Conservative Pulp Treatment - II

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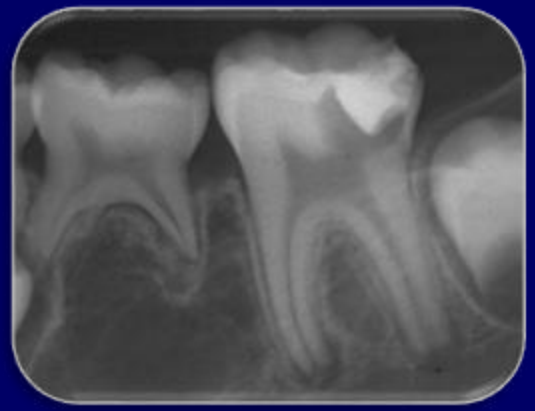
Some Treatment Dilemmas

- **Pulp Exposures**
  - ➔ Trauma
  - ➔ Caries
    - *When to do endodontic treatment?*

- **Pulp Exposures**
  - Trauma
  - Caries
  - ***When to do endodontic treatment?***

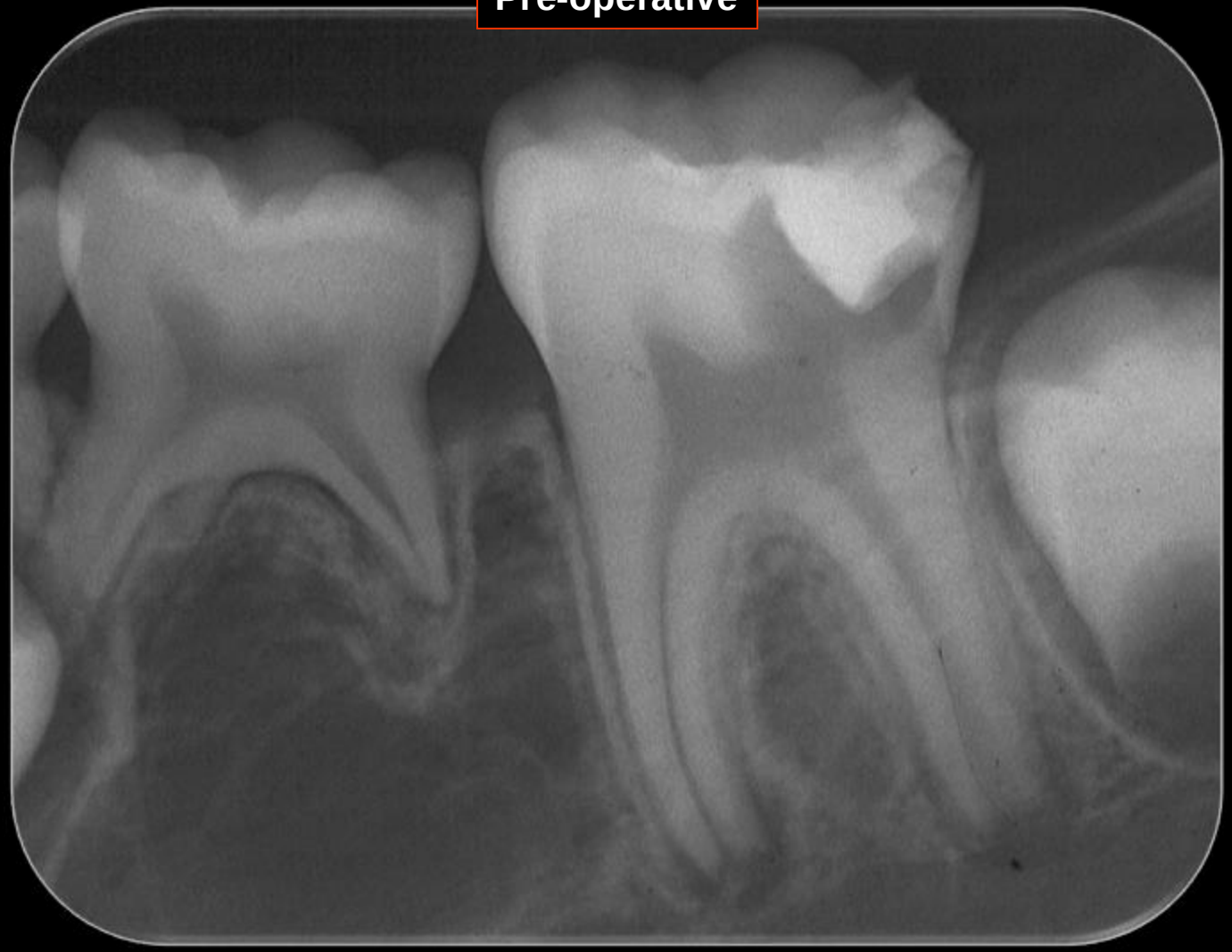
    - Irreversible pulpitis
    - Pulp necrosis + infection
    - Pulpless + infected

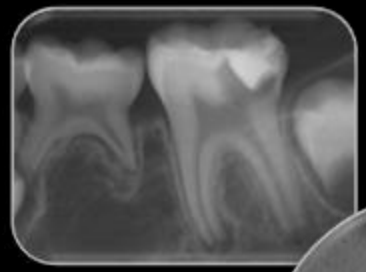
    - ***Must consider: Apexification***
      - If open apices in immature teeth



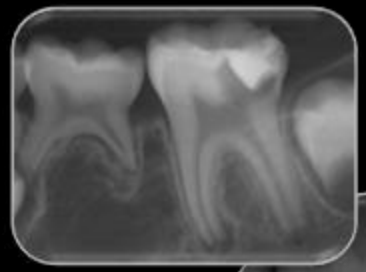
Apexification - Lower First Molar

Pre-operative

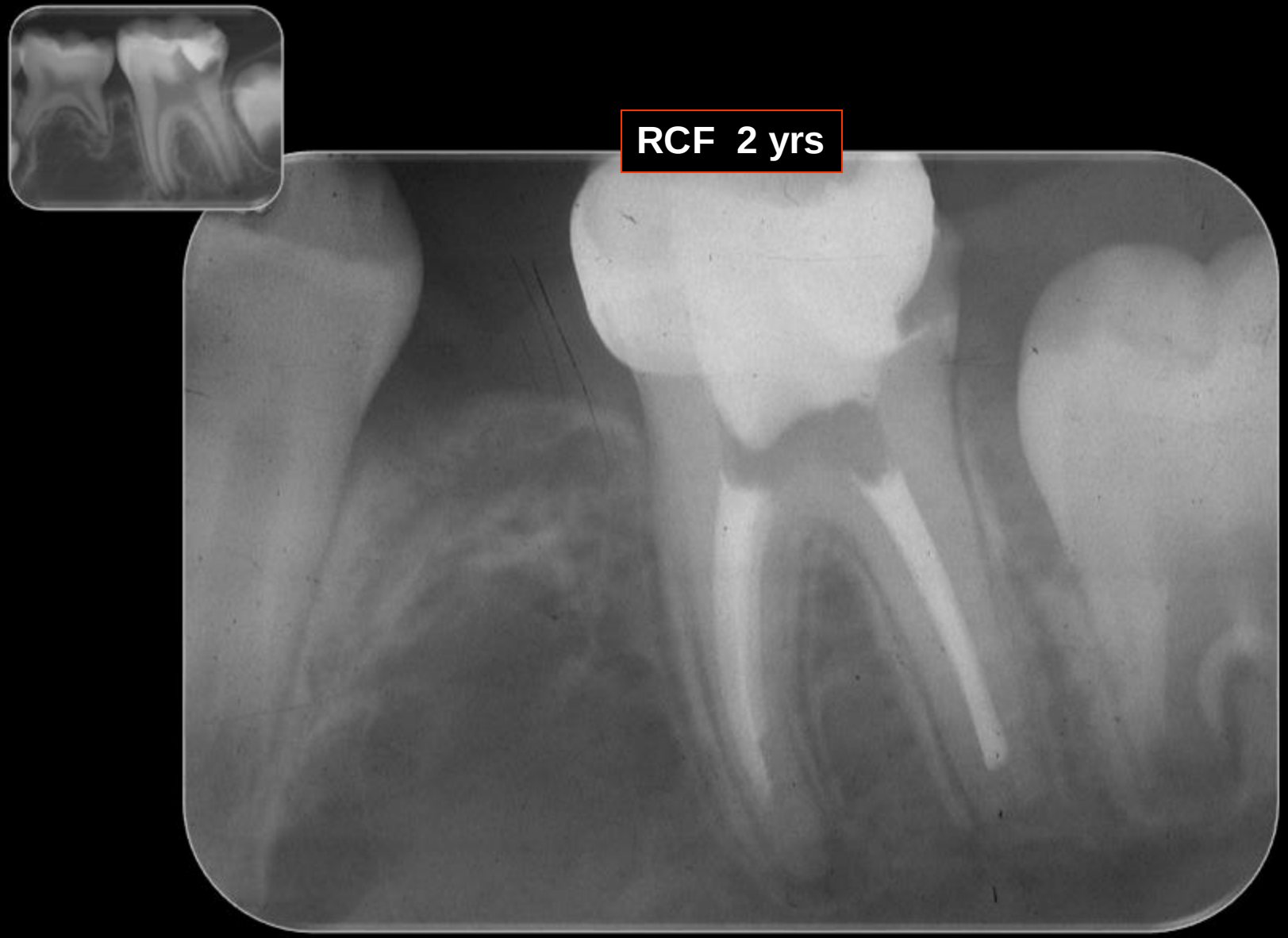




8 mths - $Ca(OH)_2$



18 mths - $Ca(OH)_2$


RCF 2 yrs


Recall 2.5 yrs

Some Treatment Dilemmas

- **Pulp Exposures**
  - Trauma
  - Caries
  - *When to do endodontic treatment?*
  - *What are the alternatives?*

- **Options:**
  - **Pulp Capping**
  - **Pulpotomy - Partial, Cervical**
  - **Pulpectomy - Partial**

Pulpotomy of carious vital teeth with periapical involvement

Çalişkan MK

Int Endod J 1995; 28: 172 - 6.

Method

- 26 permanent molars
  - - 20 lowers, 6 uppers
- Inflamed pulps with carious exposures
- Periapical involvement
  - Radiolucency or radiopacity

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Method

- 26 permanent molars
  - - 20 lowers, 6 uppers
- Inflamed pulps with carious exposures
- Periapical involvement
  - Radiolucency or radiopacity
- Aged 10 - 24 years
- Followed for 16 - 72 months
  - Clinically - examination and re-entered teeth
  - Electric pulp test
  - Radiographs

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Atraumatic Technique

- Citanest - no vasoconstrictor
- Rubber dam isolation
- Pulp amputation with high speed diamond + sterile saline spray
- Saline + pressure for haemorrhage control
- Calcium hydroxide + distilled water
- ZnO-E and amalgam restoration

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Results

- Overall - 92.3 % favourable
  (n = 26 teeth)

- No cases with -
  - Internal resorption
  - Pulp canal calcification
  - Recurrence of periapical involvement

  ➔ During time of follow - up (up to 6 years)

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Results

- Overall - 92.3 % favourable
- Radiographically -
  - 21 teeth: radiolucencies disappeared
  - 3 teeth: radiopacities healed

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  - All had a dentine bridge
  - All responded to electric pulp tests

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- Clinically - 24 teeth re-entered after 6-9 mths
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- *Unfavourable outcomes - 2 teeth*
  - After 2 weeks and 6 weeks
    - → Treated endodontically

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Fig. 1

Pre-op

3 Years

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Fig. 2

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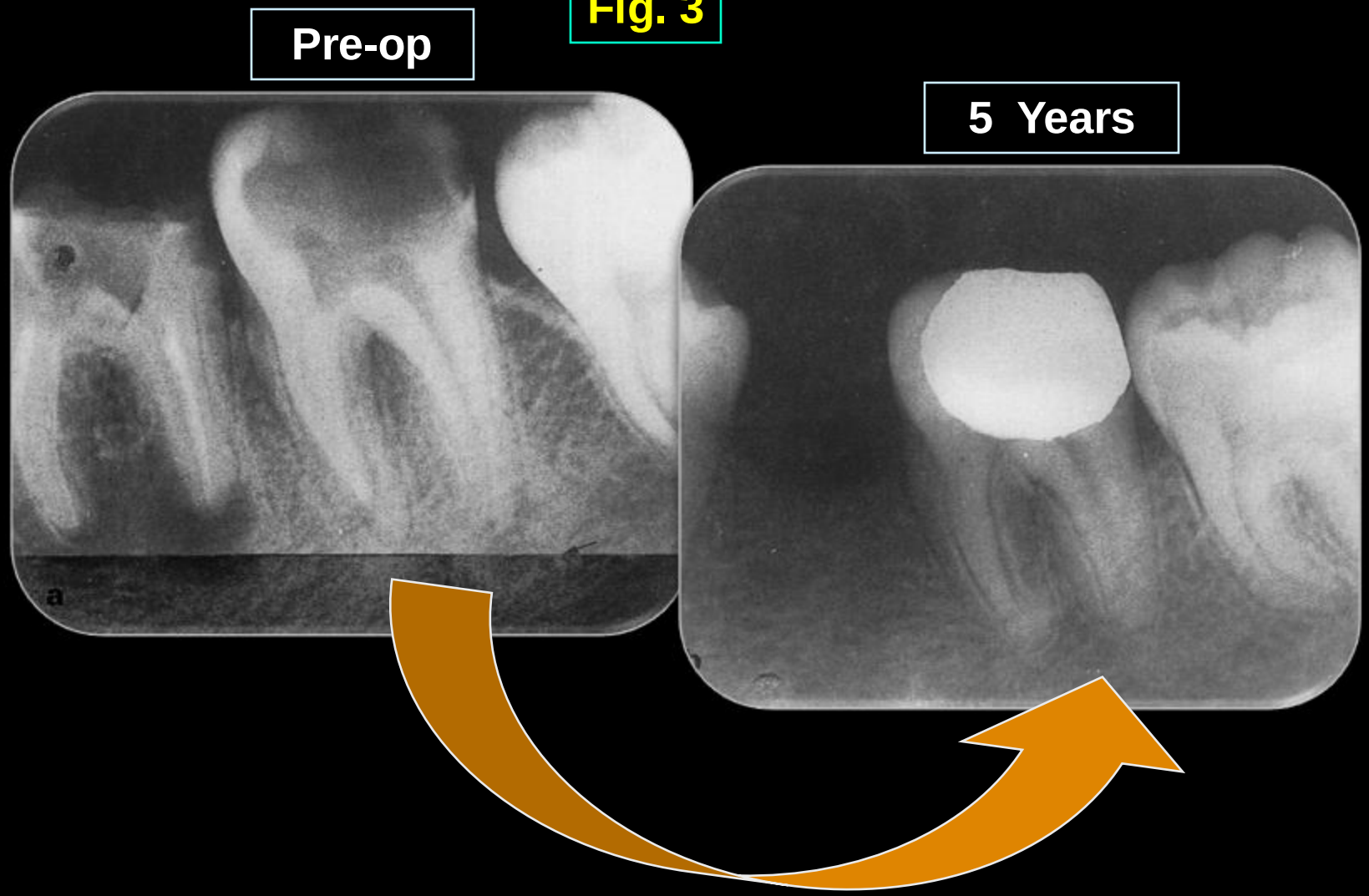
Fig. 3



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Other Cases Reported

- Moore 1967
- Sapone 1976
- Jordan *et al* 1978
- Foreman 1980
- Moule & Oswald 1983
- Çalişkan 1993
- Çalişkan & Sepetçíoğlu 1993

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Factors Affecting Outcome

- Original state of pulp
- Atraumatic technique
- Use of vasoconstrictor
- Extra-pulpal blood clot
- Material used on pulp
- Restorative material used

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Major Problem

- Diagnosis:
  - Difficult to distinguish between reversible and irreversible pulpitis
  - History provided by young patients may not be very accurate

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Major Problem

- Diagnosis:
  - Difficult to distinguish between reversible and irreversible pulpitis
  - History provided by young patients may not be very accurate
  - Responses to pulp sensibility tests vary between individuals
  - Lack of correlation between clinical findings and the histological state of the pulp

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Consider:

- Chronic pulp inflammation may be limited to the coronal pulp while the apical pulp may still be normal
  - Spouge 1973, Grossman 1976, Walton *et al* 1985, Smulsen & Sieraski 1989

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Consider:

- Chronic pulp inflammation may be limited to the coronal pulp while the apical pulp may still be normal
  - Spouge 1973, Grossman 1976, Walton *et al* 1985, Smulsen & Sieraski 1989

- Chronic pulpitis with periapical involvement often exhibits normal pulp apically
  - Jordan *et al* 1976, Russo *et al* 1982, Bender & Mori 1985, Smulsen & Sieraski 1989

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Consider:

- Histological studies show periapical pathosis is not necessarily associated with total pulp necrosis and infection
  - Mitchell & Tarplee 1960, Langeland 1981

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- Histological studies show periapical pathosis is not necessarily associated with total pulp necrosis and infection
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- Some teeth with periapical radiolucencies and normal pulps had only a few inflammatory cells in the apical portion of the pulp
  - Russo *et al* 1982

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Conclusions

- Clinical observations of many previous studies have been confirmed
- ***The indications for conservative pulp therapy may be greater than previously thought***
- Benefits to the community
  - More conservative of tooth structure
  - More long term options for the tooth
  - Less expensive
  - Less time, etc.

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Conservative Pulp Therapy

- Favourable outcome rates between 80 - 96%
  - Cvek 1978
  - Haskell *et al* 1978
  - Hørsted *et al* 1985
  - Lim & Kirk 1987
  - Stanley 1989
  - Çalişkan & Sabah 1992
  - Çalişkan 1993

- Compare with reported rates for favourable outcome of endodontic treatment: 80 - 100%

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Major Problems

- Diagnosis
  - Difficult to distinguish between reversible and irreversible pulpitis
- Dentists
  - Existing attitudes and approaches to treatment
  - Poor understanding of pulp disease
  - Poor understanding of treatment modalities
  - Poor understanding of materials
  - Often financial considerations dominate the decision making processes
    - ± *Both ways !!*

Some Treatment Dilemmas

- **Pulp Exposures**
  - ➔ Trauma
  - ➔ Caries
    - *When to do endodontic treatment?*
    - *What are the alternatives?*
    - ***What materials should we use?***

CHOICES:

- Calcium hydroxide
- **Corticosteroid / Antibiotic**
- MTA - Mineral Trioxide Aggregate

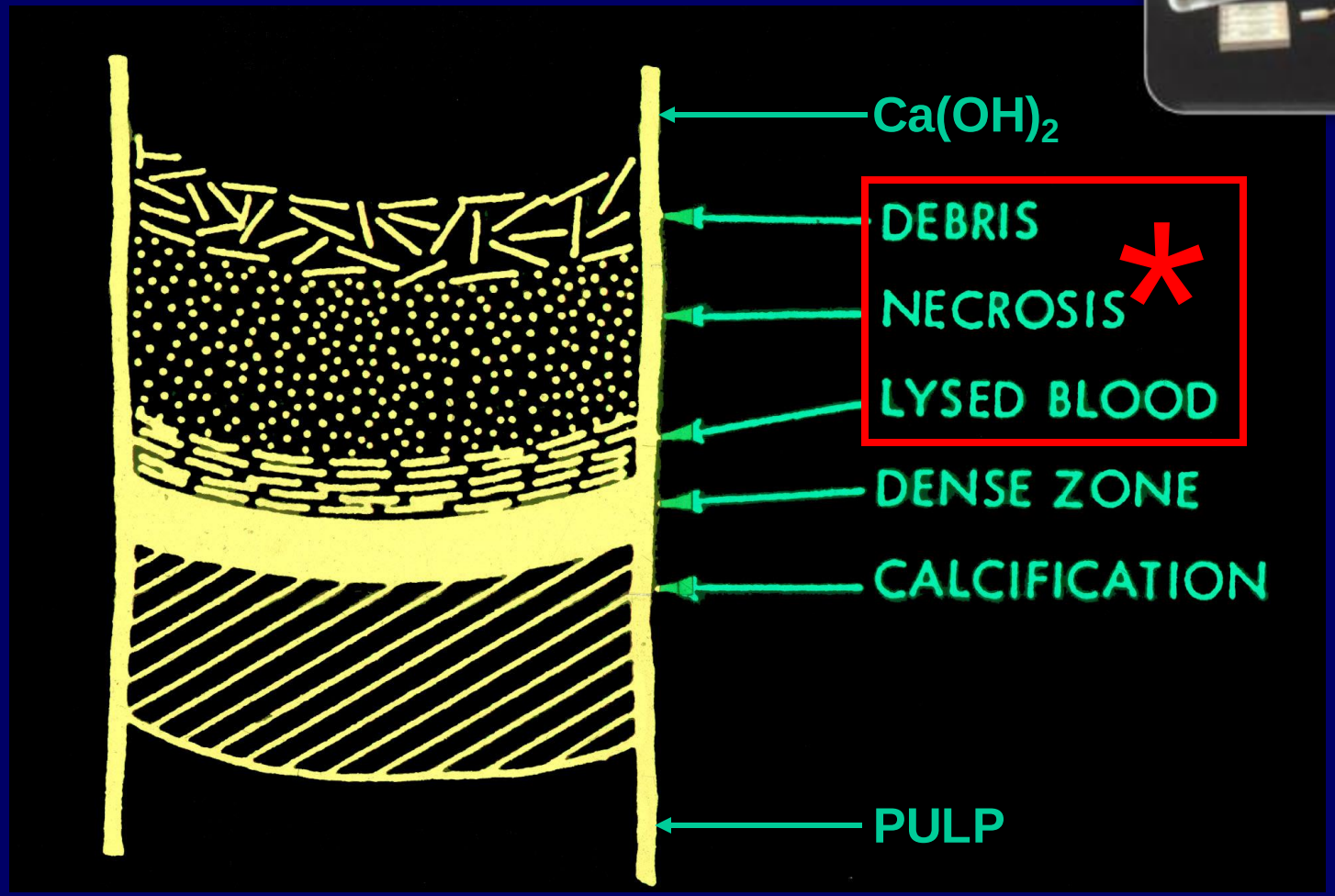
Calcium Hydroxide

- Very commonly used material
  - Well researched and supported
- But usually leads to:
  - Pulp canal calcification, or
  - Diffuse calcifications throughout the root canal

➔ *Both make future endodontic treatment very difficult, or even impossible*

- **Typical healing response with $Ca(OH)_2$**

(Clarke 1970)



Recommendation

- Success may be increased by using an anti-inflammatory dressing followed by calcium hydroxide
  - Russo *et al* 1982

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- Ledermix cement:

- Triamcinolone - 0.67 %
- Calcium hydroxide - 33.4 %
- Zinc oxide-eugenol - 47.2 %

  - Keeps options open for future treatment - if required

Ledermix cement

- Triamcinolone - 0.67 %
- Calcium hydroxide - 33.4 %
- Zinc oxide-eugenol - 47.2 %

Triamcinolone

- Anti-inflammatory agent
  - ➔ 70% released by the end of day 1
  - ➔ Rest by end of day 3 (Hume & Kenney - *JoE* 1981)

Calcium hydroxide

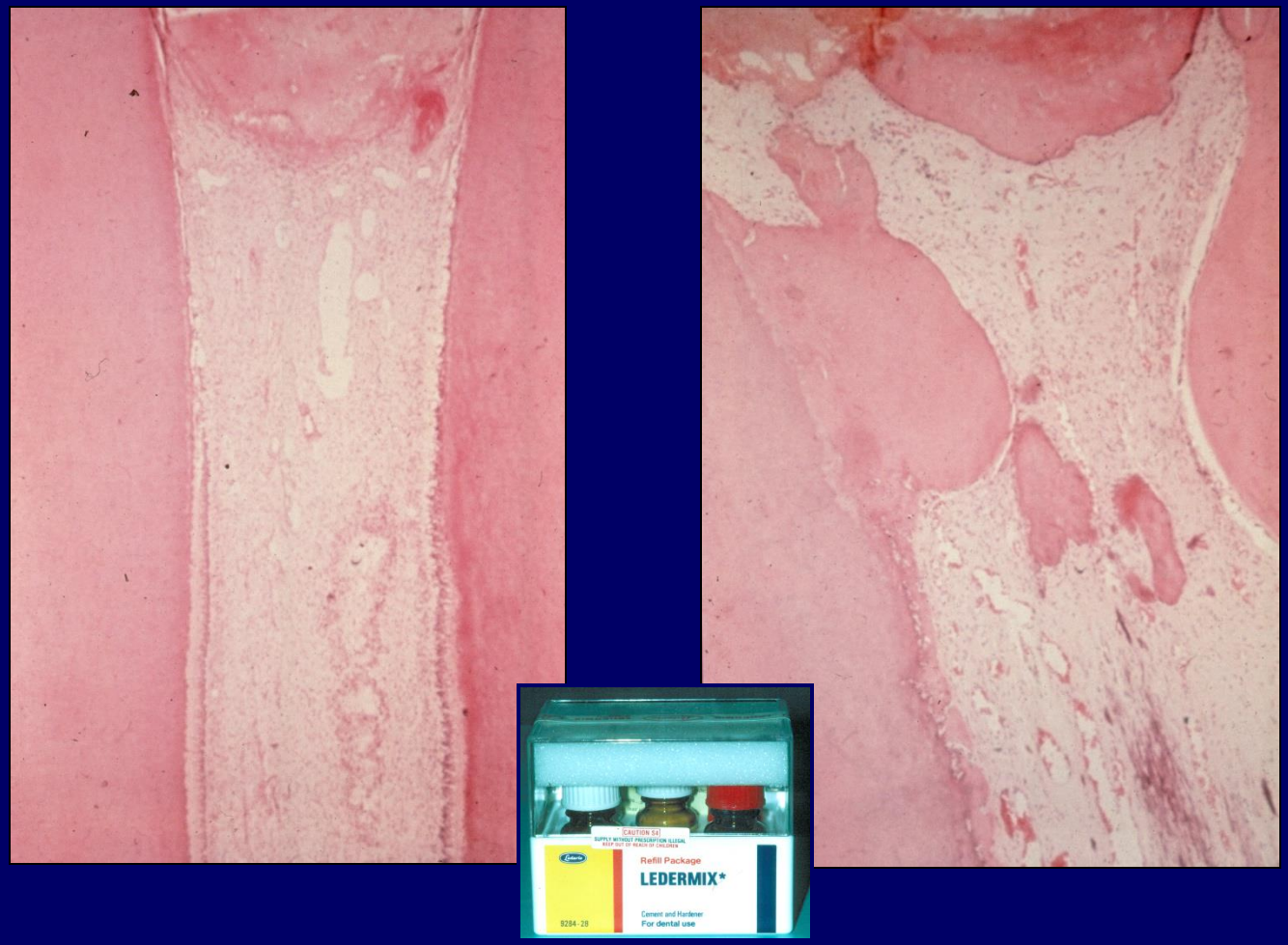
- Sedative and promotes dentine repair (numerous studies)

Zinc oxide - Eugenol

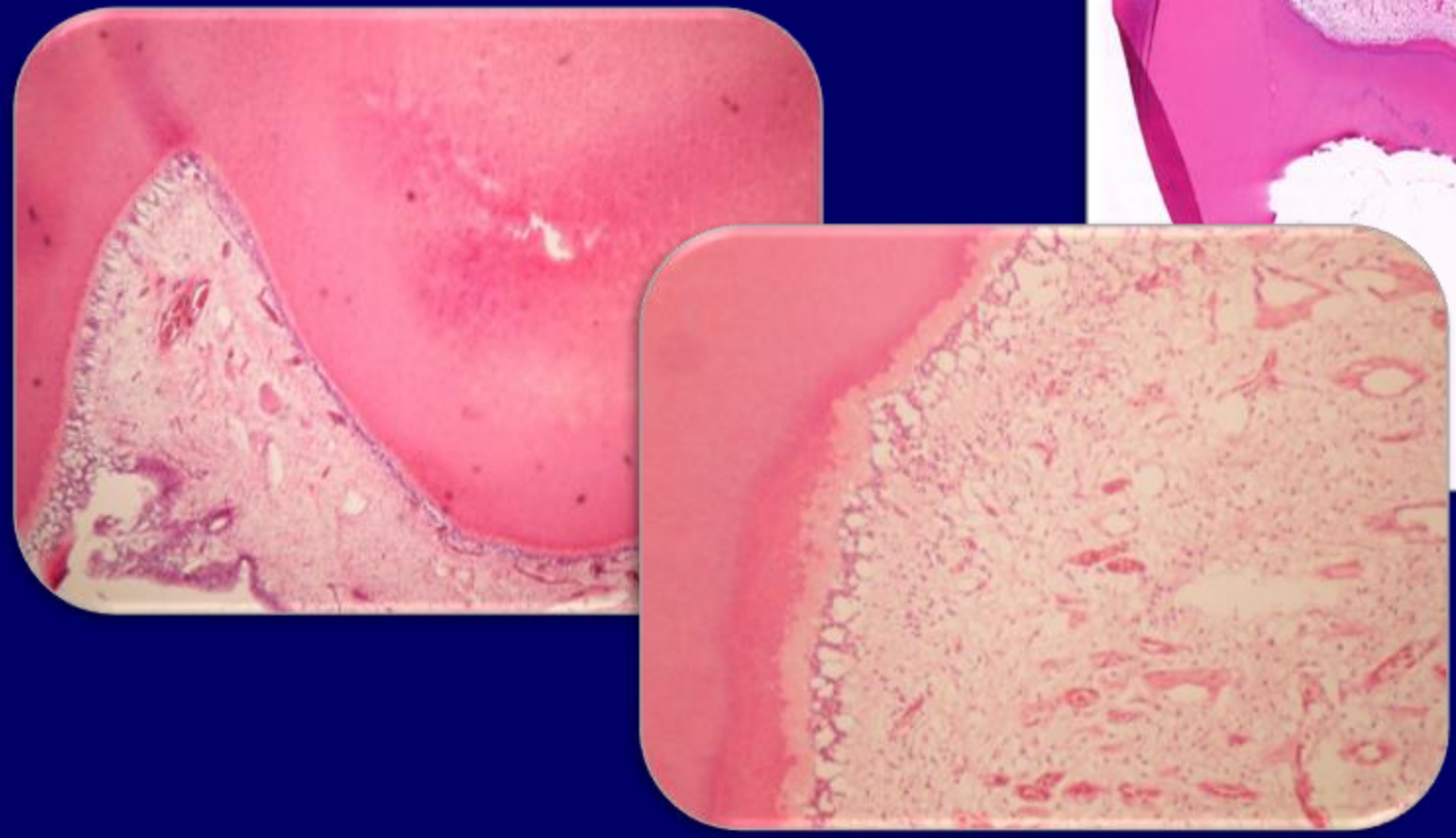
- Anti-inflammatory and anti-bacterial
  (Hume 1984, 1986, 1987; Brannström 1979)

- **Typical healing response - Ledermix cement**

Robertson 1977



Ledermix Cement
- indirect pulp cap




DENTSPLY
TULSA DENTAL
PRO ROOT® MTA
Mineral Trioxide Aggregate
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• One Visit Pulp Capping
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Distributed by
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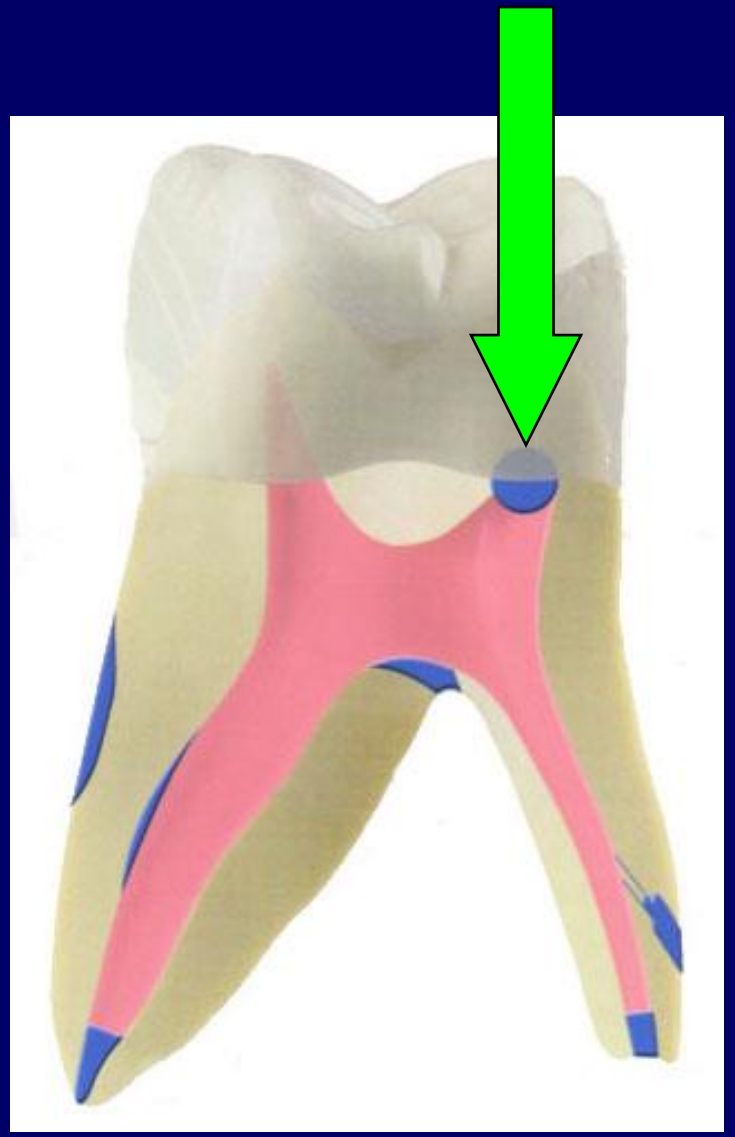
REF A 0405 000 001 00



Clinical, radiographic and histological analysis of the effects of MTA used in direct pulp capping and pulpotomies of primary teeth

Caicedo R, Abbott PV, Alongi DJ, Alarcon MY.

Aust Dent J 2006; 51: 297-305.

Pulp Treatment with ProRoot™ (MTA)

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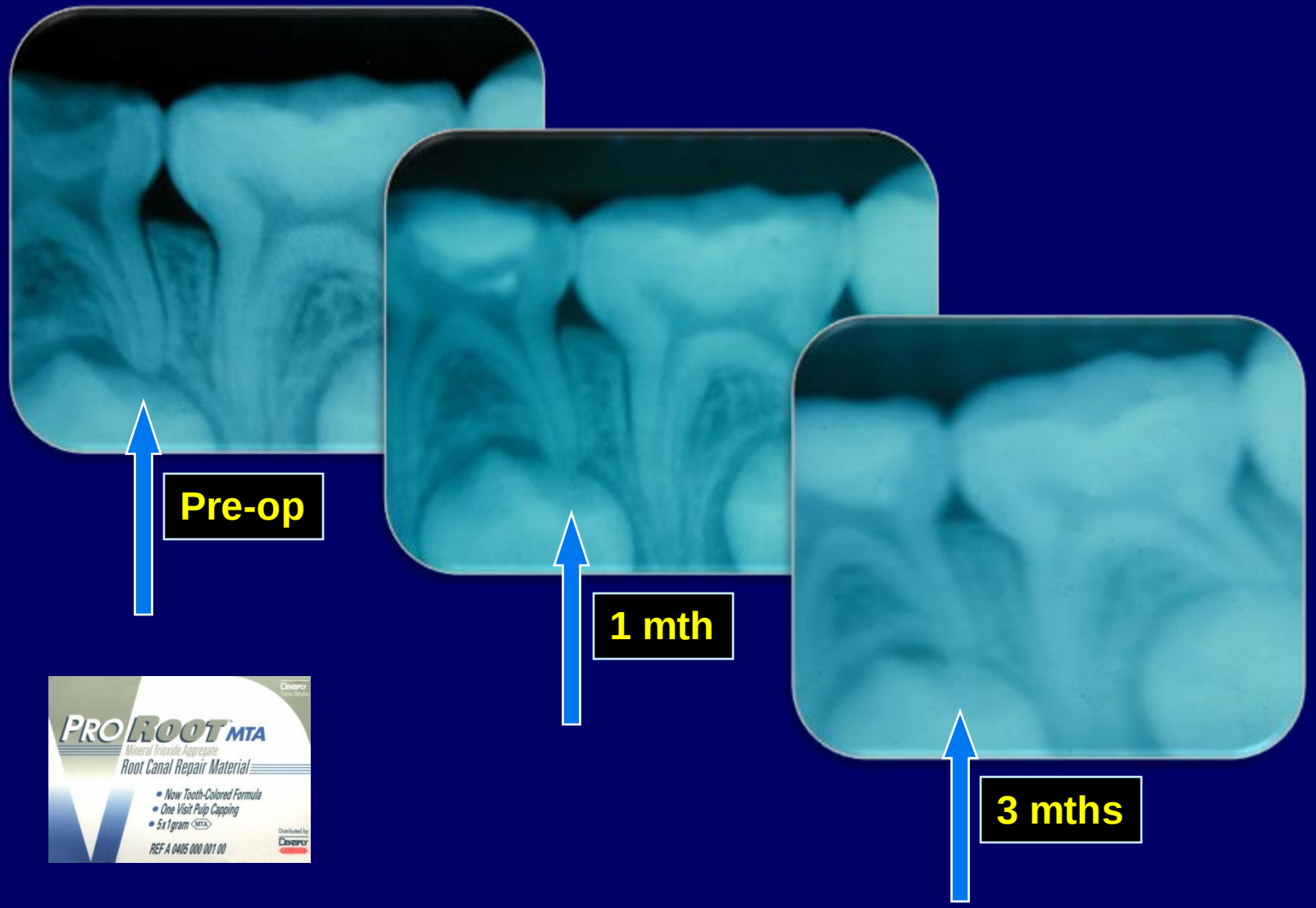
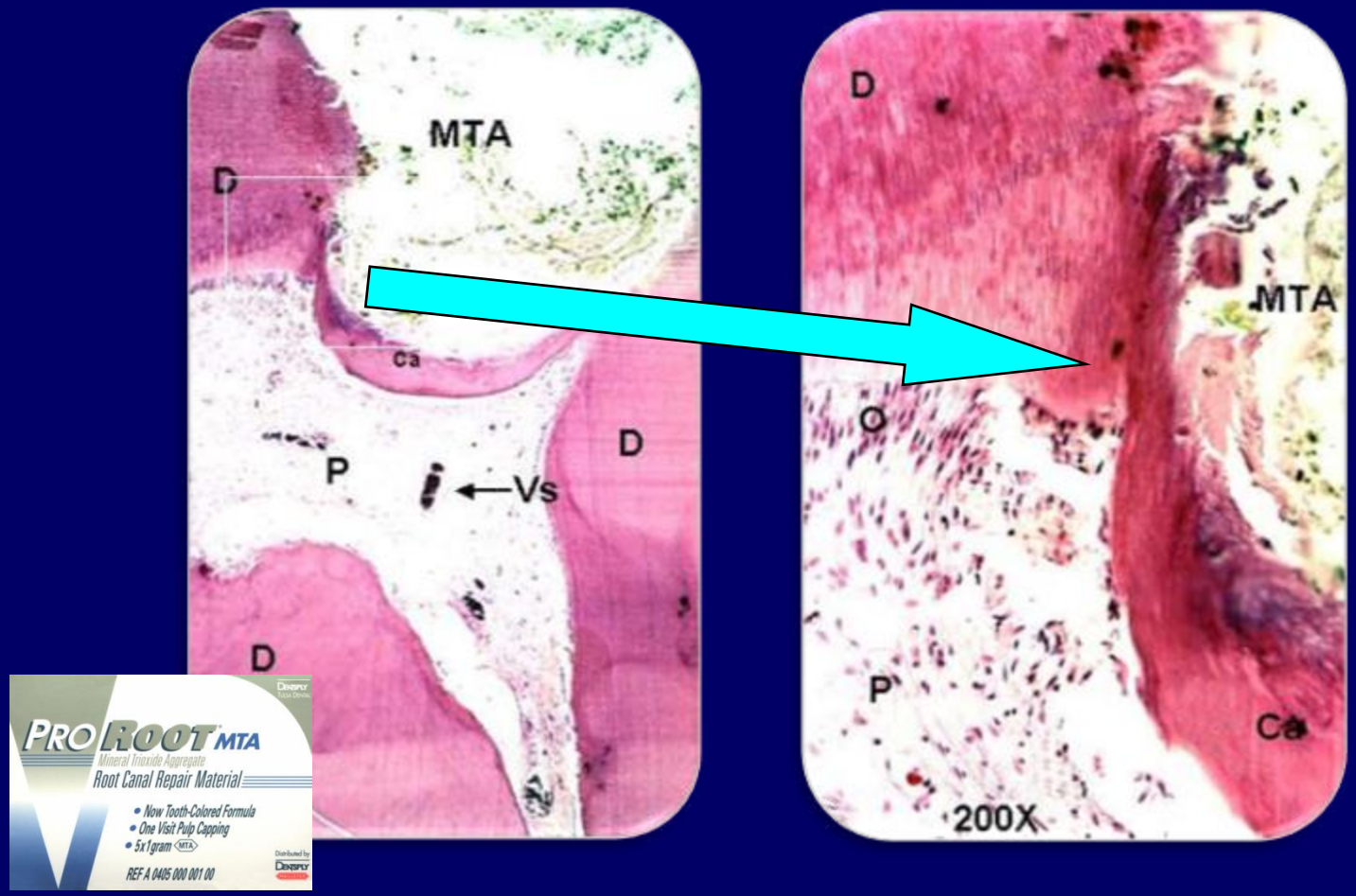


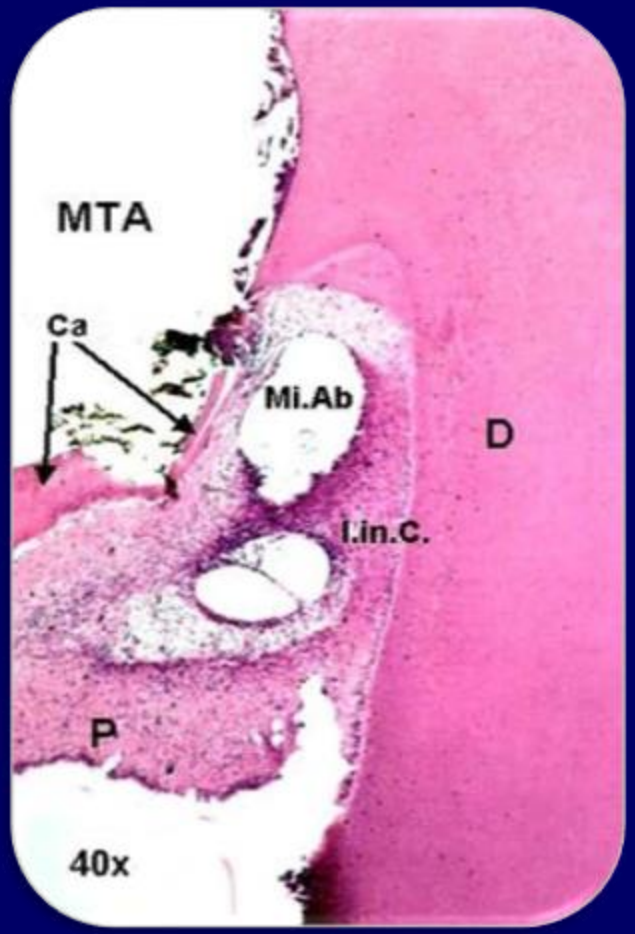
Direct Pulp Cap with ProRoot™ (MTA)

Hard tissue formation; No inflammation



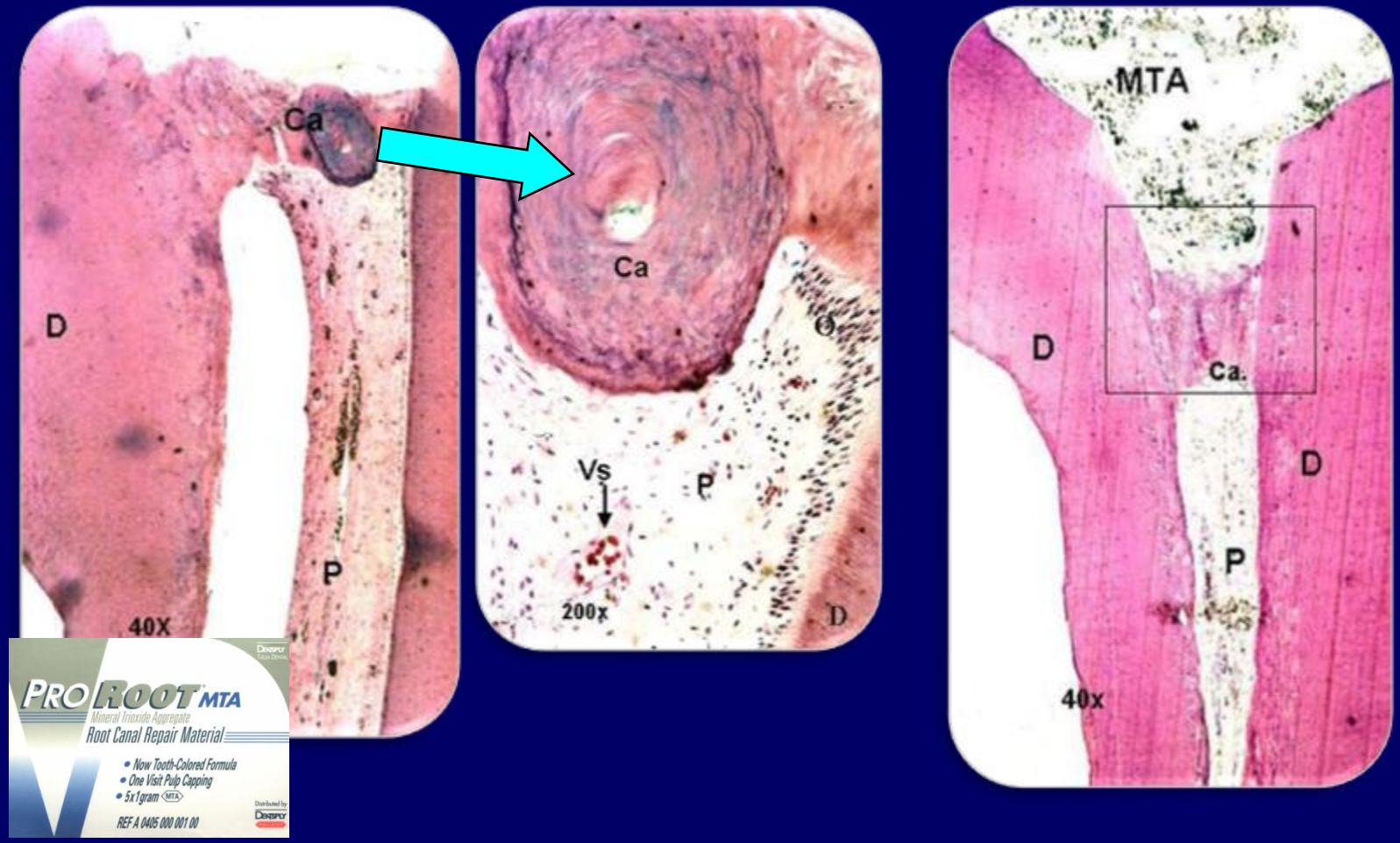
Direct Pulp Cap with ProRoot™ (MTA)

Hard tissue formation;
Chronic inflammation; Micro-abscess



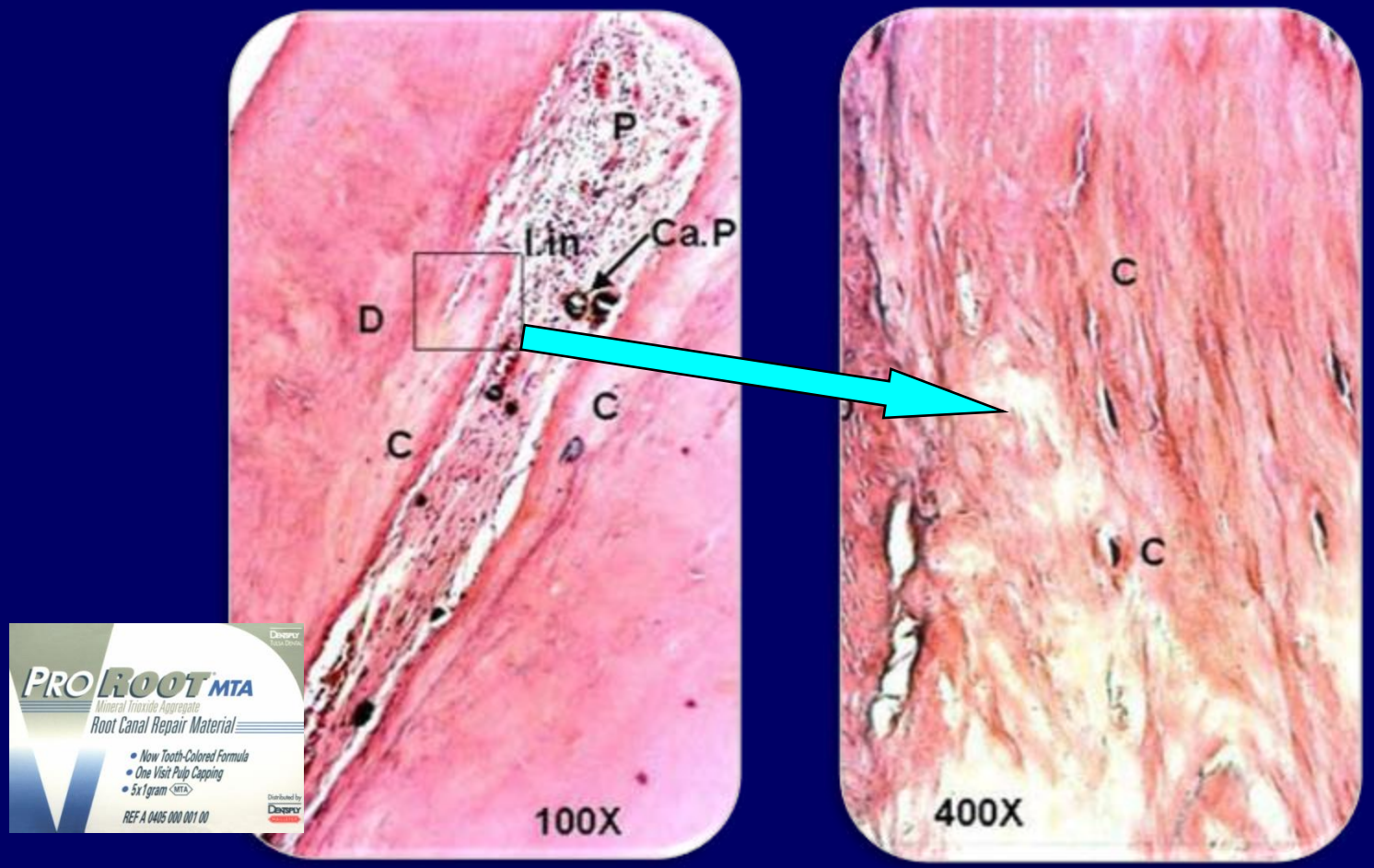
Pulpotomy with ProRoot™ (MTA)

Hard tissue formation; No inflammation



Pulpotomy with ProRoot™ (MTA)

Intra-pulpal calcifications; Some chronic inflammation



INTERNATIONAL
ENDODONTIC JOURNAL

doi:10.1111/iej.12225

Randomized control trial comparing calcium hydroxide and mineral trioxide aggregate for partial pulpotomies in cariously exposed pulps of permanent molars

P. Chailertvanitkul[1], J. Paphangkorakit[1], N. Sooksantisakoonchai[1], N. Pumas[1], W. Pairojamornyoot[1], N. Leela-apiradee[1] & P. V. Abbott[2]

[1]Faculty of Dentistry, Khon Kaen University, Khon Kaen, Thailand; and [2]School of Dentistry, The University of Western Australia, Nedlands, WA, Australia

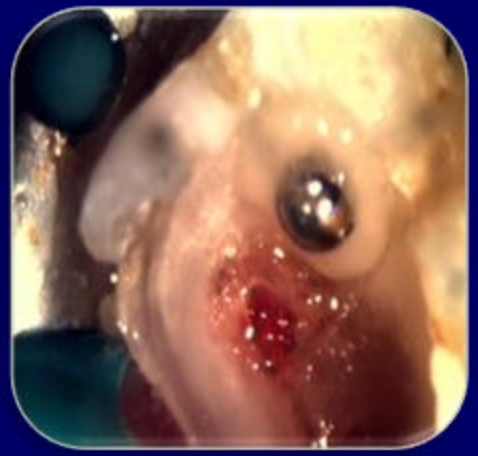
- 84 first permanent molars
  - Reversible pulpitis
  - Carious pulp exposures
- Patients aged 7 – 10 years old

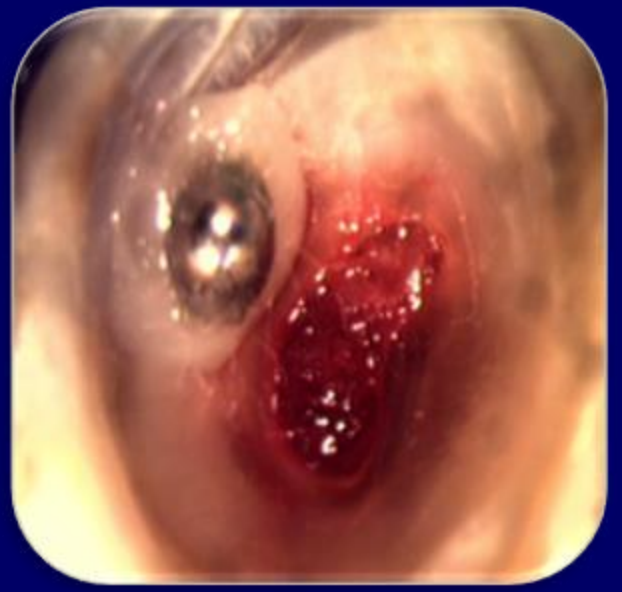
MTA –v– $Ca(OH)_2$ Partial Pulpotomies

- Cvek partial pulpotomy
  - Rubber dam, aseptic technique used
  - $Ca(OH)_2$ (Dycal) or MTA placed on pulp
  - Then Vitremer and amalgam
  - Reviewed for 2 years

INTERNATIONAL ENDODONTIC JOURNAL

Randomized control trial comparing calcium hydroxide and mineral trioxide aggregate for partial pulpotomies in cariously exposed pulps of permanent molars





MTA –v– $Ca(OH)_2$ Partial Pulpotomies

- More unfavourable outcomes when pulp exposure > 5 mm
- Median survival time: 24 months
- No difference between $Ca(OH)_2$ and MTA


INTERNATIONAL ENDODONTIC JOURNAL

Randomized control trial comparing calcium hydroxide and mineral trioxide aggregate for partial pulpotomies in cariously exposed pulps of permanent molars

Some Treatment Dilemmas

- **Pulp Exposures**
  - ➔ **Trauma**
  - ➔ **Caries**
    - ***When to do endodontic treatment?***
    - ***What are the alternatives?***
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CHOICES:

- **Calcium hydroxide**
- **Corticosteroid / Antibiotic**
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