

Management of Endodontic Emergencies

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Abstract

Introduction: An endodontic emergency presents with acute pain and swelling in the involved tooth due to pulpal inflammation and infection. Many factors contribute to pulpal inflammation, which may vary in severity from mild to severe. The treatment of which also depends on the severity of pulpal inflammation and the current state. When pulp is reversibly or irreversibly damaged. It may lead to apical periodontitis and alveolar abscess. And if untreated, it progresses to diffuse life-threatening cellulitis. Most of the cases present with extreme pain, tooth tender on percussion, intra-oral or extra-oral swelling, extrusion, and mobility of teeth as well as some systemic symptoms such as fever, fatigue, etc. The treatment includes proper irrigation and debridement of root canals after establishing drainage of pus, which will relieve the inbuilt pressure and thereby the pain. Once root canal treatment is complete, a restoration is placed. Analgesics and antibiotics must be prescribed when necessary.

Aim of the Study: The purpose of the review is to understand various endodontic emergencies encountered in clinical practice and the management of the same.

Methodology: The review is a comprehensive research of PUBMED since the year 1973 to 2017.

Conclusion: The proper treatment of endodontic emergencies in patients requires a sound understanding of case diagnosis, conventional endodontic treatment, application of local anesthesia and clinical pharmacology for appropriate pain control. The dentist should develop these clinical skills, thorough enough to treat emergency endodontic cases as a routine, conventional non-emergency endodontic treatment. The successful treatment of emergency endodontic treatment should be in a way that gratifies both the patient as well as the doctor.

Keywords: Reversible Pulpitis; Irreversible Pulpitis; Acute Apical Periodontitis; Root Fracture; Cracked Tooth Syndrome

An endodontic emergency can be defined as a pain or swelling caused by various stages of inflammation or infection of pulpal and periapical tissues. It is known in a study that pulpal or periapical disease. The main aim of emergency endodontic treatment is to relieve pain and control the root cause that is inflammation or infection. The emergency procedures are often carried out in insufficient time, but it should not affect the final treatment plan. Pulpal and periapical treatment are seen in 90% of cases of emergency dental treatment [1-3].

The endodontic emergencies can be broadly divided as [4]:

Before Treatment	Patients under Treatment	After Treatment
<ul style="list-style-type: none"> • Pulpal pain • Reversible pulpitis • Irreversible pulpitis • Acute periapical abscess • Cracked tooth syndrome 	<ul style="list-style-type: none"> • Recent restorative treatment • Periodontal treatment • Exposure of pulp • Fracture of root or crown • Pain as a result of instrumentation <ol style="list-style-type: none"> 1. Acute apical periodontitis 2. Phoenix abscess 	<ul style="list-style-type: none"> • High restoration • Overfilling • Root filling • Root fracture

Endodontic emergency before treatment

Medical history and the patient complaint is considered important to initiate the treatment. The medical history includes questioning about the location of pain, when it was first noticed, the alleviating and relieving factors of pain, presence of any swelling or associated tenderness, past dental history including any recent restorative treatment, periodontal treatment, history of trauma to teeth. Any particular disorder such as myofascial dysfunction syndrome (MPD), neurological disorders like trigeminal neuralgia, glossopharyngeal neuralgia, vascular pain syndrome, and maxillary sinus disorder should be considered since it affects differential diagnosis [4].

Diagnosis [4,5]

The diagnosis can be made using both conventional radiography and chairside test:

- Ice sticks, cold spray, hot-gutta percha, or hot water testing are a few cold and hot test for eliciting pulpal response.
- Electric pulp tester is an electronic device that uses a probe and pastes on teeth to check the pulpal response of teeth by comparing it with the control teeth.
- The periodontal probe can detect the pockets and periodontal reasons for pulpal pain.
- Periapical radiographs should be taken with a paralleling technique to diagnose any lesion, cyst, granuloma, abscess, a breach in lamina dura, or periodontal causes in the periapical region of the tooth.



Figure 1: Showing radiographic assessment of involved tooth revealing deep caries, pinned restoration, enlargement of periodontal ligament space [4].

Pulpal pain/Reversible pulpitis/Irreversible pulpitis

The stage of the pulp can be detected histologically but is not always feasible to assess in clinical practice. Therefore, signs and symptoms associated with underlying progressive pulpal and periapical diseases give a reasonable indication about the state of the inflamed pulp of whether it is reversibly or irreversibly damaged [6-8].

The pulpal irritation will cause inflammation and the level of response elicited by pulp depends on the severity of irritants. Mild inflammatory pulpal condition may resolve in a similar way to that of other connective tissue, and a layer of reparative dentine may be formed to prevent further injury. In severe inflammation, extensive cellular destruction can occur with further inflammatory involving the whole pulp leads to total pulp necrosis [8].

Certain features of pulpitis can make it borderline between reversible and irreversible pulpitis makes it difficult to determine in general practice. In response to several tests are exaggerated, then a possible state of pulp is irreversible. While the main feature of reversible pulpitis is that pain ceases as soon as the stimulus is removed (hot or cold test, fluids, sweet food). Teeth are not tender on percussion unless an occlusal trauma exists [8].

Initially, the following treatment may be required [4]:

- Placement of sedative dressing in the cavity after removal of deep caries.
- Check for occlusion and remove non-working facets.
- Application of fluoride varnish or a dentine bonding resin to sensitive dentine and prescribe a desensitizing toothpaste.

If the symptoms persist with increment in pain, then is irreversible pulpitis. The patient may fail to locate the exact position of pain since pain is referred to as both the jaws of the same side. The early stages may show a prolonged reaction to hot and cold fluids but yet not be tender on percussion. Test for sensitivity to percussion need not be done by dental instrument. Gentle pressure from fingers on the affected tooth is enough to elicit the response [4].

The tooth becomes tender on bite only when inflammation has spread throughout the pulp, and periodontal ligament has involved. In such circumstances, the application of heat will cause long-lasting pain, which may be relieved by cold. Both cold and hot tests can precipitate the pain, but to rule out the condition accurately, heat is a more significant test. The pain in the irreversibly damaged pulp can elicit response spontaneously and last from a few seconds to many hours. One of the characteristic features of irreversible pulpitis is tooth pain at night. Further, if the condition is not treated, the symptomatic pulpitis may become symptomless, and the pulp test gives equivocal results. This leads to total pulp necrosis without further developing any symptoms. This can be seen as periapical rarefaction on radiograph or patient may present with acute periapical abscess [4,8].

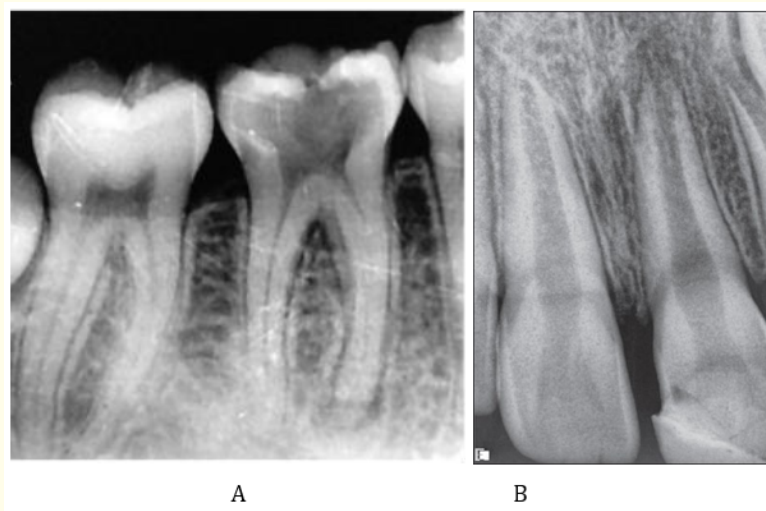


Figure 2: Showing A) Periapical radiolucency at the mesial root of molar. B) Periapical rarefaction suggestive of acute periapical abscess [9,10].

After spreading pulpal inflammation to the periodontal ligament, the inflammatory exudate may cause extrusion of the tooth and hence making it tender on a bite, which is a symptom of acute apical periodontitis and is a result of occlusal trauma [4,8].

The treatment of irreversible pulpitis involved pulp extirpation, followed by cleaning and preparation of the root canal system. In the case of the constraint of time, the pulp should be removed from the pulp chamber as well as the coronal part of the root canal; this treatment is proven to be effective. Before the instrumentation of root canal irrigation of the pulp chamber from the solution of sodium hypochlorite (recommended strength between 0.5 to 5%) is important since it has proven to be one of the most effective disinfectants in root canal treatment. Root canals are dried using paper points, and a sterile cotton wool pledget is in the root canal chamber and restored with temporary fillings. Alternatively, root canal medicament can be placed, but after the root canals have cleansed and dried, medication has shown little benefits [11,12].

While treating an inflamed pulp, local analgesia is a common problem, especially in acute cases. So, in addition to the conventional local anesthesia, supplementary analgesia can be obtained using additional infiltration of long-buccal, lingual and palatal, intra-ligamental, or intra-osseous injection, intra-pulpal analgesia, inhalation sedation [4].

Suppose the pain continues following the pulp extirpation, then its most likely due to high-points in temporary fillings, presence of infected pulp tissue in the canal, extrusion of canal content through apex, over-instrumentation or perforation of the canal wall, presence of extra canal which has not been cleaned. The remedy to all is to irrigate the pulp chamber and root canals again with sodium hypochlorite and gently instrument [4].

Acute periapical abscess

An acute periapical abscess develops from acute periapical periodontitis, and often it is not always clear to distinguish between the two. The typical symptoms are pronounced soft tissue swelling and an extremely tender tooth. Tooth extrusion occurs, which often leads to a mobile tooth. The most important differential diagnosis is a lateral periodontal abscess. The diagnosis can be made by vitality test; if the tooth is vital, then the cause of pain is most likely to be periodontal in origin. Radiographically, the change in periapex ranges from the widening of periodontal ligament to a well-defined radiolucency [4,10].

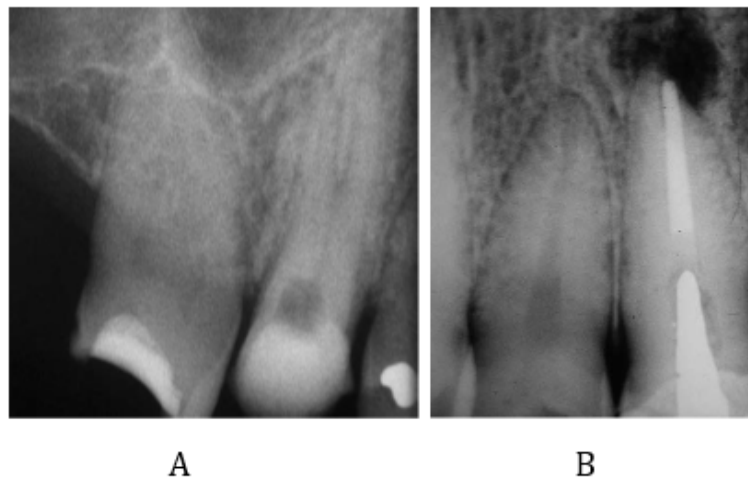


Figure 3: Showing A. Widening of periodontal ligament. B. Well-defined radiolucency seen at peri-apex region suggestive of acute periapical abscess [4].

The immediate treatment is establishing drainage and relieving pressure achieved by opening up the chamber. Gaining access can often be difficult due to the tooth being extremely tender. The use of small, round, diamond bur can reduce the trauma. Regional anesthesia may be necessary. In case the drainage is not established, the clinician must explore the canal using a very fine file of size 08 to 10 without enlarging the foramen. The intra-oral soft tissue swelling needs to be incised and drained well, but in the presence of cellulitis, medical help should be sought prior to carry out any endodontic treatment. Soft tissue swelling should be examined, and a copious amount of surface analgesias such as ethyl chloride or topical lignocaine ointment should be applied before incising since regional anesthesia may not be effective due to the presence of infection, in fact, it would rather spread the infection further into deep tissues [4].

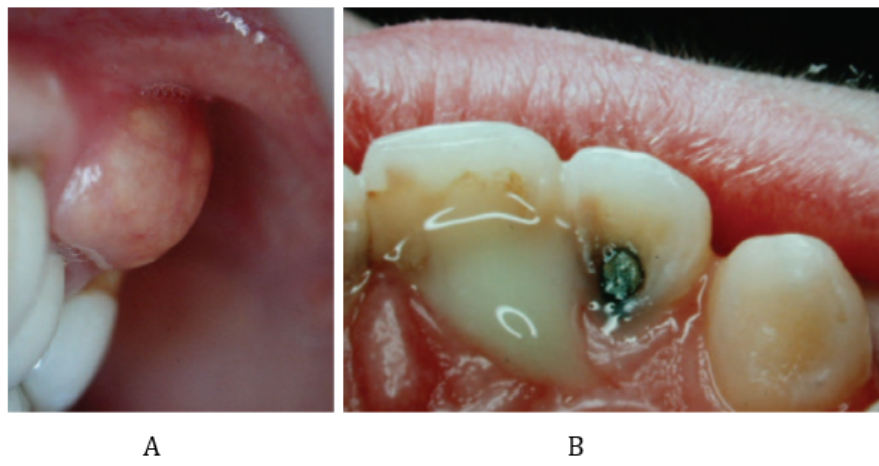


Figure 4: Showing A. Soft intra-oral swelling. B. Drainage of the affected tooth [4].

The incision is made using bard parker blade no. 11 or 15 and aspirate with wide bore needle and disposable syringe, a drain or gauze may be placed to facilitate the drainage. The procedure is the same for extra-oral incision and might need a referral to an oral surgeon. Once the drainage is established, a rubber dam is applied, and root canal treatment is initiated. Before instrumentation, the root canals are thoroughly irrigated, followed by drying of canals and placement of dry sterile cotton and temporary dressing. The tooth should not be left open to drain as much as possible since the microbial flora of the canal may change and makes treatment more difficult and lowering the long-term prognosis. If complete debridement has not been done, then the patient is recalled in 48hrs, and a calcium hydroxide dressing is placed in canals. Antibiotics are usually not required unless there is a presence of systemic spread of infection such as patients complaining of being unwell, raised temperature, fatigue, etc. The commonly prescribed antibiotics are amoxicillin 250 mgs thrice a day and metronidazole as an alternative to penicillin [13,14].



Figure 5: Showing extra-oral swelling due to periapical lesion of lower incisors developing to cellulitis [4].

Cracked tooth syndrome

Enamel crazing is common a finding and occasionally may indicate a cracked tooth. If the crack runs deep into dentin becomes a fracture and makes chewing painful. Once the fracture line communicates with pulp, patients seek treatment. Patients may present with a wide variety of symptoms, which often mimics symptoms of alveolar abscess such as pain on chewing, sensitivity to hot and cold fluids, pain difficult to localize, referred pain. Diagnosis can be difficult to establish and depends on the plane of the fracture line and its site on the tooth. A radiograph may not be useful in detecting fracture lines unless it runs in a buccolingual plane. Fiber-optic light may be useful and can detect the position of the fracture. The other diagnostic method is to ask the patient to bite on a folded rubber dam [15].

The pain appears as the bite is released. This method should be carefully exercised since it may extend the fracture line. The diagnosis depends on the site and extent of the fracture line. Vertical fracture lines running below the level of alveolar crest have poor prognosis while the horizontal or diagonal line superficial to crest has a better prognosis [15].

Endodontic emergency under treatment [4]

During the treatment, some patients may always experience pain, no matter how carefully the treatment is done. It is advisable to warn patients about little discomfort during the treatment as well as to take over-the-counter NSAIDs [4].

Recent restorations

Pain can be due to high filling, microleakage, micro-exposure of the pulp, thermal or mechanical injury during cavity preparation or an inadequate amount of lining under metallic restoration, chemical irritation from the lining, or restorative material, the galvanic effect from dissimilar metals. There is always a chance of lateral canals to communicate with periodontal ligament are exposed to periodontal treatment [4].

Exposure of the pulp

In the case of carious exposure, removal of caries should be carried out under the rubber dam. If pulp extirpation has to be done, a pulp capping, partial pulpotomy has to be done; it is better to rule out if the pulp has been irreversibly damaged or not [16].

Root or crown fractures

During the root canal treatment, root or crown fracture can be avoided by protecting teeth during treatment. Tooth structure becomes mechanically weak due to access cavity preparation and cleaning and shaping increases the chance of tooth fracture. The mechanical forces on tooth without pulp is more than that of intact tooth, this commonly leads to vertical fracture. Pain is likely to happen in the case of the damaged tooth because of the salivary bacterial contamination. Vertical fracture possess poor prognosis and mostly needs extraction, the multirouted tooth may be sectioned and saved [17].

Pain as a result of instrumentation

Acute apical periodontitis and phoenix abscess are two conditions that may require emergency treatment during the course of root canal treatment. The treatment of acute apical abscess has been mentioned before. The occlusion must always be checked that since its likely to have some amount of tooth extrusion from the socket. Phoenix abscess is defined as a sudden exacerbation of previously symptomless periradicular lesions. It is one of the common conditions to be dealt with after the initial instrumentation of tooth with a pre-existing chronic periapical lesion, which is probably due to change and activation of internal bacterial flora. The treatment includes irrigation, debridement, and root canal therapy after establishing drainage [4].

Endodontic emergency after treatment

Certain factors need to be considered following the sealing of the root canal:

- Overfilling
- Underfilling
- High restoration
- Root fracture.

After obturation of root canals, restoration given must be checked for occlusal interferences to avoid apical periodontitis or fracturing of tooth. Overfilling does not cause a major problem apart from mild discomfort. The underfilled canal is the one that has been cleaned and debride but is still left with infected debris causing pain. The most common reason for pain after the obturation is the presence of infected pulpal tissue or material in the periapical region. The overextended fillings may require occlusion correction and underfilled restoration may need re-restoration after proper debridement and removal of any infected material left. Analgesics and antibiotics are prescribed for severe pain and re-infection. The other alternative to remove root filling material is through peri-radicular surgery and apicectomy. A root fracture is also another common complication post endodontic treatment; therefore, during lateral compaction of gutta-percha, excessive pressure should not be applied. Extraction is indicated in deep vertical fractures [4,18].

Conclusion

An endodontic emergency can happen during before, during, or after the root canal treatment and presents with a wide variety of symptoms. Hence a clinician must recognize these symptoms and demands skilled diagnosis, thorough knowledge of pharmacology, and precise endodontic treatment for long-term prognosis and success of teeth restored.

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