Endodontic emergency treatment

• Approximately 60% of patients with oral or maxillofacial pain are in need of endodontic emergency treatment (Tronstad, Thieme 2003)
• Nearly 90% of patients seeking emergency dental treatment have symptoms of pulpal or periapical disease (Carrotte, Br Dent J 2004)
• Endodontic emergency treatment usually takes place between regular patients > diagnostic and therapeutic procedures must be as simple as possible but with the objective of treating the correct tooth and of relieving the patient’s pain

Endodontic emergency treatment

• Rules of thumb:
  ▪ We should be 90% or better assured that the correct diagnosis has been made and the correct tooth has been identified (Gutmann & Lovdahl, Elsevier 2011)
  ▪ First aim is to relieve pain and control inflammation > but it must be a causal treatment!
  ▪ Emergency treatment should not prejudice any final treatment plan (Carrotte, Br Dent J 2004)
  ▪ Ideally, emergency treatment should be the first phase of the regular final treatment

Endodontic emergency treatment

• Vital teeth
  ▪ Dentin hypersensitivity
  ▪ Reversible pulpitis
  ▪ Irreversible pulpitis
  ▪ Cracked tooth
• Non-vital teeth
  ▪ Symptomatic apical periodontitis
  ▪ Apical periodontitis with swelling

Topics

Reasons for pain in vital teeth

• Caries, restored or unrestored 88,6 %
• Cusp fractures (cracked tooth) 5,8 %
• Hypersensitive teeth 3,6 %
• Traumatic occlusion 2,0 %

Dentin hypersensitivity

• Attrition: Tooth surface loss by two-body wear (tooth to tooth contacts)
• Abrasion: Tooth surface loss by three-body wear (e.g., habits, toothpaste)
**Acidic erosion:** Non-carious tooth surface loss by exogenous acids (e.g., acidic foods and drinks, gastric acids > anorexia nervosa, bulimia, reflux disease)

**Dentin hypersensitivity**
- Desensitising agents 
  - Primary goal is to close the tubules by insoluble salts

**active substances**

<table>
<thead>
<tr>
<th>toothpaste</th>
<th>varnish / gels</th>
</tr>
</thead>
<tbody>
<tr>
<td>potassium salts</td>
<td>Durodent-5 medical sensitiv, El ce med Brilliant Sensitiv, Sensodyne Dental Weiss, Sensodyne P Sensodyne Multicare, Sensodyne Zahnfleisch-Komplex</td>
</tr>
<tr>
<td>potassium phosphate fluorides</td>
<td>Ambarino Sensitive, Isodan, VivaSens</td>
</tr>
<tr>
<td>strontium chlorides</td>
<td>Sensodyne C, MS Coat (Sensodyne Sealant), Tilzen</td>
</tr>
<tr>
<td>oxalate</td>
<td>GC Tooth Mousse, Bifluorid 12 (CaF$_2$ 6%, NaF 6%) Duraphat (NaF$_2$; 22,6 mg Fluorid per ml)</td>
</tr>
</tbody>
</table>

**New concept:**
- New toothpaste containing 8.0% arginine, calcium carbonate, and 1450 ppm fluoride > Pro-Argin technology (GABA)
- Fingertip topical self-application
- Significant effect after 3 days

*Ayad et al., J Clin Dent 2009*
*Schiff et al., J Clin Dent 2009*
*Docimo et al., J Clin Dent 2009*
Topics

- Vital teeth
  - Dentin hypersensitivity
  - Reversible pulpitis
  - Irreversible pulpitis
  - Cracked tooth
- Non-vital teeth
  - Symptomatic apical periodontitis
  - Apical periodontitis with swelling

Reversible pulpitis

- Pain: transient pain of mild to moderate nature; thermal and osmotic sensibility
- Sensibility (+)
- Percussion: (-)

Reversible pulpitis

- Treatment:
  - Removal of the caries; sealing of exposed dentin
  - Bacteria-tight coronal restoration: either permanent or temporary restoration (glass ionomer)

Reversible pulpitis

- Occasionally, calcium hydroxide base might be indicated
- Sedative dressings and linings (e.g., zinc oxide eugenol) should be avoided

Topics

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Localizing the correct tooth

- As long as pulpal inflammation has not spread to the periodontal ligament > pain radiates and patient is not always able to pinpoint the source of the symptoms correctly
- Management:
  - Careful thermal pulp testing of all teeth> especially application of heat
  - Anaesthetic tests
### Differential diagnosis reversible vs. irreversible pulpitis

<table>
<thead>
<tr>
<th>symptoms</th>
<th>sensitivity (%)</th>
<th>specificity (%)</th>
<th>reliability (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spontaneous pain</td>
<td>61.1</td>
<td>95.2</td>
<td>85.0</td>
</tr>
<tr>
<td>Longer history of pain</td>
<td>38.9</td>
<td>95.2</td>
<td>78.3</td>
</tr>
<tr>
<td>Pain triggered by heat</td>
<td>22.2</td>
<td>97.6</td>
<td>75.0</td>
</tr>
<tr>
<td>Pain at night</td>
<td>27.8</td>
<td>90.5</td>
<td>71.7</td>
</tr>
<tr>
<td>Pain triggered by palpation</td>
<td>5.6</td>
<td>97.6</td>
<td>70.0</td>
</tr>
<tr>
<td>Tooth tender to bite on</td>
<td>27.8</td>
<td>73.8</td>
<td>60.0</td>
</tr>
<tr>
<td>Tooth tender to percussion</td>
<td>16.7</td>
<td>71.4</td>
<td>55.0</td>
</tr>
<tr>
<td>Pain triggered by cold</td>
<td>100</td>
<td>28.6</td>
<td>50.0</td>
</tr>
</tbody>
</table>

[Sensitivity = percentage of sick people who are correctly identified as having the condition; Specificity = percentage of healthy people who are correctly identified as not having the condition] (Segura-Egea, Aust Endod J 2005)

### Characteristic features for an irreversible pulpitis

- Spontaneous pain
- Pain persists after the stimulus
- Pain triggered by heat
- Pain at night
- Longer history of pain

(Bender, Aust Endod J 2000; Carotte, Br Dent J 2004)

### Localizing the correct tooth

- **application of heat**
  - warm water after application of a rubber dam
  - gutta-percha stick

### Localizing the correct tooth

- **Anaesthetic test**
  - 2 - 3 min periodontal ligament injection > best discrimination
  - 0.2 ml each root

(Littner et al., J Endod 1983)

### Symptomatic (irreversible) pulpitis

- **Pain**: provoked by heat, cold cause relief; even spontaneous pain, pain at night, radiating pain
- **Sensibility**: (+)
- **Percussion**: (-) or even (+)

-serous pulpitis
-suppurative pulpitis
**Symptomatic (irreversible) pulpitis**

- Pulp exposure + anodyne medicament + bacteria-tight seal 92%
- Pulpotomy + anodyne medicament in the pulp chamber + bacteria-tight medicament 98%
- Pulp extirpation + anodyne medicament in the root canal + bacteria-tight seal 91%
- Complete debridement + intracanal dressing + bacteria-tight seal 99%

*Tronstad, Thieme 2003*

**Symptomatic (irreversible) pulpitis**

- Treatment: > aseptic techniques!!
  - Access cavity, pulp exposure and (if possible) removal of the pulp tissue from the pulp chamber
  - Anodyne medicament (Ledermix or eugenol) and bacteria-tight seal

*final treatment within 4-6 weeks (Molander et al., Endodontie 2004)*

**Bacteria-tight coronal seal**

- Cavit (Cavit > Cavit-G > Cavit-W)
- ZnO-eugenol-based materials (IRM; SuperEBA)
- Glass ionomer cements

- layer at least 3 - 4 mm
- maximum 1 - 2 weeks

**Cracked-tooth-syndrome**

- Up to 20% of patients suffering from odontogenic pain > cracked tooth (incomplete fracture) as main cause (Geurtsen & Garcia-Godoy, Am J Dent 1999)
- Predisposing factors: masticatory incidents, bruxism, thermal cycling

**Topics**

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Cracked-tooth-syndrome

- Second premolars and first molar are most often affected (especially those with extensive restorations)
- Symptoms: pain on chewing (hard food), sensitivity to cold and hot fluids, pain which is difficult to locate
- Fracture line: from mesial to distal (important: fracture lines in coronal restoration > radiographs are of little value for detection

Cracked-tooth-syndrome

- Ask the patient to bite on a cotton-roll, wood stick, or fracture detector (Tooth Slooth) > pain on release of pressure > most reliable aid and most expressive clinical finding

<table>
<thead>
<tr>
<th>Diagnosis</th>
<th>Informative value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Anamnesis</td>
<td></td>
</tr>
<tr>
<td>a) Sharp pain when biting on the tooth</td>
<td></td>
</tr>
<tr>
<td>b) Sensibility to thermal and/or osmotic stimulus</td>
<td></td>
</tr>
<tr>
<td>2 Pain on release of pressure</td>
<td></td>
</tr>
<tr>
<td>3 Visual detection of crack (fiberoptic, staining)</td>
<td></td>
</tr>
<tr>
<td>a) high; nearly always reported</td>
<td></td>
</tr>
<tr>
<td>b) low: characteristic finding only in about 50% of cases</td>
<td></td>
</tr>
<tr>
<td>Very high &gt; characteristic finding in nearly 95% of cases</td>
<td></td>
</tr>
<tr>
<td>unambiguous</td>
<td></td>
</tr>
</tbody>
</table>

Cracked-tooth-syndrome

- Treatment:
  - Without any signs of pulpitis > stabilization of the tooth by means of adhesive restorations or partial or full crowns (full cusp coverage!)
  - Pain when not in use > indication of irreversible pulpitis > root canal treatment and full crown

- Treatment:
  - Fracture lines extending below the alveolar crest > extraction

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Symptomatic apical periodontitis

- Pain: Tooth is sensitive to mastication and percussion; no swelling is present
- Sensibility: (-)
- Percussion: (+) to (++)
Symptomatic apical periodontitis

**Treatment:**
- Minimal treatment or instrumentation not possible:
  - Access cavity
  - Remove necrotic tissue from the pulp chamber
  - Copious irrigation of the pulp chamber using NaOCl
  - Placement of eugenol in the pulp chamber
  - Bacteria-tight seal
  - Root canal instrumentation within the next 2-3 days

Symptomatic apical periodontitis

**Treatment:**
- Instrumentation possible:
  - Access cavity
  - Determination of WL (electronic apex locator)
  - Chemo-mechanical instrumentation of the root canals
  - Intracanal dressing (mixture of calcium hydroxide + 2% CHX)
  - Bacteria-tight seal

Symptomatic apical periodontitis

**Chemo-mechanical instrumentation only results in pain decrease of 50% within 1 day and 90% within 2 days** (Holstein et al., Endodontic Topics 2002).

- Access cavity + irrigation of the pulp chamber with NaOCl: Study with 67 patients > decrease of the VAS-value from 7.3 to 2.2 within 3 days (Molander et al., Endodontie 2004) > regular treatment must be performed within a few days
- Access cavity + irrigation of the pulp chamber + placement of eugenol in the pulp chamber > pain relief in about 70% of patients within 1 day (Tronstad, Thieme 2003).

Symptomatic apical periodontitis

**Treatment:**
- minimal treatment:
  - Analgesics (ibuprofen)
  - Long-acting anaesthetic (bupivacaine) > duration of analgesia 8-10 h (Keiser & Hargreaves, Endodontic Topics 2002)
  - Fluctuancy of a swelling > incision and effective drainage
  - Further treatment > same day (scheduled)

Symptomatic apical periodontitis with swelling

**Treatment:**
- scenario 1: fluctuancy and drainage through the tooth
  - Open the tooth > drainage
  - Chemo-mechanical instrumentation > exudation has stopped > intracanal dressing > coronal seal
  - optional: if the tissue is fluctuant > incision

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Apical periodontitis with swelling

- **Treatment:**
  - scenario 2: fluctuancy no drainage through the tooth
    - Open the tooth > no drainage
    - Chemo-mechanical instrumentation > intracanal dressing > coronal seal
    - incision and effective drainage (optional: drain)

Apical periodontitis with swelling

- **Treatment:**
  - scenario 3: no fluctuance, drainage through the tooth
    - Open the tooth > drainage
    - Chemo-mechanical instrumentation > intracanal dressing > coronal seal
    - no indication to incise and drain the soft tissues

Apical periodontitis with swelling

- **Treatment:**
  - scenario 4: no fluctuance, no drainage through the tooth
    - Open the tooth > no drainage
    - Chemo-mechanical instrumentation > still no drainage > create apical patency (drainage) using sterile size 10 or size 15 files > coronal seal
    - no indication to incise and drain the soft tissues

Leaving the tooth open

- In no cases should a tooth with an inflamed vital pulp or with a symptomatic apical periodontitis without swelling be left open for drainage (*Gutmann & Lovdahl, Elsevier 2011*)
- Concept of sealing the access cavity in the first visit > only in 3-5% of cases postoperative complications (*August, J Endod 1977*).
- 5-year retrospective study comprising 2188 patients > only 11 teeth were left open because of persistent exudation (*Tronstad, Thieme 2003*).

Leaving the tooth open

- There is clear evidence that the longer a tooth is left open for drainage:
  - the more often apical surgery is required > study compromising 5,000 teeth > 10.4% were left open > out of these 18% required apical surgery to manage periapical inflammation (*Bence et al., Oral Surg 1980*)
  - the more postop appointments are required to manage the closure of the tooth (*Weine et al., Oral Surg 1975*)
  - the higher the incidence of flare-ups when closing the tooth for the first time (*August J Endod 1982; Bence et al., Oral Surg 1980*)
  - the higher the number of intracanal bacteria (*Tjäderhane et al., Int Endod J 1995*).
Leaving the tooth open

- **Rules of thumb:**
  - Only in very rare cases when exudation is so severe that it virtual impossible to close the tooth > leaving the tooth open might be considered
  - It should be good clinical practice to **re-appoint the patient with 24 hours** (Rosenberg, Endodontic Topics 2002; Tronstad, Thieme 2003)

Occlusion

- **There is evidence that**
  - Careful reduction of occlusion decreases the incidence of post-operative pain > placebo-controlled clinical study (Rosenberg, et al., J Endod 1998)
  - Emergency treatment of all teeth showing tenderness to mastication > final treatment step should be occlusal reduction