Non vital pulp with open apex

SURGICAL V.S. NON SURGICAL

(Apexification)
Disadvantages of Surgical Approach

• children and young adult patients are difficult to deal with
• chances to interfere with the adjacent vital structures
• compromise the crown-to-root ratio
• the psychological trauma of a surgical procedure on these young patients
Difficulties of the non-vital immature teeth

- opened apex, no apical stop
- thin wall, large canal, caused fracture easily
- childhood patient needs management
- long term treatment (3 months - 5 years)
- parents attitude
Problems with Immature Teeth with Necrotic Pulps

Open Apex: Controlling Root Canal Filling

Managing Root Canal Infection

Thin, weak root walls

Trope 2006
Problem solving

APEXCIFICATION

• KAISER 1964
• CARBB 1965
• FRANK 1966
• HEITHERSAY 1970
Apexification is the term that is used to describe the procedure of endodontic treatment in permanent teeth with an incompletely developed apex.
OBJECTIVES
• to get rid of the infection
• to stop root resorption
• to create the apical closure

INDICATION
• pulp necrosis with open apex
  (apical diameter > 0.8 mm.)
• failure of vital pulp therapy
Apexification

Prognosis

• Periapical healing and formation of the hard tissue barrier 75 - 96 %

Follow up

• 6, 12 months and yearly for 4-5 years
SUCCESS RATE

Vernieks AA. 1974

12 mth. 66.7%
18 mth. 79.5%

Kerekes et al. 1980

9 - 12 yrs. 95%

Ghose et al. 1987

8 - 12 yrs. 96%

Cvek M. 1992

769 teeth 95%
When should we do apexification?

- radiographic change
- pain
- negative to pulp test (cold)
- colour change

At least 2 from 4 symptom
• **Traditional Technique**: Canal disinfection, slightly instrumentation, irrigation, Ca(OH)$_2$ dressing; replace dressing periodically over 3m - 3 yr; formation of apical dentin barrier; canal obturation, reinforced canal strength

• **Alternate Technique**: Canal disinfection instrumentation, irrigation, short term Ca(OH)$_2$ dressing, place MTA apical barrier (microscope); canal obturation, reinforced canal strength
Technique

- Radiographic technique
- coronal access
- instrumentation
- irrigation / disinfection
- drying
- calcium hydroxide
- temporary stop
- check barrier
- obturation of root canal
- Canal reinforcement
- permanent restoration (coronal seal)
Radiographic technique

- Parallel technique
- additional film (change the angulation)
Technique

- coronal access remove all infection and no roof of pulp chamber left
Technique

- remove pulp 10-14 days after severe PDL injury
Technique

• WL determination: Xray, Probe
• mechanical instrumentation
Technique

canal disinfectants to minimize mechanical instrumentation

Flush with NaOCL 0.5-5%
Chlohexidine 2%
EDTA 17%

Ultrasonic device is recommended for cleaning the canal wall
Technique

Drying with paper point
• Medication: calcium hydroxide

Formulas:
• fresh mixed
• premixed
• vitapex
• ledermix
Calcium hydroxide

induced mineralization
- Frank AL. 1966

antimicrobial
- Bystrom et al 1985
- Stuart et al 1991

dissolution of necrotic tissue
- Andreasen et al 1992
- Hasseigren et al 1998
Calcium hydroxide usage consideration

- need to contact with periapical tissue
- apex have bone surrounding
- replacement time: 1-3 months
- apical closure duration: 3m-3yr
Duration of Ca(OH)$_2$ change

- 1-2 weeks
- 1 month
- 3 months until the dentin formation is complete.
Hard packing of Ca(OH)$_2$

- root canal gun (Messing gun)
- amalgam carrier
Result: same density to dentin
Consideration

calcium hydroxide should not be placed in the root canal initially (14 days) in severe PDL injury tooth because it may be cause ankylosis.

Andreasen J.O. 1981
Hamarstom L. et al 1986
Harris and Wendt 1987 suggested that cream- or ointment-based medicaments should not be used in canals to be obturated with G.P. and a ZOE sealer until an effective method of medicament removal is found.

Vitatapex
Foreign body
Technique

temporary stop: carefully clean access then do 4-5 mm. thickness temporary filling with cotton plug
Technique

• Check dentin barrier
  - By probing
  - Radiograph
Obturation and permanent restoration

Thermoplasticized gutta percha with sectional method
• Vertical condensation method with custom made gutta percha cone
• Injected thermoplasticized gutta percha
Sectional method
Permanent restoration (Coronal seal)

GI reinforced root canal with composite filling
Intracoronal bonded restorations can strengthen endodontically treated teeth and increase their resistance to fracture.

Permanent restoration (Coronal seal)

Stainless steel crown for permanent molar as semi-permanent restoration
Case 2
Apexification

Follow up

6, 12 months and yearly for 4-5 years
FAILURE

• having symptom
• resorption
• cervical fracture
• ankylosis
External inflammatory resorption
External inflammatory resorption
External inflammatory resorption
Ankylosis
Ankylosis related to mechanical injury to the periodontal membrane and tend to occur in mature teeth than in immature teeth.

Cvek et al. 1974
Case III Intrusion

Orthodontic reduction
Case III Intrusion
Alternatives in root canal treatment of non vital teeth with open apex

- One-visit apexification
- Revascularization
- LSTR: lesion sterilization and tissue regeneration
- NIST: non instrumental endodontic Tx
The use of mineral trioxide aggregate in one-visit apexification treatment: a prospective study.

Simon S, Rilliard F, Berdal A, Machtou P.
One-visit apexification

METHODOLOGY:
Fifty-seven teeth with open apices on 50 patients referred for root canal treatment received an apexification procedure in one appointment with MTA by the same operator. Patients were recalled at 6 months, 12 months and every year thereafter.
One-visit apexification

RESULTS:
Forty-three cases were included with at least 12 months follow-up. When considering the periapical index (PAI) score and the decrease in size of the apical lesion, healing occurred in 81% of cases.
Conclusion
Apexification in one step using an apical plug of MTA can be considered a predictable treatment, and may be an alternative to the use of calcium hydroxide.
• MTA is extremely biocompatible, and it has been shown historically that osteoidlike material grows right into MTA.

• The technique of one-step apexification offers an alternative to draw-out cases with several medicament-changing appointments that often result in a failed attempt at root-end closure.

• This material is the best current choice for this procedure.

• Completion of these cases in an effective and efficient way allows for permanent restorations to be done in a more timely manner, prolonging the longevity of these teeth

One-visit apexification

- Case selection
- Open access
- Control infection
- MTA placement using collagen plug barrier
- 24hr. Reentry to check for MTA setting
- Gutta percha root canal filling
- Canal reinforced
collagen plug
#35 Pulp necrosis with AAA
Dedridement... Ca(OH)_2 placed 6 months
Apical plug with MTA

Courtesy Dr Taratorn Sundharagiati
Apical plug with MTA,
Canal filled with GP from OBTURA

1 yr recall

Courtesy Dr Taratorn Sundharagiati
2 yr recall

Courtesy Dr Taratorn Sundharagiati
MTA mixed
• root canal gun (Messing)
• amalgam carrier
Thank You!

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Ankylosis treatment techniques
COMPLICATION FROM TRAUMA

WITHIN THE PULP

• pulp necrosis
• pulp obliteration
• internal inflammatory resorption

AT ROOT SURFACE

• ankylosis
• external inflammatory resorption
Pulp Necrosis

- related to initial injury to the vascular supply to the pulp
- potential to repair reflected by stage of root development

Andreasen 1985
Pulp Necrosis

- pulp necrosis related to diameter of apical foramen

Andreasen FM. 1986