



True vertical tooth root fracture: Case report and review

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ABSTRACT

It is important for the clinician not only to gather as much information about a case as possible, but also to be able to correctly interpret the data to arrive at an accurate diagnosis. Occasionally, a case presents with symptoms that might be suggestive of a condition; however, the final diagnosis may be totally different. This paper reports on an interesting case of a true vertical root fracture, in an intact maxillary molar in a 55-year-old man. The case was misdiagnosed and treated as a periodontal defect for over two months. The paper discusses the various causes and diagnostic dilemmas of root fractures.

Keywords: Misdiagnosis, periodontal defects, vertical root fracture

I. INTRODUCTION

“The eyes fail to see what the mind doesn’t know.” Thus, for a clinician it is not only the accumulation and conglomeration of various signs and symptoms that are important, but also the association of those with the presenting symptoms and correct interpretation of the data available, to arrive at an accurate diagnosis. Correct diagnosis plays a pivotal role in the success of any treatment.

Dental/oro facial pain being a very diverse phenomenon and involving interplay of various neuronal responses, requires a thorough knowledge of various etiological factors of pain to institute proper treatment. One of the not so common causes of dental pain is root fracture. Root fractures in permanent teeth are either in the form of transverse intra-alveolar root fractures, generally seen in the anterior teeth, secondary to any trauma; or, vertical root fractures (VRF) which occur both in anterior as well as posterior teeth, secondary to traumatic occlusion or iatrogenic procedures.

Most often VRF are encountered in endodontically treated teeth. However, it may occasionally occur in intact teeth as well. The prevalence of VRF in endodontically treated teeth

is much higher, [1–3] than in non-endodontically treated, restored or intact teeth. [4–6] In most cases of VRF associated with the non-endodontically treated teeth, the fractures are usually the apical extension of a fractured coronal superstructure. This can be in the form of a split tooth, secondary to traumatic occlusal forces or restorations, causing a wedging force extending apically to involve the roots. Few cases of true vertical fractures have also been reported in which the fractured tooth was intact without any restorative or endodontic intervention. [4–6]

True VRF is defined as a longitudinal fracture confined to the root that usually initiates on the internal canal wall and extends outwards onto the root surface. [7] We report here an interesting case of a true VRF in a 55-year-old man in whom, it was misdiagnosed as a case of local periodontal disease for over 2 months, till his pain became severe and characteristically presented with symptoms of acute pulpitis.

The case is presented for its unusual presentation; the diagnostic challenges such root fractures pose; and, various causative and contributing factors associated with this clinical entity.

II. CASE PRESENTATION

A 55-year-old man reported to the department of dental surgery with the complaint of a severe, sharp shooting pain, which radiated to the angular region mandibular right quadrant since the night before. Detailed history taking revealed that the patient had pain in the region for over 2 months. Initially the pain was of dull aching type, which increased on mastication.

The pain gradually kept on increasing in intensity till it became very severe at night. The patient gave no history of trauma or any other dental intervention on the affected side. Patient's dental records showed that he was being treated for the same complaint with a diagnosis of chronic



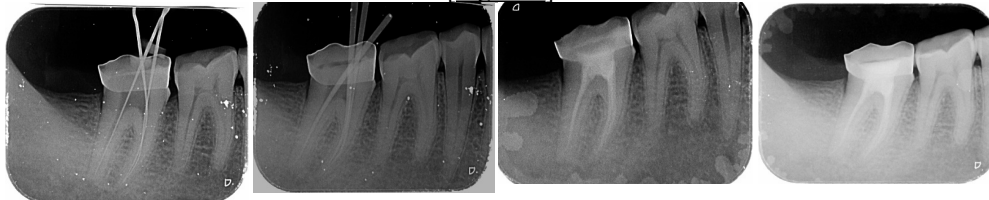
periodontitis, which of course did not give him any relief in pain.

On clinical examination, all the teeth in the left posterior quadrant appeared normal. Oral hygiene was satisfactory. Surprisingly, he had very little attrition and most of his posterior teeth had sharp and prominent cuspal inclines. Tooth #37 was extremely tender, both, on percussion and on palpation. The tooth showed no carious involvement or restoration. [Figure 1].

Considering the patient's history, which was suggestive of acute pulpitis; severe tenderness on percussion and palpation in #37; and, radiographic finding of hazy radiolucency around Distal root of #37, a clinical diagnosis of VRF was made. An intraoral periapical radiograph was advised for clarity, which confirmed the vertical split of distal root of #37



[Figure 1].

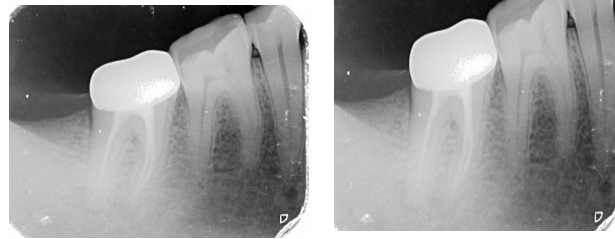


[Figure 2]

The patient was informed about the treatment options; either extraction of the whole tooth or endodontic treatment of the tooth. Orthodontic banding was achieved around #37, followed by root canal treatment in #37(25/6% gutta percha) in both mesial and distal roots after banding. [Figure 2]

After root canal MTA was placed in the pulp chamber of #37 and the orthodontic band was removed. Pt. was kept on follow up and advised not to chew hard food items from the concerned side for 1-2 weeks.

After follow up, all metal crown was given to the pt as he reported with no further pain or discomfort. Pt was kept under follow up for 2 months.[Figure 3]



All metal crown irt 37 After 1 month follow up
[Figure 3]

IV. DISCUSSION

Incomplete fractures of teeth, as a clinical entity, can pose a challenge to the diagnostic skills of an inexperienced clinician due to the varied clinical symptoms, and also because their symptoms often resemble those of periodontal disease conditions.

Often, they manifest as diffuse oro-facial pain of long duration. Brynjulfson et al.[8] found that sometimes the diagnosis of such teeth may be delayed for as long as a year and longer the duration, more diffuse is the pain. In the present case, the pain continued for over 2 months' period, before it was diagnosed as an incomplete fracture involving the root.

Vertical root fractures are generally seen in teeth with either coronal restorations or in endodontically treated roots. They occur more often in older patients, which may be related to increased number of restorations and endodontic treatments with age, resulting in weakening of the tooth structure.[9,10]

Also with ageing, due to high concentration of minerals, the teeth do get more brittle and may fracture when a high and sudden load is brought upon it.[11] It has been reported that mandibular molars account for 26.7% of all posterior tooth fractures.[12]

Among the posterior teeth fractures in the mandibular arch, premolars account for 12%, while molars account for 88%; in the maxillary arch, both molars and premolars are reported to be equally susceptible to fractures (51 and 49%, respectively).

Temporomandibular joint (TMJ), would exert more forces as compared to those that were more anterior. Therefore, it is the posterior teeth, which bear the brunt of the increased occlusal forces.

III.

Causes of vertical root fractures associated with endodontically treated teeth are as follows:[2,3,10,11]

- Vigorous and injudicious instrumentation of narrow canals.
- Excessive force during obturation, specially lateral condensation.
- Wedging effects of endodontic posts.
- Corrosion and expansion of posts.
- Immediate full coverage crown not provided after root canal treatment.
- Pathologic fractures secondary to periodontal lesions.
- Abutment teeth with unfavorable forces.

Causes of vertical root fractures associated with coronal restorations are as follows:[2,10,13]

- Excessive removal of tooth structure during cavity preparation, causing weakening of the cusps.
- Delayed expansion of amalgam.
- Excessive polymerization shrinkage of composite resins.
- Ill fitting inlays causing a wedging effect.
- Improper reproduction of the occlusal anatomy causing deflective occlusal contacts.

The present case was found to be very interesting and unique, as it did not present with any commonly listed causes of root fractures, such as previous restorations or endodontic treatments. Such true VRFs in non-endodontically treated teeth have been reported earlier by Wei and Ju,[4] Yang et al.[5] Yeh[6] and Chan et al.,[14] surprisingly, all in Chinese population.

The exact cause of these fractures is still unknown,[15] though Yang et al.[5] suggested that these fracture might have been related to special diet pattern or chewing habits in Chinese people. Yeh[6] proposed that VRFs might result from an



excessive, repetitive and heavy masticatory stress and referred to these fractures as 'fatigue root fractures'. Cameron[9] postulated that such fractures in the posterior teeth could be due to the 'nut cracker effect'. When the jaws are closed, the teeth that are close to the point of fulcrum i. e, nearer

According to Chan et al.,[6] of all the vertical root fractures, 40% occurred in non-endodontically treated (intact) teeth, and of those, 84% were in molars. For endodontically treated teeth, the incidence of VRF in mandibular 1st molars was twice as much as maxillary 1st molars.

Vertical root fractures are rare in non-endodontically treated anterior teeth. It was also found that the fractures occurred more often in thin, flat root, with smaller mesio-distal diameters such as in the mesio-buccal roots of maxillary molars (as in the reported case), and the mesial root of mandibular molars.

Grippio[16] suggested that there are many mechanical loading factors, which affect the teeth like the magnitude, frequency, direction, location, and duration of forces.

The stress induced on the tooth structure may therefore result in different patterns of fracture, depending also on the biologic or anatomical conditions of the crown, root, or the supporting bone.

He proposed that for non-endodontically treated teeth, possibly excessive and repetitive masticatory force exerted vertically on attrited surfaces may concentrate the stresses at weaker apical areas. Cracks or fatigue may then initiate coronal propagation of this fracture.

V. CONCLUSION

Though, the patient was a 55-year-old man, his dentition showed minimal attrition and very steep cuspal inclines. Both his maxillary premolars were rotated. It is possible that due to rotated premolars, there was an uneven load distribution during mastication, resulting in excessive occlusal stresses on the maxillary first molars.

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