



## CASE STUDY

### MANAGEMENT OF CRACKED TEETH

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#### ABSTRACT

Cracked tooth is a distinct type of longitudinal fracture which may extend through one or both of the marginal ridges (through the proximal surface). It is caused by occlusal forces, either large forces on a normal tooth or normal force on a weakened tooth. Cracked tooth by itself is not a diagnosis, but is a clinical finding. A cracked tooth can act as a pathway for ingress of bacteria causing pulpal and/or periapical inflammation or disease. Early diagnosis followed by proper treatment planning and periodic follow up evaluation is the goal standard protocols in treating cracks.

#### INTRODUCTION

Cracked tooth is a distinct type of longitudinal fracture extending through one or both of the marginal ridges (along the proximal surface). The fracture may be confined to the crown or extend from the crown to the proximal surface of root at different levels. It is caused by occlusal forces, either large forces on a normal tooth or normal force on a weak tooth. Complex restorative procedures and root canal treatment that removes excess dentin, compromise the internal strength of the tooth making it more susceptible to fracture (Kalyan Chakravarthy, 2012) Basically, two classic patterns of crack formation exist. The first type occurs when the crack is located centrally, thereby exposing the dentinal tubules extending till the pulp; the second is where the crack is located more peripherally which can result in cuspal fracture (Lynch, 2002). The classic symptoms of cracked tooth syndrome (CTS) include sensitivity to cold and sharp pain on release of pressure on taking fibrous foods and referred as "rebound pain". The alternative stretching and compression of the odontoblastic processes located within the crack are responsible for the short, sharp pain (Shetty R). However in clinical practice, the detection of non-displaced longitudinal fracture in tooth is a significant challenge. Clinical diagnosis is difficult because the signs and symptoms are variable or nonspecific and may even resemble post-treatment disease following root canal treatment

or periodontal disease. Radiographic signs are usually not visible when the orientation of the X-ray beam is parallel to the plane of the fracture and the superimposition of other anatomic structures limits the sensitivity of radiographs to detect fractures. Cracked tooth by itself is not a diagnosis, but is a finding. A cracked tooth can act as a pathway for bacteria that may induce pulpal and/or periapical inflammation or disease (Kalyan Chakravarthy, 2012; Mamoun, 2015). The endodontic diagnosis and treatment plan entirely depends upon the extent of the fracture. The prognosis of the tooth also depends on the extent of the fracture and if not treated will progressively deteriorate and result in severe periodontal defects or fracture of the tooth. Therefore, early diagnosis followed by proper treatment planning and periodic follow up evaluation is goal standard protocols in treating cracks (Kalyan Chakravarthy, 2012) In this paper two case reports of cracked tooth management in our department are presented.

#### Case 1

A male patient aged 33 years reported with pain in lower left first molar (36), for the past two weeks. Pain was severe, continuous and aggravated on biting. Pain was relieved on taking pain killers (NSAIDs). Soft tissue examination revealed a sinus tract in relation to the respective tooth in relation to apical region of distal root. The sinus tract was traced using 25 size gutta percha reaching towards the apical region of distal root. On hard tissue examination, crown was found to be intact with a faint crack line running mesio-distally along the occlusal surface. The tooth was tender to percussion without mobility.

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A plunger cusp in relation to the opposing tooth was noted. The tooth showed delayed response to electric test and cold pulp tests. Radiograph revealed a receded pulp chamber with a non-prominent distal pulp horn compared to the mesial root. Bone loss in relation to the furcation area was also noted. Periapical radiolucency around both the roots was seen. CBCT images revealed clear periapical radiolucency in relation to both the roots. A clear evidence of fracture line along the distal proximal wall was not seen. However, an evidence of incomplete fracture along the distal border extending till the pulp chamber could be noticed. Based on the history and clinical presentation it was diagnosed as cracked tooth with symptomatic irreversible pulpitis with associated apical periodontitis. Prior to root canal treatment the tooth was stabilized using orthodontic band. Following access cavity preparation the crack was seen to extend through the distal wall till the pulp chamber. The crack was reinforced using flowable composite. Root canal treatment was performed with ProTaper file system followed by single cone obturation. Access cavity was restored with Composite resin. Thereafter a metal crown was fabricated and cemented using luting GIC. Eight month follow up revealed absence of clinical symptoms and considerable healing in periapical and furcation areas evident on IOPAR.

## Case 2

A male patient aged 45 years reported with pain in the lower left second molar (37) for the past three weeks. Pain was sharp shooting, continuous in nature and aggravated on release of bite. On soft tissue examination, no abnormalities were detected. On hard tissue examination, h/o temporary restoration two weeks back was seen. No caries was detected in relation to the teeth. The tooth was tender on percussion without mobility. Electric pulp test and cold test showed delayed response. IOPAR showed that the pulp chamber was receded and narrow root canals were noted. Periapical radiolucency was also noted in relation to both the roots. Loss of lamina dura and widening of periodontal ligament space was noted. CBCT images could not definitely reveal a crack extending along the proximal wall. The images showed no other abnormalities except definite periapical radiolucency in relation to both the roots. Based on the history, clinical presentation and radiological evaluation it was diagnosed as symptomatic irreversible pulpitis with apical periodontitis. On removing the temporary filling a crack line running along the distal proximal wall was detected. Following this the tooth was stabilized using an orthodontic band. The crack present was reinforced with flowable composite. Root canal treatment was performed with ProTaper rotary files with

## Case report 1



Figure 1. Pre Operative X ray

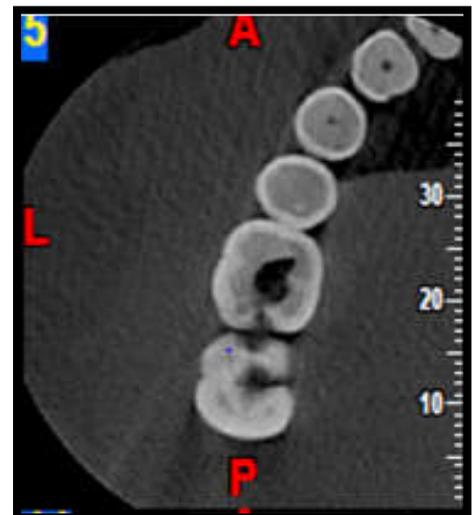


Figure 2. CBCT Image



Figure 3. Tooth with crack stabilized with orthodontic band



Figure 4. Crack stabilized with flowable composite



Figure 5. Obturation done



Figure 6. Eight months follow up

Case report 2



Figure 7. Pre- Operative



Figure 8. Pre-Op X ray



Figure 9. Access opening done



Figure 10. Obturation done



Figure 11. Six months follow up

single cone obturation and composite resin access restoration. A porcelain metal fused crown was placed as post endodontic restoration. Six month follow up revealed absence of clinical symptoms in the tooth and IOPAR showed considerable periapical bone healing.

## DISCUSSION

Patients with CTS complain of short, sharp pain on release of pressure and sensitivity to cold, heat or sweet. These symptoms can be explained by Brannstrom's hydrodynamic theory for hypersensitivity which is based on the concept that rapid movement of dentinal fluid in the tubules causes pain. This fluid movement stimulates the mechano-receptors in close proximity to the odontoblast cell body, which then activate A delta nerve fibres (faster myelinated fibres), resulting in a short sharp pain. The pain is produced due to the movement of dentinal fluid once the crack opens up due to pressure on the cusp, and it also explains the short sharp pain as the fluid moves back on releasing the pressure. Cracks appear in restored teeth as well as in intact ones (Shikdera, 2014). In the first case, a horizontal crack line running mesio-distally was detected on the occlusal surface which might have led to microbial ingress into the pulp. Upon access cavity preparation it was observed that the crack line extended along the distal wall till the pulp chamber. This could be the reason for the possible root canal infection. In a tooth exhibiting CTS, the first line of treatment is to stabilize the tooth using an orthodontic band, copper ring or full coverage acrylic provisional crowns. This is followed by reinforcement of the crack using flowable composites or GIC (Shikdera, 2014; Kahler, 2008). Crowns given in posterior teeth after endodontic therapy provides a bracing effect and prevents crack from propagating further (Kalyan Chakravarthy, 2012). The primary goal is to splint and stabilize a cracked tooth thereby preventing further extension or complete fracture of the tooth (Mittal, 2007). The main etiological factors of CTS are biting on hard substances, parafunctional habits, prominent masticatory muscles, large class I and II restorations, thermal stresses created by different restorative materials and dentin, retentive pin placement and endodontically treated teeth (Kalyan Chakravarthy, 2012).

Diagnosing CTS has proved to be difficult even for the most experienced dental practitioners, because the associated symptoms are usually very difficult to differentiate from others. A detailed clinical history along with thorough assessment of all the symptoms is important, though these may vary with the depth and orientation of the crack. If the crack is directly visible, diagnosis as well as treatment is fairly simple. But, commonly mesiodistal cracks are not visible because most of these teeth usually have an overlying occlusal or proximal restoration. With larger restorations, cracks tend to be more superficial with fewer symptoms, whereas in smaller restorations, cracks tend to be deeper and closer to the pulp.

Transillumination using a fiber-optic device and Magnifying loupes has been considered instrumental in the diagnosis of a cracked tooth. The use of Cone Beam Computed Tomography (CBCT) for diagnosing CTS has been controversial. Occlusal adjustment of affected teeth must be done immediately to reduce the stress on the tooth which prevents further damage to the tooth. If the tooth in question has a pre existing restoration, it should be removed immediately. In case of a cracked tooth, the patient should be well informed that the prognosis is always questionable. A number of factors have to be considered for evaluating the prognosis of a cracked tooth in which location and extent of the crack are the two most important factors which decide the prognosis. Prognosis is considered excellent for cracks that are limited to dentine and for those fractures which are limited to a single marginal ridge which do not extend more than 2-3 mm below the periodontal attachment. The prognosis is poor in cases when crack involves both marginal ridges and when it extends to pulp.

Anatomy of the tooth and roots, the previous operative/restorative history of the tooth and the functional forces acting on the tooth (during both functional and para functional activity), are other factors affecting the prognosis. The loss of pulp vitality has also been found to have adverse effects on the prognosis of the tooth. Finally, the technique used, skill and experience of the operator can also affect the long term prognosis of such teeth (Shikdera, 2014).

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