MANAGEMENT OF VERTICAL FRACTURE- A CASE REPORT

ABSTRACT
Vertical tooth fractures are longitudinal fractures of crown and/or root which are caused by trauma, heavy occlusal forces and dental procedures. There is little research on longitudinal tooth fractures related to diagnosis and treatment outcome. There are few reports where fractured tooth can be salvaged when repositioned early and stabilized. This paper reports a case that explains the management of vertically fractured maxillary premolar by intra coronal splinting and full coverage restoration. This method is composed of three steps. First, the stabilization of fractured segment using an orthodontic band followed by conventional root canal therapy. The second step entailed repositioning the fractured segments with ligature wires. Core build up using composite resin and placement of crown was done.

KEY WORDS: Vertical tooth fracture, Intracoronal splinting, Adhesive technique, Full coverage restoration.

INTRODUCTION
Cracked teeth and their related entities, as well as vertical root fractures are longitudinal fractures of the crown and/or root. These fractures occur in all tooth groups and are caused by occlusal forces and dental procedures. Maxillary second premolars and maxillary first molars are most common teeth that are prone to vertical fracture. There is relatively little research on longitudinal tooth fractures particularly on clinical outcome related to diagnosis and treatment. Most treatment modalities are based on opinion and anecdotal information.

Diagnosis of vertical crown root fracture
Diagnosis of vertical root fracture is very difficult. We have to rule out everything else before accepting the diagnosis, as unless and until visualization, root fracture remains an assumption. The possible ways to diagnose vertical fracture are shown below:
1. Most of the time a trans-illuminating light is used to determine whether light passes from one side of the tooth to the other.
2. A bite test with tooth sloth on each cusp can be performed.
3. Dye can be used to temporarily stain the tooth and check if it is fractured.
4. Vertical root fracture usually has multiple sinus tracts situated in or close to attached gingival, rather than in the apical region.
5. There are deep narrow isolated periodontal pockets adjacent to the fracture sites, that can be revealed by deep probing in two positions on opposite sides (around the circumference of the tooth) in the presence of otherwise normal attachment.
6. In many cases, endodontic microsurgery allows the visualization of the root to determine the problem.
7. Sometimes during the re-treatment process use of the microscope can detect the fracture as long as it is not around a curve.
8. Fiberopticscope can also be used for the diagnosis of vertical root fractures.
9. Radiographs may reveal the existence of a fracture line, separated root fragments, space beside a root filling, double images of external root surfaces, bone destruction, wide periodontal ligaments, and radiolucent halos mimicking periodontal disease.
10. A J-shaped lesion is often associated with vertical root fracture on radiographic examination.
11. Newer methods of analysis are currently being studied (e.g. cone-beam computed tomography to identify longitudinal fracture in a non-destructive fashion).

When a vertical tooth fracture extends below the gingival attachment the recommended treatment has been extraction. As asserted by Walton after the diagnosis of a split tooth is confirmed saving the tooth is not an option. But the literature also reveals long term case studies by David A Hall upto 20 years where a fractured tooth can be completely salvaged, intact and fully healthy when repositioned early and stabilized. The healing was observed by cementum deposition. Masaka in 1980 and Aouate developed a technique for preserving vertical root fractures using 4 META adhesive extra orally and then with reattachment. But they do not address the issue of potential biological cementum repair.

This paper discusses a case report for managing of a vertical fracture in premolar using orthodontic wires band for stabilising the fractured tooth and ligature wire for splinting the fractured segment along with composite resin. Final coronal stabilisation using full coverage crown was done.

CASE REPORT
A 26 year old male patient reported to the OPD with persistent pain in his left upper back tooth region since last five days. Detailed history revealed trauma one week back. Clinical examination revealed vertical coronal fracture with pulp exposure in the offending tooth(Fig 1,2). As the fractured segment was undisplaced treatment modality consisted of reattachment of the fractured segment using a ligature wire.

The tooth was discoloured so as not to further aggravate the problem. Preformed orthodontic steel band was cemented around the tooth for stabilization (Fig 3). Under proper isolation and anesthesia root canal treatment of 25 was completed (Fig 4). In the second sitting, orthodontic bands were removed.Slots 1 mm deep were prepared in the buccal and cusp using straight fissure bur. Corresponding two transverse holes were made in both buccal and palatal cusp. Fine ligature wire was passed from the buccal cusp to palatal cusp for stabilizing and splinting the tooth. The wire was tightened on the buccal side with the other end and twisted wire was compacted in the vertical groove (Fig 5, 6). Flowable composite was used to seal the grooves. Packable composite was used to seal the access cavity. (Fig 7). Metal ceramic crown was cemented on the tooth after minimal preparation on buccal and palatal aspects to conserve fractured fragments and wires for stabilization. (Fig 8). 6 month follow up revealed an asymptomatic patient (Fig 9).
DISCUSSION

Tooth fractures include trauma related crown, crown root fractures and a broad group of cracked teeth. American associations of Endodontists classify cracked teeth as – Cuspal fractures, Cracked teeth, Split tooth & Vertical root fracture. Maxillary teeth are more prone to fracture. Maxillary first molars are the most commonly encountered fractured teeth. Anterior teeth and maxillary premolars are also commonly prone to fracture due to their anatomic location. Split tooth fractures are primarily mesio distal fractures that cross both marginal ridges and extend deep to shear onto the root surface. The more centered the fracture is occlusally, the greater the tendency to extend apically. These fractures are more devastating. Mobility of one or both segments will be present. These fractures usually include the pulp. Maintaining an intact tooth is challenging if not impossible. Prognosis is variable. When the fracture extends from middle to cervical third of the root, there is reasonable chance of successful treatment and restoration. There are various treatment modalities in the literature to bind cracked teeth together, like the use of adhesives, amalgam with retention on both sides of the infractions and full coverage crowns, and experimental approaches using lasers CO2, Nd-YAG.

The outcome of the treatment is not extensively reported for teeth with infractions. Cameron reported a 75% success after 10 years following the placement of the crowns. Guthrie and Defore found that 24 of 25 teeth restored with acrylic crowns were asymptomatic after one year. Brynjulfsen et al achieved pain relief in 90% of their patients after protective restorations including endodontic treatment. Tan et al showed an 85% survival rate of 2 years after protective crowns were placed. According to Leif K Bakland a 5 year survival prediction appears reasonable in most cases. Dr. David A Hall has followed his cases up to 20 years where a split tooth can be completely salvaged, intact and fully healthy when repositioned early and stabilized where the healing was observed by cementum deposition.

In this case occlusal grinding relieved the tooth from masticatory loading. The orthodontic band was used to stabilize and approximate the fractured segments and facilitate endodontic therapy.

Two vertical grooves were made one on the buccal aspect and one on the palatal aspect to provide space for wire. In the vertical grooves two transverse holes were made parallel to each other. These grooves were used to pass a ligature wire which was tightened and twisted on buccal aspect providing stabilization to split segment. Further reinforcement was done by resin using Flowable and Packable both depending on the site of application. Final stabilization was provided by using a full coverage crown which was fabricated to avoid excessive loading.

CONCLUSION

Treating longitudinal tooth fractures is challenging and long term follow up is necessary. Many treatment options have been reported involving extensive procedures for managing vertical fractures in vital and non vital teeth. The treatment modality presented in this case can hold good prognosis when the patient reports immediately after trauma leading to fracture and the fracture extends not beyond the middle third of the root. Long term clinical trials can further establish the utility of this procedure.

REFERENCES


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