

## CLINICAL ARTICLES

# Postsurgical Endodontics

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**Apical surgery is known to be an effective and practical way of treating endodontic failures. However, in spite of seemingly proper root end management, surgical failures may occur as a result of lateral canal, dentinal tubule, end retrograde leakage. Since surgical retreatment of such failures would likely result in failure, the alternative of a nonsurgical retreatment should be carefully considered. An understanding of the relationship which exists between the quality of the orthograde treatment and the surgical prognosis is necessary to properly direct the course of treatment.**

Many surgical endodontic failures are attributed to inadequate root end management, yet some fail in spite of seemingly proper treatment. If etiological agents remain within the root canal system which are not hermetically entombed by either the conventional or retrograde filling, then failure may be inevitable. The relationship between the surgical prognosis and the quality of the orthograde treatment has been well documented (1-7). The reported pathways via which leakage and subsequent failure may occur are lateral canals (1), dentinal tubules (3), and inadequate retrograde fillings.

In addition to the quality of both the orthograde and retrograde filling, surgical prognosis is also subject to other factors which may affect repair. These include periodontal disease, cracked roots, occlusal trauma, and the role of the host. When the etiology of a surgical failure is endodontic, the retreatment must accomplish what the original root canal therapy and subsequent apicoectomy and/or retrograde filling did not. From the standpoint of practicality and patient management, repeating the surgery is usually less complicated than an extended nonsurgical treatment plan, which may involve the destruction of a new restoration or the risk of root fracture when attempting to remove a post. Difficulties may also be encountered when eliminating the existing root canal

filling material and regaining full canal length. It is reasonable to elect the surgical option and avoid the complications, provided that the root canal system appears to be adequately obturated and failure is seemingly due to inadequate root end management. It is virtually impossible, however, to judge the adequacy of an apical seal, either orthograde or retrograde, from radiographs alone. Deficiencies in preparation or filling, improper management of an isthmus, or failure to discover and treat additional canals or foramina will often not be evident. As a consequence, the reason for the failure of a retrograde filling may remain unclear until surgical reexposure permits direct visualization and retreatment of the root end. Where no obvious deficiencies in the retrograde filling can be found, the prognosis will be less favorable.

Surgical retreatment has not been shown to have a favorable prognosis (30 to 40%) (5, 8, 9). In light of the relationship demonstrated between the surgical prognosis and the quality of the orthograde treatment, it must be conceded that some failures occur in spite of proper root end management. This possibility looms larger in cases where the orthograde treatment is obviously inadequate, where undiscovered canals may remain completely untreated, and where adequate retrograde fillings appear to have been placed. In such cases, the placement of a new retrograde filling will have no effect on the leakage occurring via pathways other than the apical foramen. Consequently, the surgical retreatment might result in a rather unfortunate third endodontic failure (one nonsurgical and two surgical), lead to a loss in patient confidence, possible extraction of the tooth, and the threat of liability.

Accordingly, in selected cases of surgical failure, nonsurgical retreatment should be contemplated, but, iatrogenic damage, canal anatomy, or unretrievable root canal fillings will certainly influence that decision. The restorative condition, especially the presence of posts, will also determine the feasibility of nonsurgical retreatment, even though posts can usually be removed without jeopardizing remaining tooth structure (10, 11). The overall complexity of nonsurgical retreatment must be weighed against the predictability of surgical management in order to determine the appropriate treatment for any particular patient.

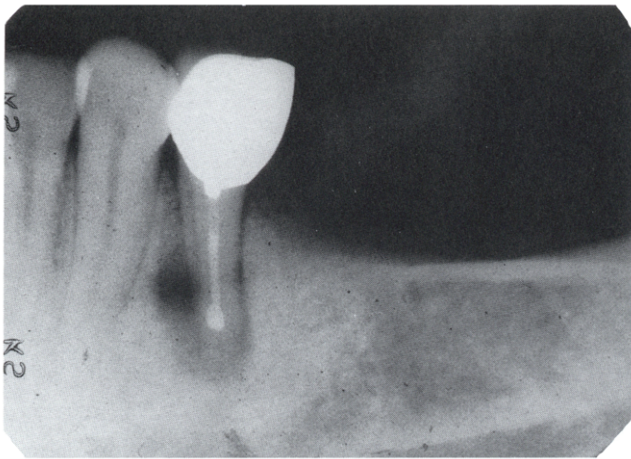


FIG 1. Preoperative radiograph shows failing apicoectomy.

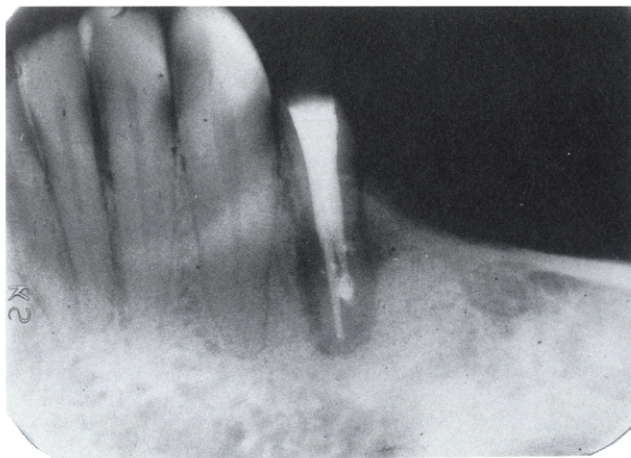


FIG 2. Undiscovered lingual canal located.

The following surgical failures were judged to be poor candidates for surgical retreatment and were, therefore, retreated nonsurgically with favorable results.

## CASE REPORTS

### Case 1

A 42-yr-old female patient presented with localized swelling and a sinus tract over the mandibular left first premolar. The history indicated that root canal therapy was performed 6 or 7 yr earlier. An apicoectomy and a retrograde filling followed 3 to 4 yr thereafter. The patient claimed to be symptom free until the present time. Radiographic examination revealed the presence of a large periapical area (Fig. 1). No obvious reason for the failure could be discerned, but the prevalence of second canals in mandibular first premolars (about 25%) (12) (which often go undiscovered during primary treatment) was the determining factor in the decision to nonsurgically retreat this case. After removing the crown and post, the chamber was explored and an undiscovered lingual canal was detected (Fig. 2). Both the buccal and lingual canals were thoroughly instrumented and treated with calcium hydroxide. Two weeks later the sinus tract was nonexistent and the canals

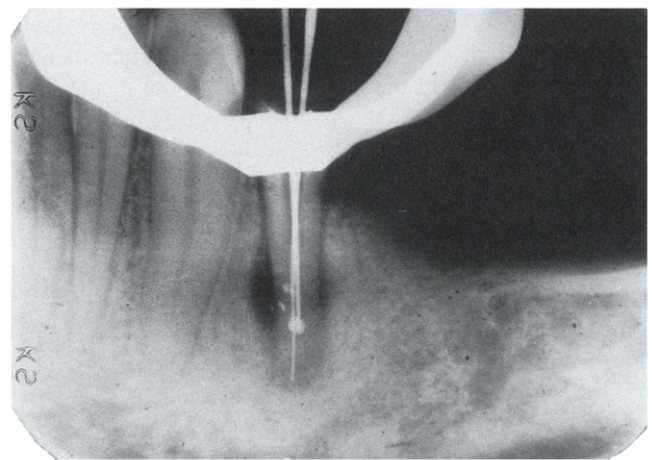


FIG 3. Both canals filled with gutta-percha.

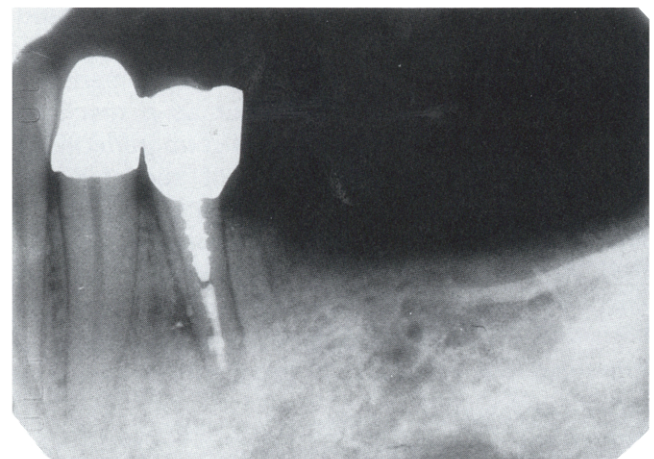


FIG 4. One-yr postoperative radiograph shows good repair.

were filled with gutta-percha (Fig. 3). A radiograph taken 1 yr postoperatively showed excellent repair (Fig. 4).

### Case 2

A 51-yr-old female patient presented for consultation and treatment of the maxillary right second premolar, which had recently developed a sinus tract. An apicoectomy had been performed about 2 yr earlier. Radiographically, a rather extensive retrograde amalgam filling was evident (Fig. 5). A small amount of amalgam scatter was not thought to be of consequence. The apparent technical deficiency of the original root canal filling was considered to be of greater concern than the somewhat unusual appearance of the retrograde filling. Nonsurgical retreatment was prescribed. Access was gained through the crown and the post was removed. An undiscovered buccal canal was located (Fig. 6) and both canals were fully instrumented and enlarged into one canal. Two weeks later the sinus tract was no longer evident and the canal was filled with gutta-percha (Fig. 7). A radiograph taken 1 yr postoperatively showed a substantial reduction in the size of the lesion (Fig. 8).



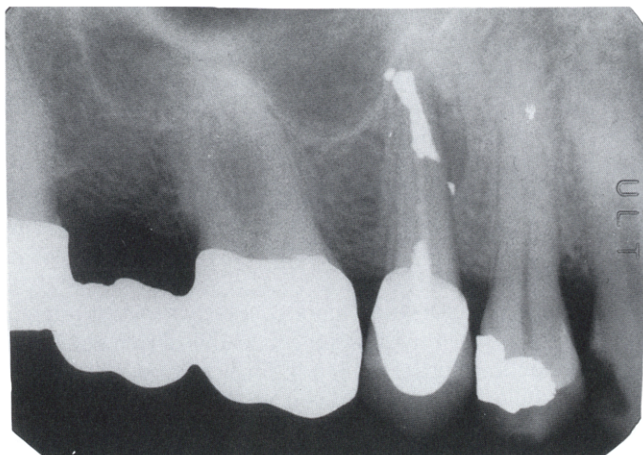


FIG 5. Preoperative radiograph shows inadequate orthograde filling and rather extensive retrograde filling.

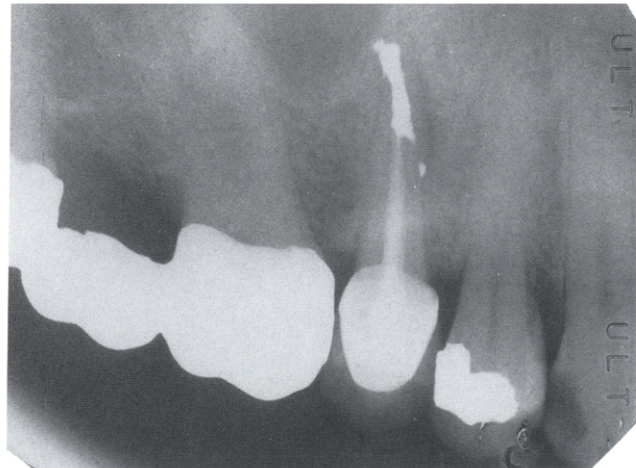


FIG 7. Both canals filled with gutta-percha.

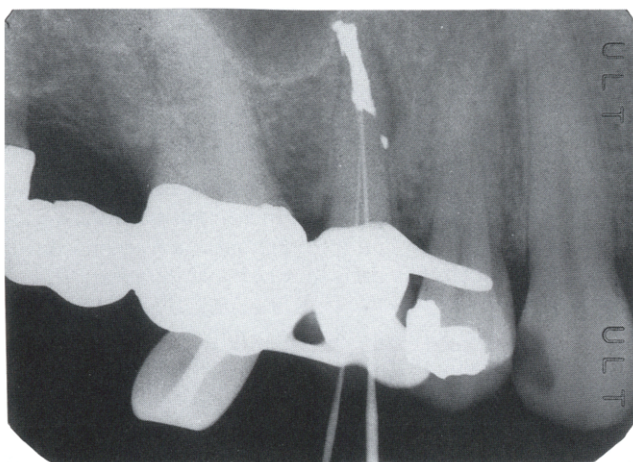


FIG 6. Both canals enlarged into one common canal.

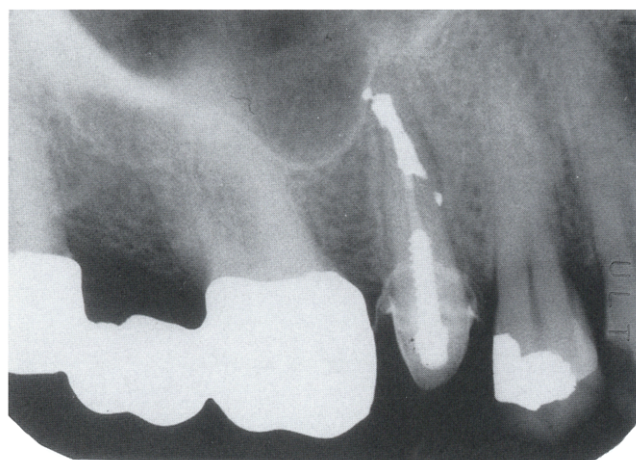


FIG 8. Six-month postoperative radiograph shows good repair.

### Case 3

A 36-yr-old female patient presented with a sinus tract over the buccal surface of the maxillary left first molar. The history indicated that root canal therapy had been performed about 4 yr earlier and surgery had preceded our consultation by about 6 months. Radiographic examination revealed a large periapical area over the buccal roots which had been treated with retrograde amalgam fillings (Fig. 9). The mesiobuccal root of the maxillary first molar commonly harbors a second canal (42%) (13) which often goes undetected during primary treatment. Any unexplained failure involving this root (or any root possibly harboring an untreated canal) demands that a thorough exploration be made to locate this canal, if present. If possible, this exploration should be nonsurgical. A small opening was, therefore, made through the crown (the post in the palatal root did not impede treatment in any way) and enough core material was removed in order to allow exploration of the floor of the chamber in the area where MB2 is usually found. This untreated canal was located and fully instrumented (Fig. 10). At the following visit, the sinus tract was no longer evident and the one canal was filled with gutta-percha. A radiograph taken 6 months postoperatively showed substantial reduction in the size of the lesion (Fig. 11).

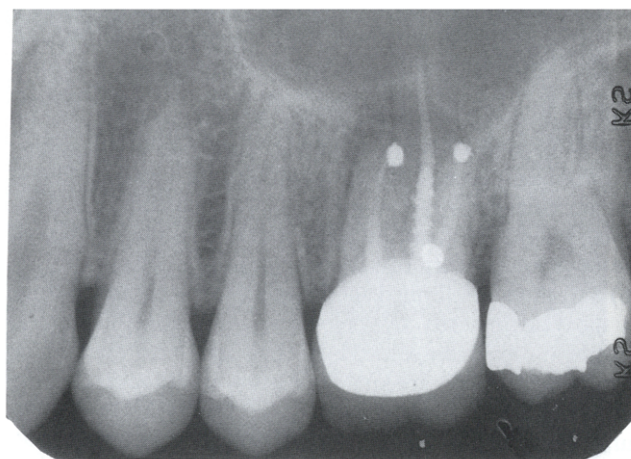


FIG 9. Preoperative radiograph shows failing apicoectomy.

### DISCUSSION

Although the preferred treatment for endodontic failures is nonsurgical (1, 5, 6, 14), many are managed surgically for reasons relating to expediency and patient management.



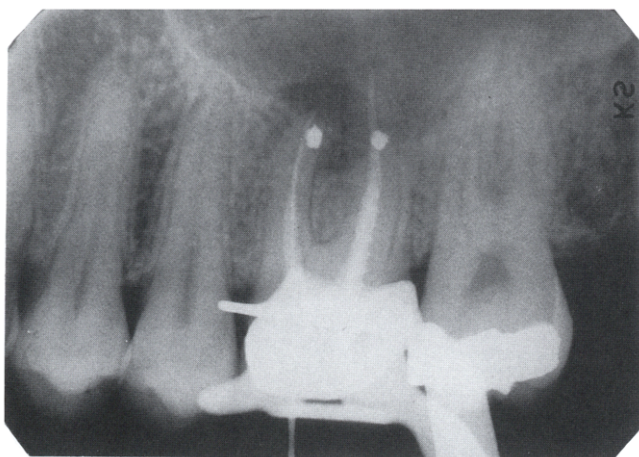


Fig 10. Fourth canal (MB2) located.

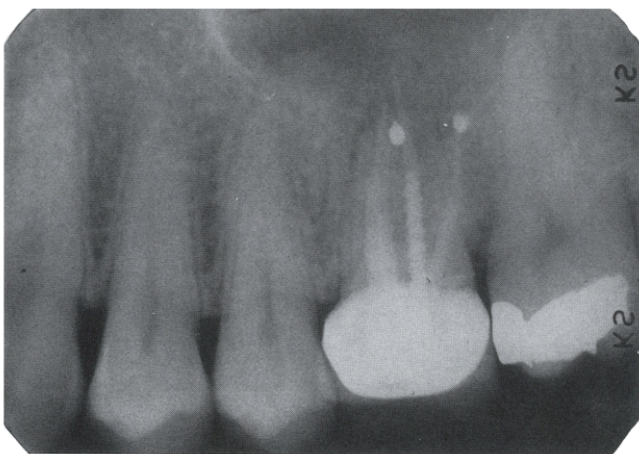


Fig 11. Six-month postoperative radiograph shows good repair.

Many researchers have attempted to quantify the rate of success for apical surgery, with widely varying results. Some of the higher success rates reported (4, 8) were based on studies utilizing a large percentage of maxillary anterior teeth, by far the easiest to effectively treat. Other studies addressed the relative difficulty of surgically treating molar teeth (15, 16) and therefore limited their studies to molar teeth alone. In the vast majority of these cases, however, the surgical treatment was accompanied by orthograde retreatment of the root canals, possibly making the surgery itself redundant and certainly improving the prognosis. In clinical practice, where surgery is usually performed in lieu of nonsurgical retreatment, the prognosis for an apicoectomy on a posterior tooth would seemingly be less favorable than these studies indicate.

In actuality, there are many variables which ultimately determine the surgical prognosis of any individual case (1, 4, 17). Some of these variables are related to clinical expertise and technique. Insufficient access (possibly resulting from poor flap design), bevels which fail to expose all apical foramina, and inadequate root end fillings are just a few of the factors which could contribute to failure. When the root canal system is not adequately debrided, failure may occur in spite

of proper root end management. Retrograde fillings cannot be depended upon to inhibit leakage (1, 2, 18) nor can leakage that occurs via lateral canals or dentinal tubules be controlled by the surgeon. Rud and Andreasen (1) performed a stereomicroscopic examination on 31 surgical failures. Retrograde amalgam fillings were present in 15 cases. Of these, six were found to have inadequate retrograde fillings. In the other nine failures, no leakage of the retrograde fillings could be demonstrated. Lateral canals were determined to be the cause of failure in two cases (1).

Various researchers have reported a higher success rate for apical surgery when it follows the nonsurgical retreatment of an endodontic failure (1, 4, 5, 14), further demonstrating the effect of the orthograde treatment on the surgical prognosis. When the primary treatment is deficient, the surgical prognosis will be diminished. Unfortunately, deficiencies in root canal fillings are not always obvious. In one study (1), deficient root canal fillings were radiographically evident in only one third of the cases examined. Failures occurring in roots which commonly have supernumerary canals should immediately arouse suspicion. These roots may not be good candidates for surgical treatment alone because a retrograde filling placed in an unbridged root canal has a questionable prognosis. Therefore, every effort should be made to discover and treat these canals nonsurgically.

The prognosis for nonsurgical retreatment in which an undiscovered canal is located and treated has been shown to be quite high (81%) (7). On the other hand, the prognosis for surgical retreatment has been shown, by various researchers, to be quite poor (30 to 40%) (5, 8, 9). Surgical retreatment in a root possibly harboring a completely untreated canal would, therefore, be a poor alternative to nonsurgical retreatment.

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### You Might Be Interested to Know

A recent article (J Oral Pathol Med 19:119) observes that the disregard for saliva as a diagnostic fluid may be attributed to its lack of "the drama of blood, the sincerity of sweat and the emotional appeal of tears." Great thought! It probably also explains why dentists sometimes have had trouble being taken as seriously as other health workers. If only the famous statesman had said, "We'll give all our blood, sweat, tears *and spit*." No, that wouldn't have worked either.

*William Cornelius*