose fitting post and canal walls. However, this procedure involves the risk of adhesive failure and debounding of the post. So a post preparation that closely matches the canal shape surrounded by a thin layer of adhesive cement indicated the ideal condition for retention[12].

Hence in the present case composite was selected as the material of choice for post and core after endodontic treatment. Other advantage was as the post used was metal free; they do not cause any metal allergies and offer good esthetics.

**Conflict of Interest.** None

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