

Guidelines for root canal treatment

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I. Introduction

Where a tooth is painful and the dental pulp is irreversibly damaged, or a tooth is badly broken down, the patient is usually faced with a choice of extraction or saving the tooth. As more and more of our patients choose to save rather than extract their teeth, there is an increasing need for root canal treatment. The Society of Endodontists (Singapore), as the organization representing practising members in this area of oral health care, has the expertise and professional responsibility to assist the dental profession by developing guidelines pertaining to endodontic treatment. Although the scope of endodontics includes, but is not limited to, the differential diagnosis and treatment of oro-facial pain of pulpal and periradicular origin; vital pulp therapy; root canal treatment; treatment of endodontic failures; surgical endodontics; bleaching of endodontically treated teeth; treatment procedures related to coronal restorations by means of a core and/ or a post involving the root canal space and treatment of traumatized teeth¹, this report, has been written to address guidelines for root canal treatment only. These guidelines are intended to represent current good practice in root canal treatment and have been formulated:

- A. To establish a standard of care in root canal treatment our patients can expect from any dental practitioner.
- B. As a guide to the profession. With the introduction of new materials and rapid advances in technology, this guideline will give practitioners the current accepted practice.

These guidelines are not meant to be exhaustive and dental practitioners are expected to apply due diligence in the selection of their treatment methods and materials.

The working committee was composed of Dr Chng Hui Kheng (Chairperson), Dr Chen Nah Nah, Dr Koh Eng Tiong, Dr Ernest Lam Choon En, Dr Lim Kian Chong and Dr Sum Chee Peng.

II. Definition

Root canal treatment is a procedure which uses biologically acceptable chemical and mechanical treatment in the root canal system to eliminate pulpal and periradicular disease(s) and to promote healing and repair of the periradicular tissues¹.

III. Considerations

The aim of root canal treatment is to preserve functional teeth. Most cases of root canal treatment can be carried out by general dental practitioners. Cases with difficulty levels which fall outside the comfort zone of the practitioner may be referred to an endodontist.

IV. Medical and dental history

1. Medical history should reveal any medical condition which may influence treatment.
2. Dental history should reveal factors which may be of importance for diagnosis and treatment planning.

3. History of present complaint - a well taken history of the present complaint will often lead to a tentative diagnosis.

V. Clinical examination & diagnosis

1. The patient should be examined both extra- and intraorally.
 - A. Extraoral examination – General appearance, presence/ absence of fever, facial asymmetry, swelling, discolouration, redness, extraoral scars, sinus tract and lymphadenopathy.
 - B. Intraoral examination – Condition of oral mucosa, presence/ absence of sinus tract, condition of teeth including cracks and restorations and periodontal status.
2. Clinical tests – Tests such as percussion, palpation, mobility, thermal and electrical should be performed. In addition, transillumination and observation of occlusal discrepancies may be necessary.
3. Radiographs – These are preferably taken with the paralleling technique and a beam-guiding device. It may be necessary to take radiographs from more than one angle. Occasionally, panoramic radiographs, bitewing radiographs, occlusal films and radiographs of the contralateral and opposing tooth/ teeth may be necessary.
4. Diagnosis and treatment planning - After establishing the diagnosis and prognosis for the tooth in question, the practitioner should:
 - A. Determine the appropriate treatment
 - B. Evaluate the complexity of the treatment.
 - C. Consult or refer to an endodontist if appropriate.

At times, it may not be possible to arrive at a diagnosis immediately. These patients should be recalled and reassessed until a definitive diagnosis can be established. It is preferred that a diagnosis be established before commencement of root canal treatment. Treatment should only be planned for those teeth that are functionally or aesthetically important and have a reasonable prognosis when restored.

VI. Records

Treatment records should include the patient's chief complaint(s), medical and dental history, results of clinical examination and diagnostic tests, informed consent, treatment rendered, prescriptions and radiographs. The treatment record should be comprehensive enough to allow another clinician to take over the treatment if required. Comprehensive records are also essential for medico-legal reasons².

VII. Infection control

1. The clinician and dental assistant should wear gloves and use an aseptic technique.
2. All instruments used within the oral cavity should be sterilized.
3. The tooth should be isolated with rubber dam.

VIII. Root canal treatment

Root canal treatment is carried out when there is irreversible pulpitis, a non-vital pulp or when the pulp is mechanically/ traumatically exposed. Occasionally, it may be necessary to carry out elective root canal treatment on teeth with vital pulps for restorative reasons. A preoperative radiograph should be examined prior to treatment. Local anaesthetic may be given as appropriate.

1. Preparation of tooth – All caries and defective restorations should be removed and, if necessary, the occlusion adjusted and the tooth protected against fracture. This may sometimes be achieved by cementing an orthodontic band around the tooth.
2. Isolation of tooth – The treated tooth should be isolated with a rubber dam. This prevents salivary and bacterial contamination of the pulp cavity. In addition, it also prevents inadvertent inhalation and ingestion of instruments and escape of irrigating solutions into the oral cavity.
3. Access cavity preparation – The objective of access cavity preparation is to provide straight line access to the root canals. The radiographs should be studied and the size, shape and position of the pulp chamber noted. The entire roof of the pulp chamber should be removed so that the pulp chamber can be cleaned. The access cavity should be prepared so that as much sound tooth structure as possible is conserved without compromising the above.

4. Determination of working length – Recognised methods of determining the working length include using radiographs and electronic apex locators. With the radiographic technique, a file is inserted into the canal to 0.5 – 1.0 mm short of the working length estimated on the preoperative radiograph. The file should be of a sufficient size (at least ISO size 15) so that its tip can be clearly identified on the radiograph. It may be necessary to take more than one working length radiograph from different angles. Electronic apex locators may be used to determine the working length. However, this should preferably be confirmed radiographically.

5. Cleaning and shaping – The objectives of cleaning and shaping are to remove any pulp tissue and micro-organisms from the root canal and shape the canal so that the root canal system can be obturated. The prepared canal should be tapered, with the apical constriction maintained. It is recognized that instruments used to clean and shape the root canals may on occasions inadvertently separate. Where an instrument separation occurs, the patient should be informed of this incident and advised regarding its subsequent management.

6. Irrigation – Copious amounts of irrigating solution should be used in cleaning and shaping of the root canal. This serves to flush out debris, eliminate microorganisms and lubricate the root canal instruments. The irrigating solution used should have disinfecting and pulp tissue-dissolving properties. One to five per cent sodium hypochlorite in a

syringe is commonly employed. To avoid extrusion of the solution beyond the apex, the syringe should not bind in the canal and the solution should not be forcefully injected.

7. Intracanal medicament – In multi-visit root canal treatment, intracanal medicament may be placed as a space filler and prevent multiplication of microorganisms left in areas of the root canal system which are inaccessible to biomechanical instrumentation. Calcium hydroxide has emerged as one of the most popular intracanal dressings available³.
8. Obturation – Obturation is carried out after cleaning and shaping is completed. Obturation blocks the dentinal tubules and closes the portals of exit to the accessory canals and periapex. The canal is filled to prevent the passage of microorganisms and fluids. The current accepted material is gutta percha with a sealer. Sealers containing formaldehyde are toxic and should not be used⁴. A radiograph should be taken after completion of root canal obturation.
9. Restoration – The final restoration must provide a permanent coronal seal and protect the remaining tooth structure. Coronal microleakage can lead to subsequent root canal reinfection. Thus, a final restoration should ideally be placed soon after root canal treatment is completed^{5,6}.
10. Assessment of endodontic treatment outcome – It is recommended that endodontic treatment should be checked clinically and radiographically

immediately post-treatment, then after 6 months and annually until complete healing is observed. Endodontic treatment may be considered successful when all the following conditions are present:

- A. The tooth should remain functional.
- B. Absence of signs and symptoms such as pain, swelling and sinus tract.
- C. Radiographically, evidence of a normal periodontal ligament space around the root. However, if an extensive lesion has healed but left a widened periodontal ligament space, it may be considered as scar tissue rather than a sign of persisting disease.

Root canal treatment is considered a failure if any of the following is observed:

- A. Signs and symptoms such as persistent pain, swelling and sinus tract are present.
- B. A lesion appears subsequent to endodontic treatment.
- C. A pre-existing lesion remained the same, increased in size or has only decreased in size during a 4-year assessment period^{7, 8}.

Further treatment may be considered in teeth with failed root canal treatment. These may include non-surgical root canal retreatment, endodontic surgery and removal of the tooth.

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