Pulpotomy as a definitive treatment for permanent teeth:

Contemporary approach for the management of deep caries

Ashraf Fouad, DDS, MS

The National Dental Practice-Based Research Network

The nation's network

2022

Investigation

Check for updates

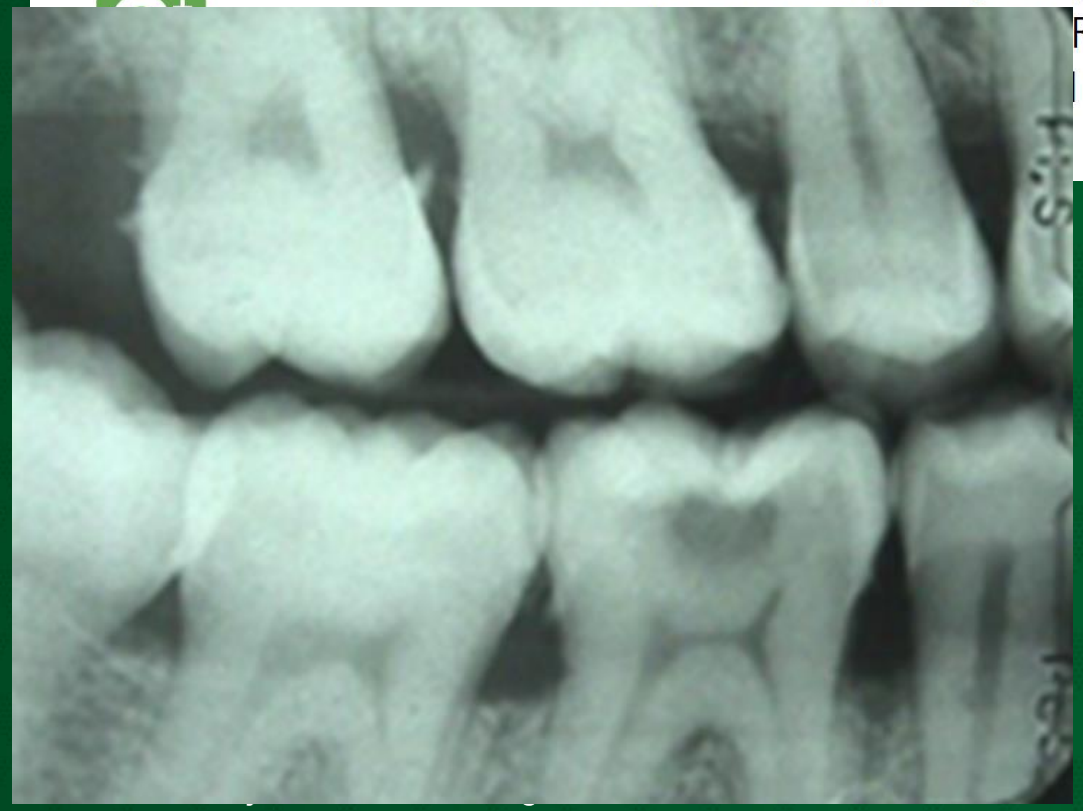
ADA CE Online

ADA American Dental Association

Deep caries removal strategies

Findings from The National Dental Practice-Based Research Network

M. Marianne Jurasic, DMD, MPH; Suzanne Gillespie, MS; Pina Sorbara, BACS; Janet Clarkson, BDS, PhD; Craig Ramsay, PGD, PhD; Denis Nyongesa, MS; RDH; Gregg H. Gilbert, DDS, MBA; William M. Vollmer, PhD; for Collaborative Group



Concordance with International Caries Consensus Collaboration (ICCC):

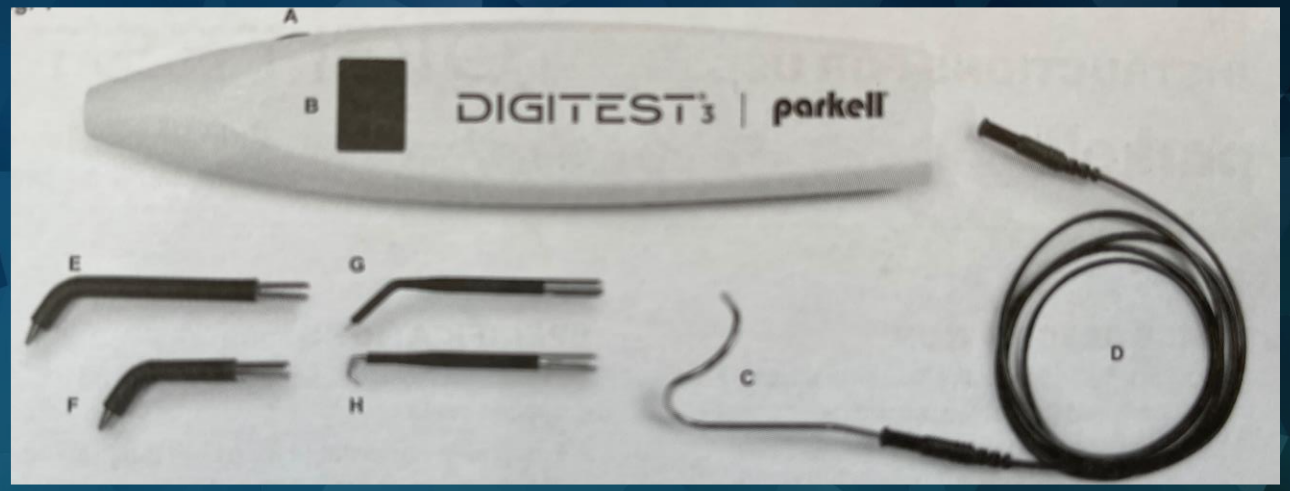
Asymptomatic = 62%

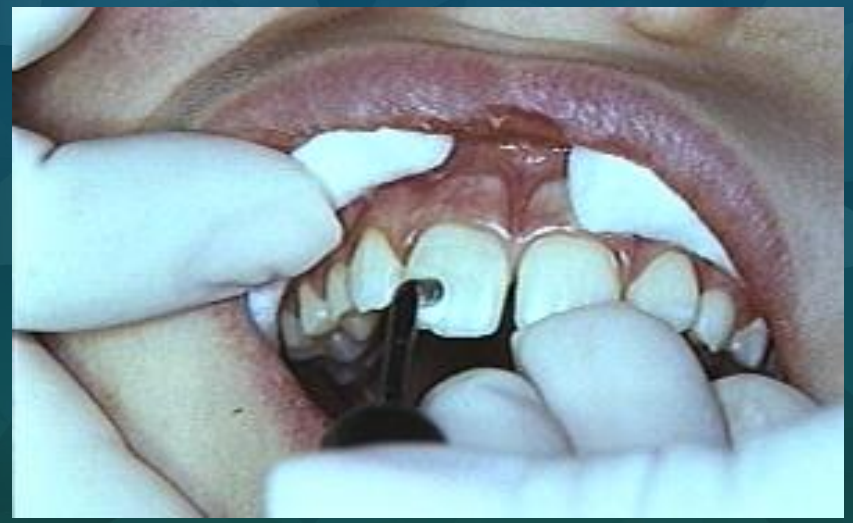
Symptomatic = 49% ($p<0.05$)

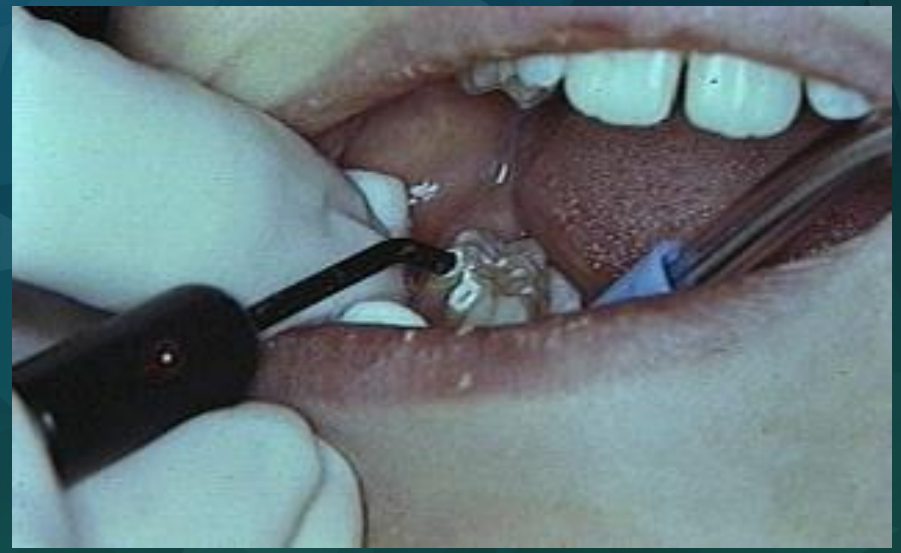
Pulp Testing

Endo Ice

Electric Pulp Testing







Diagnostic Accuracy of 5 Dental Pulp Tests: A Systematic Review and Meta-analysis

Anshul Mainkar, DDS, and Sahng G. Kim, DDS, MS†*

J Endod 2018

N=28 studies

Accuracy:

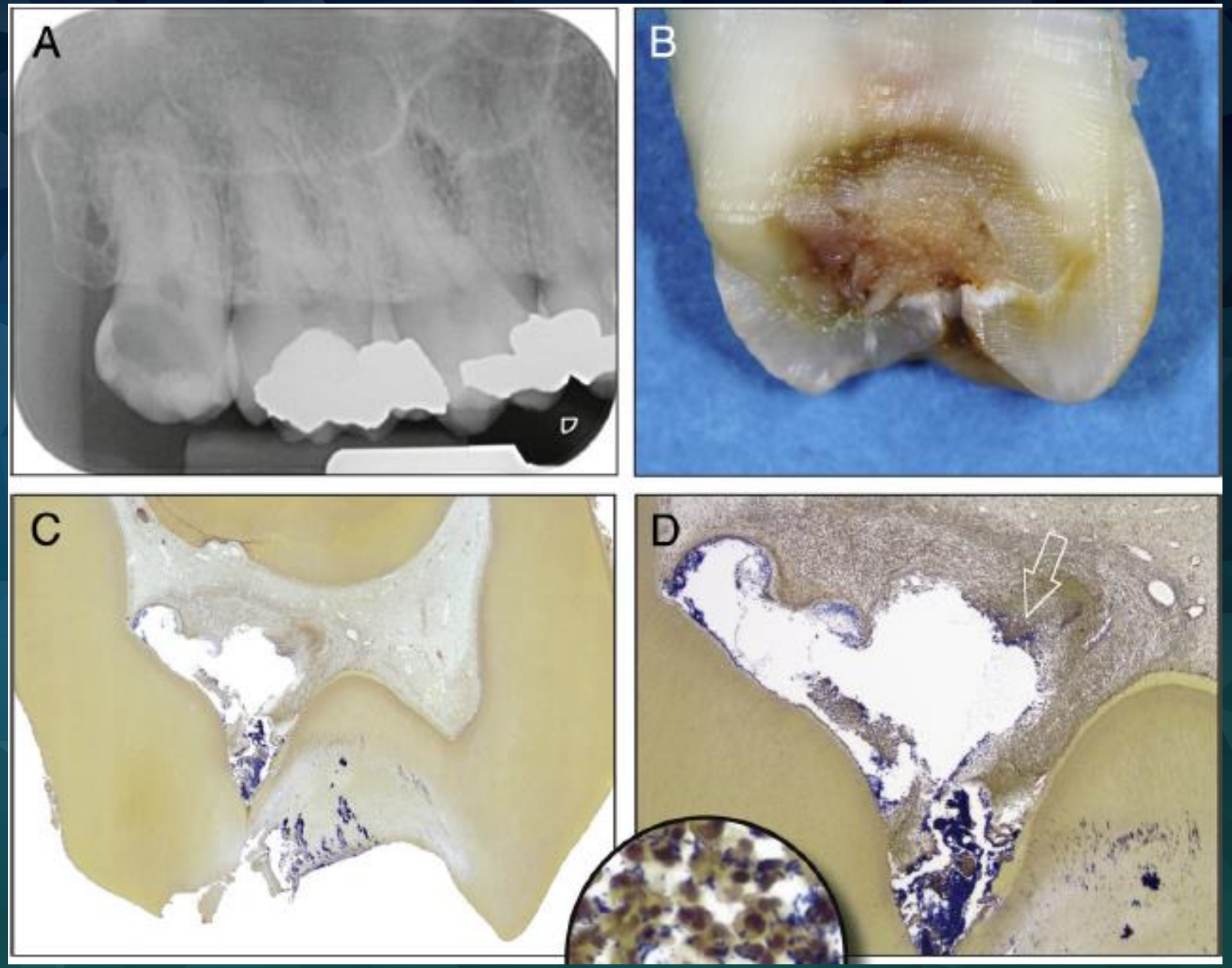
- **Cold Testing = 84%**
- **Electric Pulp Testing = 82%**

Symptomatic Irreversible pulpitis and normal apical tissues: Diagnosis

Restorable permanent teeth with signs and symptoms of irreversible pulpitis and normal apical tissues

- Sharp pain upon thermal stimulus
- Lingering pain after stimulus removed (>30secs)
- Spontaneous pain
- Nocturnal pain
- May be referred or worsened by postural changes
- History of an extensive restoration and/or caries
- No pain to percussion or palpation and no radiolucency

Example of "Symptomatic Irreversible Pulpitis"



Ricucci, Loghin & Siqueira, JOE 2014

Painless Pulpitis

Is pulpitis painful?

IEJ 2002

P. L. Michaelson & G. R. Holland

Division of Endodontics, School of Dentistry, University of Michigan, Ann Arbor, MI, USA

- N= 2202 Maxillary Anterior Teeth Endodontically Treated for Pulp Necrosis and AP
- 40% had no documented history of spontaneous or evoked pain at any time
- Patients aged >53 years had experienced Painless Pulpitis significantly more than those <33 years

So, what is true “Irreversible” Pulpitis ?

- Evidence of apical periodontitis (allodynia or radiolucent lesion)
- Bleeding that cannot be controlled with hypochlorite pellet (>10 min.)
- Evidence of partial necrosis observed in the pulp
- Internal resorption

ORIGINAL ARTICLE

2023

INTERNATIONAL ENDODONTIC JOURNAL | WILEY

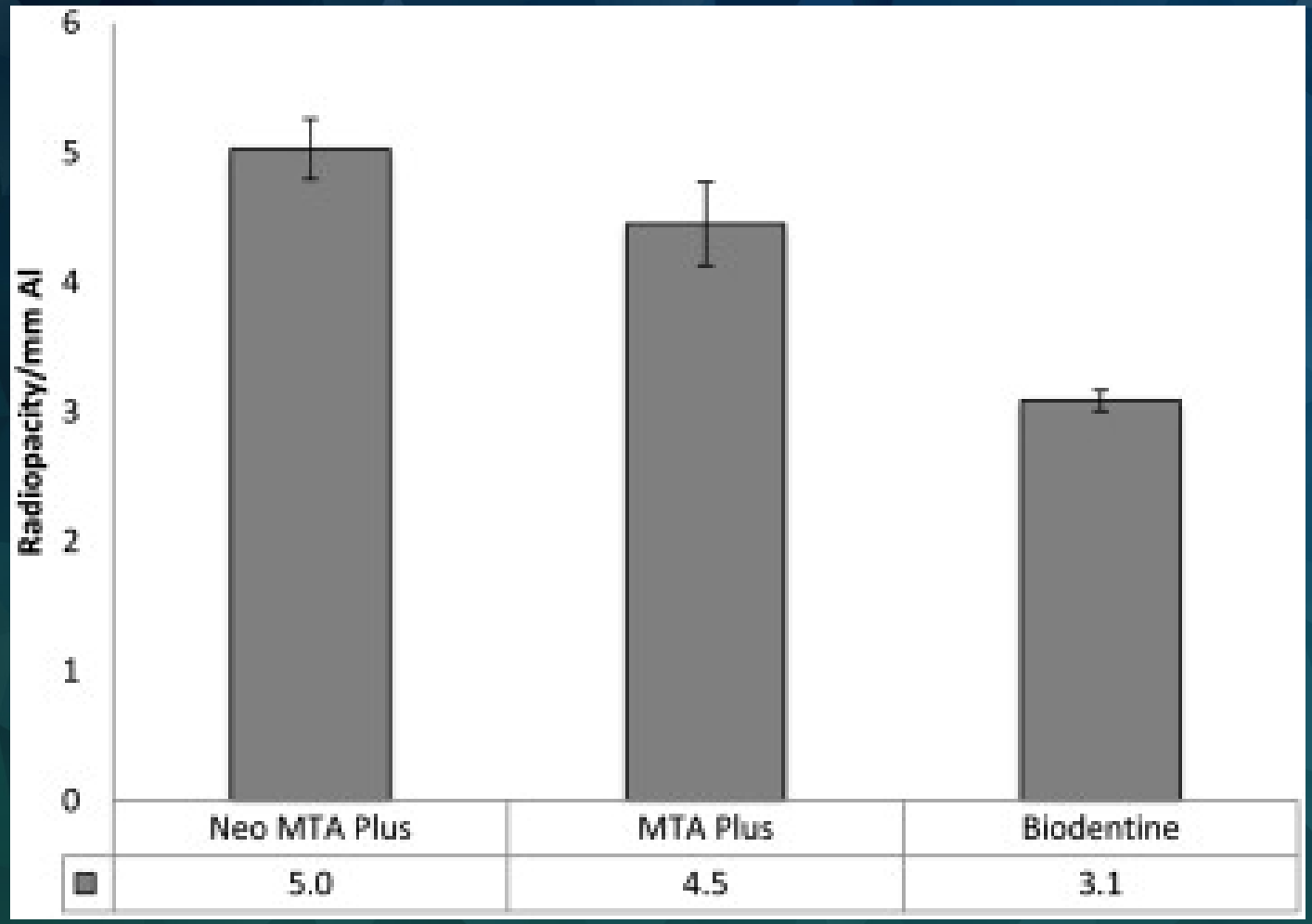
One-year outcome of selective caries removal versus pulpotomy treatment of deep caries: A pilot randomized controlled trial

S. K. X. Chua[1,2] | Y. F. Sim[2] | W. C. Wang[1,2] | B. Y. Y. Mok[1,2] | V. S. H. Yu[1,2,3]

Months	0	2	4	6	8	10	12
Pulpotomy (55)	0	0	0	1	1	1	1
SCR (58)	0	0	0	5	6	6	8

Pulpotomy significantly better than Selective Caries Removal (p=0.025)

Radiopacity

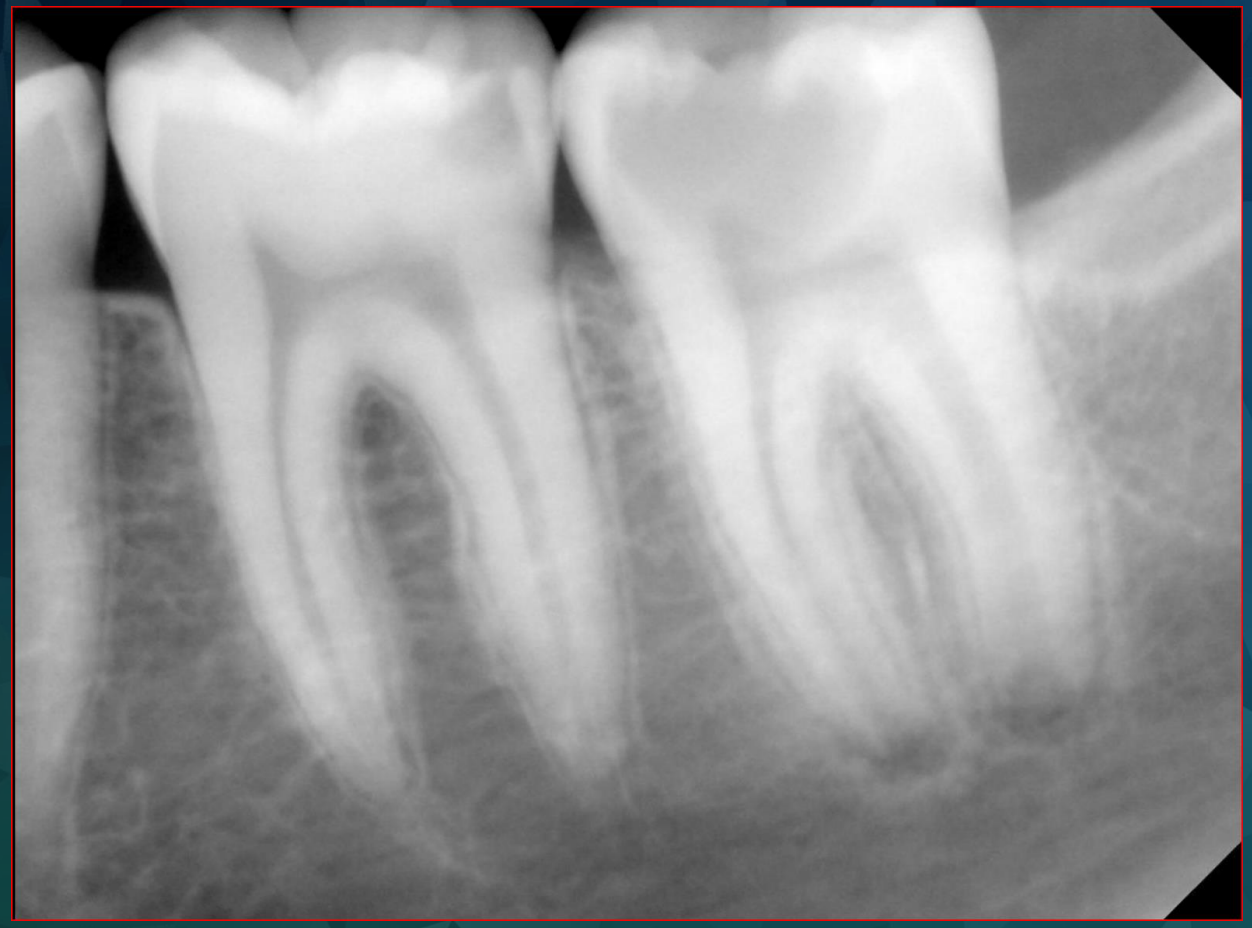


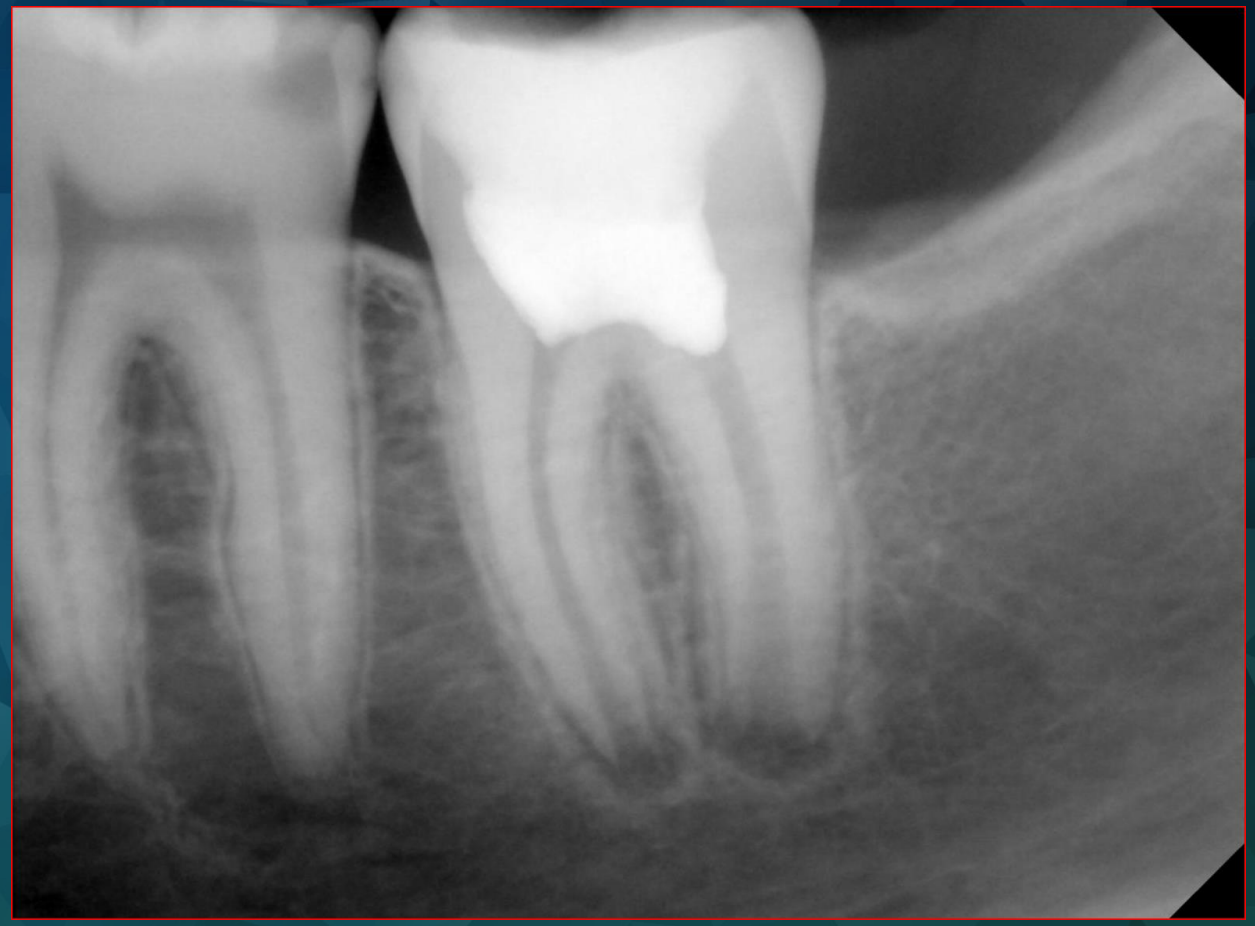
Camilleri, JOE 2015

Therapeutic pulpotomy as a permanent solution

- Complete removal of the coronal pulp
- Application of a biomaterial directly onto the pulp tissue at the level of the root canal orifice(s), prior to placement of a permanent restoration
  - Use of tricalcium silicate cement
    - Mix 30 secs 4000 rpm
    - Setting for 9-12 min

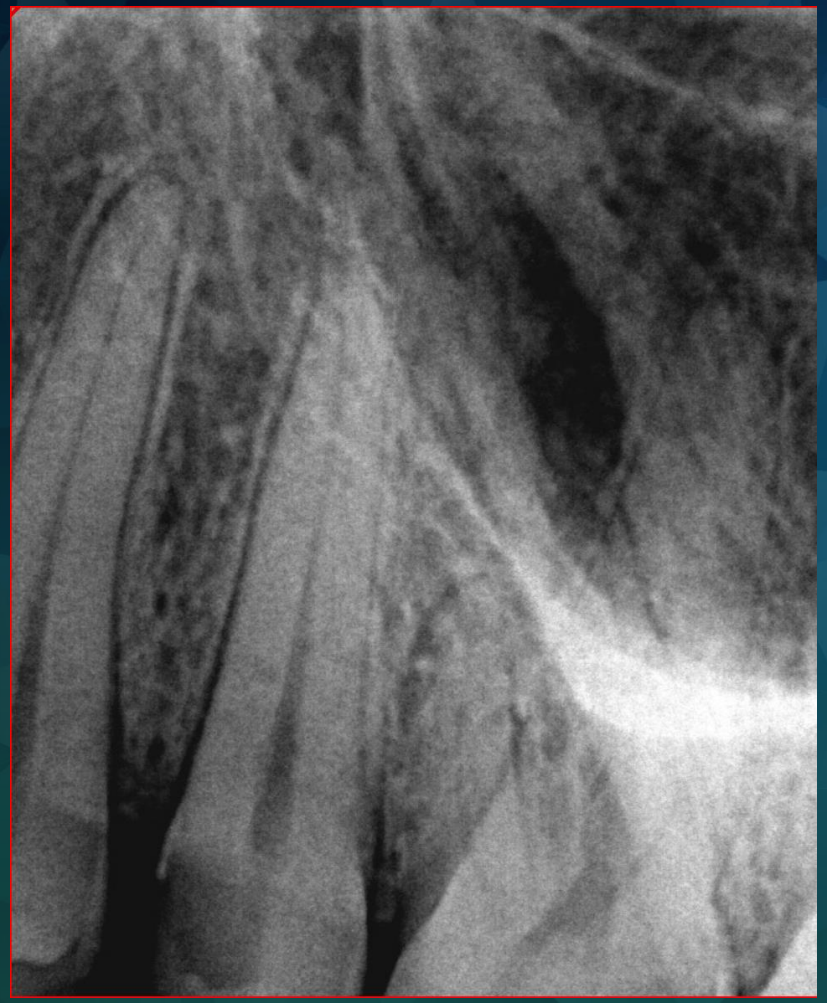
Therapeutic Pulpotomy

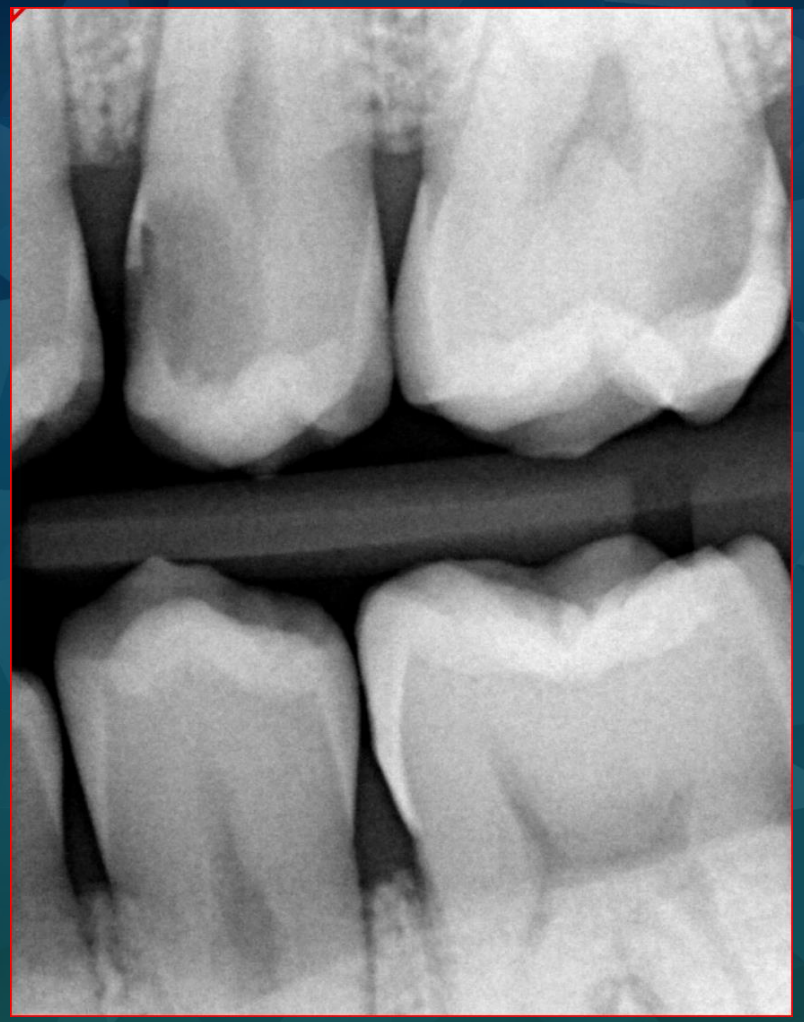


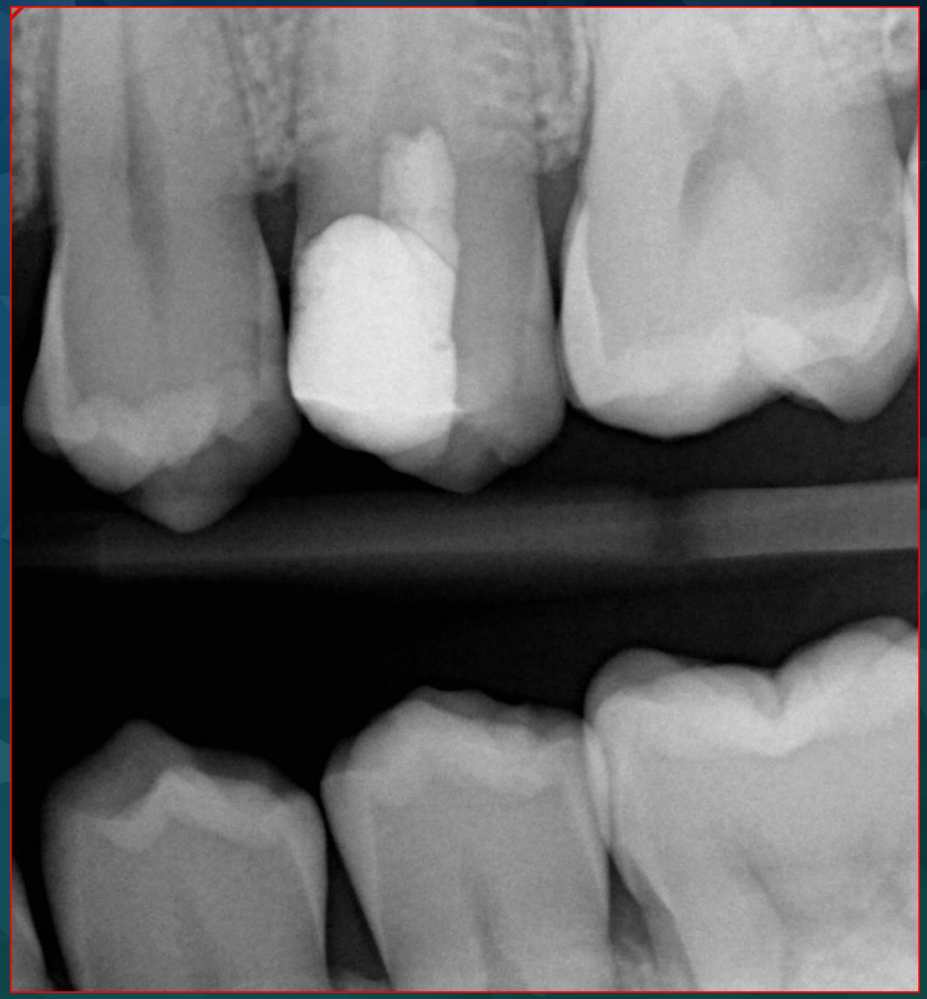


Courtesy Dr. Sally Liu

Therapeutic Pulpotomy

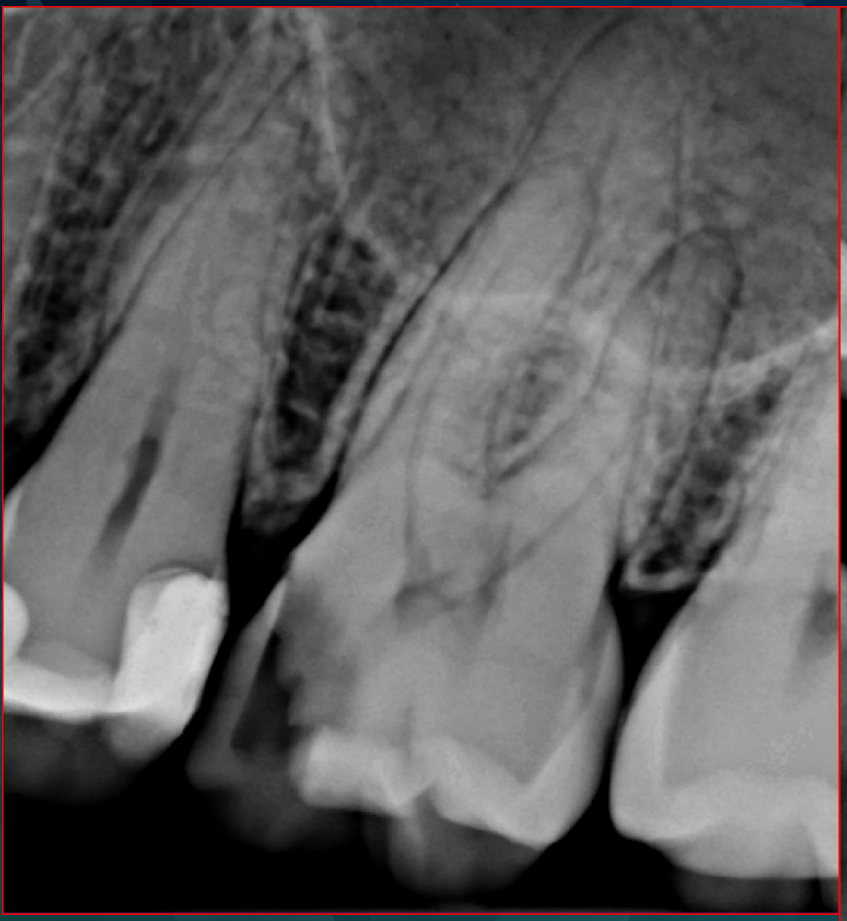


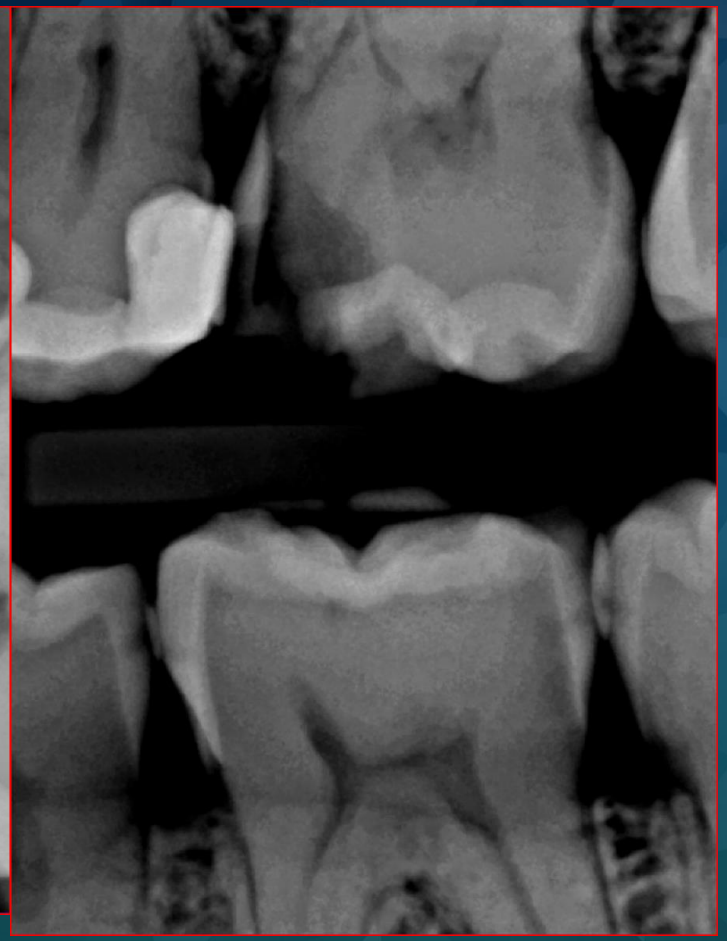


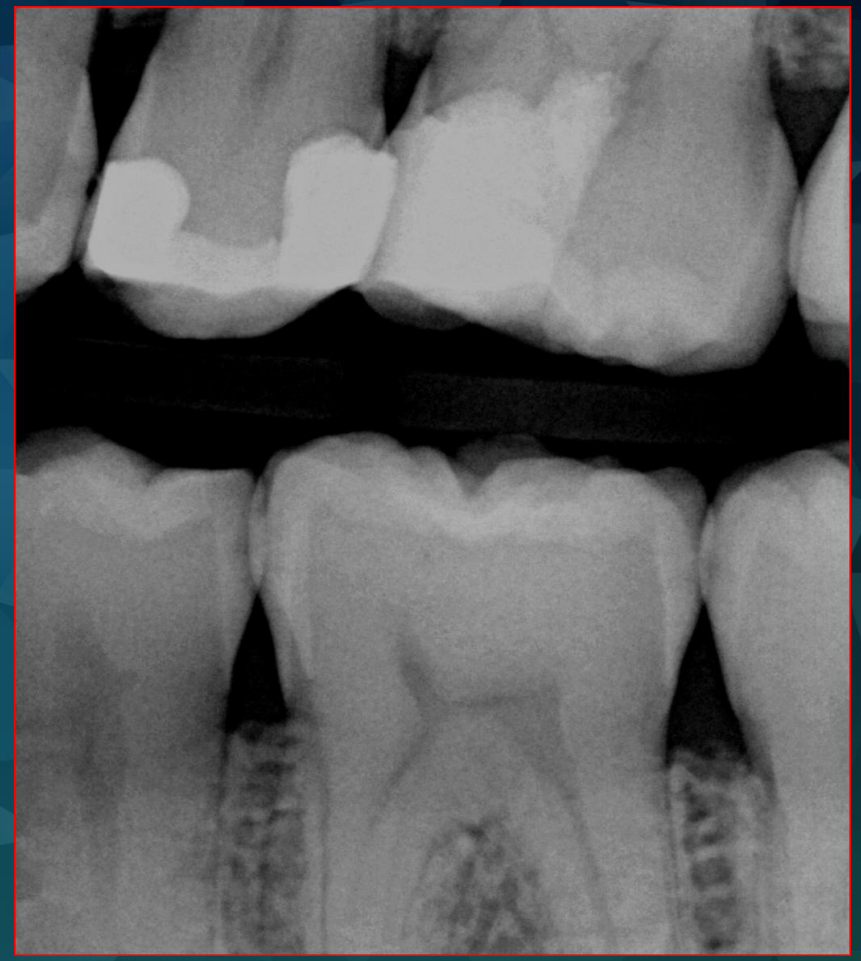


Courtesy Dr. Chris Hawkins

Therapeutic Pulpotomy







Courtesy Dr. Chris Hawkins

REVIEW ARTICLE

INTERNATIONAL ENDODONTIC JOURNAL | WILE

Effectiveness of pulpotomy compared with root canal treatment in managing non-traumatic pulpitis associated with spontaneous pain: A systematic review and meta-analysis

Phillip L. Tomson[1] | Juliana Vilela Bastos[2] | Jelena Jacimovic[3] | Aleksandar Jakovljevic[4] | Shaju Jacob Pulikkotil[5] | Venkateshbabu Nagendrababu[6]

N = 8 studies

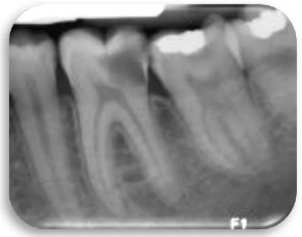
- Average success rate
  - At 12 months:
    - Clinical - 97.4%
    - Radiographic - 95.4%
  - At 36 months:
    - Clinical 94%
    - Radiographic - 88%

The PIP trial in the UK

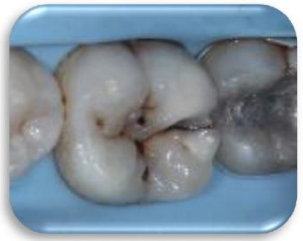
PIP Study

NIHR | National Institute for Health Research · King's College London · University of Dundee · The University Of Sheffield. · University of Aberdeen · University of Liverpool · NHS Education for Scotland · University of Glasgow

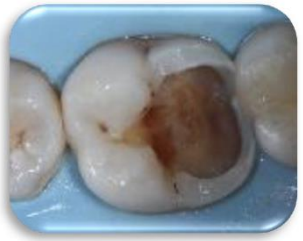
Pulpotomy Procedure



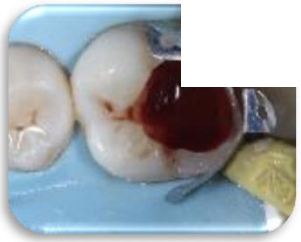
1. LA



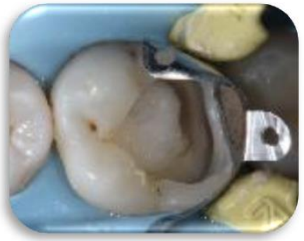
2. RUBBER DAM PLACEMENT
3. DISINFECT TOOTH SURFACE WITH 5% NAOCL



4. EXCAVATE CARIES WITH LOW SPEED BUR
5. PREPARE CAVITY WITH HIGH SPEED BUR UNDER WATER COOLANT
6. RINSE CAVITY WITH NAOCL



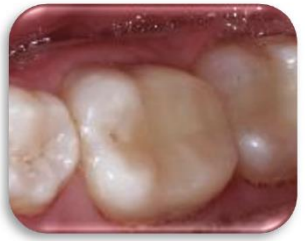
7. & 8. ACCESS & UNROOF PULP CHAMBER
9. DISINFECT PULP CHAMBER WITH 5% NAOCL
10. AMPUTATE EXPOSED PULP TISSUE WITH HIGH SPEED DIAMOND TO THE LEVEL OF THE CANAL ORIFICES
11. IDENTIFY ALL CANAL ORIFICES AND ASSESS BLEEDING



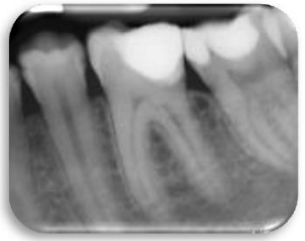
12. ACHIEVE HAEMOSTATIS
APPLY COTTON PELET MOISTENED WITH NAOCL FOR 2 MINS WITH DRY PELLET ON TOP.
- IF BLEEDING PERSISTS RE-APPLY FOR UP TO 5 MINS.
- RECORD BLEEDING TIME.

13. DRY PULP CHAMBER WITH COTTON PELLET
14. REASSESS STATUS IN ALL CANAL ORIFICES

15. MIX BIODENTINE & PLACE INTO CAVITY 3MM LAYER
16. WIAT 12 MINS FOR INTIAL SET



17. APPLY GIC LAYER – ALLOW AT LEAST 2MM SPACE
18. RESTORE WITH COMPOSITE



19. POST-OP RADIOGRAPH

Pulpotomy as a permanent solution

- Current guidelines from the American Association of Endodontists recommends considering pulpotomy for specific cases
- Adoption of pulpotomy remains limited in the US
- We need stronger evidence to guide dentists and improve patient care

Pulpotomy feasibility study

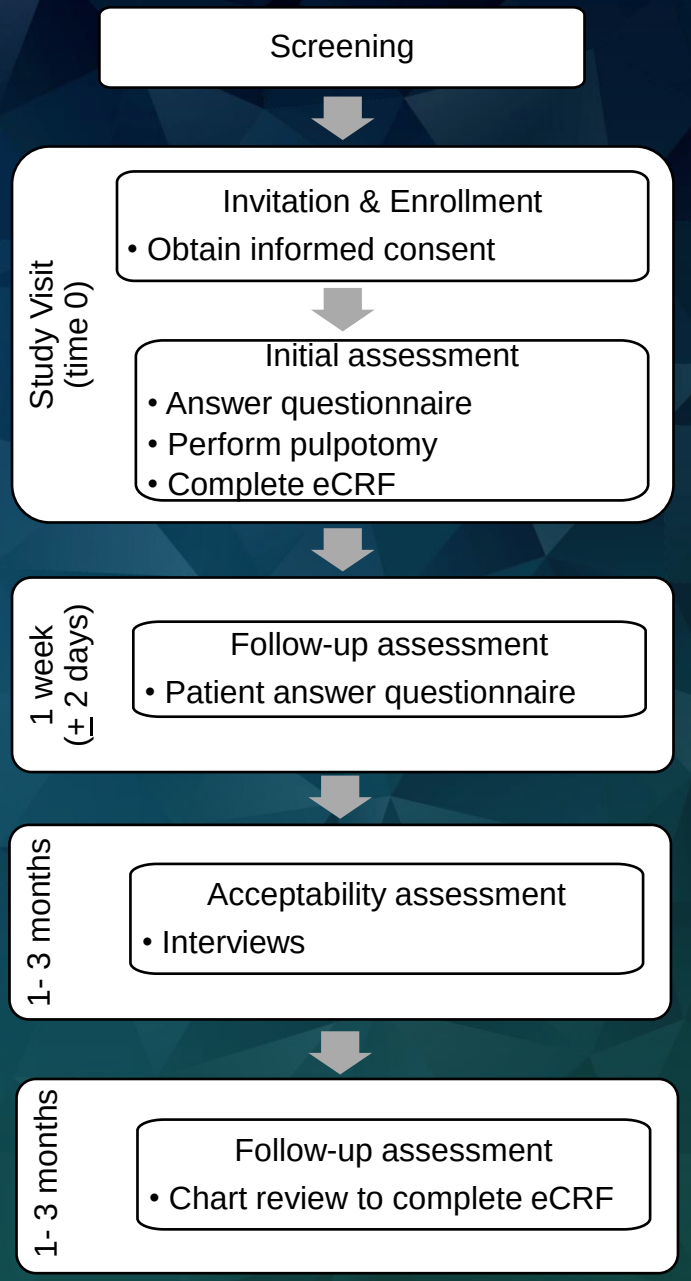
The Network is planning a study on full pulpotomy as an alternative to root canal therapy for permanent teeth with deep dental caries.

Study aims:

- To assess the feasibility of conducting a trial
- To assess acceptability by practitioners and patients
- To estimate the number of patients eligible for the procedure

Study Details

- Develop a clinical protocol and training materials
- Enroll 21 practices
- Train 21 practitioners on pulpotomy using 3-D printed teeth
- Each practice will enroll 5 patients



Training on pulpotomy intervention

Pre-operative peri-apical radiograph

Access cavity

Prepare cavity

Systematically remove carious tissue completely at the cavity periphery then progressively over the pulp, to prevent further bacterial contamination of the pulp

Place rubber dam prior to accessing the pulp chamber

Remove pulp to the level of the radicular/root canal orifices

Use a new sterile bur or sharp sterile excavator with a water coolant

Confirm that root canal pulp is vital

Perform homeostasis and disinfection

Place cotton pellet soaked with 5% sodium hypochlorite over pulp stump for up to 5 min

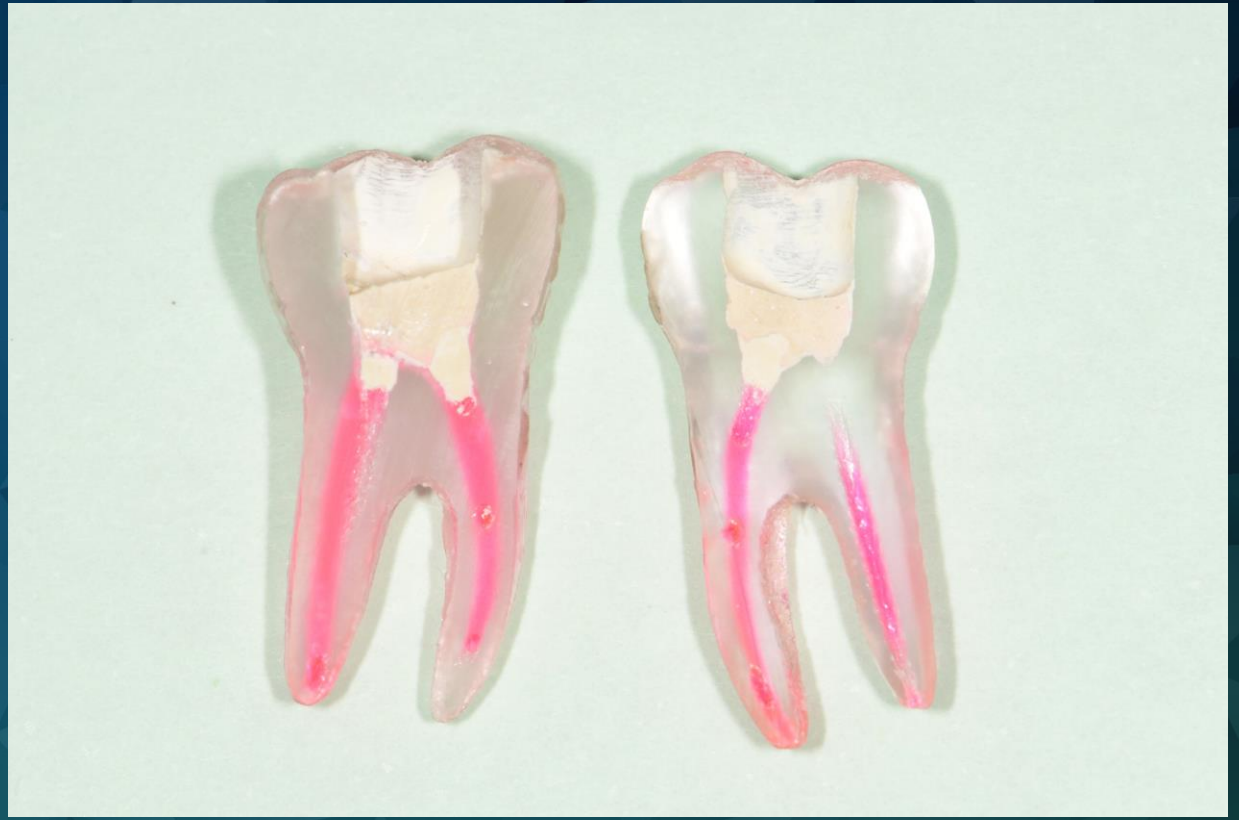
- *If homeostasis not achieved, tooth should undergo pulpectomy and root canal therapy, or extraction, as per the clinician's normal practice*

Place biocement

Hydraulic calcium silicate cement should be placed directly onto the pulp tissue

Restore tooth *as per the clinician's normal practice.*

The tooth is definitively sealed immediately to prevent micro-leakage



Practice on 3-D printed teeth

Study outcomes

	Green	Amber	Red
Recruitment Success: N of practitioners recruited	21	< 16	< 11
Recruitment Success: N of potentially eligible patients	3	1 - 2	< 1
Training Success: Fidelity in full pulpotomy in 3-D teeth	> 75%	50% - 75%	< 50%
Clinical Outcome: Intervention fidelity	> 75%	50% - 75%	< 50%
Clinical success: Patient satisfied with care	> 75%	40% - 75%	< 40%
Follow-up Success: Follow-up CRF completed	> 75%	50% - 75%	< 50%

Potential Benefits

- Contribute to groundbreaking research: Help shape the future of dental care for patients with deep caries.
- Stay ahead of the curve: Gain early access to the latest pulpotomy techniques and training.
- Enhance your knowledge and skills: Improve your confidence in managing pulpitis cases.
- Preserve natural tooth: Patients may avoid the potential discomfort and expense of root canal treatment or extraction.

Questions for breakout session

1. Based on your understanding, what specific factors currently limit the widespread adoption of full pulpotomy as a permanent treatment in the US?
2. How comfortable are you, on a scale from 1-5 (with 1 being not comfortable at all and 5 being very comfortable), performing full pulpotomy procedures on permanent molars using tricalcium silicates?
3. Are there any specific steps or considerations within the procedure that you find will require further clarification?
4. What format of training would you find most beneficial? (e.g., hands-on workshops, online modules, video tutorials, written materials, etc.)
5. Considering your practice workflow and patient demographics, do you foresee any challenges in successfully implementing the pulpotomy intervention in your setting?

The National Dental Practice-Based Research Network

The nation's network