

Guidelines for Root Canal Treatment

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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 root canal treatment. A sub-committee was set up in early 2001 to formulate a set of guidelines for root canal treatment, and this set of guidelines was adopted by the Society of Endodontists, Singapore, on 23 February 2002. Although the scope of endodontics is wide, this report has been written to address guidelines for root canal treatment only. The guidelines are intended to represent current good practice in root canal treatment, and have been formulated to establish the standard of care in root canal treatment our patients can expect from any dental practitioner, and as a guide to the profession. 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. [*Singapore Dent J* 2004;26(1):60-2]

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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. The scope of endodontics includes, but is not limited to, the differential diagnosis and treatment of orofacial 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 teeth.¹ This report has been written to address guidelines for root canal treatment only. The guidelines are intended to repre-

sent current good practice in root canal treatment, and have been formulated to establish the standard of care in root canal treatment our patients can expect from any dental practitioner, and as a guide to the profession. With the introduction of new materials and rapid advances in technology, this guideline will show practitioners the currently 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.

Definition

Root canal treatment is a procedure that uses biologically acceptable chemical and mechanical treatments in the root canal system to eliminate pulpal and periradicular disease(s) and to promote healing and repair of periradicular tissue.¹

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 that fall outside the comfort zone of the practitioner may be referred to an endodontist.

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Medical and Dental History

The patient's medical history should reveal any condition that may influence treatment. The dental history should reveal factors that may be of importance in diagnosis and treatment planning. Finally, a well-taken history of the present complaint will often lead to a tentative diagnosis.

Clinical Examination and Diagnosis

The patient should be examined both extra- and intra-orally. The extraoral examination should assess general appearance, presence or absence of fever, facial asymmetry, swelling, discoloration, redness, extraoral scars, sinus tract and lymphadenopathy. The intraoral examination includes consideration of the condition of the oral mucosa, presence or absence of a sinus tract, the condition of teeth including cracks and restorations, and periodontal status.

Clinical tests such as percussion, palpation, mobility, thermal and electrical tests should be performed. In addition, transillumination and observation of occlusal discrepancies may be necessary. Radiographs should preferably be 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 or teeth may be necessary.

After establishing the diagnosis and prognosis for the tooth in question, the practitioner should determine the appropriate treatment, evaluate the complexity of the treatment and 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.

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 reasons.²

Infection Control

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

Root Canal Treatment

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

Tooth preparation

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.

Tooth isolation

The treated tooth should be isolated with a rubber dam. This prevents salivary and bacterial contamination of the pulp cavity. In addition, it prevents inadvertent inhalation and ingestion of instruments and escape of irrigating solutions into the oral cavity.

Access cavity preparation

The objective of access cavity preparation is to provide straight-line access to the root canals. Radiographs should be studied to note the size, shape and position of the pulp chamber. The entire roof of the pulp chamber should be removed so that the 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.

Determination of working length

Recognized 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 (\geq 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. The working length determined by electronic apex locators should preferably be confirmed radiographically.

Cleaning and shaping

The objectives of cleaning and shaping are to remove any pulp tissue and microorganisms 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. Instruments used to clean and shape the root canals may, on occasion, inadvertently separate. Where instrument separation occurs, the patient should be informed and advised regarding its subsequent management.

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 root canal instruments. The irrigating solution should have disinfecting and pulp tissue-dissolving properties; 1–5% sodium hypochlorite in a syringe is commonly used. 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.

Intracanal medicament

In multi-visit root canal treatment, intracanal medicament may be placed as a space filler and to prevent multiplication of microorganisms left in areas of the root canal system that are inaccessible to biomechanical instrumentation. Calcium hydroxide has emerged as one of the most popular intracanal dressings available.³

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 currently accepted material is gutta percha with a sealer. Sealers containing formaldehyde are toxic and should not be used.⁴ A radiograph should be taken after completion of root canal obturation.

Restoration

The final restoration must provide a permanent coronal seal and protect the remaining tooth structure. Coronal microleakage can lead to subsequent root canal re-infection. Thus, a final restoration should ideally be placed soon after root canal treatment is completed.^{5,6}

Assessment of 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 functional tooth; no signs and symptoms such as pain, swelling and sinus tract; and radiographic 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 scar tissue rather than a sign of persisting disease.

Root canal treatment is considered a failure if any of the following are observed: signs and symptoms such as persistent pain, swelling and sinus tract; appearance of a lesion subsequent to treatment; and no change or an increase in size of a pre-existing lesion or only a decrease 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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