Management of the open apex
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Bob Philpott BDS MFDS RCSEng RCSI MClinDent
MRD RCSEd (Endo)
Specialist Endodontist

Open Apex, Robert Lorenson
PROBLEMS

"KNOCKED IT WHEN I WAS YOUNG"

"PIMPLE ON MY GUM"

"DARK TOOTH"

"CHIPPED TOOTH"
Aims

• What is “The open apex?”
• Why does it occur?
• What significance does it have for treatment?
• How do we manage it clinically?
• Clinical cases & outcomes.
• Standard/Advanced/Complex.
Open apex - Definition

• Apical foramen (Dummer et al. 1984)
• Open apex (Andreasen >1mm; Cvek’s 5 stages)
• Blunberbuss vs. Non-blunderbuss
Cvek's stages root development

<table>
<thead>
<tr>
<th>STAGE</th>
<th>APPEARANCE</th>
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<tbody>
<tr>
<td>1</td>
<td>WIDE DIVERGENT OPENING; &lt; 50% ROOT LENGTH</td>
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<tr>
<td>2</td>
<td>WIDE DIVERGENT OPENING 50% ROOT LENGTH</td>
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<tr>
<td>3</td>
<td>WIDE DIVERGENT OPENING 66% ROOT LENGTH</td>
</tr>
<tr>
<td>4</td>
<td>WIDE APICAL OPENING NEARLY COMPLETE ROOT</td>
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<tr>
<td>5</td>
<td>CLOSED APICAL FORAMEN COMPLETE ROOT LENGTH</td>
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</table>
Why does it occur?

- Incomplete root development due to caries/trauma;
- Apical periodontits (Vier & Figueiredo 2002-83-87% of cases);
- Over-instrumentation (rotary instruments);
- Root end resection.
What significance does it have for us?

- Pulpal diagnosis
- Open apices
  1. WL determination
  2. Preparation
  3. Obturation control including revision of previous treatments
- Thin dentinal walls
- Short crown:root ratio
- Coronally:
  1. Lack of tooth tissue following trauma
  2. Weakened cervical region
  3. Aesthetic issues

Endodontic & Restorative
Management: Diagnosis

- Pulpal diagnosis
- Neural supply (Bernick 1964)
- Trauma
- Patient age
Management

1. Working length determination;
2. Chemo-mechanical debridement;
3. Obturation;
4. Restoration;
5. Prognosis.
Approaches-Working length determination

1. EAL (file size, resorption @ apex) (Goldberg et al. 2002-62% accuracy)
2. Paper point technique (Rosenberg 2003, Arenal et al. 87%)- problems;
3. Tactile (new vs old technique)
4. A. ElAyouti et al. 2009- 98% of cases within 0.5mm
Chemo-mechanical debridement

- Instrumentation: Is it necessary?
- Irrigation;
- Activation of irrigants;
- Medicaments: Types and duration.
Approaches - Obturation

Obturation

- No barrier placement
  - Customised cone
  - Short fill?
  - Thermoplasticised techniques

- Barrier placement
  - Apexification
    1. Calcium hydroxide
    2. MTA
    3. Others
  - Apexogenesis
    1. Antibiotic tri-paste
    2. Others
Chloroform Dip Technique

• Dip master cone in chloroform for 3–4 secs (size)
• Dry
• Into damp canal
• Remove & LEAVE ON TWEEZERS
• Van Zyl et al. 2005
• Customisation reduced apical voids
• Less extrusion with CL & customisation
• Any problems?
Apexification—the history

- **Definition:** method to induce a calcified barrier in a root with an open apex or the continued apical development of an incomplete root in teeth with necrotic pulp

- **Materials**
  - amalgam
  - glass ionomer cement
  - composite
  - mineral trioxide aggregate6
  - calcium hydroxide powder
  - freeze dried bone/dentin
  - resorbable ceramic
  - tricalcium phosphate
  - dentinal shavings

- **Techniques**

- **Outcomes**
CALCIUM HYDROXIDE

• How it works
• Protocol
• Outcomes
• Problems - Andreasen et al.
  2002
MTA

• Composition- why is it suitable?

• Technique
  1. Debridement
  2. Placement
  3. Compaction
  4. Obturation

• Outcomes- evidence?

  • Hiremath et al. 2008
  • PRP + HA into lesion
  • Lawley et al. 2004
  • Ultrasonic placement

Roberts et al. 2008
MTA

• 22 year old
• Trauma many years previously
• RCT 12
• Re-tx 11 open apex
• Debridement
• CaOH2
• MTA plug apically
• Obtura backfill
• Non-vital bleaching
• Removal of extruded root filling material;
• Control of irrigants/medicaments;
• Decision on obturation techniques;
• Coronal structure
Apexification of immature teeth with calcium hydroxide or mineral trioxide aggregate: systematic review and meta-analysis
Chala et al. 2011

Regarding success and apical barrier formation, either calcium hydroxide or mineral trioxide aggregate may be used for the apexification of immature teeth.
Restorative considerations

• Remaining tooth tissue
  1. Trauma;
  2. Cervically (how can we manage this?)
  3. Dentinal canal walls.

• Discolouration
  1. Management
  2. Bleaching vs Restorative options.

• Prognosis.
10MM POCKET SINUS AT 6 MONTH FOLLOW-UP APPOINTMENT

MTA PLUG FOLLOWED BY OBTURA BACKFILL

FOLLOW-UP
Strengthening immature teeth

• Cervical fracture

• Practical techniques:
  1. Access
  2. Preparation
  3. Medication

• Bonded composite restoration (Katebzadeh et al. 1998, Rabie et al. 2006).

• Glass ionomer cement (Goldberg et al. 2002)

• Cast restorations (veneers/crowns)
Regenerative techniques - Apexogenesis

- Shin et al. 2009
- CHX + NaOCl irrigation
- MTA coronally
- Composite restoration
- Antibiotics
- 7, 13, 19 month review shows healing

Encourage physiological development & root formation

© Shin et al. IEJ 2009
Get To the Point
• Protocol
  • 5% NaOCl 1mm from apex
  • Dried canal
  • Mixture of minocycline, cirprofloxacin, metronidazole to 8mm
  • Cavit temp

• 4 weeks later re-access
  • Bleeding encouraged @ 15mm
  • Clot 3mm below CEJ
  • MTA

• Problems:
  • LA
  • Staining
  • Tissue in canal
Patency filing?

• Definition
• Teaching (Cailleateau 1997)
• Risks vs benefits
• Control of preparation - rotary instrumentation
• Control of obturation
• Apexum!!
Conclusions

• Difficulties with stages of treatment;
• Many choices—strategise;
• Outcomes—ideal, expected and actual;
• Restorative considerations.