

# Surgical endodontic retreatment

Peter Jonasson<sup>1</sup> · Magnús Friðjón Ragnarsson<sup>2</sup>

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**Abstract** Surgical retreatment is a predictable treatment option for teeth with post-treatment apical periodontitis. The main objective is to eliminate and prevent bacterial infection in the root canal system from causing an inflammatory reaction in the periradicular tissue.

**Keywords** Apical surgery · Apicectomy · Retrograde root canal treatment · Surgical retreatment

## Indications

Apical periodontitis  
Blocked root canals  
Presence of posts, ledges, or broken instruments  
Presence of foreign body in the periapical tissues  
Radicular cyst  
Extraradicular infection  
Surgical exploration/diagnostics

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✉ Peter Jonasson  
Peter.Jonasson@odontologi.gu.se

<sup>1</sup> Department of Endodontology, Institute of Odontology, The Sahlgrenska Academy, University of Gothenburg, Gothenburg, Sweden

<sup>2</sup> Hafnarfirði, Iceland

## Materials/instruments

Surgical operating microscope  
Local anesthesia  
Epinephrine  
Cotton pellet  
Aluminum chloride or ferric sulfate  
Mineral trioxide aggregate (MTA)  
Ultrasonic tips  
Surgical burs  
Saline  
Surgical sutures

## Procedure

To choose the treatment option a thorough clinical and radiographic examination, including adjacent and opposing teeth, should be performed. Along with the other basic assessments, following considerations should also be made during surgical retreatment planning [1]:

### Technical considerations

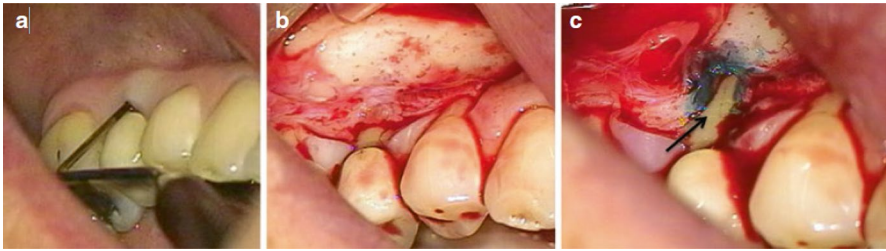
Surgical retreatment should be considered when orthograde retreatment fails to control the infection or cannot be undertaken due to blocked canals caused by dystrophic calcifications or iatrogenic errors such as ledges, broken instruments and presence of posts (Fig. 1).

### Biological considerations

Surgical retreatment is indicated when a persistent infection is suspected after root canal treatment [2]. The presence of extraradicular infection [3], radicular cyst or a foreign body in the periapical tissues can cause endodontic failure by triggering an inflammatory response [4]. A local deep pocket is also an aggravating factor for the



**Fig. 1** **a** Radiograph of the upper left first molar with a fractured instrument in the mesiobuccal root diagnosed with symptomatic apical periodontitis. **b** Immediately postoperatively. **c** A 1-year follow-up



**Fig. 2** **a** Upper right second premolar with a deep pocket located buccal. **b** An exploration is done to inspect the root surface. **c** A vertical fracture line seen after removing the soft tissue and staining with methylene blue



**Fig. 3** An upper molar with a symptomatic apical periodontitis. **a** The radiographs show a periapical radiolucency and fractured instrument in the apical third of the mesiobuccal root. **b** With a mesial eccentric radiographs, the root-filled canal in the mesiobuccal root moves from the X-rays, not centralized in the canal, indicating a second untreated canal

prognosis. As part of the diagnostic examination, a surgical exploration may be an alternative for excluding a vertical root fracture from a sinus tract formation originating from an endodontic lesion (Fig. 2).

### Anatomical considerations

The accessibility of the site of infection should be judged preoperatively. Periapical radiographs should be carefully evaluated in different angulations for planning and performing treatment (Fig. 3).

In the lower jaw, proximity to the mandibular nerve and/or a thick cortical bone buccal to the tooth may limit the accessibility. In upper jaw, the accessibility to the palatal root is limited surgically especially for the second maxillary molars.

Surgical treatment on teeth with apex or a periapical lesion in close apposition to the maxillary sinus should be carefully performed.

### Medical considerations

There are no absolute medical contraindications to endodontic surgery. However, there are several medical conditions and medications that cause a depressed immune

system, where surgical intervention is contraindicated until white blood cell count and antibody levels become normal. Patients with increased risk for bleeding need special attention. Patients with haemophilia or impaired liver function should only be treated after consultation and in agreement with the patient's physician. Medication with antiplatelet and anticoagulant agents increase the bleeding time intra- and postoperatively. Surgical treatment is possible in most cases but need certain treatment protocols.

### *Endodontic surgery technique*

Today's state-of-the-art in surgical endodontic retreatment is a minimal invasive microsurgical approach which is described in the following:

- To gain access to the root, a horizontal incision is given either including the papilla or cutting through the base of papilla. Submarginal incision is often recommended to minimize the risk of gingival recession in the esthetic zone. Subsequently, a full-thickness flap is raised.

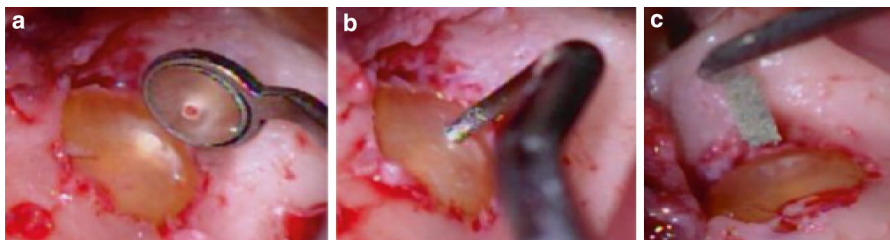
- The highly vascularized granulation tissue in the bone crypt is removed.

Hemostasis is achieved using local anesthesia containing epinephrine. Aluminium chloride or ferric sulfate can also be used for controlling bone crypt hemorrhage. If more severe bleeding occurs, electrocauterization may be considered.

- Root resection is performed to eliminate infected ramifications, lateral canals and contaminated dentin.

A root resection of 3 mm (mm) apically is sufficient to remove most of the infected ramifications and lateral canals. It is performed in a 90° angle to the long axis of the root. This minimizes any leakage that can occur through cut dentinal tubules. Retrograde root-end cavities are prepared by ultrasonic tips in exposed canal orifices. MTA is used for root-end filling (Fig. 4).

- The wound surface is thoroughly irrigated with the saline and the wound is closed using surgical sutures for optimal healing. Surgical sutures should hold



**Fig. 4** Single-rooted maxillary incisor treated by surgical retreatment using microsurgical technique. **a** The resected root and canal with gutta-percha seen in the micro-mirror and microscope ( $\times 6$ ) with good haemostatic control. **b** Retrograde preparation with a contra-angled ultrasonic tip (3 mm). **c** Application of the retrograde filling (MTA)

the edges of a flap in apposition until the wound has healed sufficiently to withstand the normal functional stresses and resist reopening.

Resorbable or non-resorbable threads in diameters 5–0 or 6–0 and three-eighths reverse-cutting or tapered needle are used. The sutures are removed after 7–14 days.

## Pitfalls and complications

- Pain and swelling after surgical treatment.
- Secondary infection of the surgical site.
- An insult to blood vessels.
- Lack of control of possible coronal leakage and carious lesions under restorations.
- Limited access to the root canal full length.
- Limited possibility to use chemical disinfection.

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