Surgical Endodontics

Year 5 DDS - November 2014

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Outline:

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3- Indications and contraindications
4- Peri-radicular surgery:
   • Clinical and radiographic assessment
   • Clinical steps
   • Post-operative care
   • Treatment outcome
   • Complications and their management
5- Hemisection and root amputation
6- Intentional replantation.
Definition:

- Surgical endodontics is a term used to describe any surgical procedure undertaken on the roots and the periapical tissues.
- May be indicated in teeth with persistent peri-radicular pathoses that have not responded to non-surgical approaches.
- Should be considered an extension of non-surgical treatment because the underlying aetiology of the disease process and the objectives of treatment are the same; prevention or elimination of apical periodontitis.
- The objective of surgical endodontics is to achieve a satisfactory seal of the root canal and thus prevent noxious substances entering into the adjacent tissues.
- Also used to manage lateral root perforation, root resorption, a fracture of the apical third of a root, curettage and biopsy of periapical pathosis.
Surgical endodontics includes:

1- Incision for drainage
2- Trephination: I&D through the bone
3- Peri-radicular surgery:
   • Apical curettage
   • Apicectomy (Apicoectomy)
   • Apicectomy with retrograde filling
4- Repair of perforation
5- Hemisection and root amputation
6- Intentional replantation
Indications for surgical endodontics

1- Failed conventional endodontics

2- Conventional endodontics is impracticable:
   2.a: Restorative reasons:
       • A long threaded post
       • Tooth serving as an abutment for a recently cemented bridge
   2.b- Anatomical reasons:
       • A calcified root canal
       • Marked curvature of a root canal
   2.c- Pathological reasons:
       • Root resorption
       • Persistent peri-radicular pathology
   2.d- Iatrogenic-reasons:
       • Extruded obturation material??
       • A separated instrument that cannot be retrieved non-surgically.
   2.e- Traumatic
       • Horizontal fracture of the apical third of a root, with pulp necrosis.
Contraindications for surgical endodontics

Local anatomical factors:

- Limited access to the periapical tissues.
- Anatomical structures may compromise flap design, e.g. a short sulcus depth, or prominent fraen al and muscle attachments.
- Anatomical structures in close proximity (e.g.: the inferior alveolar or mental neurovascular bundles, or the maxillary antrum).

Medical conditions:

- Bleeding disorders
- Previous radiotherapy to the face and jaws
- Unstable angina
- A compromised immunological state.
- Patients on bisphosphonates.
Peri-radiccular surgery:

Apicectomy/ apico-ectomy

A surgical procedure that involves raising a flap, curettage of the apical granulation tissue/ cyst, root-end resection, retrograde cavity preparation and the provision of retrograde fluid-tight seal

The objective is to seal the residual infection within the root canal space confines and prevent its progression to the peri-apical tissues
Clinical steps:

1- Haemostasis and local anesthesia
2- Flap (incision) design
3- Flap reflection and retraction
4- Exposure of peri-apical site
5- Excision of the peri-apical granuloma/ cyst
6- Root-end resection
7- Retrograde cavity preparation
8- Placement of the retrograde restoration
9- Closure of the surgical site
10- Post-operative care
1- Local anesthesia and Haemostasis:

- Conventional labial/ buccal & lingual/ palatal infiltration
- To cover the whole area of surgery including the area of releasing incisions
- Anesthetic solutions with higher concentration of vasoconstrictors are recommended (2% lidocaine with 1:50,000 adrenaline)
- Sufficient time should be allowed before surgery commences in order to achieve vasoconstriction (at least 10 minutes)
- A long-acting LA (0.5% bupivacaine with 1:200,000 epinephrine) can be used at the end of treatment to reduce post-operative pain
2- Flap design:

Must allow for unrestrained visualization and access of the operative field
Has both a vertical and horizontal components

Vertical:

- The margins of the flap must rest on sound bone after surgery is completed
- The vertical releasing incision should be parallel to the supra-periosteal vessels
- Must avoid cutting through frenum and muscle attachments, and dental papilla
2- **Flap design:**

Horizontal incision:

a) Sulcular (intrasulcular) incision

![Horizontal incision diagram]

b) Sub-marginal incision (Ochsenbein-Luebke)

![Sub-marginal incision diagram]

c) Papillary-base incision

![Papillary-base incision diagram]

d) Semilunar flap

![Semilunar flap diagram]
3- Flap reflection and retraction:

- The muco-periosteum should be raised as a complete unit (*tears can result in more postoperative pain and swelling*).
- Flap reflection may be difficult in the presence of a discharging sinus tract, or fibrous scar tissue from previous surgery.
- A sharp periosteal elevator is recommended. Smaller instruments for papilla reflection.
3- Flap reflection and retraction:

Flap must be retracted to:

- Provide adequate space for bone removal and root-end resection
- Prevent soft tissue trauma

Different retractors are available
Healthy bone should be preserved (micro-osteotomy)

Heat generation must be minimized

Site of bone removal:

- If buccal bone plate has been lost, it is simple!
- Push a sharp probe through the buccal cortical plate to identify the pathological cavity around the tooth apex.
- Use the preoperative radiograph.
- CBCT

Round carbide vs. diamond burs.
5- Curettage of the apical tissues

Curettage is undertaken to remove:

- Foreign bodies such as excess root-filling material.
- Periapical soft tissue which **MUST** be sent for histopathologic examination

A curved spoon excavator, periodontal curette or a Mitchell’s trimmer can be used in a peeling manner.
5- **Localized hemostasis:**

Good hemostasis during surgery:

- Enhances visibility
- Reduces contamination of the root-end filling
- Reduces surgery time and blood loss
- Post-operative haemorrhage and swelling

Starts pre-operatively with good medical history investigation and appropriate anesthesia selection

Atraumatic surgical approach is important in reducing the amount of bleeding
5- **Localized hemostasis:**

Haemostatic agents used either form a artificial clot or enhance the clotting mechanism and vasoconstriction (or both)

1- Collagen-based materials
2- Surgicel
3- Bone wax
4- Ferric sulfate
5- Calcium sulfate
5- Epinephrine pellets
6- Cautery/ electrosurgery
6- Root-end resection:

The apical 3mm of the root are resected
A straight fissure bur in a straight handpiece is used
A handpiece with a rear air exhaust
No bevel is needed!
The surface of the apicected root is examined to exclude a root fracture before the retrograde cavity is cut.
Methylene blue dye aids identification of a root fracture.
<table>
<thead>
<tr>
<th></th>
<th>1 millimeter</th>
<th>2 millimeters</th>
<th>3 millimeters</th>
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<tbody>
<tr>
<td>Apical Ramifications</td>
<td>52%</td>
<td>78%</td>
<td>98%</td>
</tr>
<tr>
<td>Lateral canals</td>
<td>40%</td>
<td>86%</td>
<td>93%</td>
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Bevel or no bevel?
7- Retrograde cavity preparation

The ideal preparation is a class I cavity prepared along the long axis of the tooth to a depth of at least 3mm.

A rose head bur in a microhandpiece vs ultrasonic tips
A root-end filling is inserted into the retrograde cavity preparation to seal the root surface.

Many dental materials have been used including:

- Amalgam
- Zinc-oxide eugenol cements:
  - IRM
  - Super EBA cement
- Composite resin
- GIC/ RMGIC
- MTA and calcium silicates.

A selection of micro-pluggers are available commercially.
Debridement:

After the root-end filling is inserted, the tissues are irrigated with sterile saline and an excavator is used to remove debris.

A check radiograph can be taken at this stage. This provides an opportunity to:

- Correct an inadequate apical seal before wound closure.
- Removal of any residual debris within the apical tissues.
9- Closure of the surgical site:

a) Flap repositioning:

The interdental papillae are first repositioned to their correct anatomical location.

A moist gauze can be used to apply gentle pressure.

b) Suturing:

Simple interrupted sutures is sufficient in most cases to secure the edges of the mucoperiosteal flap.

The knots should be placed away from the incision line.

Gentle pressure is applied to the flap for a few minutes with a moist gauze swab to obtain haemostasis.
Postoperative instructions should be given in writing.

Management of post-operative pain:

- NSAIDs (Ibuprofen 400 – 800mg)
- This can be alternated with paracetamol
- Long-acting LA immediately after surgery is completed

Antibiotics given to prevent postoperative wound infection after surgical endodontics is controversial.

Ice pack applications (20 mins on/ 20 mins off)

Sutures removal: 2-4 days after surgery

Review appointment in 7-10 days (after sutures removal) and then 3-12 months after surgery
The micro-surgical technique:

Involves the use of:

1- Microscope magnification

2- Microsurgical instruments (micro-mirrors, micro-pluggers...)

3- Micro-sutures: 6/0 prolene vs 4/0 vicryl

4- Micro-osteotomy (3-4mm vs. 8-10)

5- Ultrasonic retrograde cavity prep

6- Bioactive retrograde filling
Assessing the outcome of surgical endodontics:

a) **Clinically:** absence of signs and symptoms of persistent peri-radicular pathology. (Pain, discomfort, tenderness, swelling, abscess, sinus tracts, mobility, soft tissue defects.

b) **Radiographically:** resolution of the apical radiolucent lesion (complete regeneration of periapical bone and an intact lamina dura).

However, a persistent apical radiolucency after surgery does not necessarily indicate an unsuccessful outcome. The capacity for bone regeneration diminishes with age, and healing with scar tissue is not uncommon.
Few RCTs, mainly prospective Cohort studies and case series

Traditional methods: 44-90% success rate (Kim and Kratchman 2006)

Microsurgical approach: RCT: IRM vs MTA. 2 years: MTA: 92%, IRM: 87%.

(No statistical difference).

Cochrane review (Fabbro 2008): no difference between surgical and non-surgical endodontic treatment outcome after 4 years.
Thank you