

Management of vertical root fracture using a combination of two different techniques

¹Dr. Sneha Mann, MDS, Department of Conservative Dentistry & Endodontics, K.D. Dental College And Hospital, Mathura, Uttar Pradesh, India

²Dr. Suneel Kumar Gupta, Senior lecturer, Department of Pedodontics and Preventive Dentistry, Sri Aurobindo College of Dentistry, Indore, Madhya Pradesh, India

³Dr. Niketa Sahu, Post Graduate student, Department of Pedodontics and Preventive Dentistry, K.D. Dental College And Hospital, Mathura, Uttar Pradesh, India

⁴Dr. Neeraj Khatkar, MDS, Department of Prosthodontics, Crown and Bridge and Implantology

Corresponding Author: Dr. Suneel Kumar Gupta, Senior lecturer, Department of Pedodontics and Preventive Dentistry, Sri Aurobindo College of Dentistry, Indore, Madhya Pradesh, India

Citation of this Article: Dr. Sneha Mann, Dr. Suneel Kumar Gupta, Dr. Niketa Sahu, Dr. Neeraj Khatkar, “Management of vertical root fracture using a combination of two different techniques”, IJDSIR- September - 2021, Vol. – 4, Issue - 5, P. No. 05 – 09.

Copyright: © 2021, Dr. Suneel Kumar Gupta, et al. This is an open access journal and article distributed under the terms of the creative commons attribution noncommercial License. Which allows others to remix, tweak, and build upon the work non commercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

Type of Publication: Case Report

Conflicts of Interest: Nil

Abstract

Vertical root fracture is the third most common reason for extraction in endodontically treated teeth. VRFs are characterized by an incomplete or complete fracture line that extends through the long axis of the root toward the apex. The etiology is mainly trauma and iatrogenic. VRFs constitute an ongoing problem in dentistry because they are difficult to be diagnose in the early stages. Sometimes the fracture line is not visible and can only be detected by specific tests. Many attempts have been made for the treatment of vertically fractured roots. But the long term prognosis of reunion of the fractured roots is still questionable. The following case report discusses an attempt to treat a mandibular 2nd molar with vertical root fracture.

Keywords: Vertical root fracture, Halo appearance, Precipitous pockets, Banding, Biodentine

Introduction

Vertical Root Fracture (VRF) according to the American Association of Endodontists is defined as “A longitudinally oriented fracture of the root that originates from the apex and propagates to the coronal part.”⁽¹⁾ It is the third most common reason for extraction of endodontically treated teeth and is a major threat to the tooth prognosis during and after root canal treatment.⁽²⁾ Leukbe described 2 classifications of root fractures- on the basis of separation of the fragments and on the basis of the relative position of the alveolar crest. Depending on the separation of the fragments it is classified into Complete fracture- Where total separation is visible or fragments can

be moved independently and Incomplete fracture- In the absence of visible separation. Based on the relative position of alveolar crest it can be Intra osseous and Supra Osseous Fractures.⁽³⁾

Vertical Root Fractures present distinct clinical features. These include spontaneous dull pain on mastication, slight tooth mobility and single or multiple sinus tracts.⁽⁴⁾ Intraosseous fractures create deep, narrow, sharply defined and isolated periodontal pockets ('precipitous pockets').⁽⁵⁾

Radiographic examination may also show unilateral thickening of PDL along the fracture side of the root. As the fracture advances, a characteristic diffuse radiolucency (or halo) is seen surrounding the root uniformly.⁽⁶⁾ Other radiographic features that can be appreciated include existence of a fracture line; separated root fragments; space beside a root filling; double images of external root surface; and vertical bone loss.⁽⁷⁾

Sometimes the fracture line is not visible and can only be detected by a tooth sloth, a burlew disk, disclosing dye, trans-illumination test, surgical exploration, or by removal of an existing restoration.⁽⁸⁾

Preserving a vertically fractured tooth can help in improving the function, esthetics and in maintaining the integrity of the arch by preserving the alveolar bone height.

Several attempts have been made for the treatment of vertically fractured roots. But the long term prognosis of reunion of the fractured roots is still questionable.⁽⁴⁾

The following case report discusses an attempt to treat a mandibular 2nd molar with vertical root fracture using banding to stabilize the tooth fragments, Biodentine to seal the fracture line followed by conventional root canal treatment.

Case Report

A 40 year old patient reported to the Department of Conservative dentistry and Endodontics with the complain of mild pain in lower left back region of the jaw since past 2 months. Clinical examination revealed a vertical fracture in the mesio-distal direction separating the buccal and lingual fragments. Radiographic examination displayed characteristic diffuse radiolucency (halo appearance).

Conventional root canal treatment and sealing the fracture line with Biodentine after banding was decided as the treatment option. Band fabrication was done to stabilize the buccal and lingual fragments. Root canal treatment was initiated and access cavity was prepared. The fracture line was identified using the microscope. (Figure 1)

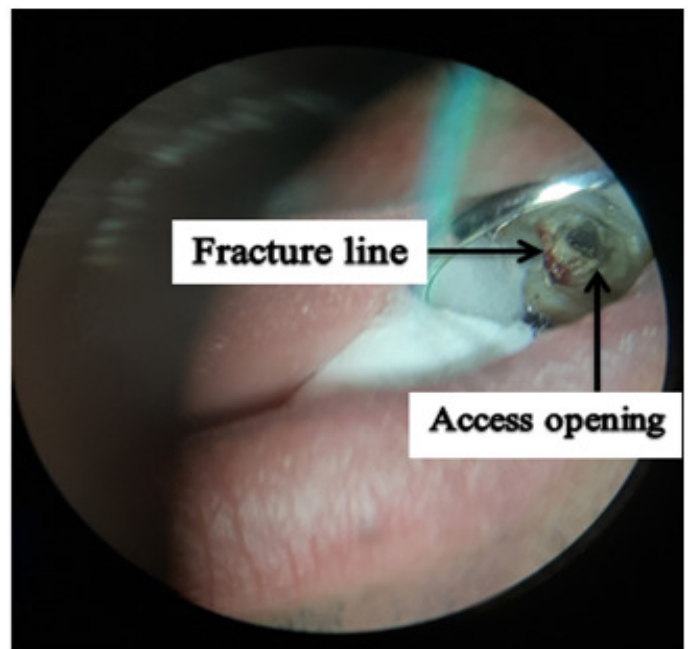


Figure 1: Fracture line and access opening seen under magnification

Pulp tissue was extirpated using barbed broaches. Fracture line was sealed with Biodentine and calcium hydroxide was placed in the canal. (Figure 2)

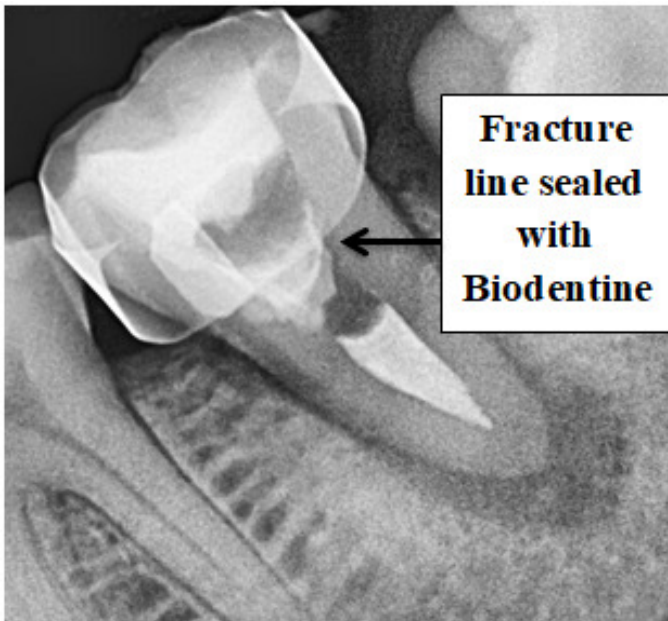


Figure 2: Fracture line sealed with Biodentine after stabilization with band

The working length was established and canal was prepared and calcium hydroxide dressing was placed. (Figure 3)

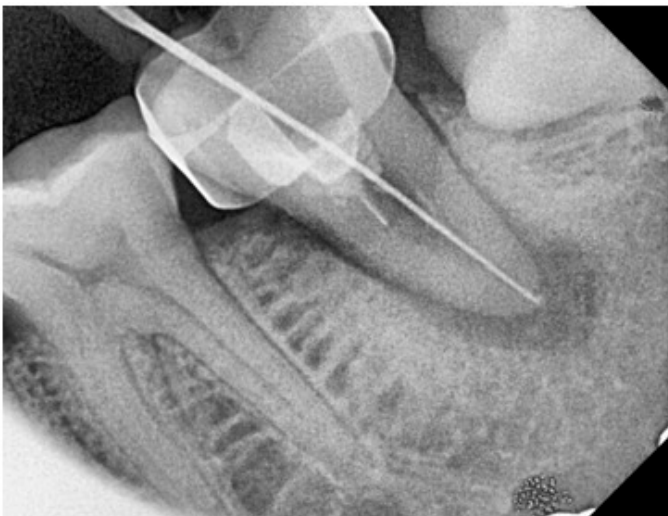


Figure 3: Working length established

Thermoplasticized obturation was done and post endodontic restoration was done with composite. (Figure 4)



Figure 4: Thermoplasticized obturation with post endodontic restoration

The patient was evaluated for 3 months. The patient showed no clinical signs and symptoms and also showed evidence of bony healing. Band was removed using BR Plier. Tooth Preparation was done and metal prosthesis was given to the patient. (Figure 5, 6)



Figure 5: Metal prosthesis given after removal of band



Figure 6: Postoperative clinical photograph

Discussion

Vertical root fracture poses a diagnostic challenge to the clinician. Diagnosis can be confirmed with clinical signs, bite tests and radiographic features. Clinical diagnostic tests range from bite test, trans-illumination, dye test etc. Often radiographs also fail to disclose vertical root fractures as not all the typical signs of a fractured root may be present in each case. So a combination of clinical signs, symptoms and radiographic features can provide a clue for the diagnosis of vertical root fracture. Currently, CBCT has been shown to be promising in the early detection of vertical root fractures. Intra oral periapical radiograph can detect a fracture line only in 35.7% cases.

The reasons for this may be,

- Superimpositions of root canals on fracture line
- X-ray beam not parallel to the plane of fracture
- Fracture line present in the fused root superimposed by radiopaque anatomic structures
- Location of fracture line precludes the use radiograph.⁽⁹⁾

Numerous approaches have been made to preserve a tooth with vertical root fracture. These include:

1. Extraction and replantation after bonding: Some studies have reported successfully treating tooth with VRF by extracting the fractured tooth atraumatically, bonding the fragments, and then replanting the tooth.⁽¹⁰⁾
2. Use of composite resins⁽¹¹⁾, Mineral Trioxide Aggregate⁽¹²⁾ and silver glass ionomer cement⁽¹³⁾ for bonding the fracture line.
3. Calcium hydroxide to promote tissue repair and resolve osseous defects before the roots.
4. Orthodontic bands and elastics used before endodontic treatment to stabilize the buccal and lingual fragments.⁽¹⁴⁾
5. Bonding the fractured segments with glass ionomer bone cement and replanting the tooth in conjunction with an e-PTFE (e-poly tetra fluoro ethylene) membrane⁽¹⁵⁾,
6. Use of 4-META/MMA-TBB(4-methacryloyloxyethyl trimellitate anhydride /methyl methacrylate-tributyl borane) resin through the root canals to bond the fractured teeth⁽¹⁶⁾,
7. Use of dual-cured adhesive resin cement is preferred for bonding the fractured fragments, as it has a controlled polymerization and is easy to apply⁽¹⁷⁾ and
8. Use of CO₂ and Nd:YAG laser to fuse fractured tooth roots.⁽¹⁸⁾

In this case report, the tooth was treated using a combination of 2 techniques. Orthodontic bands were used to stabilize the buccal and lingual fragments following which the fracture line was sealed with biodentine before the completion of root canal treatment.

Conclusion

Many of the treatment options implemented involve extensive procedures which often present with poor outcomes. Though theoretically numerous techniques have been suggested and in many cases successful outcomes have been claimed, the long-term prognosis is yet to be proven.

Though this method of treating a vertically fractured tooth seems favourable, there is a need for further clinical research on the treatment of teeth with VRF using the above treatment alternative.

References

1. American Association of Endodontists. Endodontics: Colleagues for excellence-Cracking the cracked tooth code. Chicago, IL: American Association of Endodontists; Fall/Winter 2008.
2. Toure B, Faye B, Kane AW, Lo CM, Niang B, Boucher Y. Analysis of reasons for extraction of endodontically treated teeth: A prospective study. *J Endod* 2011;37:1512-5.
3. Leubke RG. Vertical crown-root fractures in posterior teeth. *Dental Clin North Am* 1984; 28:883-894.
4. Khasnis SA, Kidiyoor KH, Patil AB, Kenganal SB. Vertical root fractures and their management. *J Conserv Dent* 2014;17:103-10
5. Moule AJ, Kahler B. Diagnosis and management of teeth with vertical root fractures. *Aust Dent J* 1999; 44: 75–87.
6. Tamse A, Kaffe I, Lustig J, Ganor Y, Fuss Z. Radiographic features of vertically fractured endodontically treated mesial roots of mandibular molars. *Oral Surg Oral Med Oral Pathol Oral RadiolEndod* 2006; 101: 797–802.
7. Mullally BH, Ahmed M. Periodontal signs and symptoms associated with vertical root fracture. *Dent Update* 2000; 27: 356–360.
8. Meister F, Lomme TJ, Gerstein H. Diagnosis and possible causes vertical root fracture. *Oral Surg Oral Med Oral Pathol* 1980;49:243-53
9. Wang P, Wenxi H, Hantang S. Detection of vertical root fractures in non- endodontically treated molars using cone beam computed tomography: A report of four representative cases. *Dent Traumatol* 2012;28:329-33.
10. Kawai K, Masaka N. Vertical root fracture treated by bonding fragments and rotational replantation. *Dent Traumatol* 2002;18:42-5.
11. Hasegawa A, Bando H, Fukai K, Vongsurasit T, Tsuchida T. Periodontal surgical approach to the vertical fracture of the root. The application of composite resin to the fractured root surface. *Nihon ShishubyoGakkaiKaishi* 1988;30:1180-5.
12. Schwartz RS, Mauger M, Clement DJ, Walker WA 3rd. Mineral trioxide aggregate: A new material for endodontics. *J Am Dent Assoc* 1999;130:967-75.
13. Seiden HS. Repair of incomplete vertical root fractures in endodontically treated teeth *in vivo* trials. *J Endod* 1996;22:426-9.
14. Takatsu T, Sano H, Burrow MF. Treatment and prognosis of a vertically fractured maxillary molar with widely separated segments: A case report. *Quintessence Int* 1995;26:479-84.
15. Trope M, Rosenberg ES. Multidisciplinary approach to the repair of vertically fractured teeth. *J Endod* 1992;18:460-3.
16. Masaka N. Long-tenn observation of fractured tooth roots preserved by adhesion. *J Adhes Dent* 1995;3:156-71.
17. Oztürk M, Unal GC. A successful treatment of vertical root fracture: A case report and 4 year follow-up. *Dent Traumatol* 2008;24:e56-60.
18. Arakawa S, Cobb CM, Rapley JW, Killoy WJ, Spencer P. Treatment of root fracture by CO2 and ND: YAG lasers: An *in vitro* study. *J Endod* 1996;22:662-7.