

Root canal retreatment

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Introduction

- ▶ Clinical decision making is a complex process.

- ▶ Factors to consider :
 - i. Evidence
 - ii. Individual cases
 - iii. Patient preferences

- ▶ Treatment decisions can vary widely depending on :
 - i. Operators experience
 - ii. Personal preferences

Introduction

- ▶ Treatment decision should include :
 - i. Alternatives
 - ii. Risks and benefits
 - iii. Prognosis
 - iv. Costs
- ▶ Absence of clear guidelines on how to treat endodontically involved teeth.
- ▶ Treatment planning dilemma for many clinicians.

Etiology of persistent periapical inflammation

Etiology of persistent periapical inflammation

Microbial factors

Siquiera 2001, Nair 2006, Virdee and Thomas 2017

Nonmicrobial factors

Siquiera 2001, Nair 2003, Nair 2006, Abbott 2011

Etiology of persistent periapical inflammation

► Microbial factors

1. Intraradicular infection
2. Extraradicular infection

Etiology of persistent periapical inflammation

Intraradicular infection

Coronal leakage

- i. fracture or loss of the temporary/permanent restoration
- ii. fracture of the tooth structure; recurrent decay exposing the root canal filling material
- iii. delay in the placement of permanent restorations

History of previous RCT

? Follow standard protocol

Presence of microorganisms

- i. missed canal
- ii. lateral canal
- iii. apical deltas
- iv. ramifications
- v. inadequate obturation

Etiology of persistent periapical inflammation

Extraradicular infection

Microorganisms survive in an inhospitable environment

- i. Avoid destruction by phagocytes
- ii. Change antigenic coats
- iii. Induce proteolysis of antibody molecules

Microorganisms establish in the periradicular tissues

- i. *Actinomyces* spp.
- ii. *Propionibacterium propionicum*

Etiology of persistent periapical inflammation

► Nonmicrobial factors

1. Periapical true cyst
2. Foreign body reaction
3. Scar tissue healing

Etiology of persistent periapical inflammation

Radicular cysts

Pocket cyst

True cyst

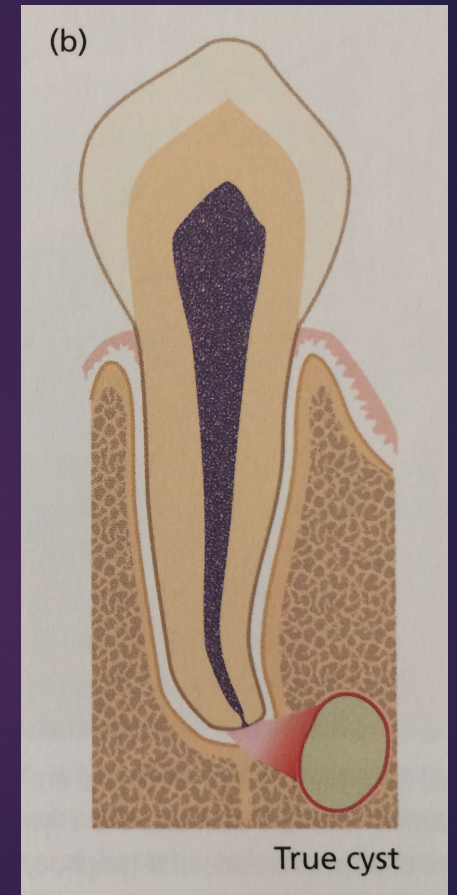
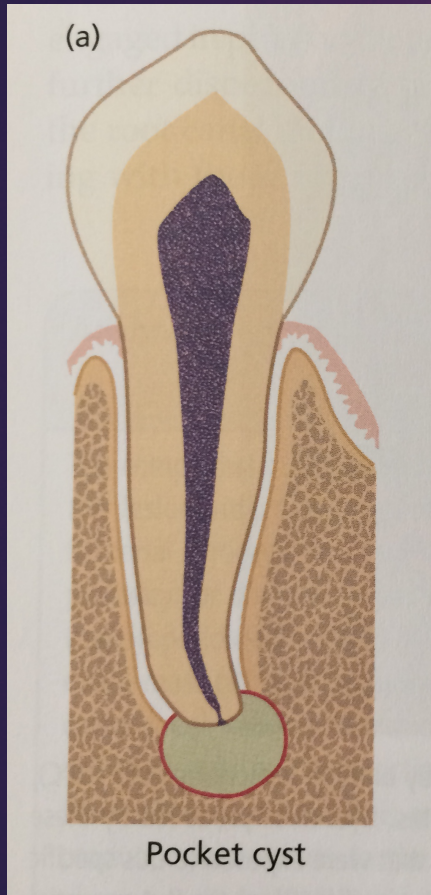


Fig. 7.9 Radicular cysts may appear in two configurations: a pocket cyst (a) where there is direct communication between the cyst cavity and the root canal space; and a true cyst (b) where no such pathway exists.

Etiology of persistent periapical inflammation

Gutta percha

Cholesterol crystals

Sealer

**Foreign body
reaction**

Amalgam

Particles from powdered gloves

Fibers from paper points

Etiology of persistent periapical inflammation

Scar tissue healing

Etiology of persistent periapical inflammation

- ▶ **Residual microbes** in the apical portion of the root canal system is the major cause of persistent periapical inflammation.

Nair 2006

- ▶ Periapical actinomycosis, true cysts, foreign body reaction and scar tissue :
 - i. are of **rare** occurrence (Nair 2006).
 - ii. may have **no symptoms** for much of their existence (Abott 2011).
 - iii. will only have symptoms if there is an **acute exacerbation** of the chronic inflammation associated with them (Abott 2011).

Treatment planning

Treatment planning

Factors to consider

Patient factors

Others

Individual cases

Operator factors

Treatment planning

► Patient factors

1. Preferences
2. Patient's age, general health, oral health
3. Willingness to proceed
4. Finances

Treatment planning

► Individual cases

1. Diagnosis of the presenting condition.
2. History of the previous treatment :
 - i. when it was completed
 - ii. follow standard protocol
 - rubber dam
 - antimicrobial root canal irrigants

Treatment planning

► Operator factors

1. Personal experience
2. Preferences

Treatment planning

► Others

1. Any complications associated with the proposed treatment.
Eg : wide and long intraradicular post
2. Any implications for the patient's overall oral status, their ability to function and their finances.
Eg : long span bridgework

Treatment planning

Treatment options

Review and reassess

Periapical surgery

Root canal retreatment

Extraction

Combination

Treatment planning

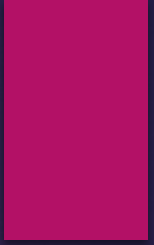
Persistent periapical inflammation

Orthograde root canal retreatment

Restorability

?

Assessment



Access to pulp chamber and root canal

Access to pulp chamber and root canal

► May involve :

- i. Removal of existing restorations
- ii. Intraradicular posts, cores
- iii. Others : silver point, carrier-based obturation material

Access to pulp chamber and root canal

► Remove or not to remove?

Eg : crowns

- i. The condition and amount of remaining tooth structure can be assessed.
- ii. Visibility and achieving straight line access to the root canals is improved.
- iii. Canal orifices can be located relatively easy.

Access to pulp chamber and root canal

► Remove or not to remove?

Eg : crowns

- i. If the crown is of good quality clinically and radiographically, no evidence of marginal deficiencies, it may be retained.
- ii. If the crown has been fitted quite recent, root canal retreatment can be carried out through a conservative access cavity.

Access to pulp chamber and root canal

► Intraradicular posts, core

Eg : Metal vs Fiber, parallel versus tapered, active versus passive retained, post head configuration.

- i. Core material is removed from around the head of the post using a bur and ultrasonic tips.
- ii. Screw posts - unthread from canal.
- iii. Ultrasonic vibration.
- iv. Post removal devices.
- v. Fiber posts - drilled out.

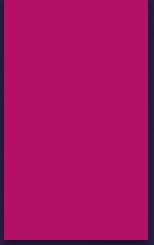
Access to pulp chamber and root canal

- ▶ Silver points, carrier-based obturation material
 - i. Core material is removed from around the head of the silver point or carrier-based obturation material.
 - ii. Silver point - Ultrasonic vibration, post removal system eg. Masserann kit.
 - iii. Carrier-based obturation material - braiding technique with 2 Hedstrom files.



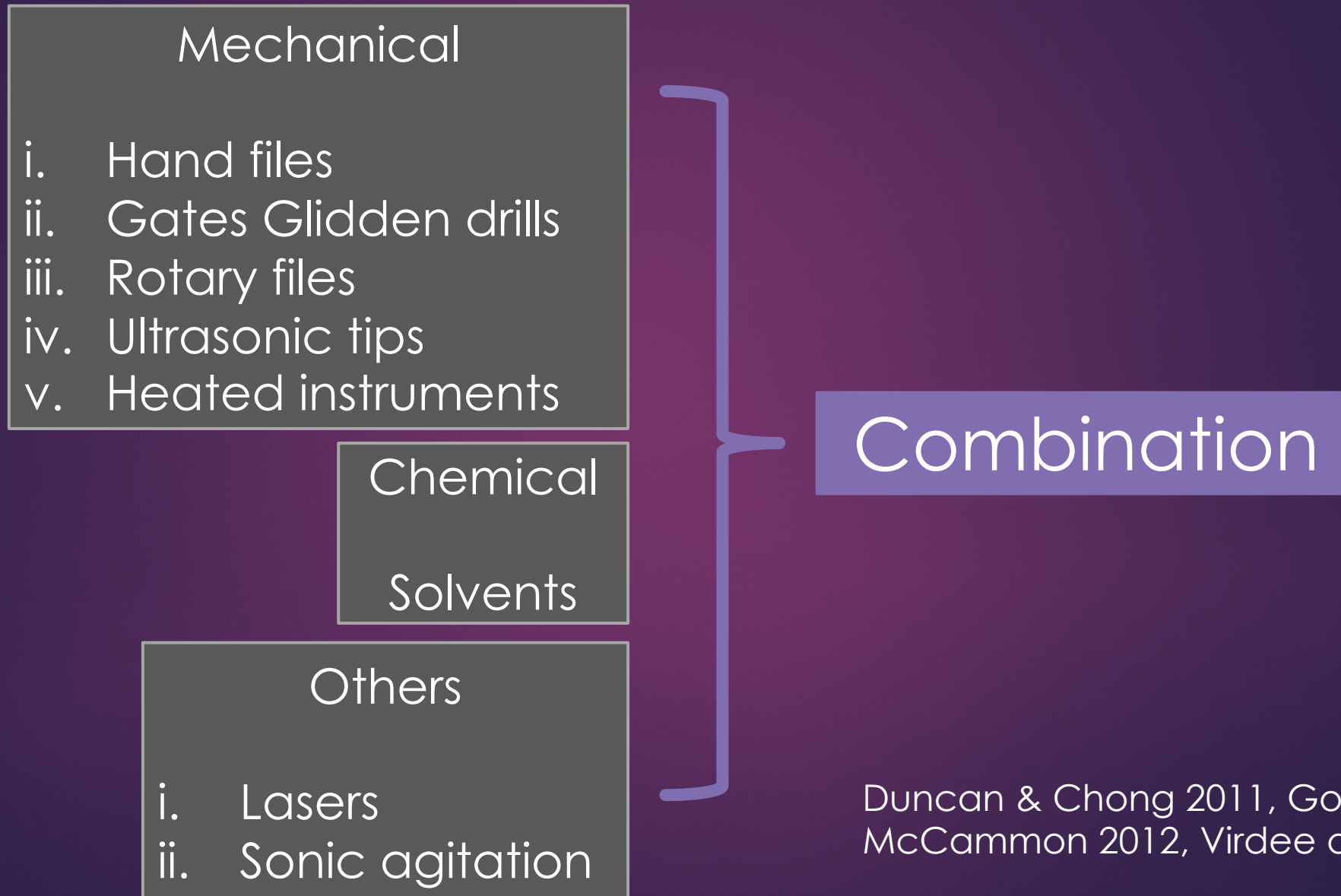
Silver point

Thermafil



Techniques for removal of root filling materials

Techniques for removal of root filling materials



Duncan & Chong 2011, Good and McCammon 2012, Virdee and Thomas 2017

Techniques for removal of root filling materials

- ▶ Hand files

- i. Hedstrom file



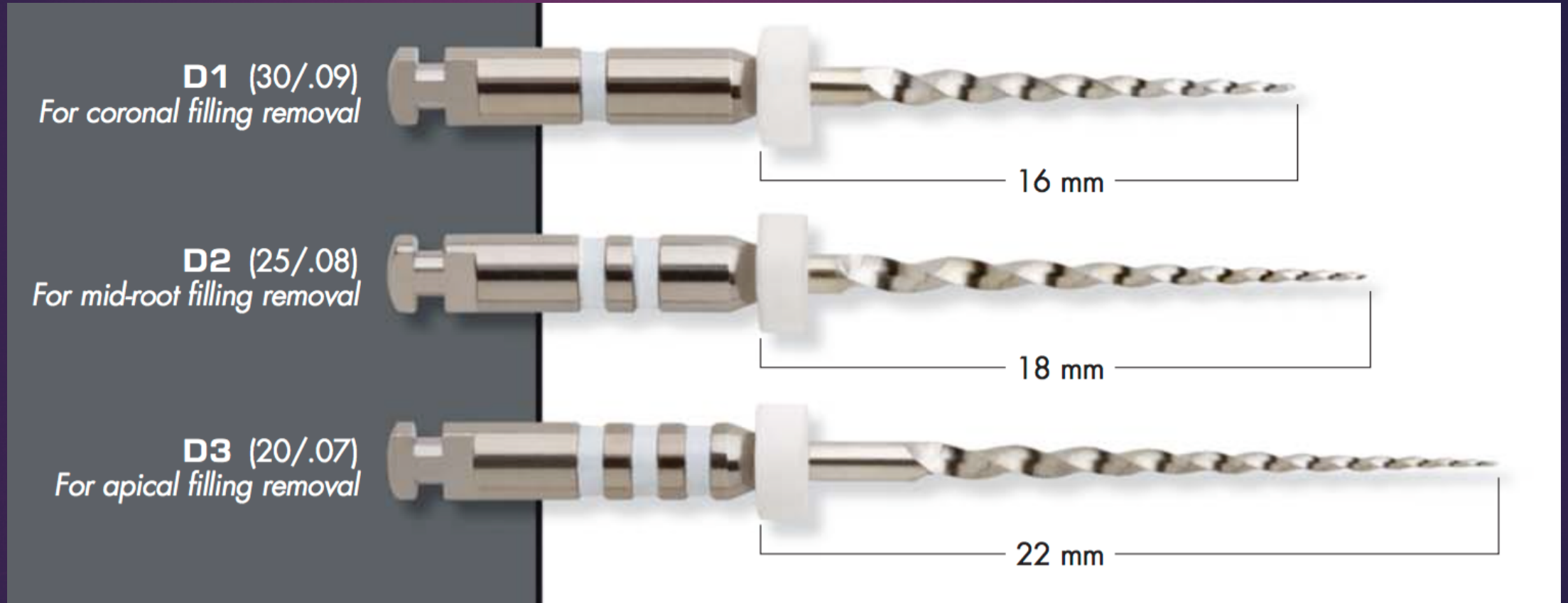
Techniques for removal of root filling materials

► Gates Glidden drills



Techniques for removal of root filling materials

► Rotary files



Protaper D series

Techniques for removal of root filling materials

► Ultrasonic tips

MODEL E7	MODEL E8
• Removal of filling and foreign material.	• Removal of filling and foreign material.
	
NSK Satelec® MODEL E7 ORDER CODE Z217307	NSK Satelec® MODEL E8 ORDER CODE Z217308
• Water not required	• Water not required

Techniques for removal of root filling materials

► Heated instruments



System B

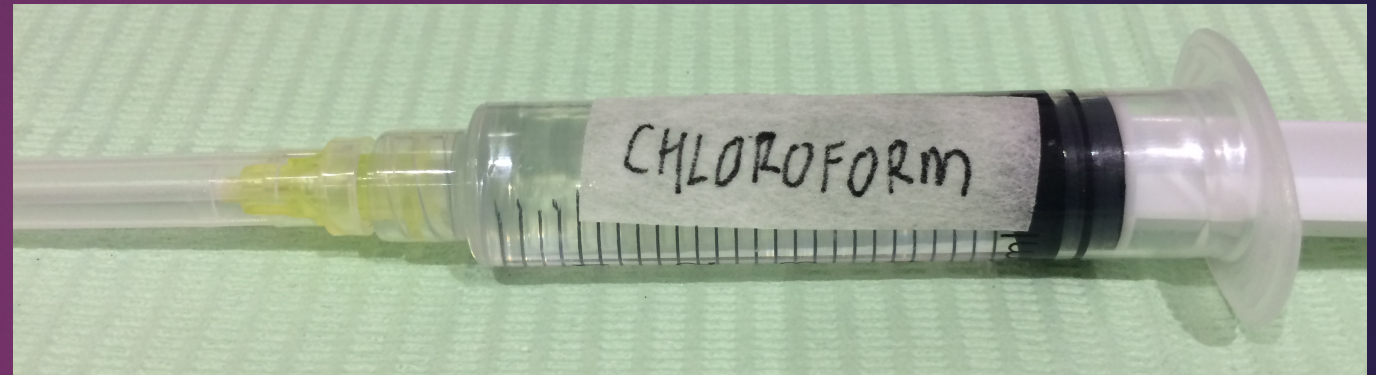


Elements Obturation System

Techniques for removal of root filling materials

► Solvents

- i. Chloroform
- ii. Orange oils (RC Solve)
- iii. Xylol
- iv. Halothane
- v. Eucalyptol
- vi. Tetrachloroethylene
- vii. Turpentine



► Adjuncts to mechanical removal of root filling materials.

Techniques for removal of root filling materials

► Others

i. Lasers

Limited studies.

There is concern regarding the increase in temperature of the root surface.

Duncan and Chong 2011, Good and McCammon 2012

Techniques for removal of root filling materials

► Others

iii. Sonic agitation



Techniques for removal of root filling materials

- ▶ Remnants of root filling materials are still present on the root canal wall irrespective of the technique used.

Duncan and Chong 2011, Kumar et al., 2012

- ▶ The use of rotary NiTi instruments is an acceptable technique for removing gutta percha.
- ▶ They are at least as effective as hand instruments.

Duncan and Chong 2011

Techniques for removal of root filling materials

Step 1 : Gross coronal GP removal

Step 2 : Gross apical GP removal

Step 3 : Fine GP removal

Virdee and Thomas 2017

A practitioner's guide to gutta-percha removal during endodontic retreatment

S. S. Virdee*¹ and M. B. M. Thomas²

In brief

Outlines a staged approach to endodontic access through extensively restored teeth.

Outlines a staged approach in removing gutta-percha from obturated root canals

Familiarises practitioners to Gates Glidden burs, Hedstrom files, K-files and endodontic solvents and the design features that make them ideal for gutta-percha removal.

Endodontic retreatment can be a challenging task that can result in many complications if not approached cautiously. Many of these difficulties revolve around regaining access to the pulp chamber through extensive coronal restorations and removing residual root filling material, the commonest being gutta-percha (GP), from within obturated canals. This can often be an untidy, time consuming process that places teeth at a greater risk of iatrogenic injury and inhibits the operator achieving the necessary chemical disinfection required to eliminate the persistent apical disease. Therefore the following article aims to aid practitioners, particularly those who are unfamiliar, with accessing and removing GP from endodontically treated teeth. The outlined systematic approach is accessible in general practice, where the vast majority of endodontic treatment is conducted, requires basic equipment and with the correct experience can be applied to both straight and curved canals. By overcoming this initial stage of retreatment, subsequent chemical disinfection, which is critical to success, can be carried out to a higher standard reducing risks of re-infection.

Introduction

The Restorative Index of Treatment Need (RIOTN) recognises endodontic retreatment as being in a higher category of complexity than primary endodontic therapy.¹ This is reflected by reduced success rates in some but not all studies, and that achieving a predictable outcome can be challenging by even experienced practitioners.² The demanding process of regaining access through extensive coronal restorations and debriding the contents of obturated root canals, the commonest filling being gutta-percha (GP), certainly contribute to this difficulty.^{3,4} It can be an untidy and time consuming process that places teeth at a greater risk of iatrogenic injury and inhibits thorough chemical disinfection.

Therefore, the following article aims to aid practitioners, particularly those who are unfamiliar, in accessing and removing GP from endodontically treated teeth. The outlined systematic approach is accessible in general practice, where the vast majority of endodontic treatment is conducted, requires basic equipment and with the correct experience can be applied to both straight and curved canals. By overcoming this initial stage of retreatment, subsequent chemical disinfection, which is critical to success, can be carried out to a higher standard reducing risks of re-infection.

Indications for retreatment

The aim of non-surgical endodontic retreatment is to relieve patient symptoms and re-establish healthy periapical tissues following failure of initial therapy by removing materials from the root canal space, chemically disinfecting canals and if present, addressing deficiencies of pathological or iatrogenic origin.⁵ It is indicated in teeth with radiological findings of persisting apical periodontitis, with or without symptoms, in the presence of an inadequate

root filling or coronal seal.⁶ Additionally, if the initial obturation permits coronal leakage (that is, voids), elective retreatment may be necessary before non-vital bleaching to minimise risks of root resorption.^{6,7}

The associated complications are similar to those of primary endodontic therapy, however, re-infection can still persist if GP is not adequately removed as it presents a barrier to chemical disinfection.² Teeth are also more vulnerable to iatrogenic injuries such as perforation, file separation or irreversible damage to a coronal restoration the patient has become accustomed to.² It is therefore important to discuss these details with the patient in order to gain informed consent.⁸

Persistent apical infections

Intra-radicular sources

GP length and condensation, although giving no information on previously employed irrigant regimes, hold prognostic values and are considered features that help determine if initial treatment was completed to a satisfactory standard.^{6,9} Root fillings that are poorly condensed or do not extend to the apex can

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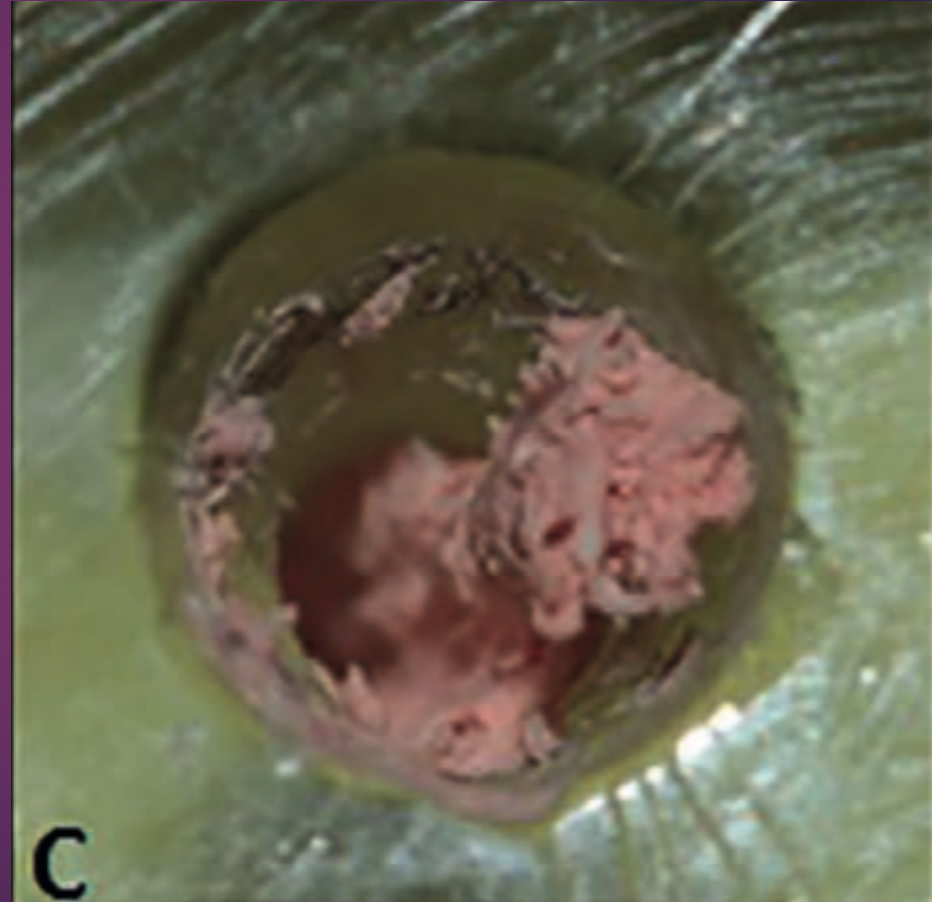
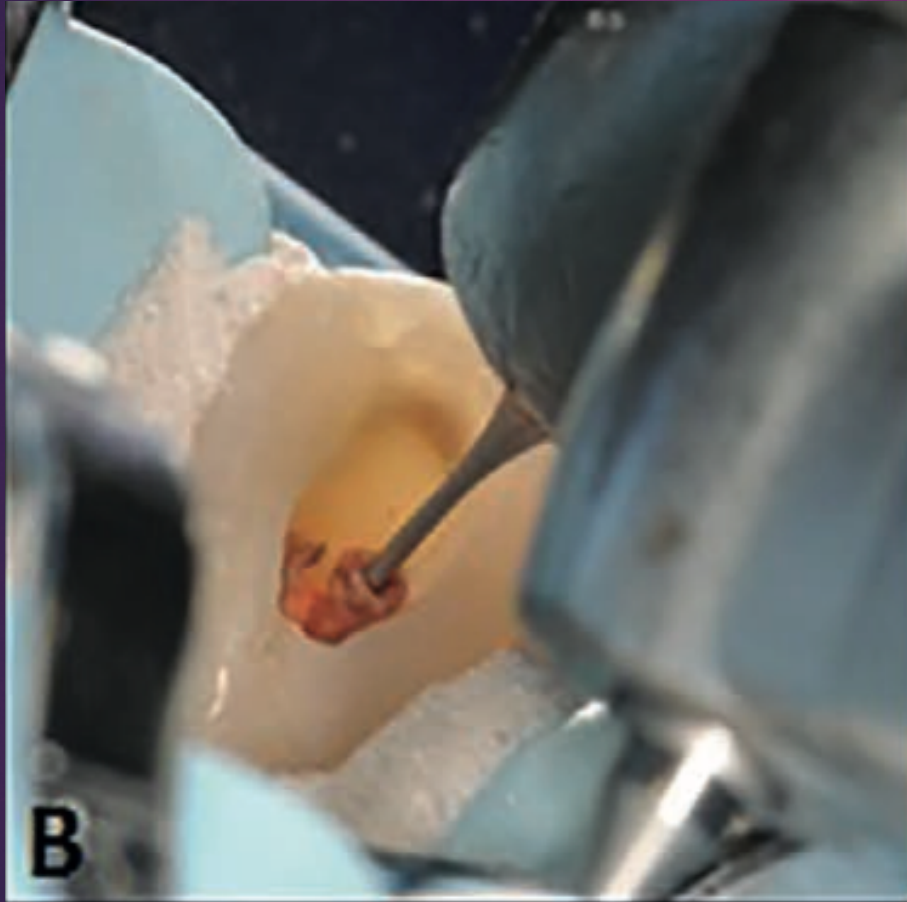
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Techniques for removal of root filling materials

- ▶ Step 1 : Gross coronal GP removal



Techniques for removal of root filling materials

- ▶ Step 1 : Gross coronal GP removal



Techniques for removal of root filling materials

- Step 2 : Gross apical GP removal

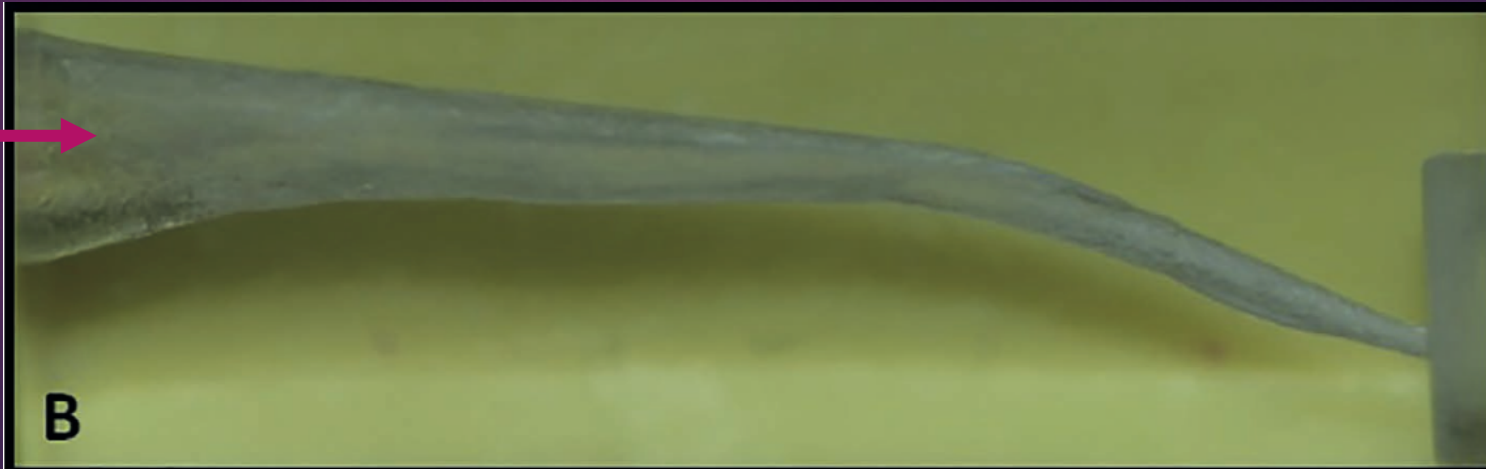


Techniques for removal of root filling materials

► Step 3 : Fine GP removal



Canal filled
with solvent

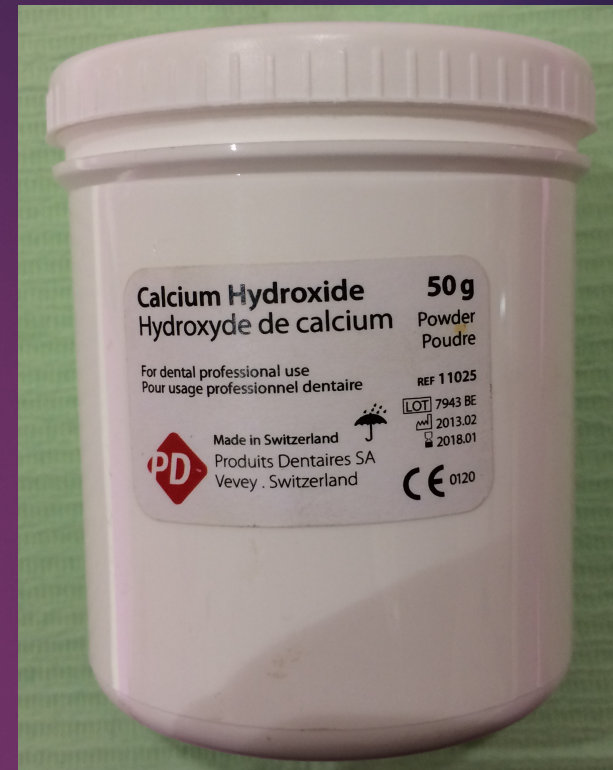


Case 1

Preoperative



Case 2



Placement of calcium hydroxide



1 month review

Case 3

Preoperative



Case 4

Preoperative

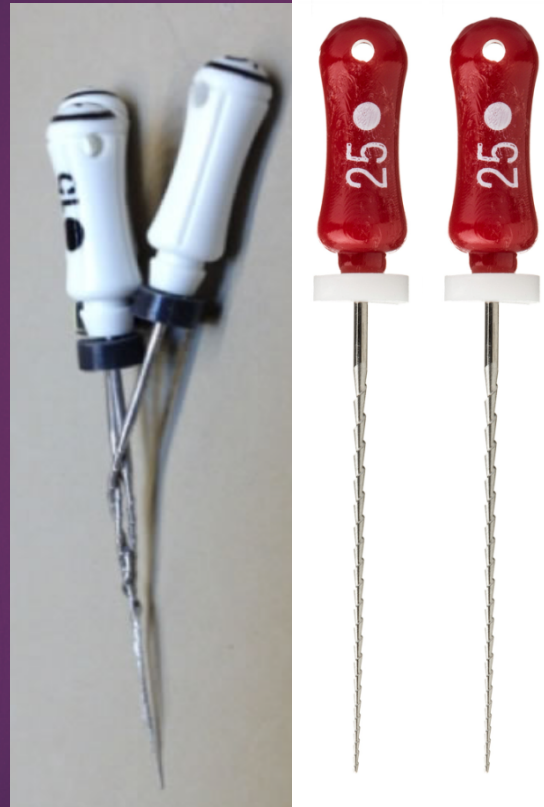
Post op



Carrier-based obturation : Thermanfil



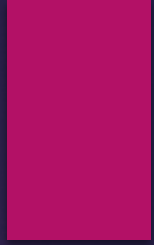
D1 and
D2 files



Braiding technique
with 2 Hedstrom files

Plastic carrier

Final flush with chloroform



Working length

Obturation

Case 5

Preoperative



Ultrasonic tips

Masserann Kit

Silver point attached to trephan bur

Silver point

Obturation

1 year review

Case 6



Preoperative

Removal of post and GP

Apical plug
with MTA

Case 7

Preoperative



Case 8

Preoperative

Post op

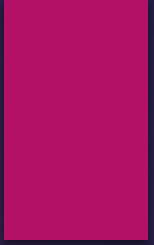
Periapical radiograph of 12

Case 9

Post insertion

Preoperative

Review



The outcome of root canal retreatment

The outcome of root canal retreatment

Study	Year	Method	Observation period	Findings
Gorni and Gagliani	2004	Prospective Clinical Study Subjects : 451 patients (452 teeth) 2 groups : Root canal morphology respected (RCMR) 245 teeth and Root canal morphology altered (RCMA) 207 teeth	2 years	In single rooted teeth, success was 83.3% for the RCMR and 48.7% for the RCMA In premolars, success was 87.2% for RCMR and 50.3% for RCMA In molar group was 87.1% for RCMR and 44.1% for RCMA Preoperative presence of periapical lesion reduced success rate.

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The Outcome of Endodontic Retreatment: A 2-yr Follow-up

Fabio G. M. Gorni, DDS, and Massimo M. Gagliani, MD, DDS

Retreatment is common in endodontics. The purpose of this article was to classify the different clinical situations encountered in retreatment cases and relate them to the outcome after an observation period of 24 months. A total of 425 patients (452 teeth) from 451 patients, consecutively admitted for root-canal retreatment, were monitored during a 24-month period. All teeth (254 molars, 107 premolars, and 91 single-root anterior teeth) were divided into two major categories: teeth with modified anatomy from previous endodontic treatment (root-canal-morphology altered) and teeth in which no significant anatomical changes were made by the former endodontic treatment (root-canal-morphology respected). Although the overall success was 69.03%, the success in the root-canal-morphology-respected group was 86.8% and in the root-canal-morphology-altered group 47% (Mann-Whitney U test $p < 0.0001$). The clinical success of an endodontic retreatment seems to depend on whether alterations in the natural course of the root canals were caused by previous root-canal treatment.

In addition, only a few clinical trials have assessed orthograde retreatment efficacy, and most were conducted more than 10 yr ago. Bergenholtz et al. (5) reported a success rate of 78% in teeth with periapical pathologies and 94% in teeth without. Others, reviewing earlier literature on retreatment, reported a favorable outcome for greater than 66% of the study cases considered for the literature analysis (6). Allen et al. (7) obtained a favorable 65.6% outcome in a sample group of 667 subjects controlled after 6 months or more.

On the contrary, other authors related their outcomes to microbiological problems to discriminate root-canal retreatment. Sundqvist et al. (8), for example, reported an overall success rate of 74% of 50 cases examined after retreatment. They found that the success rate in bacteria-free canals was almost 80%; whereas in teeth with particular bacteria species the outcome was significantly lower (66%). In a study by Sjogren et al. (9), similar results were achieved and further considerations were made regarding the size of the lesions: the greater the lesion, the lower the success rate. Chugal et al. (10) confirmed these results.

During the diagnostic phase, only clinical signs and symptoms are available for dentists. Further information should be collected using radiographic analysis of the tooth to be retreated. Although Friedman (11) has offered a clear explanation, no attempts have been made to differentiate the many clinical situations and relate them to the final outcome. The purpose of this article was to classify the different clinical situations encountered in retreatment cases and relate them to the outcome after an observation period of 24 months.

MATERIAL AND METHODS

A total of 451 patients, whose characteristics are briefly summarized in Table 1, consecutively admitted for root-canal retreatment (RCRT), were monitored during a 24-month period.

Inclusion Criteria

After the anamnesis collection of data and an overall examination of oral status to exclude existing pathologies, the teeth needing retreatment were diagnosed. The diagnosis for retreatment was made according to the signs and symptoms reported by the patient, the preoperative radiographs showing apical radiolucency or not (taken with film holder and positioning arm), and classical clinical complaints, such as tenderness on touch, fistulas, and chewing pain on palpatory action of the buccal area.

The outcome of root canal retreatment

REVIEW

Outcome of secondary root canal treatment: a systematic review of the literature

Y.-L. Ng¹, V. Mann² & K. Gulabivala¹

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Abstract

Ng Y-L, Mann V, Gulabivala K. Outcome of secondary root canal treatment: a systematic review of the literature. *International Endodontic Journal*, **41**, 1026–1046, 2008.

Aims (i) To investigate the effects of study characteristics on the reported success rates of secondary root canal treatment (2°RCT or root canal retreatment); and (ii) to investigate the effects of clinical factors on the success of 2°RCT.

Methodology Longitudinal human clinical studies investigating outcome of 2°RCT which were published up to the end of 2006 were identified electronically (MEDLINE and Cochrane database 1966–2006 Dec, week 4). Four journals (*Dental Traumatology*, *International Endodontic Journal*, *Journal of Endodontics*, *Oral Surgery Oral Medicine Oral Pathology Endodontics Radiology*), bibliographies of all relevant papers and review articles were hand-searched. Two reviewers (Y-LN, KG) independently assessed and selected the studies based on specified inclusion criteria and extracted the data onto a pre-designed proforma, independently. The criteria were: (i) Clinical studies on 2°RCT; (ii) Stratified analyses available for 2°RCT where 1°RCT data included; (iii) Sample size given and larger than 10; (iv) At least 6-month post-operative review; (v) Success based on clinical and/or radiographic criteria (*strict* = absence of apical radiolucency; *loose* = reduction in size of radiolucency); and (vi) Overall success rate given or could be calculated from the raw data.

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Three strands of evidence or analyses were used to triangulate a consensus view. The reported findings from individual studies, including those excluded for quantitative analysis, were utilized for the intuitive synthesis which constituted the first strand of evidence. Secondly, the pooled weighted success rates by each study characteristic and potential prognostic factor were estimated using the random effect model. Thirdly, the effects of study characteristics and prognostic factors (expressed as odds ratios) on success rates were estimated using fixed and random effects meta-analysis with DerSimonean and Laird's methods. Meta-regression models were used to explore potential sources of statistical heterogeneity. Study characteristics considered in the meta-regression analyses were: decade of publication, study-specific criteria for success (radiographic, combined radiographic & clinical), unit of outcome measure (tooth, root), duration after treatment when assessing success ('at least 4 years' or '<4 years'), geographic location of the study (North American, Scandinavian, other countries), and qualification of the operator (undergraduate students, postgraduate students, general dental practitioners, specialist or mixed group).

Results Of the 40 papers identified, 17 studies published between 1961 and 2005 were included; none were published in 2006. The majority of studies were retrospective ($n = 12$) and only five prospective. The pooled weighted success rate of 2°RCT judged by complete healing was 76.7% (95% CI 73.6%, 89.6%) and by incomplete healing, 77.2% (95% CI 61.1%, 88.1%). The success rates by 'decade of publication' and 'geographic location of study' were not significantly different at the 5% level. Eighteen clinical factors had been investigated in various combinations in previous studies. The most frequently and thoroughly investigated were 'periapical status' ($n = 13$), 'size of

Study	Year	Method	Observation period	Findings
Ng et al.,	2008	Systematic review of 17 studies : 1 RCT 4 Prospective studies 12 Retrospective studies	6 months to > 4 years	77% success rate Prognostic indicators : i. presence of pre-operative periapical lesion ii. apical extent of root filling iii. quality of coronal restoration

The outcome of root canal retreatment

Study	Year	Method	Observation period	Findings
Torabinejad	2009	Systematic review (26 endodontic surgeries, 8 Re-RCT) 8198 teeth were included in the meta-analysis.	2-4 years	The overall weighted success rate for endodontic surgery was 75.0% and for Re-RCT was 78.0% (not statistically significantly different) endodontic surgery : 77.8% Re-RCT: 70.9%
			4-6 years	endodontic surgery : 71.8% Re-RCT: 83.0%
			> 6 years	endodontic surgery : 62.9%.

Review Article

Outcomes of Nonsurgical Retreatment and Endodontic Surgery: A Systematic Review

Mahmoud Torabinejad, DMD, MSD, PhD, Robert Corr, DDS, MS, Robert Handysides, DDS, and Shabrokh Shababang, DDS, MS, PhD

Abstract

Introduction: The purpose of this systematic review was to compare the clinical and radiographic outcomes of nonsurgical retreatment with those of endodontic surgery to determine which modality offers more favorable outcomes. **Methods:** The study began with targeted electronic searches of MEDLINE, PubMed, and Cochrane databases, followed with exhaustive hand searching and citation mining for all articles reporting clinical and/or radiographic outcomes for at least a mean follow-up of 2 years for these procedures. Pooled and weighted success rates were determined from a meta-analysis of the data abstracted from the articles. **Results:** A significantly higher success rate was found for endodontic surgery at 2-4 years (77.8%) compared with nonsurgical retreatment for the same follow-up period (70.9%; $P < .05$). At 4-6 years, however, this relationship was reversed, with nonsurgical retreatment showing a higher success rate of 83.0% compared with 71.8% for endodontic surgery ($P < .05$). Insufficient numbers of articles were available to make comparisons after 6 years of follow-up period. Endodontic surgery studies showed a statistically significant decrease in success with each increasing follow-up interval ($P < .05$). The weighted success for 2-4 years was 77.8%, which declined at 4-6 years to 71.8% and further declined at 6+ years to 62.9% ($P < .05$). Conversely, the nonsurgical retreatment success rates demonstrated a statistically significant increase in weighted success from 2-4 years (70.9%) to 4-6 years (83.0%; $P < .05$). **Conclusions:** On the basis of these results it appears that endodontic surgery offers more favorable initial success, but nonsurgical retreatment offers a more favorable long-term outcome. (*J Endod* 2009;35:930-937)

Key Words

Endodontic surgery, nonsurgical retreatment, success, systematic review

The major goals of root canal treatment are to clean and shape the root canal system and seal it in 3 dimensions to prevent reinfection of the tooth (1, 2). Although initial root canal therapy has been shown to be a predictable procedure with a high degree of success (3-6), failures can occur after treatment. Recent publications reported failure rates of 14%-16% for initial root canal treatment (3, 7). Lack of healing is attributed to persistent intraradicular infection residing in previously uninstrumented canals, dentinal tubules, or in the complex irregularities of the root canal system (8-11). The extraradicular causes of endodontic failures include periapical actinomycosis (12), a foreign body reaction caused by extruded endodontic materials (13, 14), an accumulation of endogenous cholesterol crystals in the apical tissues (15), and an unresolved cystic lesion (16, 17).

Previously treated teeth with persistent periapical lesion(s) might be preserved with nonsurgical retreatment or endodontic surgery, assuming the tooth is restorable, periodontally sound, and the patient desires to retain the tooth. When a decision is made to preserve the tooth, the clinician and patient face the challenge of selecting the treatment with the most beneficial long-term outcome. Patients are entitled to the most current and accurate information regarding the prognosis of their treatment options, and it is the responsibility of an astute clinician to provide this information. Patients usually tend to choose treatment procedures consistent with the clinician's recommendation (18). However, it appears that the recommendations are often subjective and inconsistent, and there is a lack of consensus among dental professionals when making decisions related to retreatment or endodontic surgery (19-22).

Evidence-based dentistry recommends selection of alternate treatment options on the basis of the best available evidence (23). Paik et al (24) in 2004 identified clinical studies pertaining to the success and failure of nonsurgical endodontic retreatment and assigned a level of evidence to the pertinent articles. Mead et al (25) published a similar literature review in 2005 for clinical studies related to endodontic surgery. They reported that the endodontic literature lacks studies at the highest level of evidence and that the vast majority of literature are low-level case series. A number of expert opinion articles have been published discussing decision factors between nonsurgical endodontic retreatment and endodontic surgery (26-31). However, only 1 systematic review has been published that has compared the outcomes of these 2 procedures. Del Fabro et al (32), as part of the Cochrane Collaboration in 2007, reviewed randomized controlled trials (RCTs) that directly compared nonsurgical endodontic retreatment with endodontic surgery. Their findings were based on only 3 articles with significant limitations. One of their articles was the study by Danin et al (33) in 1999, who reported short-term (1 year) postoperative follow-up data of only 38 patients. The small sample size and short follow-up time in this study are insufficient to adequately assess long-term success (34). Their other 2 articles were studies by Kvist and Reit (34) published in 1999 and 2000. Both studies reported on the same data set; the latter study reported

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0099-2299/09 - see front matter.
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The outcome of root canal retreatment

- ▶ The **prognostic indicators** for Re-RCT are **similar** to those for primary RCT.
- ▶ The **principles** and strategy for Re-RCT are **identical** to those for primary RCT.
- ▶ The difference is whether or not the **access to apical** infection can be achieved (either due to iatrogenic errors in canal preparation or inability to fully negotiate canal blockages due to natural or artificial materials).
- ▶ The **outcome** of Re-RCT should therefore be **similar** to primary RCT as long as access to the **apical infection can be re-established**.

Conclusion

- ▶ Patient should involve in decision making process. Clinician and patient jointly decide which management option to choose.
- ▶ Fully informed consent must be provided :
 1. full explanation of all treatment options
 2. details of treatment, likely outcomes, possible complications, costs
- ▶ If no association with pulp/root canal origin, consider referral to an appropriate dental and/or medical specialist for further assessment and appropriate management.

Conclusion

1. Status of coronal restoration
2. Quality of the obturation
3. Presence of wide and long intraradicular post
4. Presence and the location of separated instruments in root canal
5. Whether or not histological analysis of periapical tissues is required
6. Long span bridgework
7. Recently cemented crown

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