International Journal of Enhanced Research in Medicines & Dental Care (IJERMDC),
ISSN: 2349-1590, Vol. 11 Issue 8, August 2024, Impact Factor: 8.325

Pediatric Endodontic Emergencies

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ABSTRACT

Endodontic treatment is sometimes necessary to be done in children to resolve pulpal pathologies. Although it may alleviate pain in children, it can sometimes lead to unpleasant events/episodes called Endodontic Emergencies. Endodontic emergencies can be a result of many different conditions of the pulp, root canal, to give an overview of commonly seen endodontic emergencies that can occur in pediatric dental practice and their management.

Keywords: endodontic emergencies, pain, infection, swelling, management, drugs, antibiotics

INTRODUCTION

Endodontic therapies in vital or non-vital teeth may alleviate painbut can lead to unpleasant events like endodontic emergencies. According to Abbott PV, Endodontic Emergencies can be defined as occurring when a patient has pain associated with inflammation of the pulp and/or peri-radicular tissues, or when the pain (with or without swelling) is caused by infection of the root canal system and/or the peri radicular tissues[1]. Endodontic emergencies can also occur in the Pediatric dental practice as an unexpected event which can become a stressful situation for both, the child and the dentist[2]. Thus, It is incumbent on pediatric dental surgeons to provide prompt assistance to children who have an emergency, allowing sufficient time to manage the situation comprehensively[3]. Hence, the pediatric dentist should advise root canal therapy after careful consideration of the patient, be aware of the latest guidelines to manage emergencies if they report to a dental office, and perform each procedure in a way to avoid unnecessary complications[3]. Various classifications for endodontic emergencies have been proposed, of which the most accepted is Grossman's classification[4] , according to which, the endodontic emergencies can be classified as[4] (figure 1) Occurring before any intervention, between the appointments when the patient isundergoing endodontic treatment over more than one appointment and after endodontic treatment has been completed.

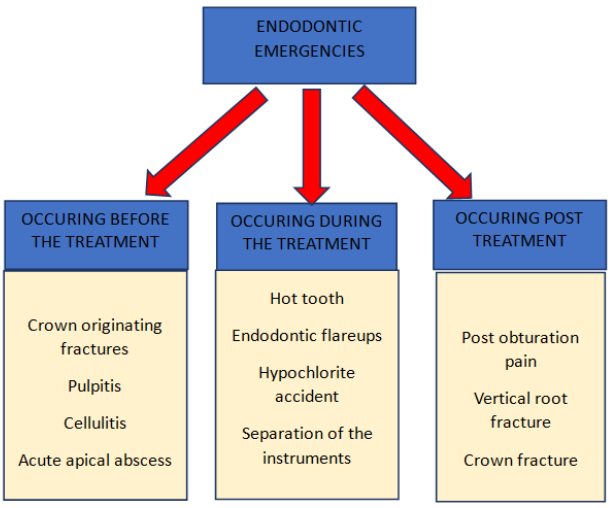

Figure 1: Classification of endodontic emergencies according to Grossman

ENDODONTIC EMERGENCIES BEFORE THE ENDODONTIC TREATMENT

Cracked tooth syndrome: Crown-originating fracture (COF) denotes an incomplete fracture of a tooth with a vital pulp. The fracture involves enamel and dentin, and rarely involves the dental pulp.

Management: The cracked tooth syndrome is managed whether the fracture line involves the pulp. If there are symptoms of reversible pulpitis (based on the history of pain- no spontaneous pain), a 2-week waiting period is recommended,[5] followed by stabilization of the tooth with the splint. For the fractures extending to the pulp, definitive treatment aims to preserve pulpal vitality by requiring full occlusal coverage for cusp protection.[5]

Pulpitis: is the inflammation of the pulp caused by noxious stimuli orcaries. It can be classified into reversible or irreversible pulpitis. Reversible pulpitis is pulpal inflammation reversible in nature, commonly induced by dental caries and operative procedures, in which the patient responds to thermal or osmotic stimuli. Still, the symptoms disappear when the etiology is eliminated. Deep dentinal caries or deep restorations usually cause irreversible pulpitis. Spontaneous pain may occur or be precipitated by thermal or other stimuli. The pain is lingering and lasts for several minutes to hours.

Management: Reversible pulpitis can be managed by Removing all restorations, caries, cracks—if the tooth is suitable for restoration, the conservative pulp treatment options are Indirect pulp cap, Direct pulp cap, Partial pulpotomy, orPulpotomy, use of cavity varnish or base in cases of deep cavities followed by restorations. Follow-up after 3-4 months should be done for radiographic evaluation and to check the status of the pulp.

The choice of treatment for irreversible pulpitis is the complete removal of the pulp or pulpectomy in the primary teeth and root canal treatment in permanent teeth and follow-up after 6 months to review any radiographic or clinical changes.

Symptomatic Acute Apical Abscess - Symptomatic (acute) apical abscess is an inflammatory reaction to pulpal infection and necrosis characterized by rapid onset, spontaneous pain, tenderness of the tooth to pressure, pus formation, and eventual swelling of associated tissue.[6]

Management: The main goal for managing swelling secondary to endodontic infections is to gain drainage, remove the source of the infection, and control systemic signs and symptoms.[7]Firstly, Drainageneeds to be established via the root canal and/or incision and drainage of the swelling to relieve the intra-pulpal pressure. Antibiotics need to be administered if systemic signs of illness (malaise, increased temperature, lymph node involvement, etc.) are present. Along with antibiotics, Analgesics need to be administered for pain control.

Cellulitis-Cellulitis of odontogenic origin is an acute, deep, and diffuse inflammation of the subcutaneous tissue that spreads through the spaces between the tissue cells to several anatomic regions and tissue spaces occurring due to dental or supportive tissue-associated pathologies.

Management: The treatment of facial cellulitis is managed via two approaches- removal of the underlying cause of cellulitis and gaining drainage through surgical intervention with antibiotics as co-adjunctive therapy. [8]

For the treatment of facial cellulitis, drainage needs to be established via the root canals or through the incision or the needle aspiration. Systemic antibiotics need to be administered if the patient presents with systemic signs and symptomsand analgesics for pain control. Once the patient's acute condition subsides, the decision is taken on the basis of clinical and radiographic examination, about saving the tooth (by pulpectomy/RCT) or extracting the offending tooth.

ENDODONTIC EMERGENCIES OCCURRING DURING THE ENDODONTIC TREATMENT

Hot Tooth - Hot toothis a tooth that is difficult to anesthetize. Managing hot tooth can be challenging but few things can be done to manage this condition effectively.[6]

Management: Before initiating access preparation, a small test cavity can be made to ensure the effectiveness of anesthesia. Additional anesthetic or supplemental injections are necessary to achieve sound anesthesia and buffering of the local anesthesia can be done.[6]

Endodontic Flare-Ups-An endodontic flare-up is an acute exacerbation of a peri-radicular pathosis after the initiation or continuation of nonsurgical root canal treatment.[7]

Management: The main cause of endodontic flareup is the pushing down of the necrotic pulp/debris beyond the apex into the peri-radicular tissue.The key to the effective management of endodontic flareupsis successful asepsis, adopting

a chemical-mechanical procedure producing less amount of debris extrusion (crown down technique), the use of preoperative medicines such as analgesics and completing endodontic treatment in one visit if possible, and use of intracanal medications between sessions for infected teeth[9]

Accidental Extrusion of Irrigant or Sodium Hypochlorite-Inadvertent extrusion of irrigantbeyond the periapex, mainly sodium hypochlorite accident can lead to hypochlorite accident.[6]

Management: The first step towards management of hypochlorite accident is always informing the patient or the parents about the accident.[6]In cases where the patient is not under local anesthetic, block anesthesia should be given immediately. The canal is flooded with normal saline so that the accumulated blood comes out and the level of pain decreases. The application of a cold compress can further help to reduce the discomfort and associated 'burning sensation'.Antibiotics are administered to reducethe likelihood of secondary infection, analgesics and steroids are given for reduction of inflammation caused by the extruded sodium hypochlorite.[10]

Instrument Aspiration-Though rare, Instrument inhalation or ingestion (sharp instruments like endodontic files, hypodermic needles, etc)[11] can occur while treating pediatric patients due to sudden movement of the child, especially when the child is uncooperative or due to gag reflex elicited during the endodontic treatment.[12]

Management: The first step towards the management of the aspiration of the endodontic instrument is performing Heimlich's maneuver to retrieve the instrument. if not retrieved by this method, then an anteroposterior chest x-ray or CT scan should be done immediately to locate the instrument. if the instrument is aspirated in the respiratory tract, surgical/laparoscopic bronchoscopy can be done to retrieve the aspirated instrument. For most of the cases of aspiration of the endodontic instruments in the gastrointestinal tract, surgical intervention is not required as they have been seen to pass through the tract via the excretion of fecal matter.[12]

Tissue Emphysema-Subcutaneous emphysema occurs when air gets trapped in tissues under the skin. It happens when the air is forcefully pushed into the submucosal spaces, leading to tissue distension- such as during the forceful drying of the root canals through compressed air.. Though subcutaneous tissue emphysema is a self-limiting condition and can be managed conservatively using analgesics, antibiotics, corticosteroids, and fluids, but still can lead to great discomfort especially in the pediatricpopulation.[13]

Needle Breakage and Retention of the Needle in the Tissues- Needle breakage during injecting the solution in oral cavity is associated with a sudden movement of the patient (seen in the cases of highly uncooperative patients, fearful children or in children with special health care needs), choosing the needle with the narrower diameter, a change in the direction of the needle when inserted into the tissues, and a sudden change in the position of the clinician.[14]

Separation of Endodontic Instruments-Instrument separation is caused by repeated use of the old files (having high torsional and cyclic fatigue), an increase in canal curvature, which causes the canal to narrow in this area- as the cyclic fatigue of the instrument grows, pronounced canal curvature reduces the life expectancy of files which ultimately leads to the separation of the instrument. .[15]

Management: Instrument separation can be managed depending upon the level of the canal at which instrument separation has taken place. If the instrument separation has occurred in the coronal 1/3 of the canal, an attempt can be made to retrieve the instrument using ultrasonics or different instrument retrieval systems (e.gMassernan's kit). If the instrument separation is seen in the middle third of the root canal, then retrieval can be attempted, if not possible, the canal can be obturated after bypassing the instrument. If the separated instrument is seen in the apical third of the root, then extraction is the treatment of choice in primary teeth as the roots will resorb. In permanent dentition, an attempt can be made to bypass the instrument and obturating the canal (making sure to not push the instrument beyond the apex).[16]

ENDODONTIC EMERGENCIES OCCURRING POST-ENDODONTIC TREATMENT

Post-Obturation Pain -After endodontic treatment, patients sometimes report back to the dental office with the chief complaint of pain. This persistent pain that arises after the endodontic treatment is known as post-obturation pain which might be due to over-obturation or under-obturation. .[6]

Management: In cases of over-obturation or under-obturation, the clinician should re-attempt the root canal treatment with the optimal obturation to achieve coronal and apical seal of the canals.[35] Missed canals should be prepared biomechanically and later obturated. High points on the occlusal table should be removed to reduce the pressure from mastication on the tooth.[6]

Vertical Root Fractures-Vertical root fractures are longitudinal fractures that originate in the roots of teeth. These fractures occur most commonly in endodontically treated teeth.[6]

Management: Vertical root fractures upto the middle third of the root length can be managed by reuniting the fractured segments using dual light cure resins followed by splinting the tooth for 4 weeks.[17]Longitudinal fractures of the root have poor prognoses so the extraction of the tooth with the root fracture is the treatment of choice.

Crown Fractures Post Endodontic Therapy-. Fracture of the crown is a common occurrence in dental practice if the endodontically treated tooth with a grossly mutilated crown is not restored with full coverage restoration, due to loss of structural tissue from the tooth, which is capable of holding the tooth together under functional load.

Management: In cases of severely fractured tooth, extraction is the treatment of choice

PHARMACOLOGICAL MANAGEMENT OF THE ENDODONTIC EMERGENCIES

The third "D" of the 3D's (Diagnosis, Definitive dental treatment, and Drugs) principle for managing dental pain is to consider the use of drugs as an adjunct to the definitive dental treatment.[18] Drugs should only be used where the dental treatment may not fully resolve the patient's pain or other symptoms (e.g. swelling).Drugs used in Pediatric Endodontic Emergencies are NSAIDS and Analgesics.Ibuprofen is generally considered to be the most effective NSAID available. Acetaminophen (paracetamol) is the recommended alternative non-narcotic drug for patients who cannot take or tolerate ibuprofen or other NSAIDs. The opioid narcotics generally used in dentistry are codeine and tramadol but they are avoided until necessary like in cases of unbearable pain. Antibiotics should only be prescribed when the patient has an infection that is causing systemic symptoms or signs—such as fever, malaise, swelling, and/or lymph node involvement. The most commonly administered antibiotic is amoxicillin, amoxicillin-clavulanic acid combination, and metronidazole in emergencies. Ampicillin is administered parenterally. If penicillinis not tolerated by the patient, then cephalosporins are the drug of choice to treat the infection.

CONCLUSION

The management of each endodontic emergency demands a tailored approach, necessitating the expertise of a pediatric dentist. Therefore, it is paramount for clinicians to meticulously gather the child's dental history and conduct a thorough examination of the affected tooth before initiating any endodontic intervention. Precautionary measures must be taken throughout the treatment process to mitigate the likelihood of encountering endodontic emergencies.

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