

A PRACTICAL APPROACH IN CONSERVATIVE MANAGEMENT OF VERTICAL CORONAL FRACTURE IN MOLAR: A CASE REPORT

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ABSTRACT

Coronal vertical root fracture with posterior teeth due to exogenous acute trauma is uncommon compared to its occurrence in anterior teeth. Endodontic and restorative management of such fractures is a challenge for the clinician. Newer advancements in adhesive techniques can provide successful intracoronary splinting of such teeth to reinforce the remaining tooth structure. This paper describes the diagnosis and management of a case of complicated vertical coronal fracture in mandibular first molar using splinting followed by buildup with a new fibre reinforced composite core.

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KEY WORDS

Coronal root fracture; Cuspal fracture; Fibre reinforced composite; Vertical root fracture.

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INTRODUCTION

Most common causes of coronal fracture in posterior teeth are chronic masticatory trauma due to presence of large restorations or un-restored endodontically treated teeth [1,2] or an acute trauma. When a visible separation is present at the interface of segments along the line of fracture, it is termed as “complete fracture” [3]. The fracture is seen in the crown and generally terminates near the cemento-enamel junction (CEJ) or may extend apically into the root. When the coronal fracture extends mesiodistally there may be an involvement of a marginal ridge. A definite treatment plan for management of such teeth should involve proper history, diagnosis of signs and symptoms, examination of the fractured segment and the provision of necessary treatment with a suitable restoration that protect the remaining tooth structure [4]. This case report shows a practical approach for the management of fractured fragments and preservation of remaining tooth structure in a case of posterior vertical coronal tooth fracture.

CASE REPORT

An 18-year-old female patient reported to the department of Conservative Dentistry & Endodontics, Sinhgad Dental College & Hospital, Pune with the complaint of pain in the lower right posterior tooth region since three days. She gave a history of trauma after she met with a traffic accident. On examination a vertical fracture in crown of right mandibular first molar with pulpal exposure was seen. The fracture line extended mesiodistally towards the mesiolingual aspect. The fragments were intact and in position. Wedging with a probe showed movement of the lingual segment indicating a complete fracture. After adequate isolation, remaining tooth surfaces were carefully examined for presence of other cracks or craze lines. Soft tissues around the tooth were examined for any defects such as swelling, dehiscence or fenestration to rule out any root fracture. Radiographs taken at different horizontal angulations suggested fractured fragments separated by a narrow radiolucent line extending to the CEJ [Figure –1].

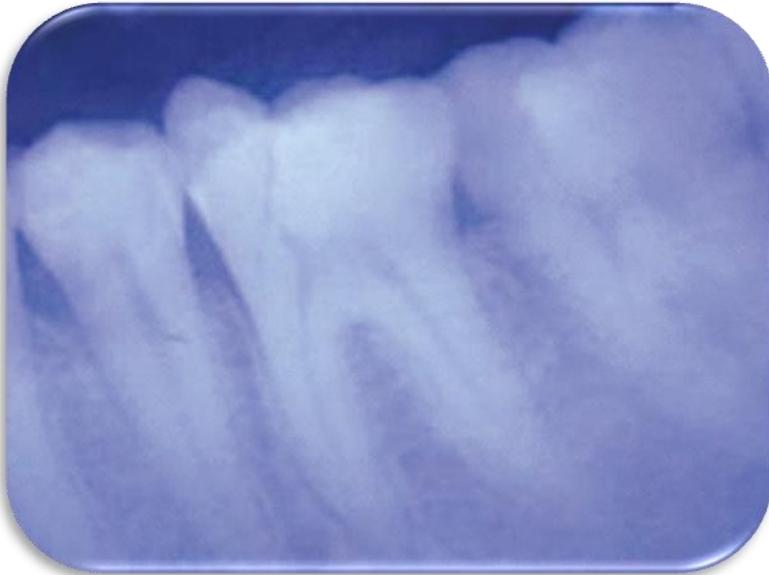


Fig: 1. Pre – operative radiograph showing fractured fragments separated by a narrow radiolucent line extending to the CEJ

The case was diagnosed as a vertical coronal fracture in the mesiodistal direction running upto the dentin and involving pulp but confined to the crown of the tooth. Treatment plan proposed was placement of molar band for stabilization around the crown followed by root canal treatment with restoration using a fibre reinforced composite as core material and covered by an onlay of nanofilled composite. This treatment plan was informed to the patient and consent obtained.

The tooth was adjusted out of occlusion in the same appointment. A preformed orthodontic stainless steel molar band (Ortho organizers, CA, USA) was cemented around the tooth (Cem – Zinc, D – tech Dental Technologies, Wagholi, Pune) to hold the fragments in position [Figure– 2].



Fig: 2. Splinting of fractured cuspal fragment using orthodontic band followed by access opening

This stabilization also helped in isolation during the root canal treatment. Access opening was done, pulp was extirpated. Canals were prepared using hand protaper (Dentsply Mallifer, USA) and was temporized using temporary filling (Prime Dental Products, Mumbai, India). The patient was recalled after a week after which the canals were obturated using lateral condensation technique and RC fill, a ZOE based sealer (Prime Dental Products, Mumbai, India) [Figure– 3].



Fig: 3. Immediate post obturation radiograph

After performing the standard adhesive technique [acid etching carried out using 37% phosphoric acid (Etching gel, Prime Dental Products, Mumbai, India) followed by bonding using 5th gen single bottle adhesive system Tetric Bond (Ivoclar Vivadent Schaan, Principality of Liechtenstein)], the cavity surfaces were coated with a layer of low-viscosity resin composite (Protect Liner F, Kuraray, Japan). Curing was done using a combination of pulse and progressive curing technique. Restoration was done incrementally with fibre reinforced composite (everX Posterior GC, India) composite core and an onlay of nanofilled composite resin (Solare X, GC, India) [Figure-4]. Orthodontic band was removed using band removing plier (Eltee, Libral traders, New Delhi). A full coverage crown was given after the post endodontic restoration [Figure- 4].

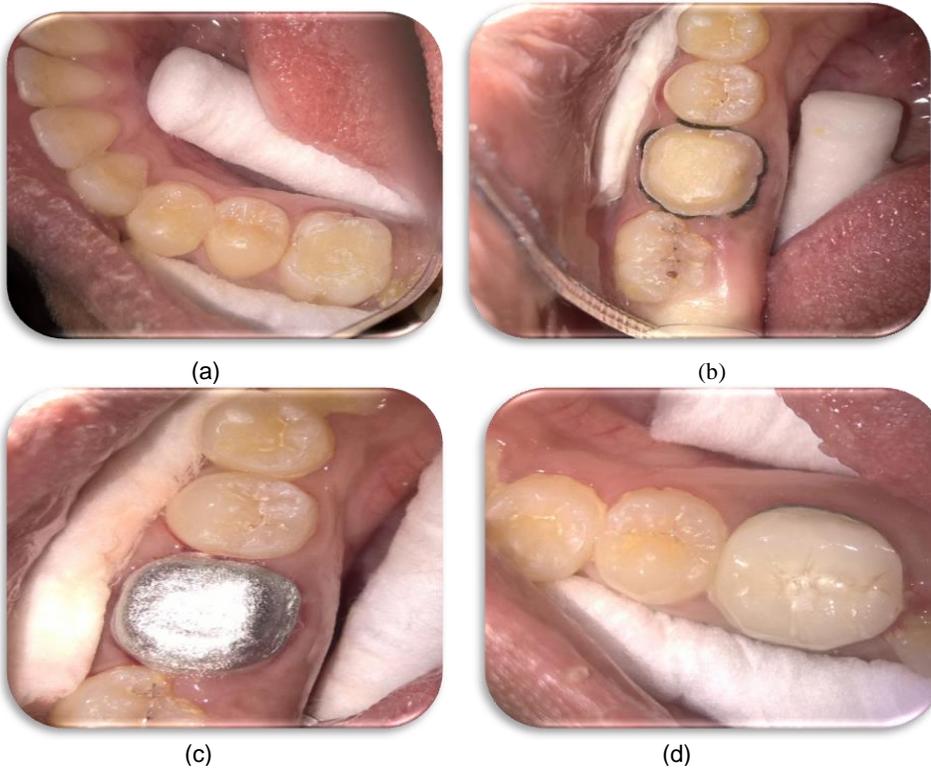


Fig: 4(a). Post endodontic restoration using everX Posterior & onlay of Solare X. (b) Crown preparation. (c) Metal Try-in. (d) Full coverage crown.

A follow-up done at the end of 10 months showed satisfactory healing, suggesting the successful outcome of the treatment in saving the fractured tooth segment [figure– 5].



Fig: 5. 10 month follow up Radiograph

DISCUSSION

One of the most common causes of a posterior crown fracture is acute trauma[5]. Fractures involving both marginal ridges usually involve pulp and may extend apically into the root. Saving such fractured teeth remains a major concern for the clinician. Under occlusal load, coronal fracture increases the cuspal flexure. Resultant flexure not only weakens the tooth but also decreases the stiffness of the tooth. Hence, in such situations a temporary restoration should protect a tooth from further deterioration during endodontic treatment. Although traditional treatment approaches like the cast restoration or cuspal coverage has been suggested as the final restoration, studies have shown the importance of intracoronal strengthening of teeth to protect them against fracture[6]. Pane et al.[7] proved that stainless steel bands reduce cuspal flexure by one-half compared to teeth without bands and also doubled the fracture strength. The stainless steel band provides a good immediate treatment option to protect fractured teeth during root canal therapy. This paper discusses the use of stainless steel bands in restoring molar with cuspal flexure rather than extracting the fractured cusp followed by cuspal build up. The main objective of this case report is to stabilize fractured teeth from further weakening during access cavity preparation[8]. Post endodontic restoration remains an integral step in determining the final success of the endodontic therapy in the presence of fracture lines or cracks which are a cause of failure[9]. To increase the longevity of the treatment, the remaining tooth structure needs to be preserved and reinforced. Recent advances in bonding materials like fiber-reinforced composites (FRC) have been successfully used to prevent further fracturing of the traumatized tooth/cusps when incorporated in restorative adhesive resins. Miller TE in 1993 investigated the embedding of these fiber-reinforcement materials into dental resins and found that they provided for an increase in certain physical properties and for more durable tooth stabilization [10-11]. The fibrous assemblies can increase the effective fracture strength of the teeth. The fibers act as stiff bands when stretched over prefractured surfaces. This arrangement resists crack opening and creates a strong bridge between the fractured fragments [12].

Kangasniemi et al in 2003 stated that out of several different types of fiber reinforcement materials like kevlar, carbon, glass, ultra-high-molecular- weight polyethylene (UHMWPE) have also been used to provide fiber reinforcement[13].UHMWPE present in the form of a leno weave provides an increase in fracture strength. This is explained based on the combined effect of the fiber modulus and the interwoven structure (which has fibers oriented in multiple directions), allowing for the forces to be distributed over a wider area, thereby decreasing stress levels. The fibers provide multiple stress paths for redistribution of imposed stresses to intact portions of the

teeth, and away from the bonded surfaces [9]. According to Karbhari VM et al in 2007, the UHMWPE braid and lenoweave- reinforced specimens did not fail through rupture but showed a deflection and bending of the beam [14]. Samadzadeh A et al in 1997 stated that the lock-stitch weave of the UHMWPE is the tight weave that allows the ribbon to maintain a structural integrity by minimizing weave and fabric shifting within the composite [15].

A pulse-curing technique can reduce stress development at the cavosurface margins, which avoids the formation of microcracks[16] and results in an improved marginal adaptation and improved physical properties of composite resin[17]. A combination of incremental placement of composite resin and UHMWPE fiber reinforcement system reduces polymerization shrinkage, reinforce the remaining tooth structure, and reduce the total composite volume [18]. everX Posterior gives maximum strength, with the optimum size and combination of glass fibers and barium fillers within a tough polymer matrix. The short fibers used in everX Posterior provide fracture toughness greater than collagen-reinforced dentine and almost double that of conventional composite. When everX Posterior was used as a substructure followed by nanofilled composite (Solare X) as overlay, the combination required greater load to fracture as compared to Solare X alone.

The possible reasons could be –

1. The fibres in everX Posterior increased the adhesion to overlying composite by providing added mechanical retention.
2. Fibres orientate into a horizontal plane within the cavity. Due to the strong adhesion between resin and silanated fibres in everX Posterior, the direction of the fibres minimizes shrinkage in the horizontal plane after placement[19].
3. Short fibres prevent fracture propagation in fillings and tooth structure
4. Reliable bond to any overlying composite as well as to the tooth substance.

CONCLUSION

This paper presents a practical clinical technique for vertical coronal fracture management using stainless steel molar band and a fibre reinforced composite.

CONFLICT OF INTEREST

None

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None

FINANCIAL DISCLOSURE

None

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