

# Evaluation and clinical management of previous endodontic therapy

Marwan Abou-Rass, D.D.S., M.D.S., Ph.D.\*

University of Southern California, School of Dentistry, Los Angeles, Calif.

**I**ncreasingly, endodontists are reaching a consensus on the criteria for acceptable and unacceptable endodontic treatment (Table I). The reasons for endodontic successes and failures have been reported in the literature (Figs. 1 and 2).<sup>1-20</sup> The evaluation of previous root canal therapy is discussed in this article and guidelines proposed for the retreatment of endodontic failures.

## IMPORTANCE OF UNDERSTANDING PREVIOUS ROOT CANAL THERAPY

Before beginning restorative dentistry, the previous root canal therapy should be analyzed for quality. Dentists are frequently asked to evaluate a tooth with root canal therapy that is asymptomatic and of questionable quality. With the lack of symptoms, the dentist often chooses to proceed with the restorative treatment. This could be a definite risk since the tooth could become symptomatic later and jeopardize the restorative effort. Unlike restorative failures, endodontic failures are seldom obvious and are difficult to detect.

The biologic constitution of the patient, the endodontic method used, and the behavior of the filling material frequently determine the prognosis of the patient. Endodontic failures are demonstrated by recurrent pain, swelling, lack of healing, lack of function, lesion formation, or root resorption. The failure may occur years before the symptoms develop and the problem becomes apparent, usually within a minimum of 2 years but sometimes up to 10 years.<sup>12</sup> Thus, many endodontic procedures that could be asymptomatic failures are considered clinical successes at the time of treatment.

## PROCEDURES FOR EVALUATING PREVIOUS ENDODONTIC TREATMENT

### Radiographic examination

Every dentist should be able to diagnose endodontic failure. A primary tool for analysis is the radiograph,

but the limitation of this method should be understood. The radiograph is valuable for detecting gross hard tissue changes. Previous radiographs should be compared to analyze the lesion development. Exposures at different angles are useful for separating overlapping structures and detecting additional canals or vertical fractures.

Radiographs are valuable in diagnosing the following conditions: (1) proximal surface perforations with posts or fractured instruments, (2) stripping of root structure, (3) proximal and apical root defects, (4) endodontic overfills, (5) untreated canals, (6) periodontal and apical lesions, (7) vertical and horizontal root fractures, and (8) canal calcifications and obstructions.

Radiographs are of limited value in the following conditions: (1) buccal and lingual root perforations with posts or endodontic instruments, (2) structural cracks of the tooth, (3) occlusal trauma, (4) anatomical anomalies of the roots, (5) host resistance, (6) chronic inflammation of apical tissue, (7) perforations under full crown restorations, and (8) lesions that did not perforate the buccal bone plate.

### Examination of the patient

The patient should be questioned about a history of systemic or chronic conditions that would inhibit healing. The inquiry should include the symptoms of pain and swelling. The functional ability of the tooth should be examined and a history obtained of previous treatment or surgical endodontics.

The tissue should be anesthetized for thorough exploration of the region. The periapical tissue should be palpated for tenderness. Tests for tooth mobility are made to differentiate movement from chronic periodontal disease, restorative failure, or coronal tooth fracture. The presence of exudate should be determined while probing the region. Fistulas should be explored by placing a gutta percha point in the tract and obtaining a radiograph. The gingival margins of cast restorations should be examined for recurrent caries, voids, or tooth

\*Associate Professor and Chairman, Department of Endodontics.

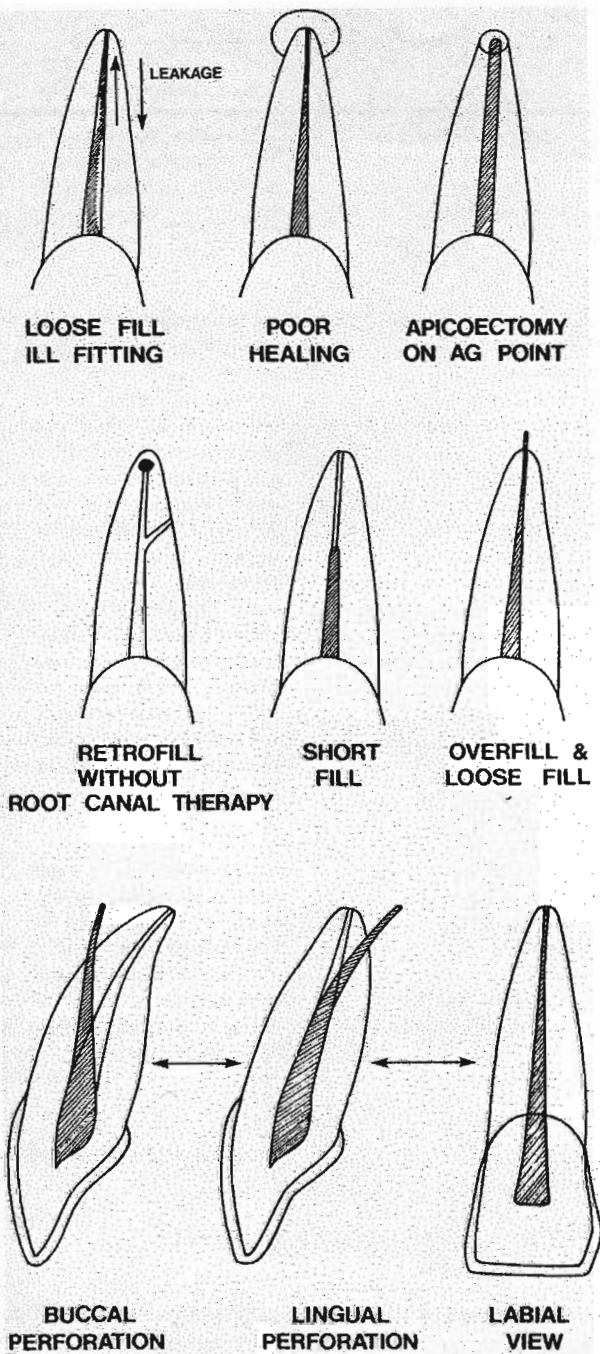


Fig. 1. Schematic representation of possible causes of endodontic failure.

cracks. The occlusion should be analyzed for trauma. Additional important diagnostic steps may include:

1. Access preparation to evaluate the adequacy of the seal and the hidden structures under the crown.
2. Removal of all defective restorations to determine

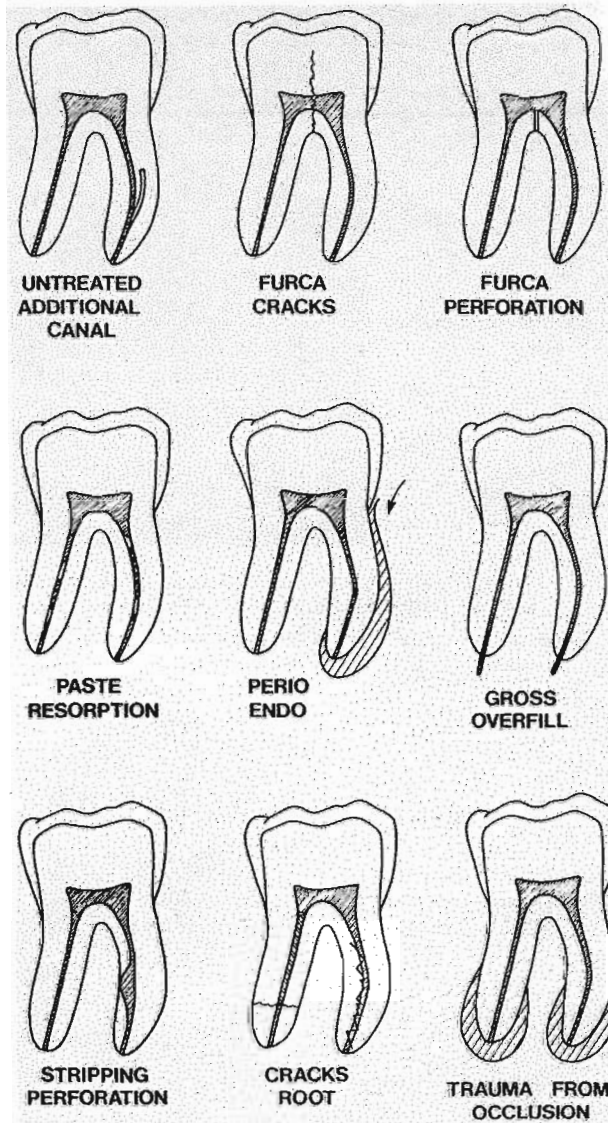


Fig. 2. Schematic representation of possible causes of endodontic failure.

the extent of caries and the presence of structural cracks and to facilitate the retreatment process.

3. Exploratory surgery to examine the radicular tissue area.

### SEQUENCING OF RETREATMENT

The first step is to relieve the acute symptoms by proper incision and drainage, antibiotic medication, and oral physiotherapy. When the emergency condition subsides, the condition of the patient is evaluated in depth to determine the course of treatment.

Asymptomatic failures are associated with any root canal material. The previous endodontic work should

**Table I.** Suggested guidelines for evaluation of root canal therapy

Clinical guideline	Desired outcome	Acceptable conditions	Unacceptable condition
Patient report	Functional use of tooth; no history of swelling or spontaneous pain	Tenderness or pain on palpation of apical area 4 to 8 weeks following root canal treatment; slight pain of disappearing quality and intensity during mastication	Spontaneous recurrent swelling and pain; inability to use tooth in mastication
Radiographic evaluation	No new lesions; lesion resolution; bone repair; no root resorption; arrest of root resorption	Regression of lesion size; asymptomatic overfill; asymptomatic underfill less than 2 mm; new thickening of periodontal ligament root perforation at apical third; broken instrument within canal associated with proper root canal filling; calcifications preventing canal fill without lesions	New lesion formation; root resorption; failure of past lesion to heal 12 to 18 months following root canal treatment; symptomatic overfill and underfill; sympathetic broken instrument in apical area; root stripping or perforations in furca; canal calcifications with lesions
Tooth and tissue examination	Closure of fistula or tissue repair; disappearance of swelling; normal tissue structure and physiologic mobility; tooth restored within 3 to 4 weeks following root canal treatment; intact tooth structure	Tooth restored within 8 weeks; tenderness on palpation of apical area; some degree of mobility	Persistent swelling; fistula track present; tissue discoloration; severe tenderness; tooth fractures; lack of final restoration; pathologic mobility; periodontal complications
Clinical exploration of root canal treatment	All canals found; all canals well condensed; no leakage in canals; no pain on exploration of canal; chamber floor intact and un gouged or perforated	Untreated orifices leading to canals without foramen; calcified orifices and canals without radiographic lesions; tightly fitted silver points that cannot be removed without lesions	Furca perforations; cervical zone perforation; loose filling of a root; paste fillers; leakage around silver points; canal obstruction with lesions; severe weakening or gouging of floor of pulp chamber

be clinically explored to determine the quality of the seal. If the failure is caused by poor quality treatment, the defective material should be removed and all canals reprepared and filled with gutta percha. Radiographically acceptable root canal therapy that fails is best managed by surgical methods.

#### PATIENT EDUCATION AND CASE PRESENTATION

The patient is informed at the outset of the condition and strategic value of the tooth and that the prognosis of endodontic retreatment is unpredictable. All possible alternatives should be discussed to explain that the retreatment is an exploratory procedure. The patient is made aware that retreatment is more difficult than initial treatment and that complications may occur causing removal of the tooth. If the patient is informed

about the alternatives, there will be more cooperation with the treatment plan.

#### ENDODONTIC RETREATMENT GUIDELINES

Regardless of the type of previous root canal filling materials, there are guidelines to consider for the retreatment.

**Clinical exploration.** Prior to restorative treatment, each canal should be clinically explored to assess the seal and filling condensation. This is done regardless of the symptoms or the radiographic appearance of previous root canal therapy.

**Standard retreatment.** Nonsurgical endodontic retreatment is first considered prior to surgery or extraction. Retreatment may disclose furca perforations, additional canals, structural



Fig. 3. A, Severely discolored teeth of 37-year-old patient with 10-year-old silver points. Clinical exploration showed evidence of leakage. Points were removed and radiograph obtained. B, No evidence of effective cement remaining in canal. Apparently, silver points were only seal.



Fig. 4. A, Failing silver point with swelling and pain before removal of silver point. B, After removal of silver point, no evidence of cement or sealer was found in canal, thus explaining its failure and point corrosion.

cracks, poor condensations, or sealer resorptions.

**Restorability.** All defective restorations should be removed prior to retreatment of canals. This will help determine whether restoration is feasible and will facilitate the retreatment process.

**Diagnostic surgery.** Surgical endodontic therapy is indicated (1) if the root canal is inaccessible due to obstruction, calcification, or strategic restorations (pre-

cision attachment); (2) if the quality of the root canals is acceptable and a good quality of dental care is evident; or (3) for diagnostic purposes.

**Retrofills.** The apical seal during surgery is checked to determine the need for retrofill. These problems include loose silver points, paste fillers, loose gutta percha, or additional foramina. A well-condensed gutta percha apical seal does not require an alloy retrofill.

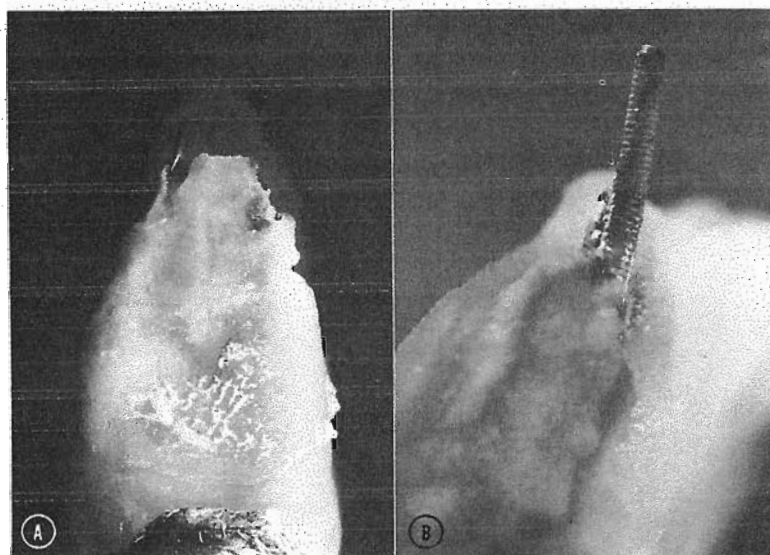


Fig. 5. A, Failing silver point associated with apical root resorption showed evidence of silver coating of metal core rather than solid silver point. B, Silver point. (Magnification,  $\times 15$ .)

### EVALUATION AND RETREATMENT OF SILVER POINT ENDODONTICS

The use of silver points in root canal therapy was introduced by Trebitsch<sup>18</sup> and Jasper.<sup>19</sup> Although this method provides an easy technique with immediate radiographic success, the use of silver points in root canal therapy has declined. After several decades, the silver point method is reported not as effective and the radiographic appearance is not always taken as a true measure of events following the root canal filling.

It has been noted that silver points corrode and leak to cause lesions, root resorptions, tooth discoloration, and pain. Retreatment of silver point methods has demonstrated resorption of the sealers used to retain them (Figs. 3 and 4). Although inert and biologically acceptable in implant studies, silver points behave differently in human root canal therapy. If the filling procedures abrade the surface of the point, corrosion and metal breakdown occur, producing toxic products like sulfides, carbon, and amino sulfides. Seltzer et al.<sup>17</sup> found used and corroded silver points more toxic than intact points. This explains the biologic acceptability of nonused silver points in experimental animal studies.

The procedural errors of canal ledges, gross underfill and overfill, loose fit, and underbridement of canal content increase the potential for failure. Bhaskar<sup>20</sup> observed that overfills with silver points in dogs cause bone and root resorption and lesion formation in only 9 months. Silver particles were also found in bone marrow.

The sealing abilities of silver points are poor when compared to those of gutta percha. The sealing ability is improved when the silver point is forced through the apex and tightly fitted with size 100.<sup>21</sup> The ease of silver point insertion into the canal encourages leaving pulpal debris in the canal. Toxic products are exchanged between the canal voids and the apical tissue. A survey of 97 retreatment procedures with silver points showed empty canals without effective sealer, indicating resorption of the sealer. Other studies of silver points show wire coated with silver rather than a solid silver point (Fig. 5).

When necessary, the silver point should be removed through the access preparation with small spoon excavators and a curved hemostat. Performing an apicoectomy before retreating the canal is incorrect because the problem needing retreatment has not been identified. Surgical efforts may fail if the root canal filling is not corrected.

### EVALUATION AND RETREATMENT OF PASTE FILLERS

Root canal pastes, usually composed of eugenol, formaldehyde, phenol, or iodoform, are used as root canal fillers with or without a solid core. Their purpose is to sterilize and fix the pulpal tissue. The paste sealers have many disadvantages.

1. Pastes resorb from the canal causing voids. Radiographs do not clearly show the paste filling because of radiopaque fillers that contain barium

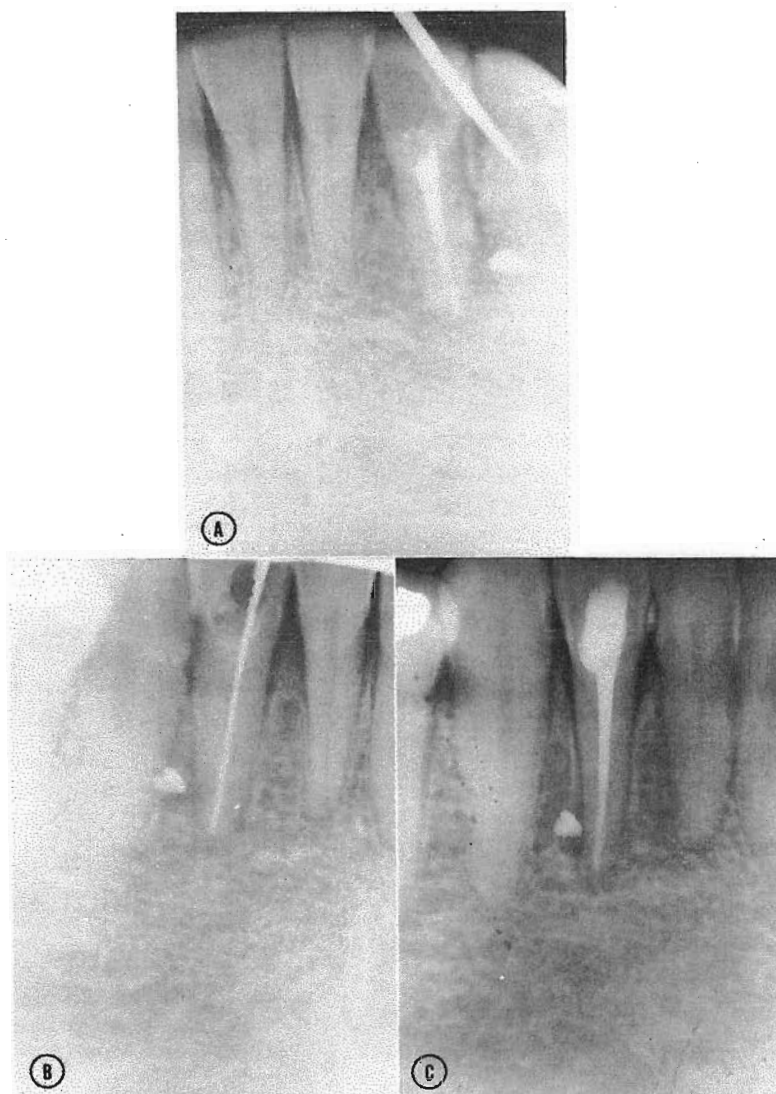


Fig. 6. A, Paste filler of lower lateral incisor overfill. B, Clinical exploration enabled insertion of No. 40 endodontic file directly to apex, indicating pseudoseal. C, Root canal retreatment with gutta percha.

sulphate. It has been demonstrated that the root canal walls may be coated with the sealer but that voids remain in the canal space without showing on the radiograph. Further, resorbability is a slow process requiring years. This is related to apical foramen size, lateral canals, root cracks, quality of coronal seal, canal voids, and cementum permeability (Fig. 6).

2. Paste fillers cannot be condensed to produce a solid canal fill.

3. Paste cannot be confined to the root canal, especially if there is no apical stop.

4. Pastes contain strong medications that irritate the periapical tissue by osmosis.

Zinc oxide pastes may be removed from the canal with endodontic files taking care to avoid pushing the cement beyond the apex. Rotary instruments may be used in addition to the files.

#### RETREATMENT OF GUTTA PERCHA FAILURES

Gutta percha points are reported to be the superior root canal filling material. They are made from zinc oxide and gutta percha and require thorough enlargement of the root canal and thorough débridement of the canal contents.

A gutta percha failure can be attributed to improper



gutta percha canal preparation and material handling. Gutta percha condensation techniques have shown more success than single point fillings.

If gutta percha fillings fail, the material is removed by chemical softening or rotary instruments if canal size permits. After the gutta percha is removed, the canal should be enlarged and refilled. These errors can be surgically corrected if the canal is densely filled with gutta percha and the failure is due to apical perforation or overfill. In this case, the main canal does not have to be retreated.

## SUMMARY

Endodontic recall studies and clinical experience have resulted in more universal criteria for acceptable and unacceptable endodontic treatment. Before the initiation of restorative treatment on teeth previously treated endodontically, the prosthodontist should evaluate the quality of endodontic treatment to assure that it will provide a risk-free, permanent, solid foundation for the future restorative work. Lack of symptoms alone does not indicate success of endodontic treatment. Radiographic evaluation is also not sufficient. The prosthodontist should use a thorough and combined evaluation of the endodontic history, radiographic evaluation, and tooth and tissue examination, as well as physically assess the treatment of all canals and their seals. As a rule, endodontics of questionable quality should be retreated by way of the canal. The removal of defective restorations is done to facilitate the retreatment effort and assure the soundness of tooth structure. Following retreatment, the tooth is restored and healing of the patient is followed up.

Surgical endodontics is avoided unless retreatment is first attempted or the quality of previous root canal therapy is acceptable or the canal obstructed.

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### Reprint requests to:

DR. MARWAN ABOU-RASS  
UNIVERSITY OF SOUTHERN CALIFORNIA  
SCHOOL OF DENTISTRY  
P.O. Box 77951  
LOS ANGELES, CA 90007

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*mar@abourass.com*  
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