Pain in Endodontics: causes, prevention and management

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ABSTRACT

Pain related to endodontic treatment can be annoying and perplexing problem to the patient and the dental surgeon. Though the pain may not indicate endodontic failure, relief of pain is more important to the patient than success or failure of the treatment. Prevention and management of pain is a crucial factor for the dental surgeon’s success in his/her practice. In this article, some commonly overlooked and misdiagnosed factors will be described and methods to improve the success rate will be discussed.

Key words – Root canal treatment, endodontic pain, endodontic success.

Introduction

Post treatment endodontic pain is one of the widely studied topics in endodontics. There are several factors associated with pain after root canal treatment. Some of these are common. Pre-operative factors like acute exacerbation of chronic lesion1,2, non-vital tooth3, previously opened tooth, unusual canal anatomy4,5, periapical cyst6, abscess or fractured teeth are responsible for more flare-ups and pain. Intra-operative factors like lack of use of rubber dam7, irritating canal dressing materials8,9 and irrigation10,11, apical extrusion of filling materials and instruments12, procedural complications, overlooked canals13 can give rise to more pain. Post operative factors like leaky temporary or permanent filling materials and lack of post operative medicaments may also give rise to pain.

Amongst these, some factors are frequently overlooked or misdiagnosed by a busy practitioner. This can lead to unexpected postoperative complications, especially pain. Knowledge about such factors is essential to judge and prevent such consequences.

Factors that may be overlooked by the clinician

- Position of apical foramen14: Usually it is 0.5 mm short of radiographic apex. If it is 1.5 – 2 mm short of radiographic apex, instrumentation done upto radiographic apex can lead to overinstrumentation and periapical injury.
- Pulpal tissue15 in the isthmus portion of root tip between two canals. 60% of mesiobuccal roots of upper first molars and 30% of distal roots of lower first molars have pulp tissue in the isthmus portion between two canals. It is difficult or impossible to clean this area during conventional root canal preparation. Postoperative pain should urge one to consider surgery in such a situation.
- Maxillary lateral incisors16 and mandibular central incisors show higher incidence of postoperative pain due to missed canal.
• Incidence of 4th canal\textsuperscript{17} in maxillary first molar is 60% and in mandibular first molar is 30%. Effort should always be made to find the 4th canal.

• Invaginated tooth\textsuperscript{17} may possess irregularly extended root canals causing difficulties for proper canal preparation and obturation. If one fragment of canal is left untreated, it may lead to persistent pain after obturation.

• Females\textsuperscript{17} have been shown to have more pain and flare ups and greater inclination to seek assistance for untoward clinical manifestations than males.

• Periapical cyst\textsuperscript{17} can often be confused with periapical granuloma radiographically. Such cases may lead to flare ups.

• Palatogingival groove\textsuperscript{18} is usually seen in upper central incisors. Periodontal diseases may give rise to pulpal infection in such cases.

• Mobile\textsuperscript{18} teeth have unhealthy periodontal ligament and cementum at the apex. Bacteria of endodontic origin will easily penetrate the cementum and dentinal tubules of root tip, which will be difficult to eradicate.

• Emotional problems\textsuperscript{18} like tension and depression can contribute to lack of rest with lowered resistance, which can disturb healing after periapical damage.

• Patients with low immunity\textsuperscript{18} have more pain and take longer healing time.

• History of pain: Lesion of long duration\textsuperscript{18} indicates extra time for treatment and healing.

• Calcified canal\textsuperscript{17}: Canal orifice may be constricted due to calcification but microscopically bacteria will pass easily through that narrow space towards periapical tissue. Efforts should always be made to negotiate calcified canals.

• Instrumentation\textsuperscript{17} before measurement of root canal length will give rise to ledge formation.

• Periapical extrusion\textsuperscript{18} of root canal debris: Vigorous instrumentation will extrude infected pulp tissue, dental debris and pus beyond root canal oramina. This may cause pain even after proper obturation. Thorough irrigation and recapitulation with small sized instrument after successive instrumentation should be done to prevent such complications.

• Incorrect measurement of root canal length\textsuperscript{18}: Sometimes correct length is not measured with one or two radiographs. Repeated radiographs are sometimes needed for correct length measurement.

• Keeping canal empty\textsuperscript{19} for long time after instrumentation will allow bacteria to re-enter the canal, resulting in reinfection and periapical flow of bacteria.

• Single visit endodontics\textsuperscript{19} may not be ideal for all teeth. It may give rise to pain or flare ups, if case selection is not proper.

• Hyperocclusion\textsuperscript{19}: Continuous periapical injury from hyperocclusion will cause postoperative pain.

• Crack of septa\textsuperscript{20} between two closely placed canals resulting from overzealous instrumentation, as in mesiobuccal roots of upper molars and distal roots of lower molars. Cracked septa will make proper apical seal during obturation impossible.

• Irrigation\textsuperscript{21}: Hydrogen peroxide generates oxygen with a catalase reaction, that might cause periapical discomfort. It should not be the last irrigant, since nascent oxygen may remain after cavity closure and build up pressure.

• Silver points\textsuperscript{22}: if used for obturation, after dissolution of sealer, leakage and silvercone corrosion, may cause pain long after obturation.
- Obturation technique: More pain occurs immediately after lateral condensation compared to single cone obturation technique but long term prognosis will be poor for single cone obturation technique.

The purpose of case selection is to determine the feasibility and practicability of treatment and to avoid treating cases that will fail regardless of the quality of treatment. 22% of failures are attributed to poor case selection.

Failures may be related to misjudgment about feasibility of treatment, technical difficulties in the course of treatment like unegotiable canals, root resorption, impossibility of restoring the tooth etc. Failures may also be related to conditions that are not considered to be contraindications to therapy, which may deteriorate during or following therapy so as to cause failure.

Malaligned tooth after endodontic treatment may lead to occlusal trauma or secondary periodontal problems may arise, if it is difficult or impossible to maintain good oral hygiene. Because of poor case and treatment modality selection, periapical involvement may be transformed into periapical cyst. Cyst may lead to further complications, if not treated appropriately.

**Clinical measures to improve success**

Success may be defined as achieving a set goal or desired end.

Success in endodontics rests on a series of well planned and executed steps beginning with application of rubber dam and ending with a hermetic seal of the canal.

Pain relief is the most common purpose for which patients come to the dental office and successful pain management is an important factor for building practice. Following measures, if followed, will improve the chances of success and help to minimize failures.

- Under no circumstances should enlarging instruments be used before rubber dam placement. After gaining access to the cavity, rubber dam must be applied. Rubber dam helps to achieve aseptic environment and prevents aspiration of instrument as well as the discomfort of unpleasant taste of irrigants.

- Extreme care should be taken to avoid insult of periapical tissues by instruments, extruded canal debris, infected debris or the filling materials. Over instrumentation is the most frequent cause of postoperative pain. Even when there are large radiolucencies, when debridement and obturation are carried out within the confines of canal, regeneration will take place in most cases without surgery.

- Disocclude the tooth wherever indicated to avoid periapical trauma and possible delay in periapical healing.

- Filing or reaming should be performed only after working length determination. Attempt to enlarge the canal before measuring root canal length may give rise to ledge formation in curved or narrow canals.

- Use of endodontic microscopes can multiply chances of success and to overcome complications.

- Thorough irrigation is necessary to remove smear layer, root canal bacteria and root canal debris from the canals. Combination of 5.25% sodium hypochlorite and 17% EDTA are the most effective irrigants. Electrochemically activated water is also proven to remove smear layer selectively from intertubular dentin, leaving smear layer on tubules to prevent re-entry of bacteria into canal.

To avoid instrument breakage, discard the instrument, if flutes are opened up or disturbed. Before using new instruments, magnifying lens should be used to check for any irregularity or unevenness in flutes.
Conclusions

There are numerous factors which can account for pain either during or after endodontic treatment. Some of these factors such as unusual canal anatomy, presence of extra canal, lateral canals, variations in location of apical opening, acute exacerbation of chronic conditions are not entirely under the control of the dental surgeon. However, there are other causes such as use of irritating medicaments and irrigants, over instrumentation, overlooked canals, etc. which are very much under the dental surgeon's control.

To be forewarned is to be fore-armed. The precautions, approaches and efforts discussed can decide the level of success or failure in endodontics.

References


