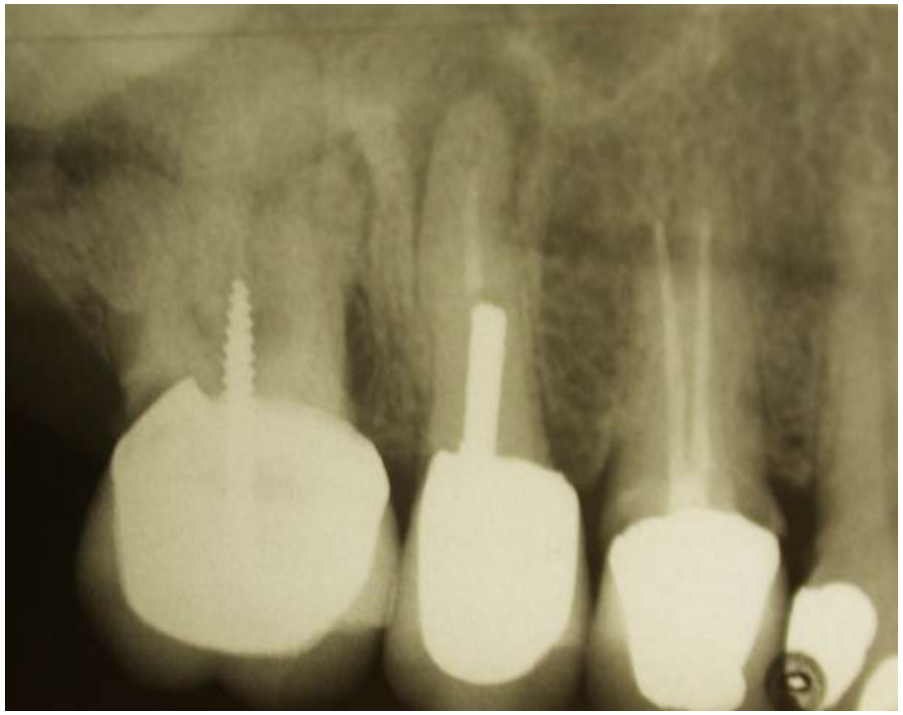
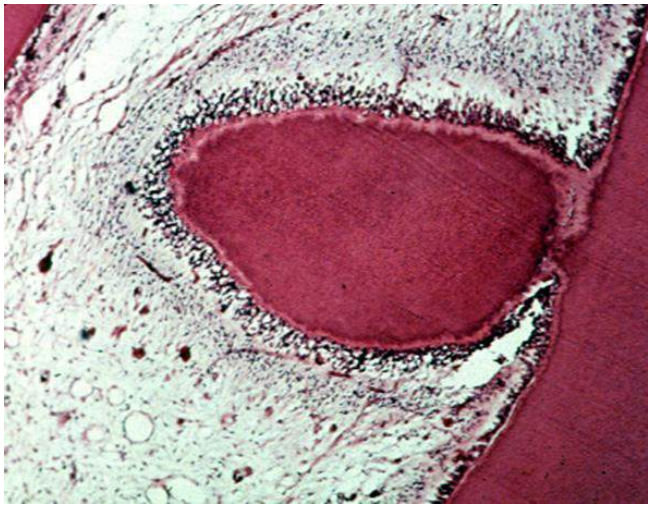
Growing old with endodontics?



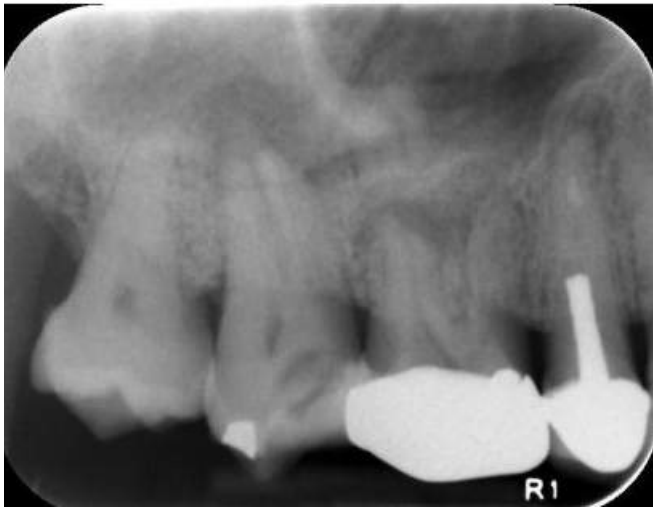


John Whitworth

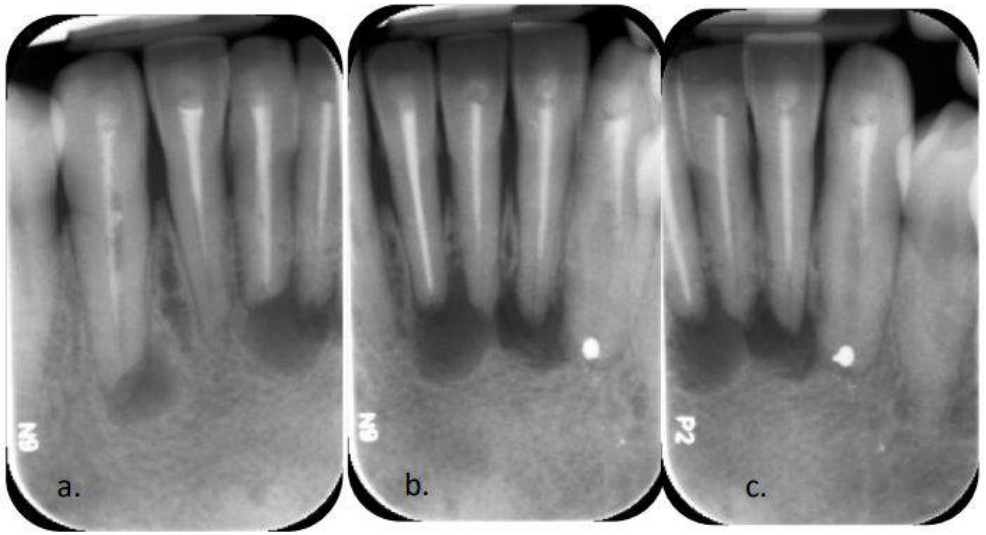
Newcastle University

Newcastle, June 2025

Are we growing old with endodontic disease?

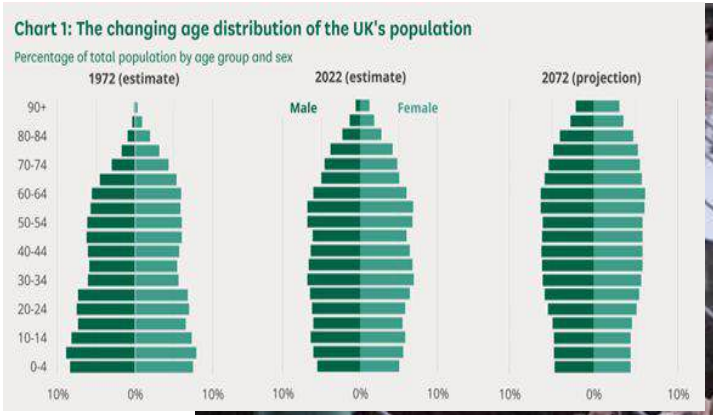


Are you growing old with endodontic treatment & decision-making?



Are we growing old with endo disease?

Demographic change is coming…..



OBR: By 2070, 1 in 4 will be >65

I'll soon be one of them!

We’re ageing with teeth

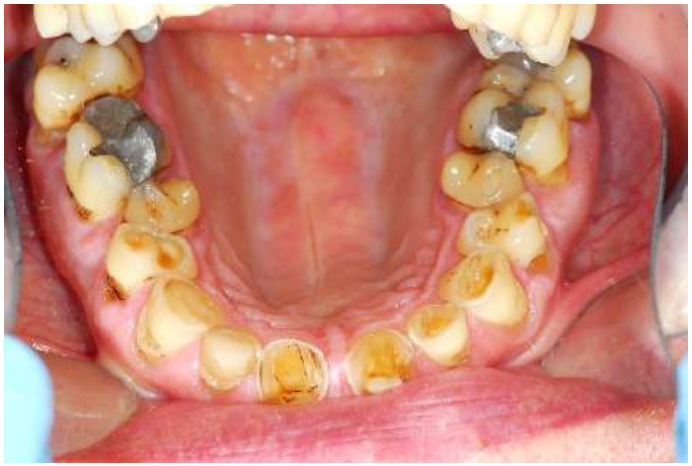
95% English adults

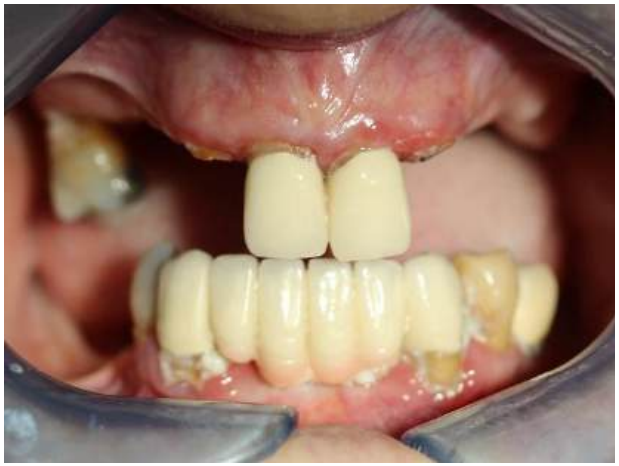
1 or more teeth (Av 25)

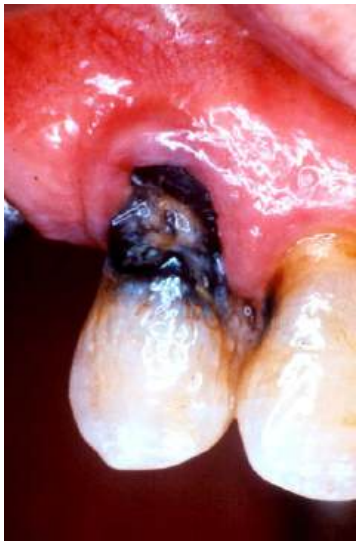
www.gov.uk/government/statistics/adult-oral-health-survey-2021 (Accessed: 19.02.25)

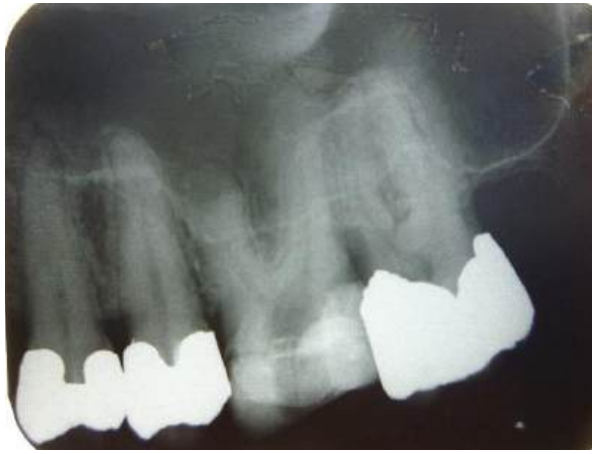
Increasing demand on dental services

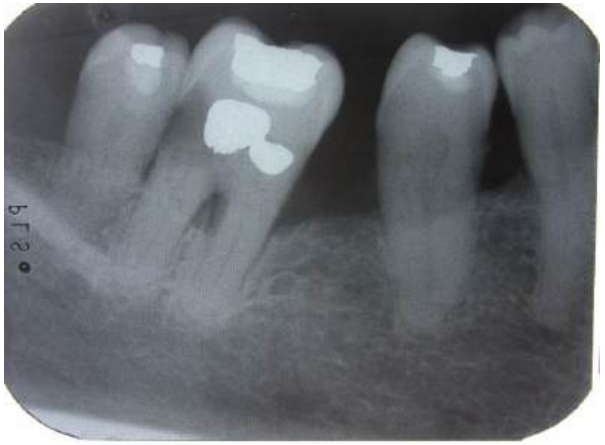
Carrying legacies of dental disease, treatment, failure, replacement……..











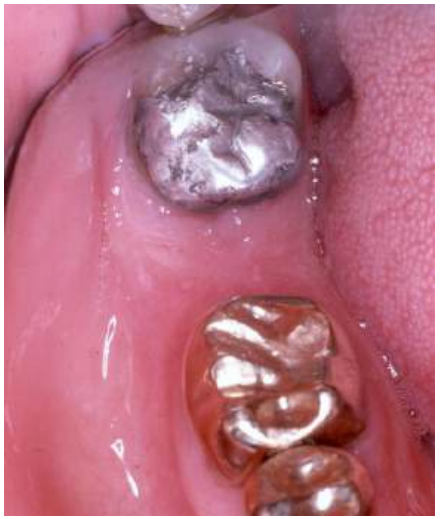
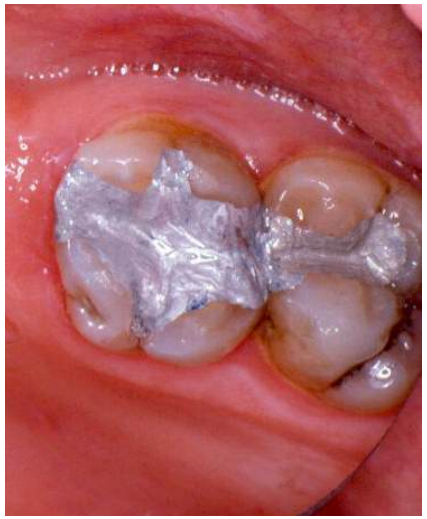
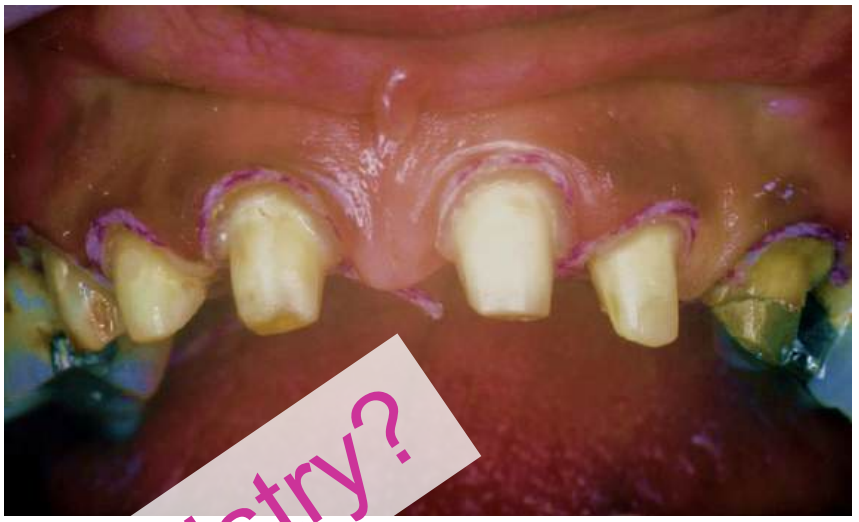
Public Health England

What is Known About the Oral Health of Older People in England and Wales: A review of oral health surveys of older people (2015)

Caries (main risk factor for pulp disease)

- Increased prevalence in older adults
- Higher still in care homes
- Adult Dental Health Survey of dentate adults
  - 29% had active caries
  - 40% aged 75 to 84
  - 33% aged >85

Pulp breakdown after disease & restoration

~9% of patients who receive large (3-4 surface) restorations

Ptak *et al* (2023) The Pulpal Response to Crown Preparation and Cementation *J Endod* 49: 462-8

Pulp death after crowns

20% after 25 years Valderhaug *et al* (1997) *J Dent* 25: 97-10

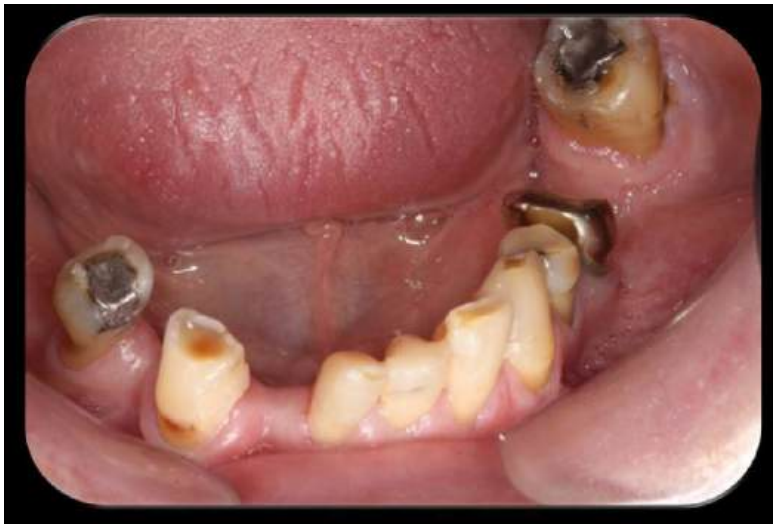
Saunders & Saunders (1998) *Brit Dent J* 185: 137-40

20-50% teeth treated by endodontists through crowns

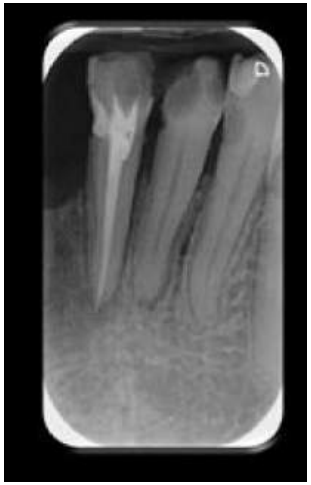
Trautmann *et al* (2000) *Quint Int* 31: 713-8

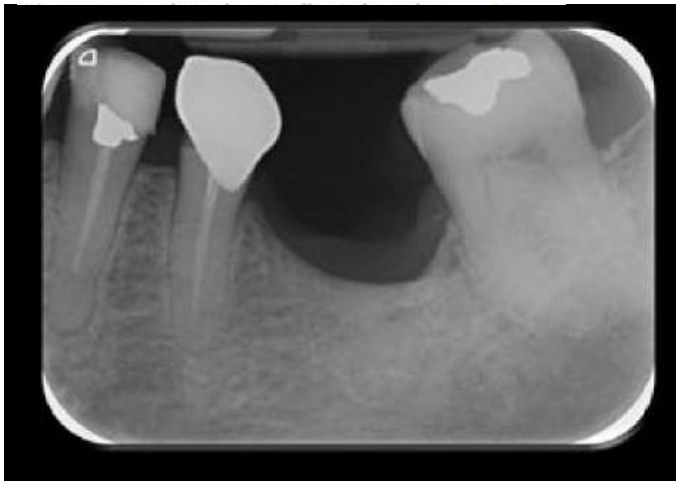
Dentistry begets dentistry?

We do our best with best intentions

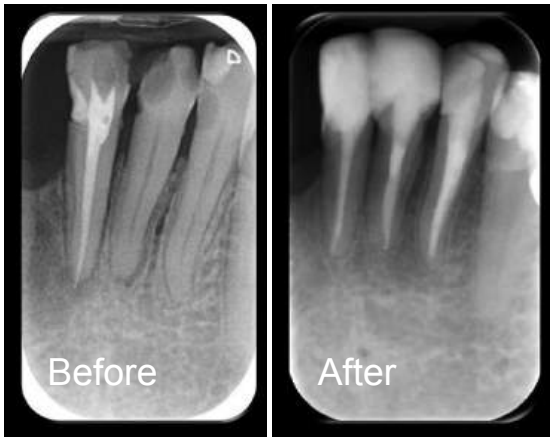


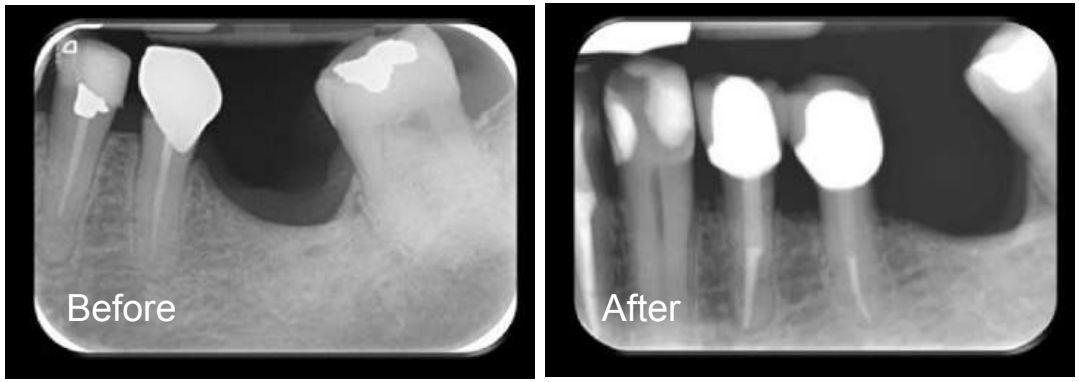
70 yr old, no dependency
'always looked after my teeth…..'
lots of treatment





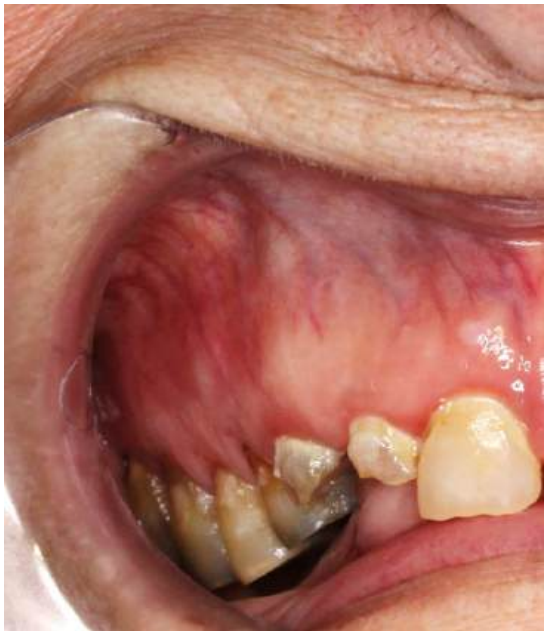
Monitoring/revising as needed…..





‘The prognosis of these teeth is favourable subject to meticulous oral hygiene, periodic maintenance & continued patient compliance. Reviews every 3 months.’

All good until something changes……



Xerostomia
Dietary changes
Impaired plaque control
Access/cost of dentistry

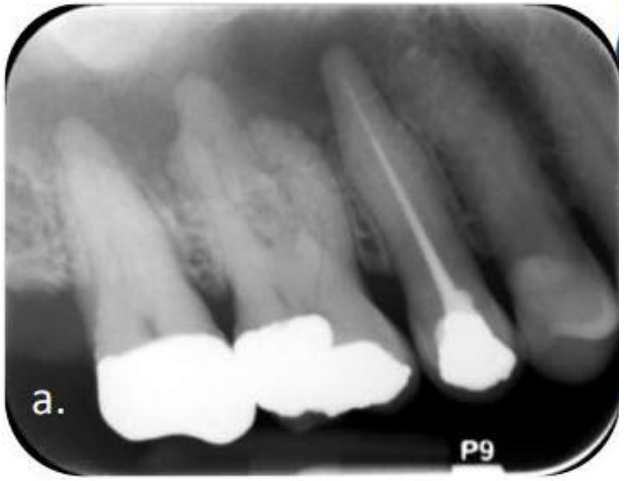
Mobility
Ability to tolerate care

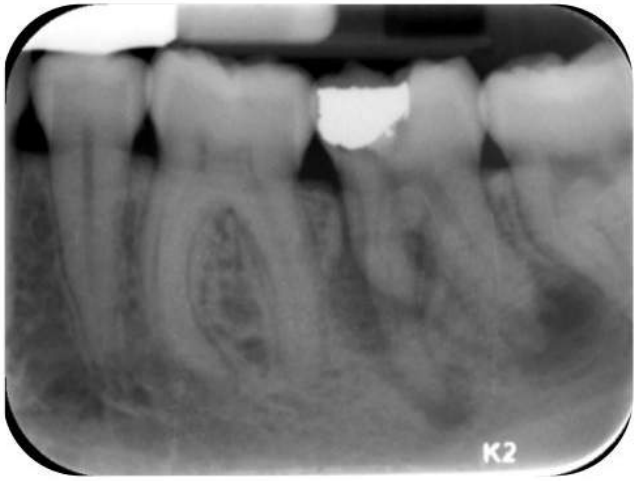
How well do we plan for failure?

What age should we start?

https://www.dayodental.com/get-a-zirconia-smile-in-mexico/full-smile-makeover-zirconia-crown/
(accessed 28.11.18)

Apical periodontitis





A consequence of dental disease & treatment

How common?

So what?

What is the risk of acute flare-up?

What is the risk to health & wellbeing?

How common?

Pulpal involvement, ulceration, fistula or abscess (PUFA) - consequences of severe untreated dental caries

In dentate English adults

7% had one or more PUFA indicators

8% in those 75-84

10% in those over 85 *crude; no radiographs*

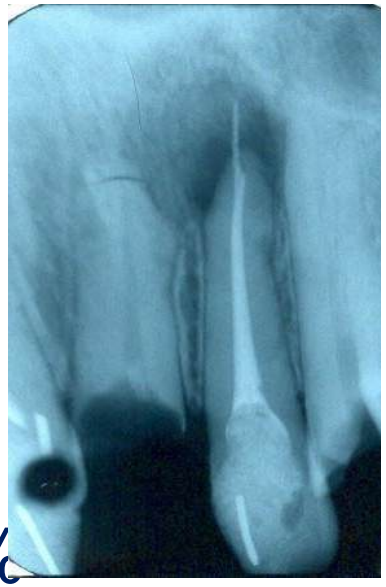
Public Health England

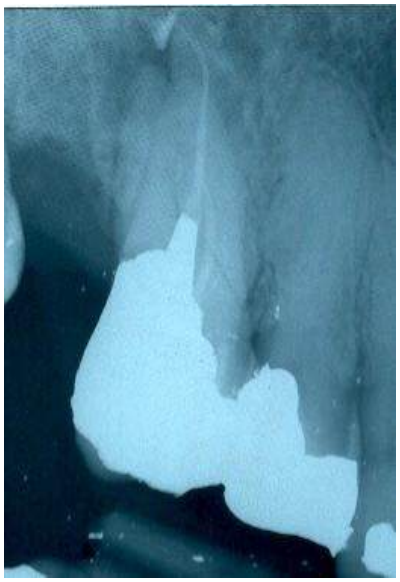
What is Known About the Oral Health of Older People in England and Wales A review of oral health surveys of older people (2015)

AP Global prevalence

52% of individuals have AP

5% of teeth have AP





AP in root-filled teeth: 39%

AP in non-root filled teeth: 3%

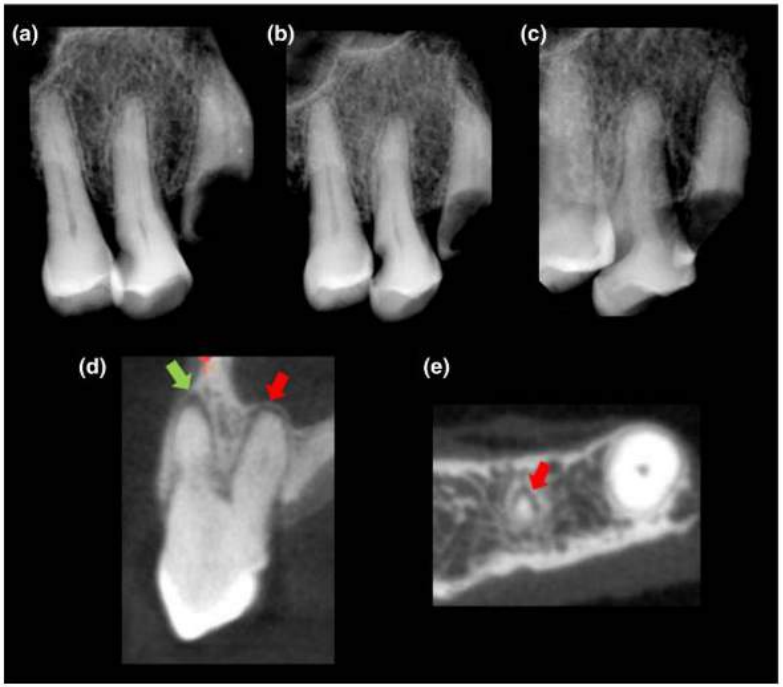
AP in individuals with ‘systemic condition’: 63%

AP in ‘healthy’ individuals: 48%

Tibúrcio-Machado *et al* (2021)
The global prevalence of apical periodontitis: a systematic review and meta-analysis
Int Endod J 54: 712-35

Lot of it about!

Higher detection with CBCT

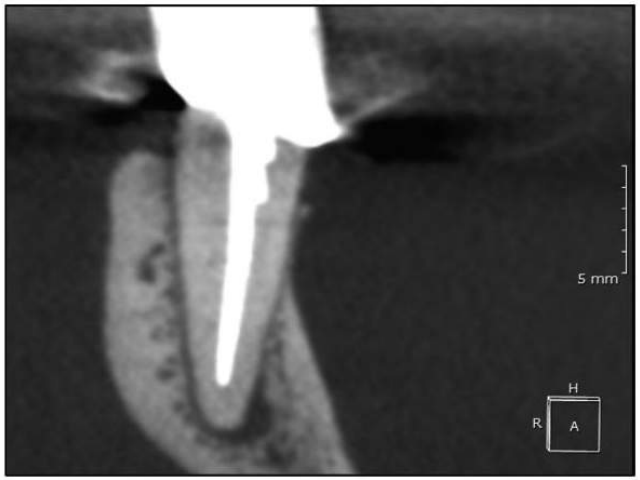


Kanagasingam *et al* (2017) Diagnostic accuracy of periapical radiography and cone beam computed tomography in detecting apical periodontitis using histopathological findings as a reference standard. *Int Endod J* 50: 417-26

… studies using CBCT report higher proportions of individuals and root filled teeth with AP compared studies using panoramic and periapical radiographs

Tibúrcio-Machado *et al* (2021) The global prevalence of apical periodontitis: a systematic review and meta-analysis. *Int Endod J* 54: 712-35

But not all shadows are disease



Non-root filled teeth

CBCT diagnoses almost all cases of AP correctly - very small risk of over-diagnosis

Root filled teeth

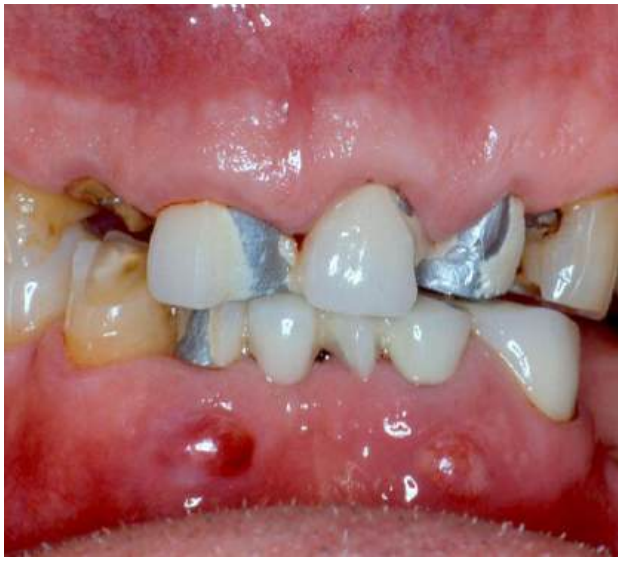
Increased risk of diagnosing AP when not truly present

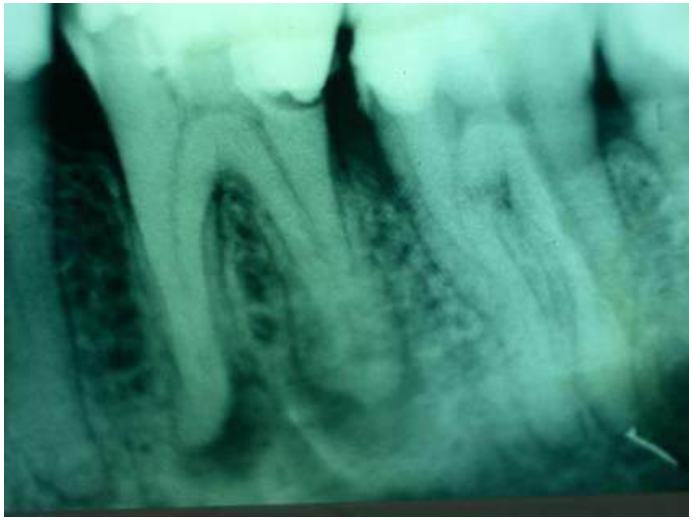
Kruse *et al* (2019) Diagnostic accuracy of cone beam computed tomography used for assessment of apical periodontitis: an *ex vivo* histopathological study on human cadavers. *Int Endod J* 52: 439-50

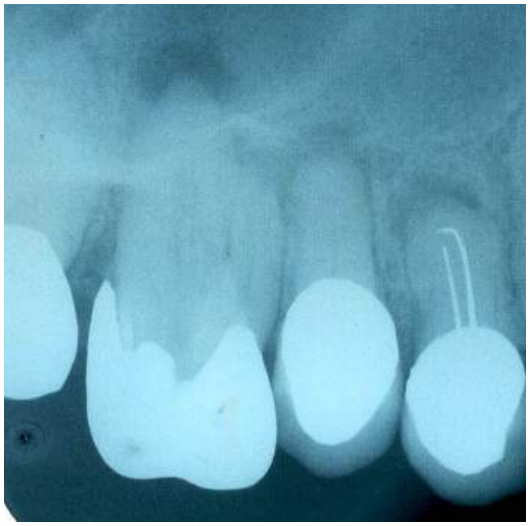
Dentitions ageing with needs….

Maintenance & repair

Managing persistent & new disease







Kontakiotis *et al* (2015) *Int Endod J 48:* 512-7 – **pulp necrosis & crowns**
Dawson *et al* (2014) *J Endod* 40: 1303-7 – **AP and restorative treatment**

Apical Periodontitis - So what?

Risk of acute flare-up

127 patients with 185 lesions persisting 5 yrs after endo treatment

Median patient age 56 (range 21-82)

Risk of flare-up 5.8% over 20 years
Minimal impact on daily living

Yu *et al* (2012) Incidence and impact of painful exacerbations in a cohort of post-treatment persistent endodontic lesions. *J Endod* 38: 41-6

420 asymptomatic roots with radiographically deficient root fillings (short, overextended and/or permeable root fillings)

Monitored radiographically (median time 6 years)

No change 94.8%, healing 2.4%, failure 2.8%

Van Nieuwenhuysen *et al* (1994) Retreatment or radiographic monitoring in endodontics. *Int Endod J* 27: 75-81

Yet long-term risk data not strong

AP: a risk to health & wellbeing?

The Guardian UK edition

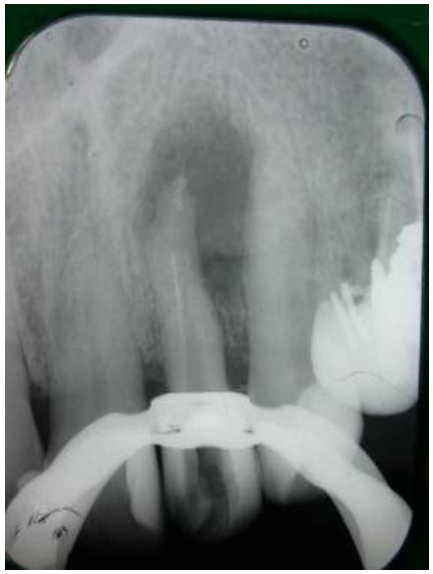
We'll live longer but suffer more ill-health by 2035, says study

Number of old people suffering from four medical conditions to double in less than 20 years, researchers claim

The number of older people who have at least four different medical conditions is set to double by 2035, in a trend that will put huge extra strain on the NHS,

31-61% Europeans have AP
25-64% root filled teeth have AP

No good evidence that these infection-related lesions present a risk
or that they do not



Call for ‘endodontic medicine’ to parallel focus of ‘periodontal medicine’

Chronic, polymicrobial oral infections,
triggering cytokine responses

Potential to cause or exacerbate medical conditions?

Should we take the elimination of AP more seriously?

Segura-Egea *et al* (2015)
Endodontic medicine: connections between apical periodontitis and systemic diseases
Int Endod J 48, 933-51

Recent studies on AP & general health

Sebring *et al* (2023)
Primary apical periodontitis correlates to elevated levels of interleukin-8 in a Swedish population:
A report from the PAROKRANK* study*. Int Endod J*. 1–11

…inflammation at the periapex is more than a local process; systemic influences cannot be disregarded

Whether observed alterations in plasma levels of inflammatory markers have any *dismal* effects on systemic health is presently unknown but…. demand further investigation

**PAROKRANK:*
Periodontitis and Its Relation to Coronary Artery Disease

Sebring *et al* (2024)
Endodontic inflammatory disease and future cardiovascular events and mortality.
A report from the PAROKRANK study *J Endod* 50: 1073-81

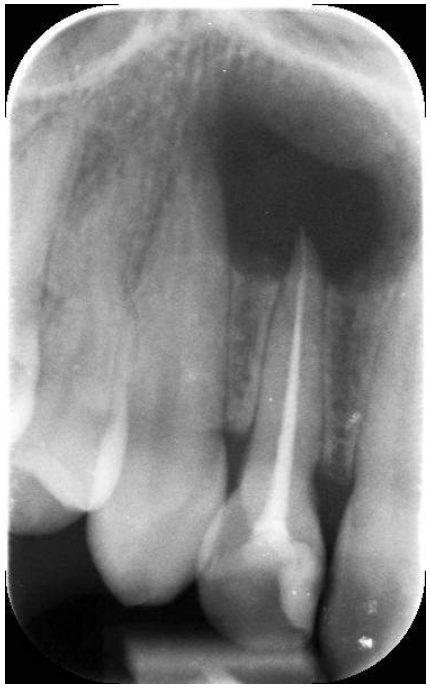
805 patients admitted following MI + 805 controls

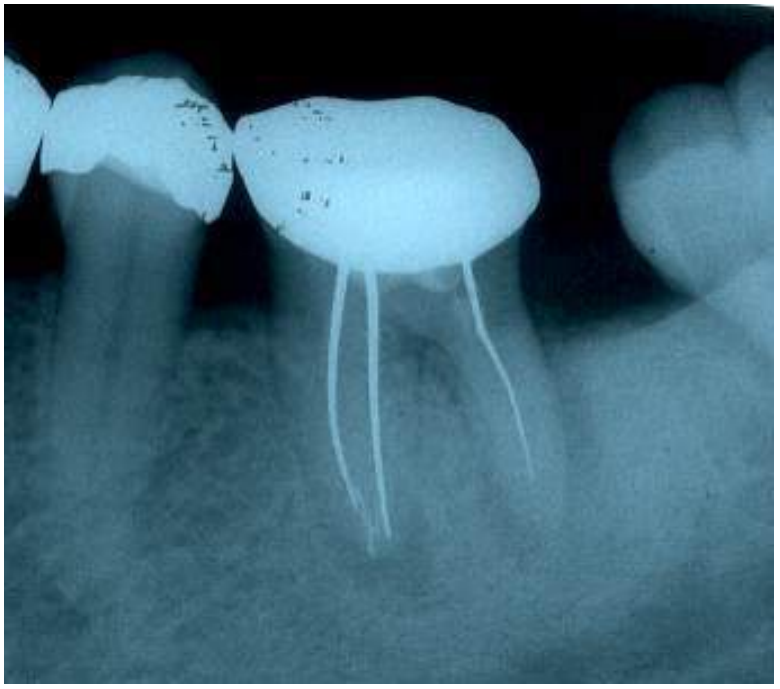
Conclusions:

- Tooth loss - strong indicator of increased risk for future cardiovascular events

- Root filled teeth - limited value as a risk indicator when accounting for other risk factors

- Potential effect of dental interventions on future events should be assessed in future research





Much interest in establishing causal links between AP and systemic conditions

There would be implications….

European Society of Endodontology

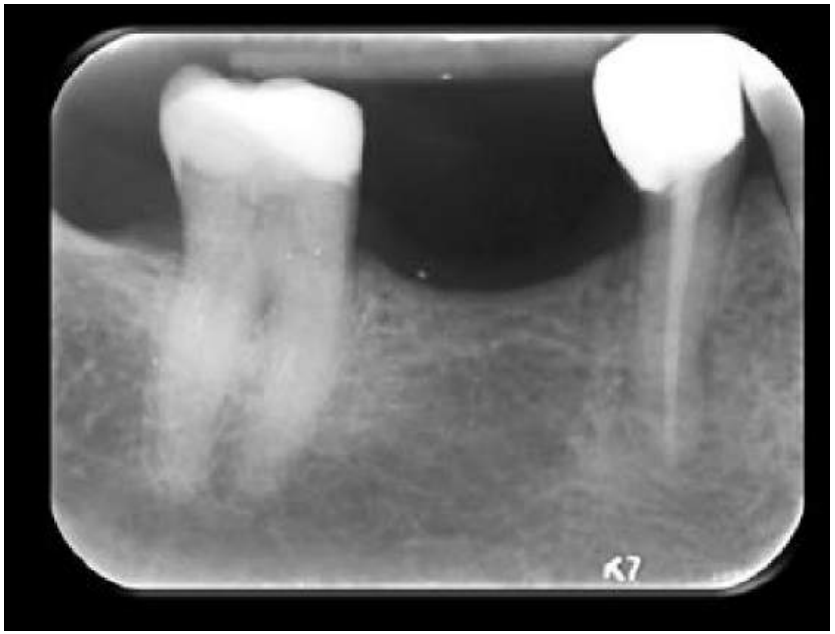
Research Grant 2024

Monitoring Apical Periodontitis in Root-Filled Teeth

Can asymptomatic root-filled teeth with AP be safely monitored over five years?

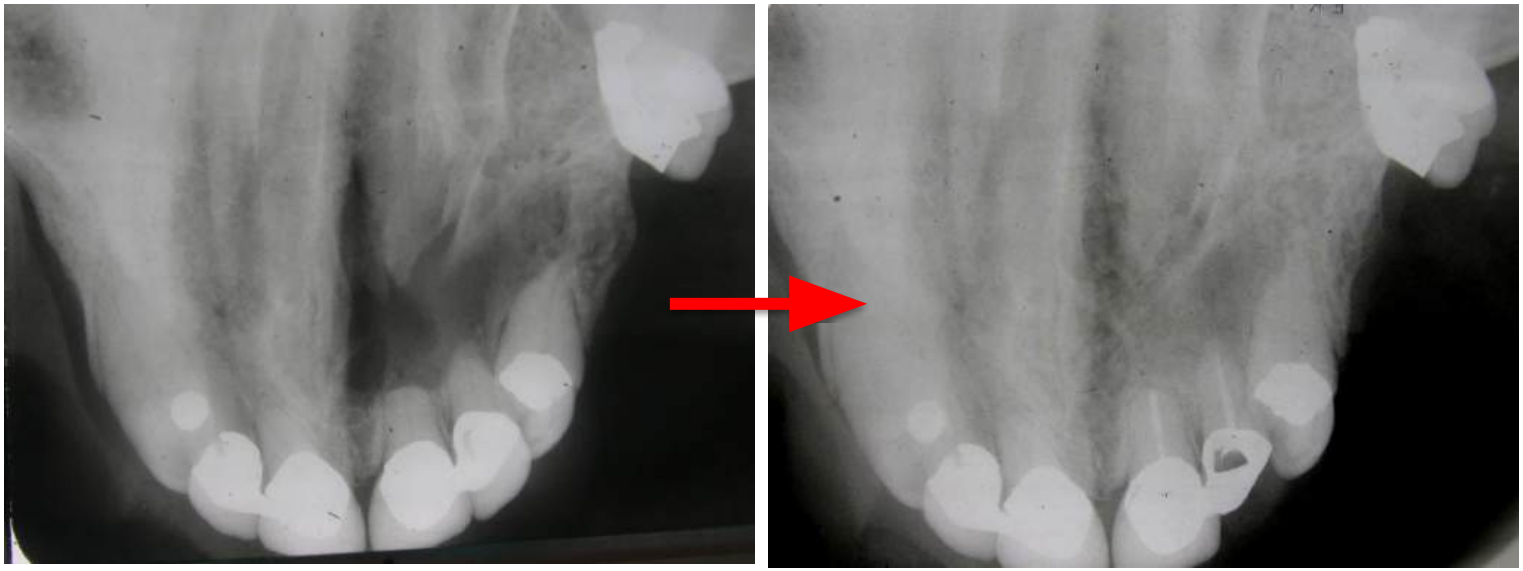
What are the risk factors for adverse outcomes?

What we think we know



Probability of long-term tooth survival after RCT ranges between 93% (4-5 yrs) & 87% (8-10yrs)

Ng *et al* (2010) Tooth survival following non-surgical root canal treatment: a systematic review of the literature. *Int Endod J* 43:171–89



85, no dependency

Routinely collected demographic data on factors such as patient age and sex show no significant influence on root canal treatment outcome

Gulabivala & Ng (2023) Factors that affect the outcomes of root canal treatment & retreatment - A reframing of principles. *Int Endod J* 56, Supp 2: 82-115

Endodontic treatment can help preserve teeth and avoid extractions & their complications at any age

Retaining strategic teeth can improve QoL, self-confidence & emotional wellbeing in older adults

Costs of endodontic interventions often lower than alternatives

Kytridu *et al* (2023) A literature review of local & systemic considerations for endodontic treatments in older adults. *Gerodont* 40: 410-21

Shakiba *et al* (2017) Influence of patient age on longitudinal outcomes of root canal treatment: a systematic review. *Gerodont* 34: 101-9

Does systemic disease affect endodontic treatment outcome?

- Relationship between systemic diseases & endodontic outcome uncertain
- HIV and oral bisphosphonate use did not appear associated with endodontic outcomes
- Cardiovascular disease, smoking &/or diabetes *may* be associated with impaired PA healing and tooth retention
- Statin use may enhance periapical healing
- No evidence yet of cause-and-effect relationships

Segura-Egea *et al* (2023) Impact of systemic health on treatment outcomes in endodontics. *Int Endod J* 56 Suppl 2: 219-35

Alghofaily *et al* (2018) Healing of apical periodontitis after nonsurgical root canal treatment: the role of statin intake. J Endod 44: 1355-60

Aminoshariae *et al* (2017) Association between Systemic Diseases and Endodontic Outcome: A Systematic Review *J Endod* 43: 514–9

So we aim to preserve dentitions

‘Suficient’
Comfortable
Functional
Aesthetic
‘Safe’

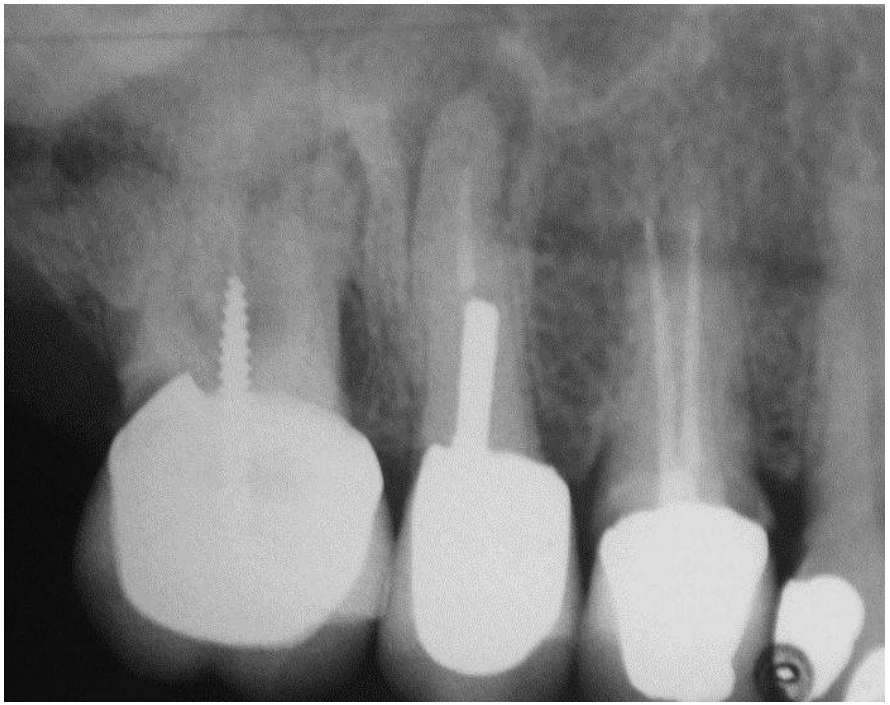
https://metro.co.uk/2018/12/07/100-year-old-man-says-key-to-long-life-is-daily-mixed-grills-and-red-wine-8215457/ Accessed 05.03.25

Endodontic procedures may help with that

What makes *us* grow old with endodontics?

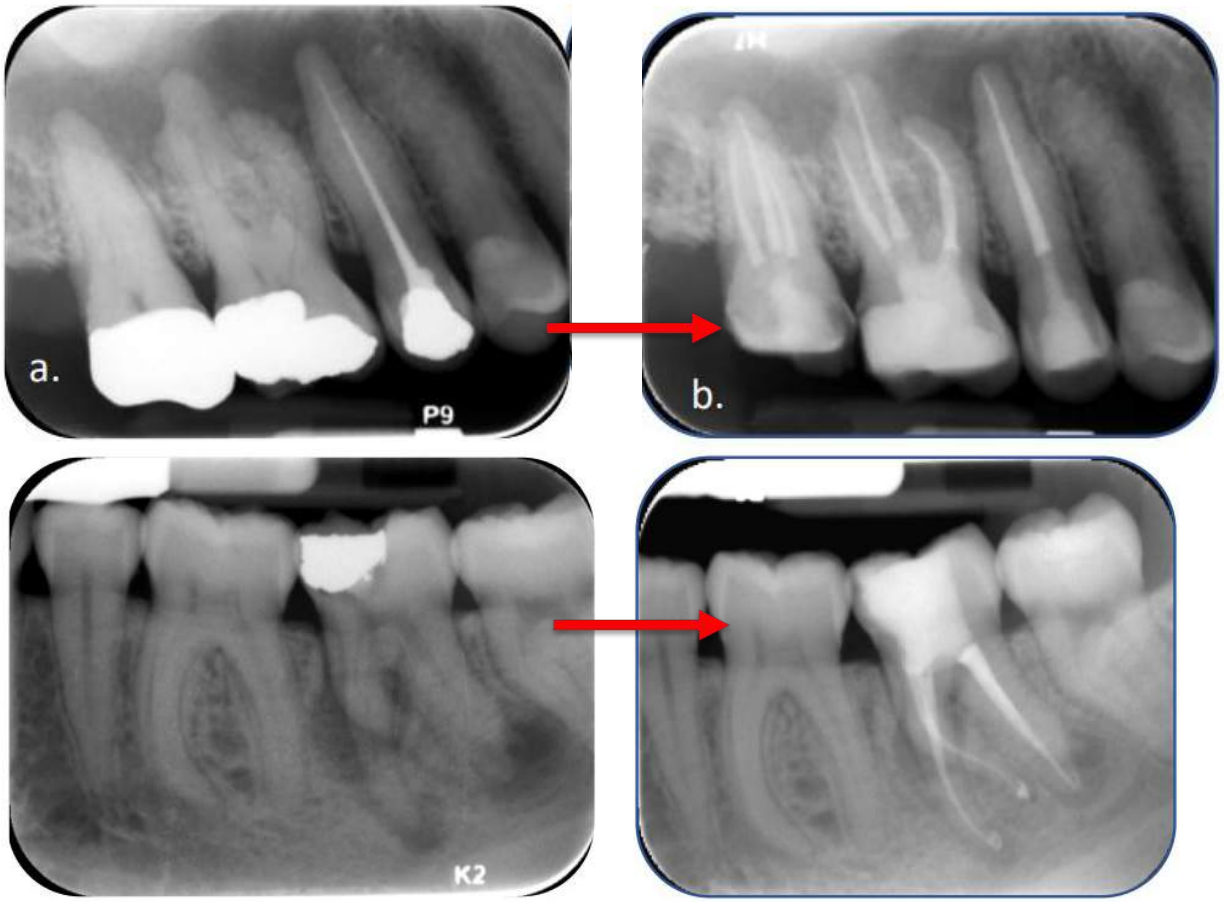
Technical challenges?

Decision-making?



Technical challenges……you're not alone:

root canal treatment commonly associated with dentist stress, anxiety, frustration

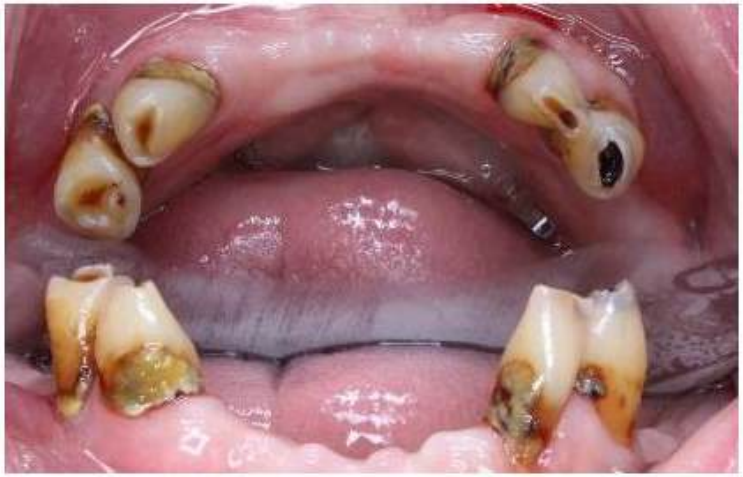


Lindström *et al* (2025) *Int Endod J* 58: 225-38

Can we better prevent pulp disease & AP?

What scope for conservative caries management in older people?

Selective/stepwise excavation, ART?



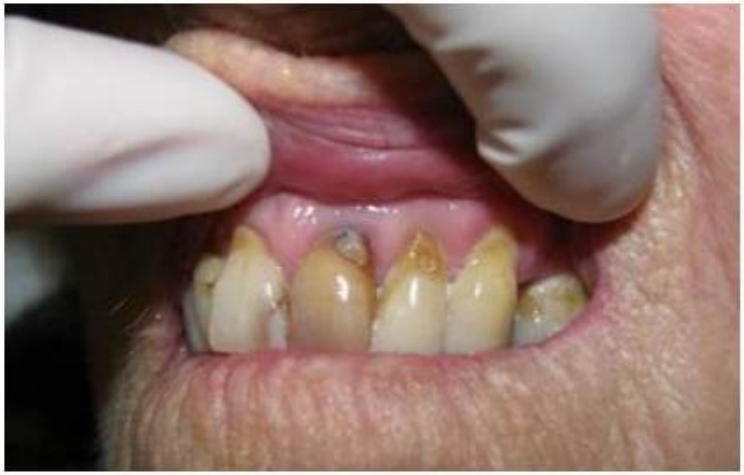
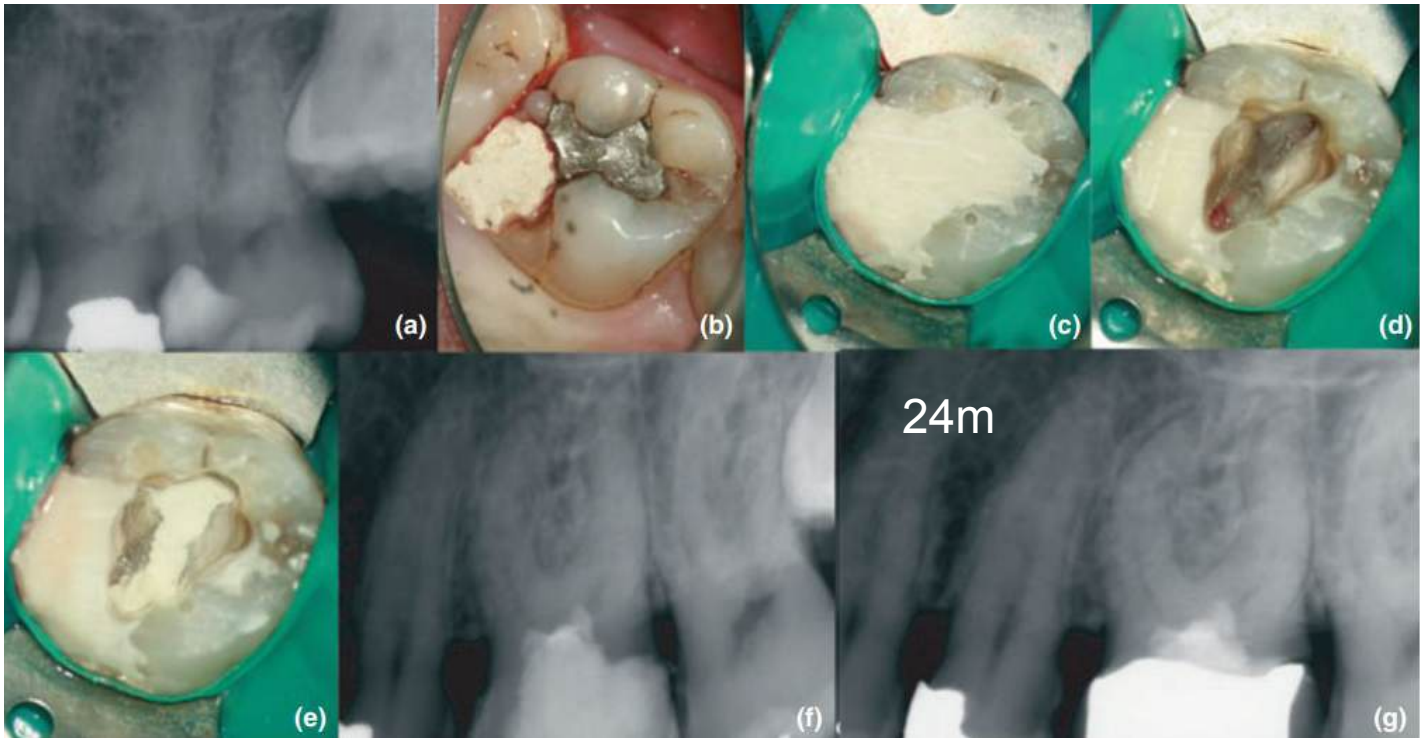


Photo: Dr Martina Hayes

ART?
http://www.gerodontology.eu/assets/documents/2015/presentations/CristianeDaMata.pdf
(Accessed 19.03.25)

European Society of Endodontology position statement (2019):
Management of deep caries and the exposed pulp. *Int Endod J* 52: 923-34

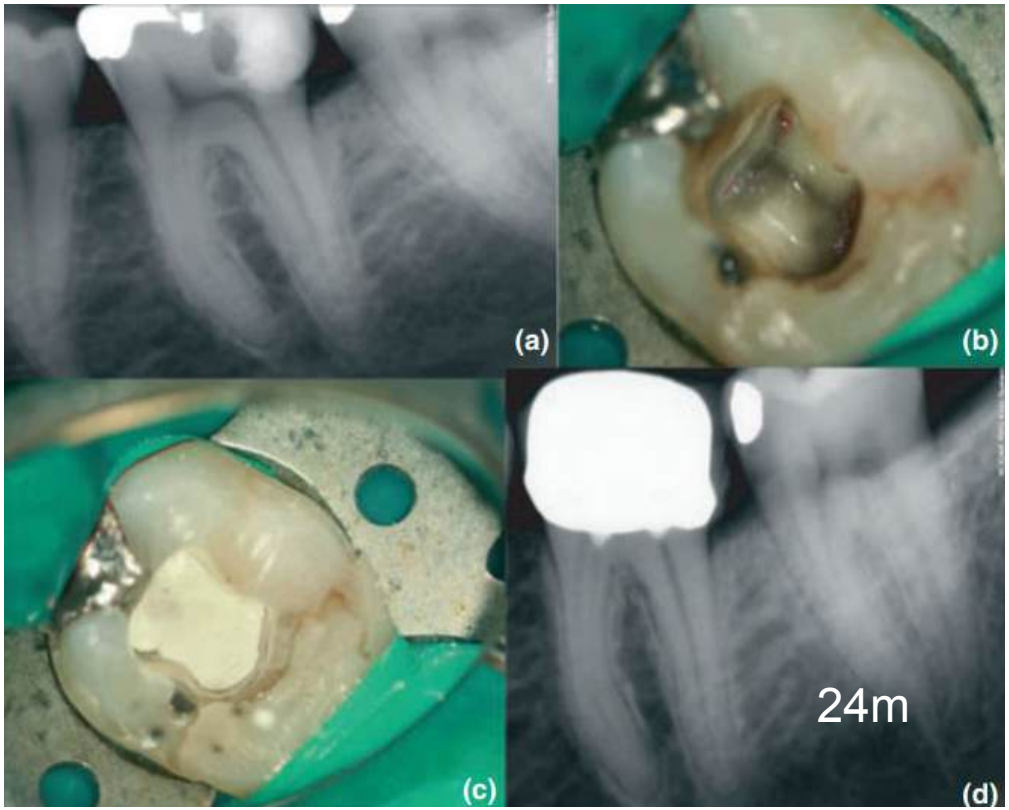
What role for vital pulpotomy in older adults?



Simon *et al* (2013) Should pulp chamber pulpotomy be seen as a permanent treatment? *Int Endod J* 46: 79–87

Moretto *et al* (2025)
Association between patient age and vital pulp therapy outcomes: A systematic review and meta-analysis of prognostic studies. *Int Endod J* (*in press*)

Age not a prognostic factor for partial or full pulpotomy

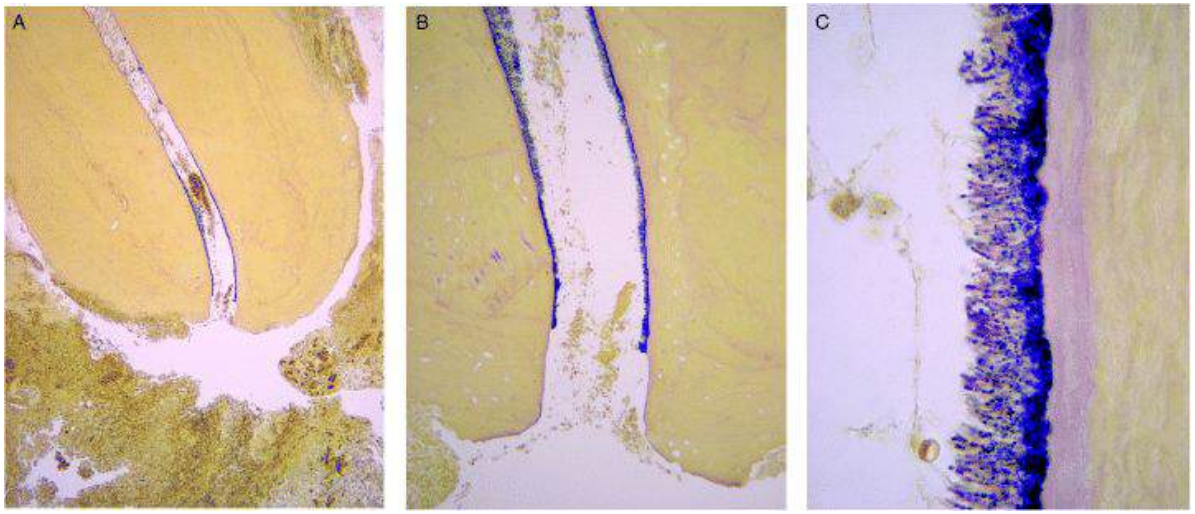


But age >40 is for pulp capping

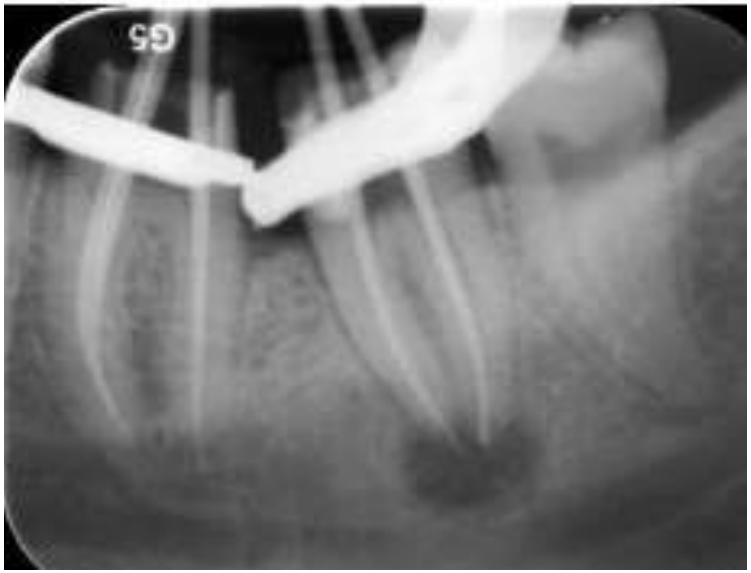
Wadhwa *et al* (2025) Effect of age on the success of direct pulp capping using two bioceramic materials in cariously exposed teeth with reversible pulpitis: A prospective clinical study.
J Endod (*in press*)

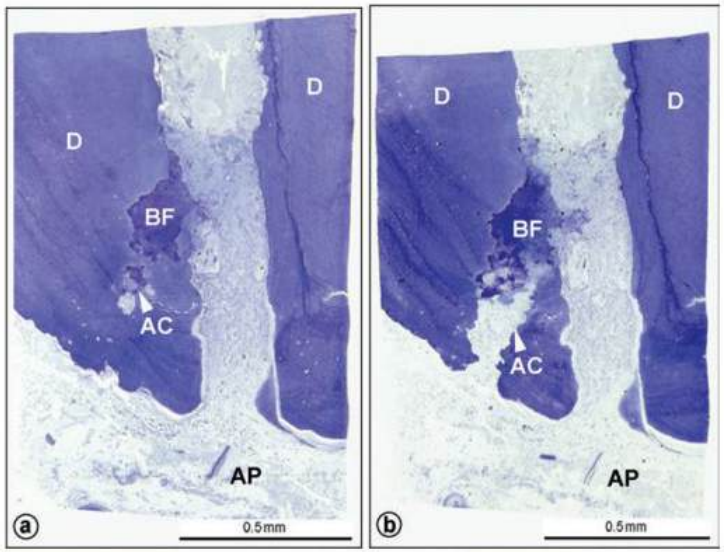
Successful root canal treatment

All about access
to apical 1/3 biofilm



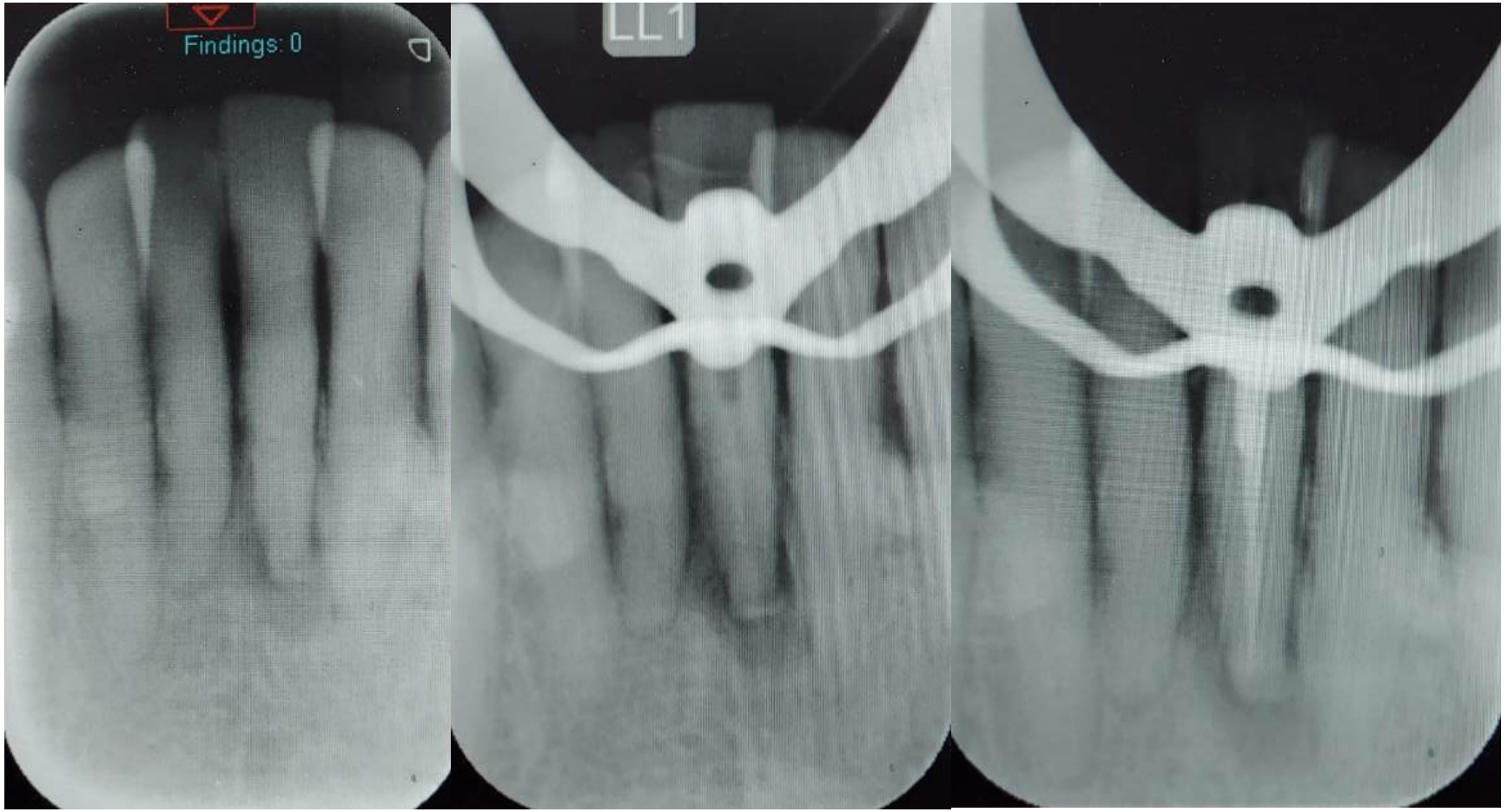
Svensäter & Bergenholtz (2004) *Endod Topics* 9: 27-36





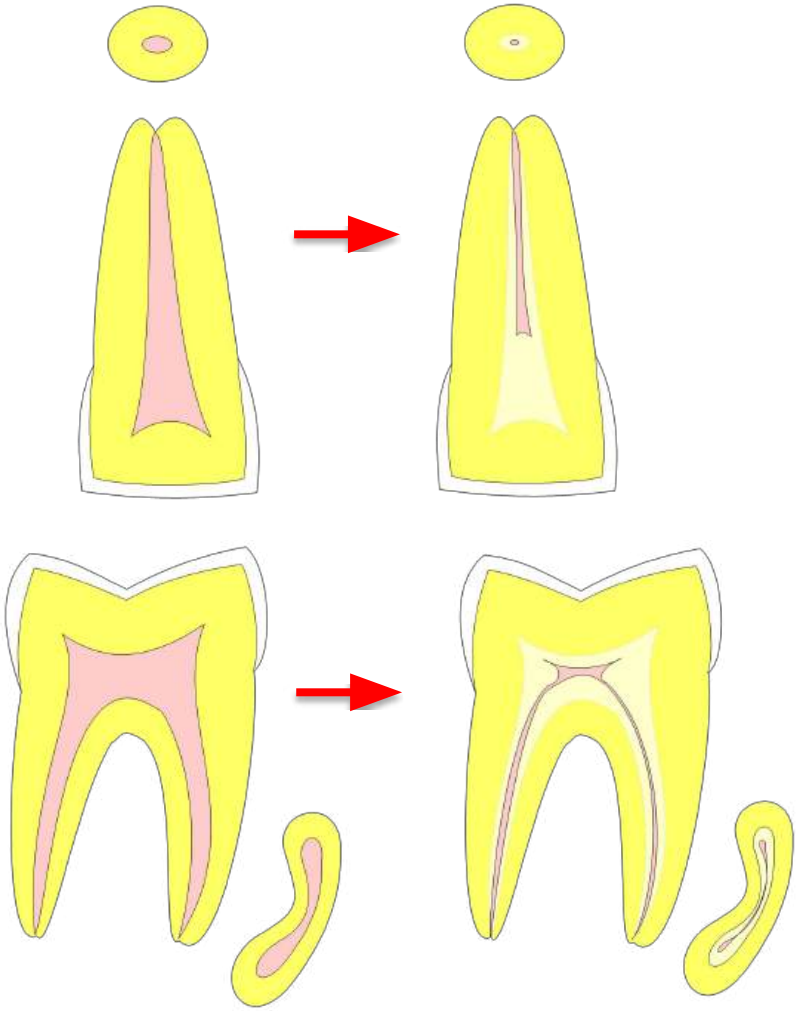
Nair (2006) *Int Endod J* 39:249-81

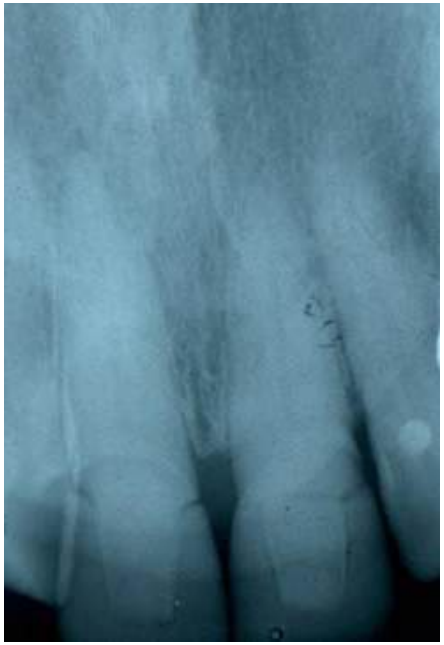
Not always easy in older teeth

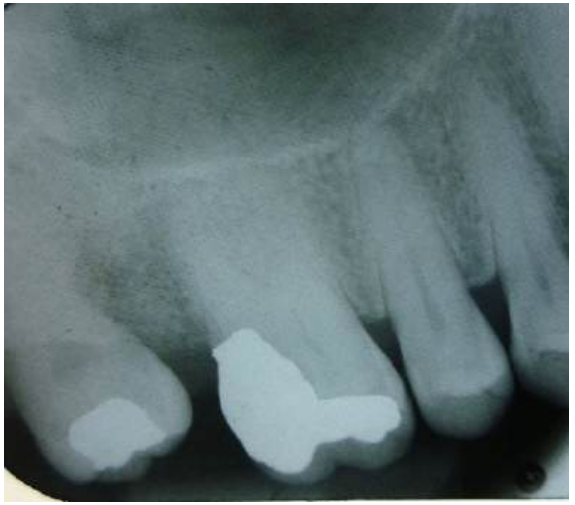


Diminished pulp-volume

1. Secondary dentine

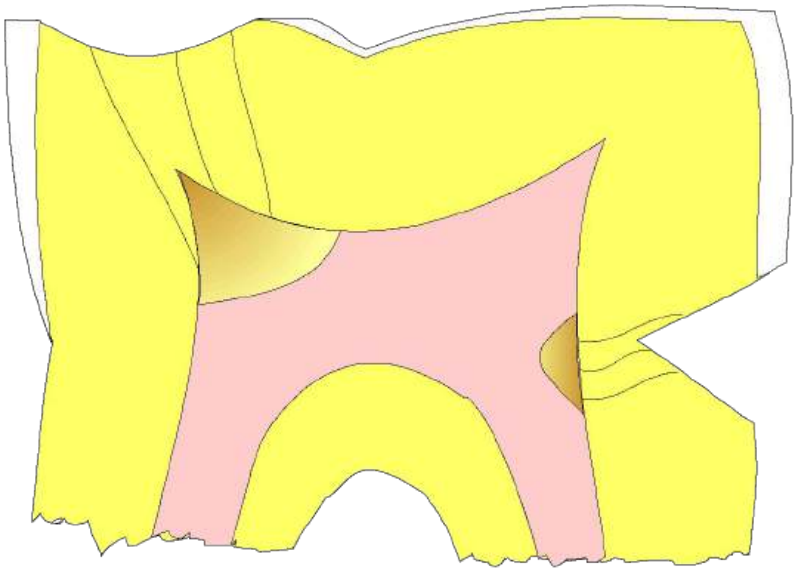


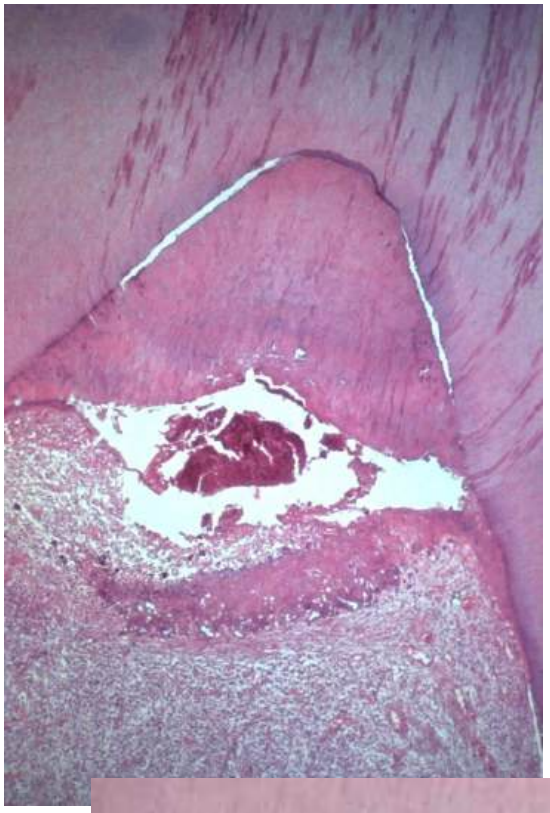


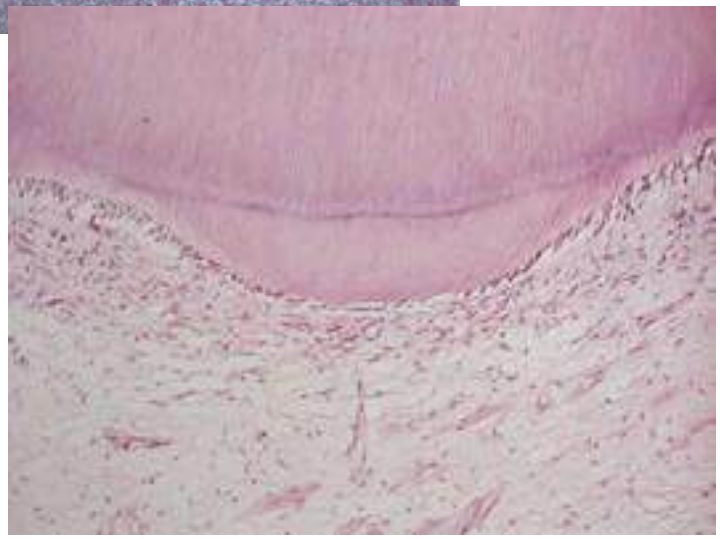


Localised tertiary dentine deposition

- reactionary
- reparative





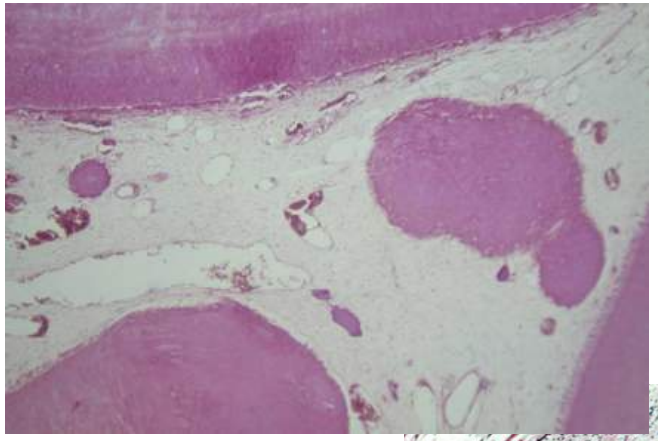


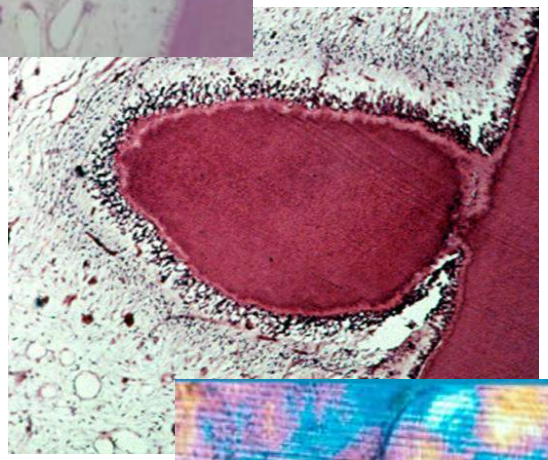
Inclusions

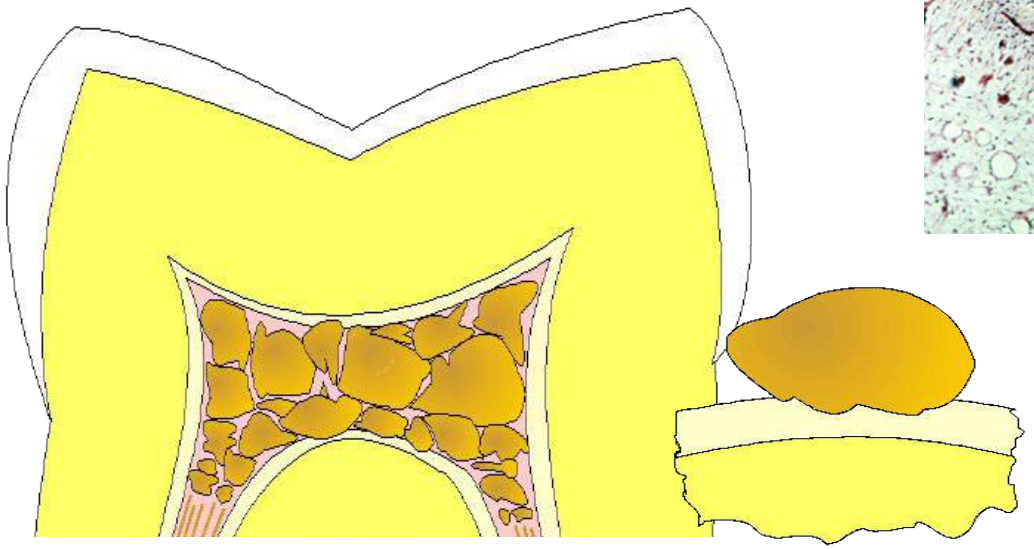
Pulp stones

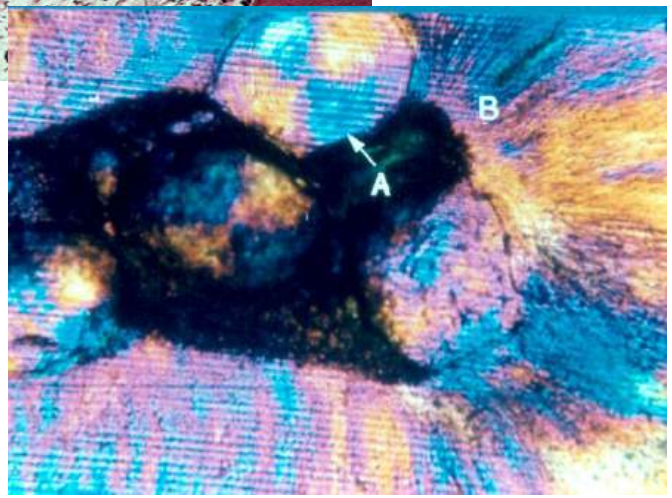
- Free
- Attached
- Embedded

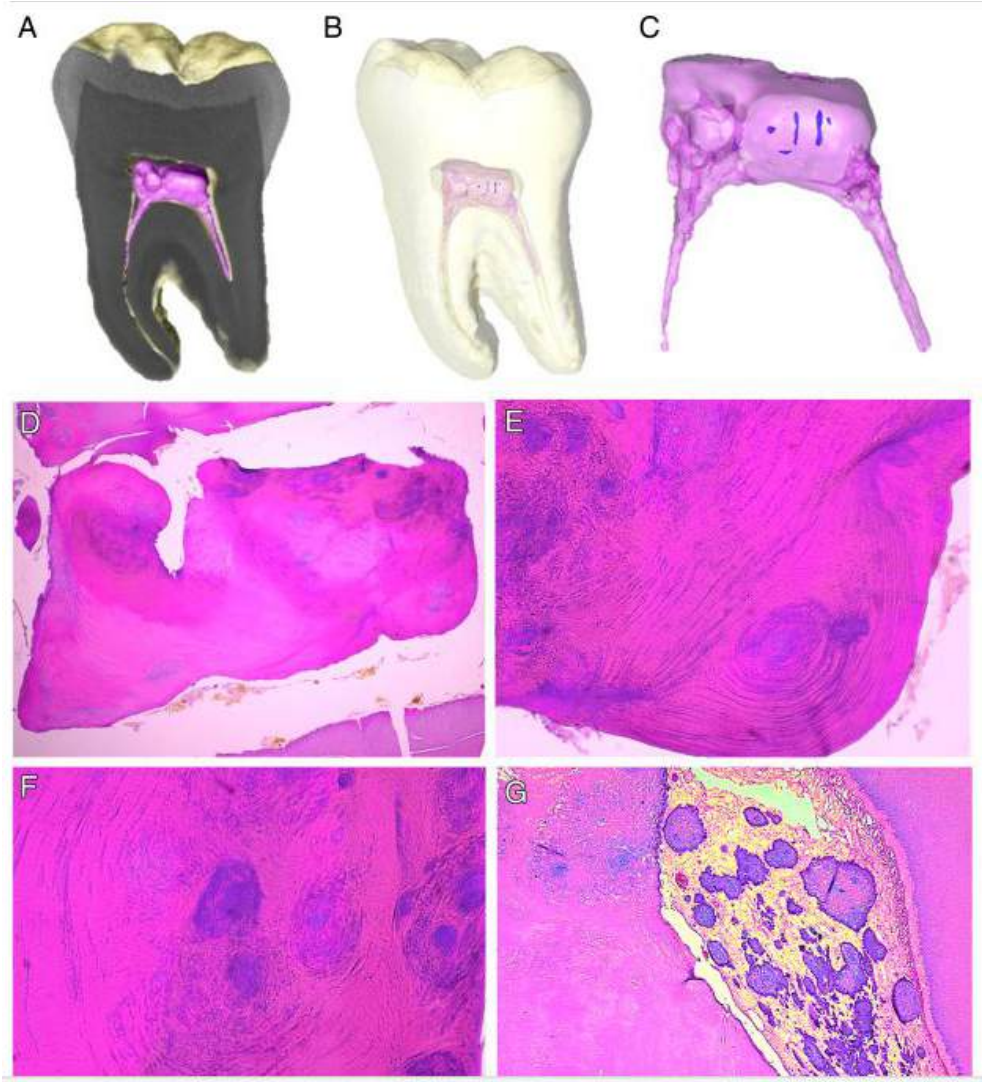
Goga *et al* (2008) IEJ 41: 457-68





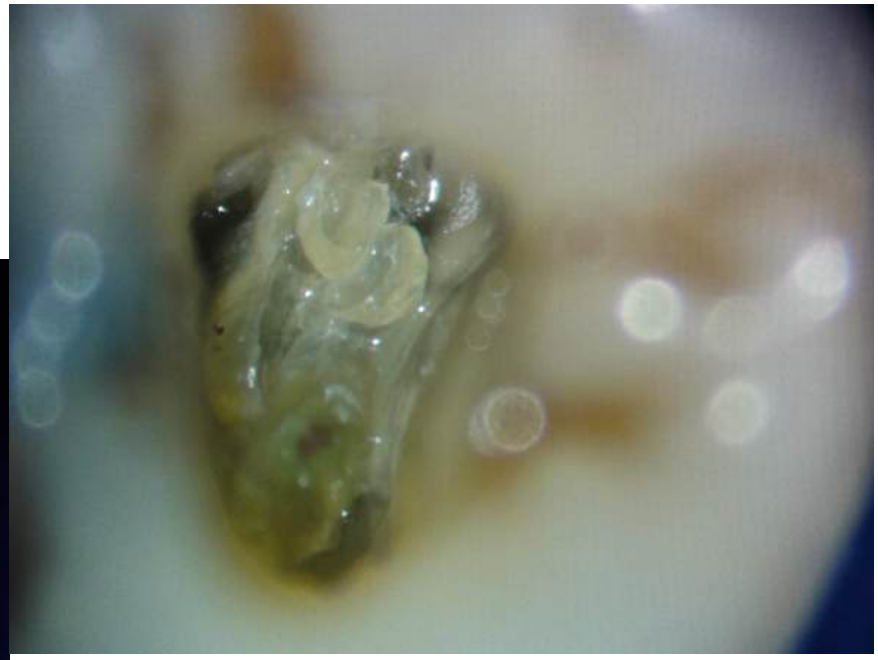


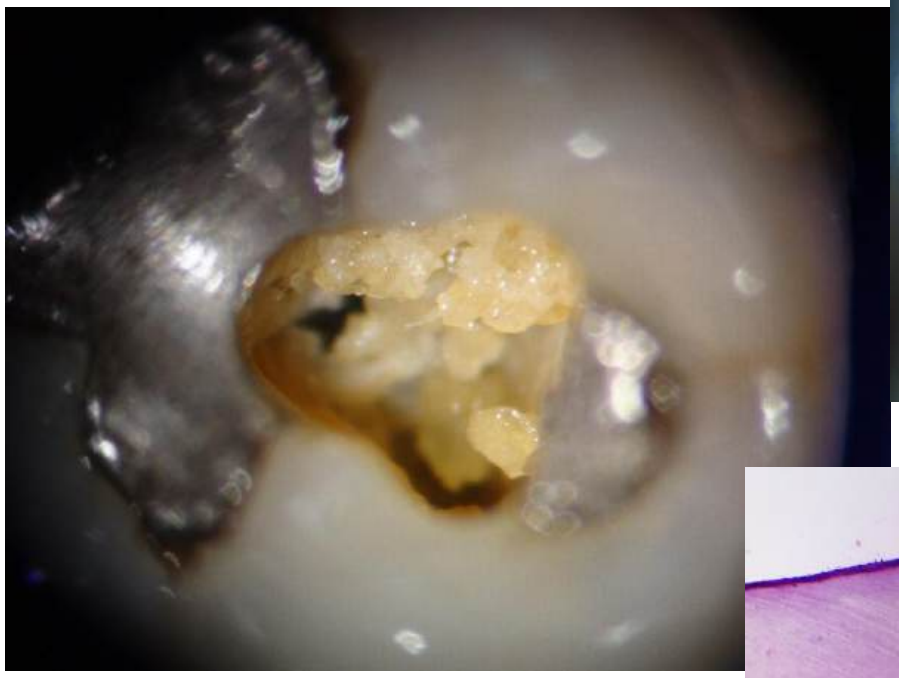


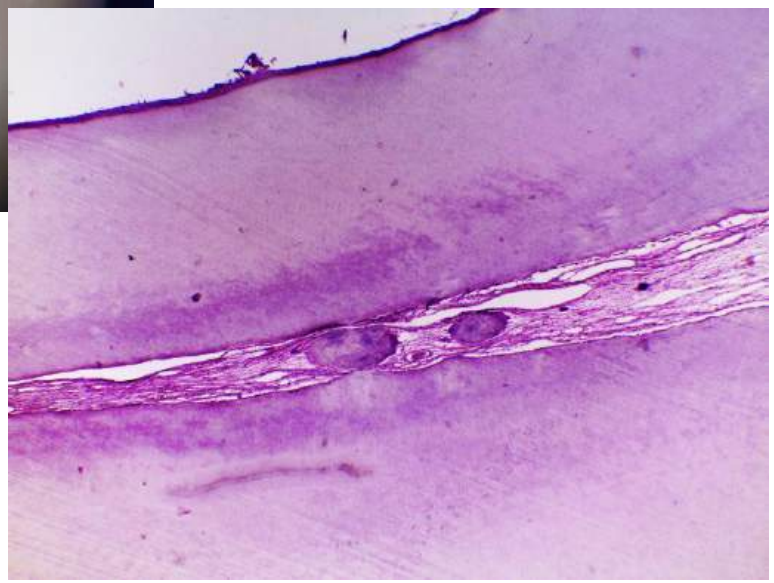


Tosco *et al* (2025) Evaluation of morphological and chemical composition of dental pulp stones: a combined microanalytical approach. *J Endod* (*in press*)

Removing free & attached pulp stones

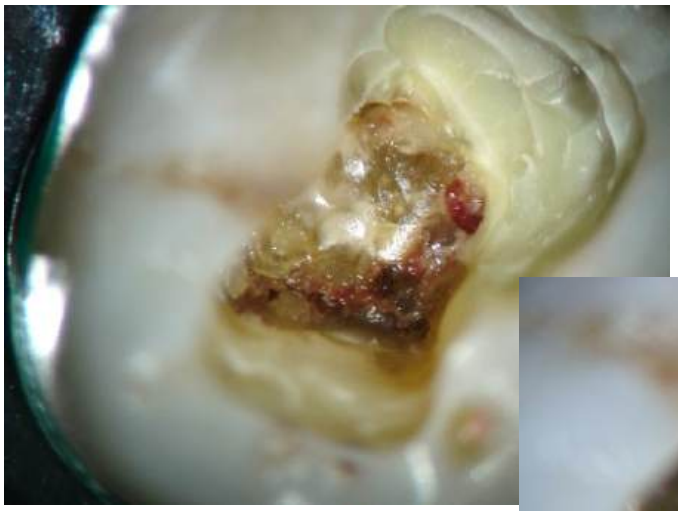


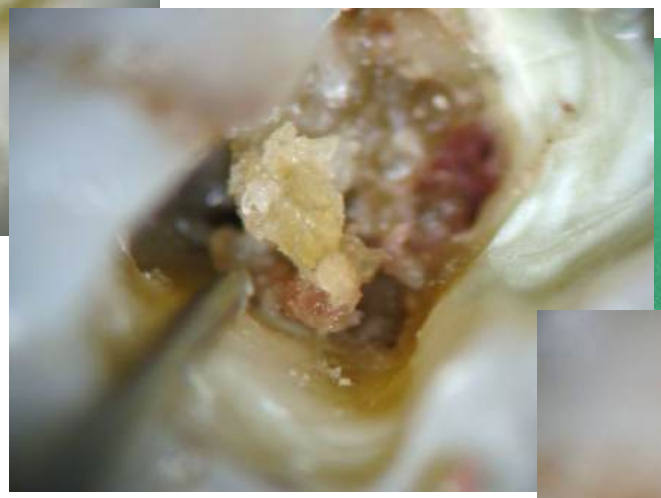


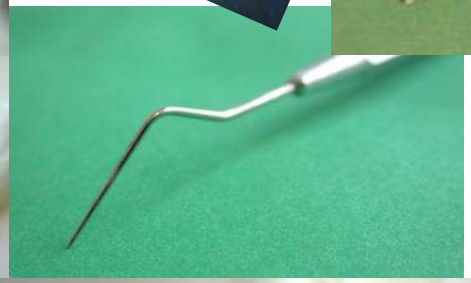


Most of the time

Finding the floor

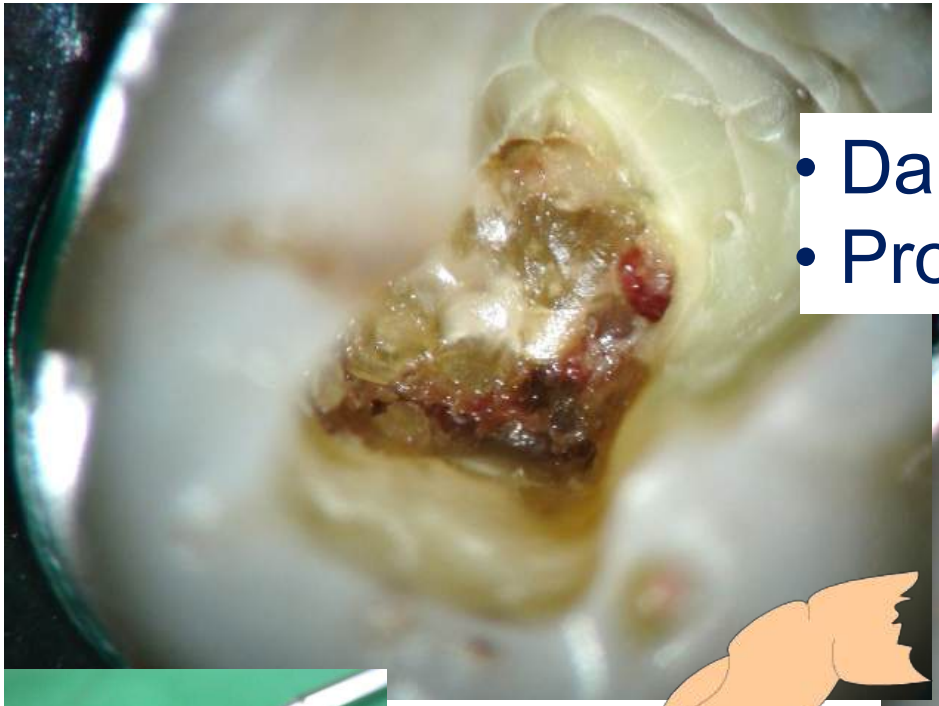




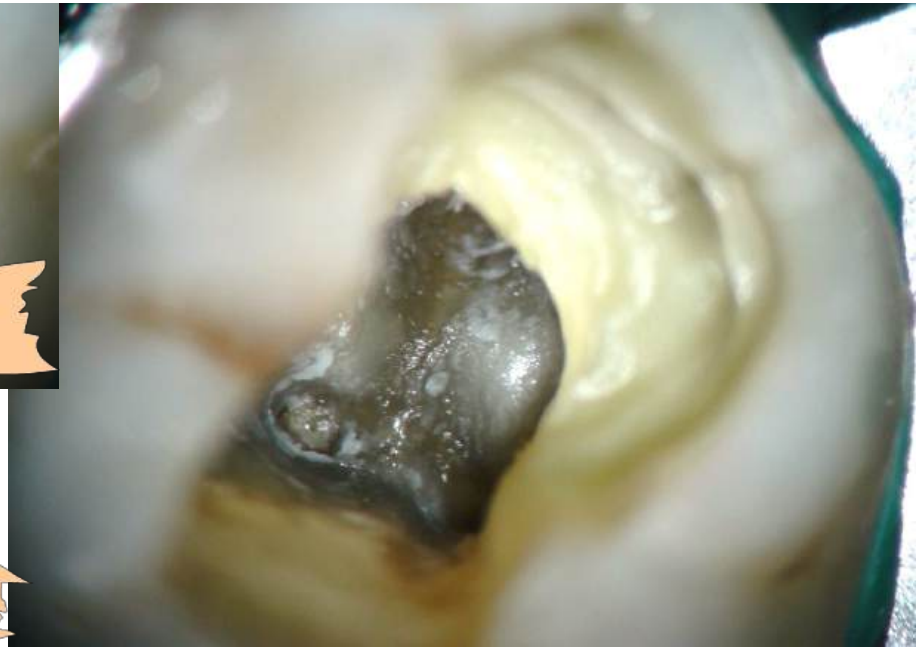


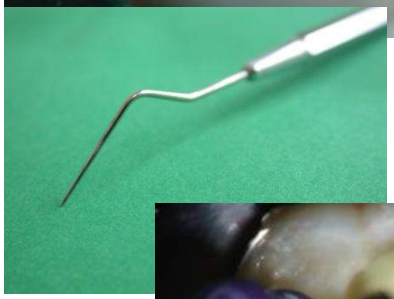
- Ultrasound
- Burs
- DG16 probe

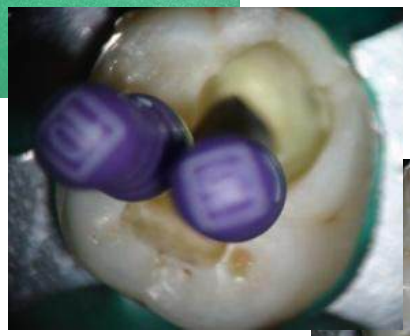
Ultrasonics – pulp stone removal

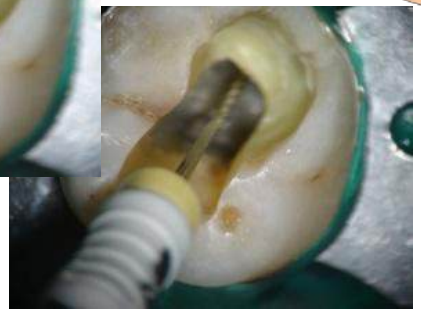


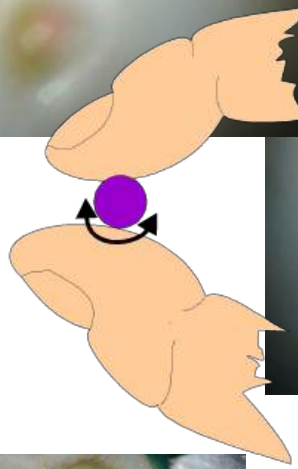
- Dark, domed, road-map
- Probe entrances & walk in



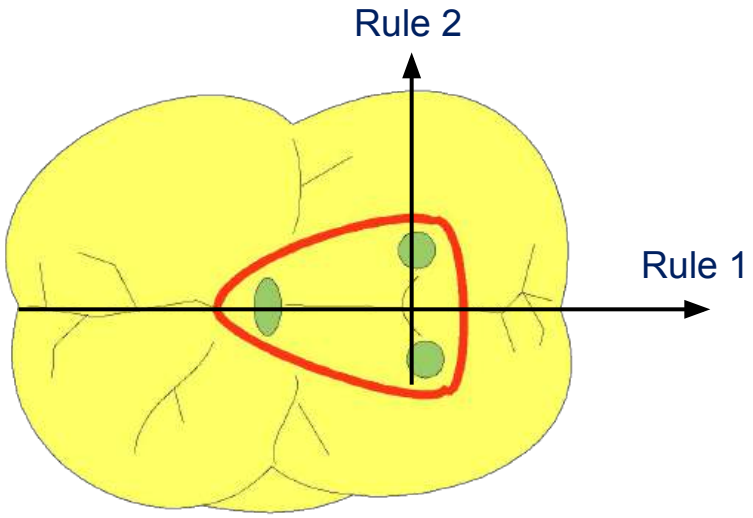


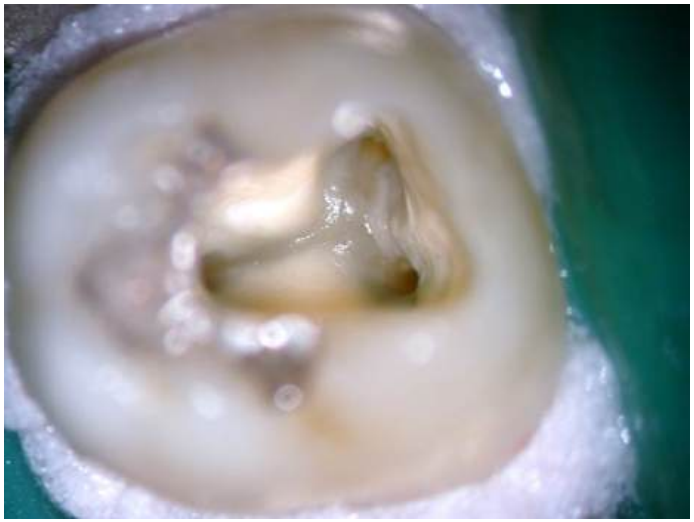






Finding entrances: Krazner & Rankow (2004) *J Endod* 30: 5-16





Symmetry rule 1:

Canal entrances are equidistant from the mesio-distal mid-line

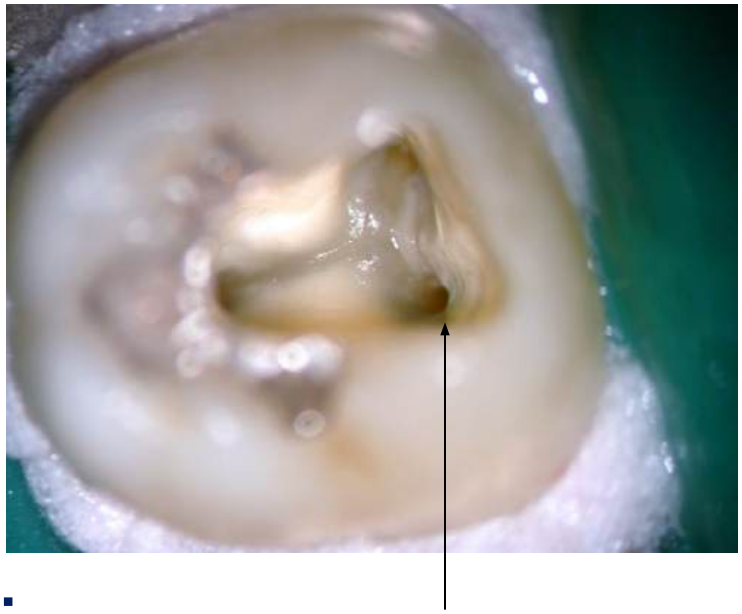
Not maxillary molars

Symmetry rule 2:

Canal entrances lie on a line perpedicular to the mesio-distal mid-line

3. Law of colour change:

Pulp chamber floor is always darker than the walls



Law 4 and 5

4. First law of orifice location:

Canal entrances are always at junction of walls & floor

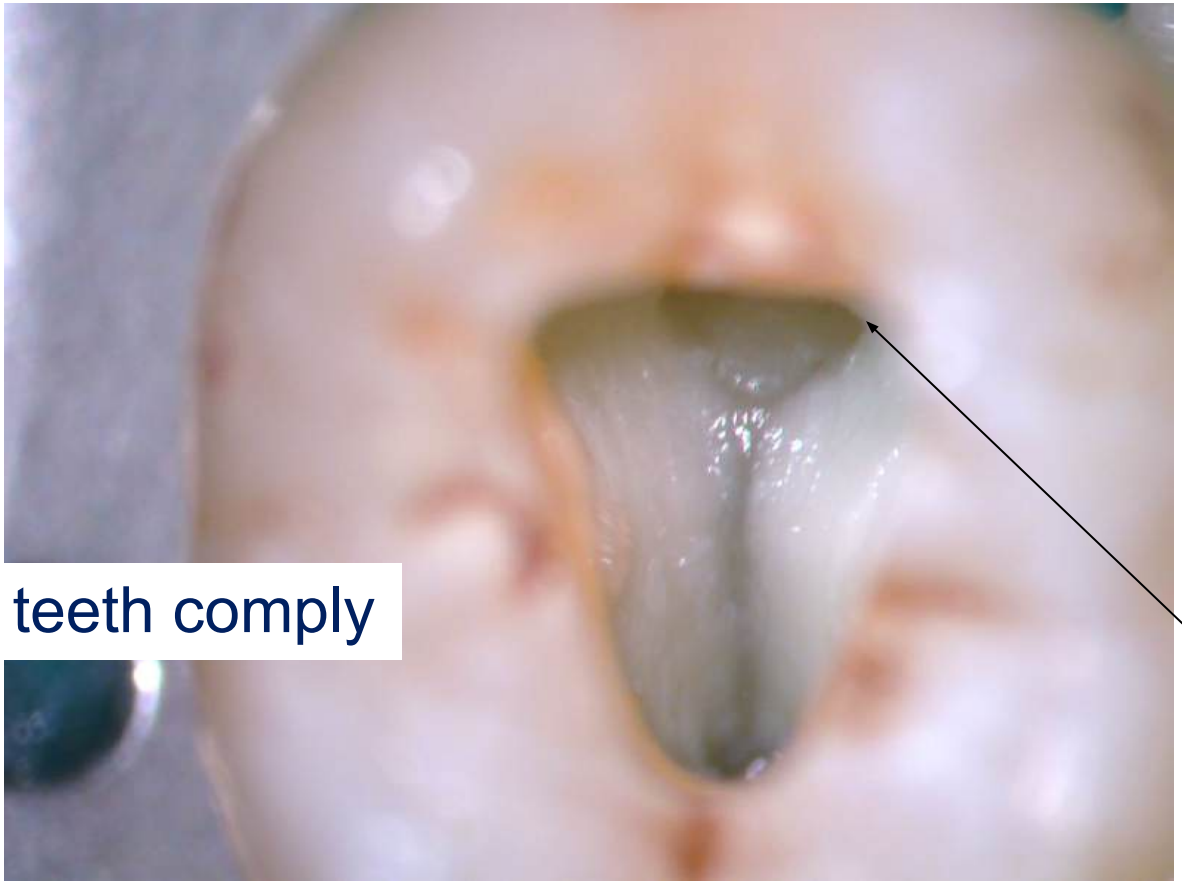
5. Second law of orifice location:

Canal entrances always at angles of floor-wall junction

6. Third law of orifice location:

Canal entrances are always at the terminus of developmental fusion lines ('the road map')

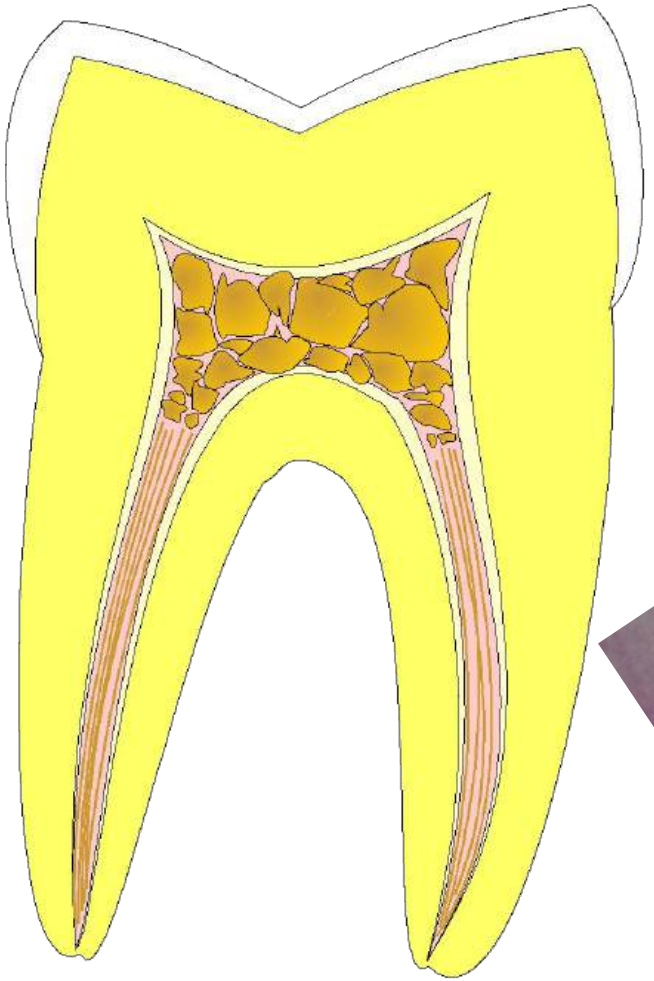
– *helps if you can see*

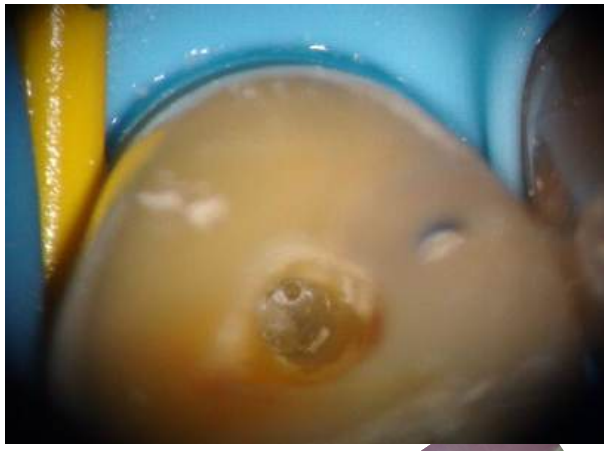


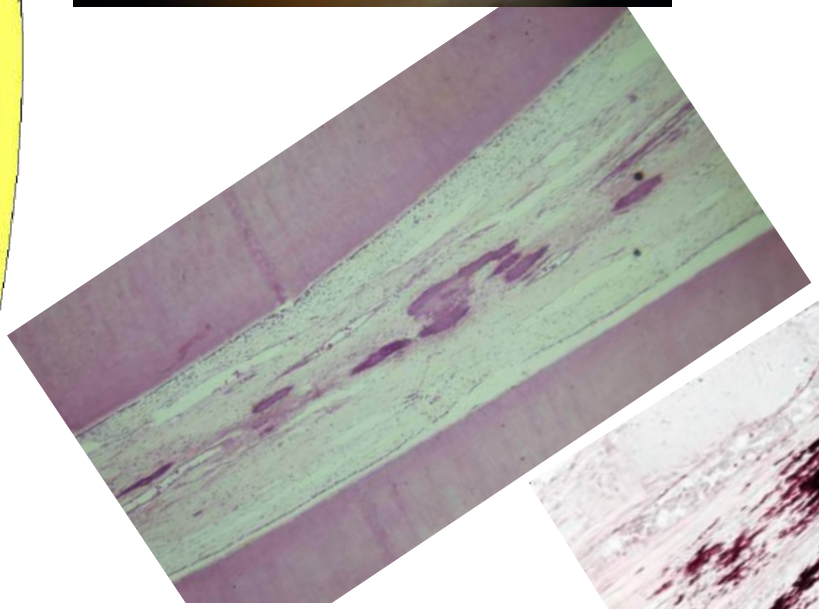
95% of teeth comply

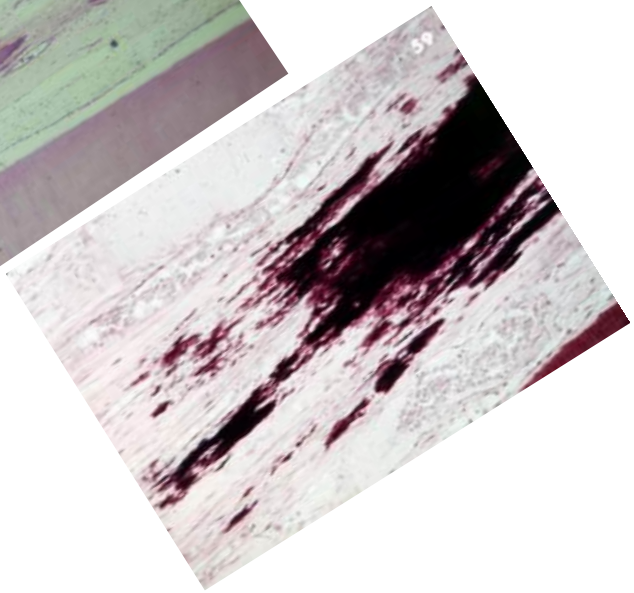
Rule 6

Overcoming ‘calcified’ canals



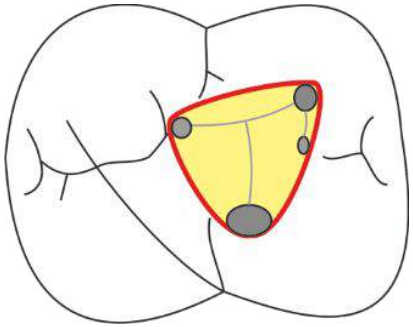


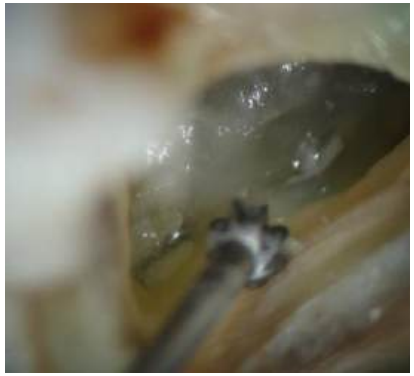




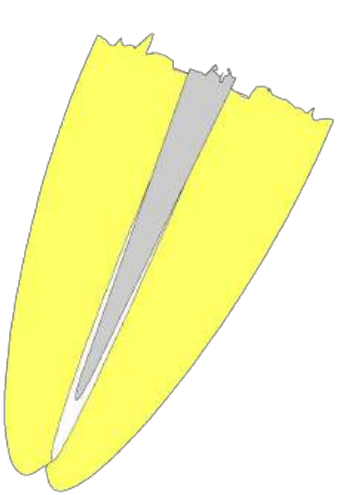
Linear deposits

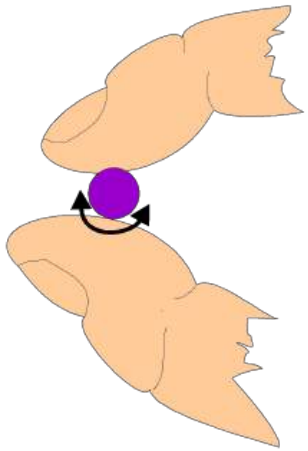
Chasing canal entrances, walking in

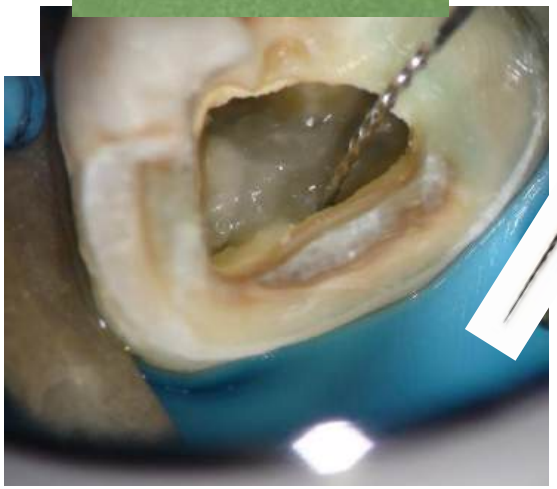




- Probe it firmly, feel it stick
- Don't assume it's the file tip binding
- Try 20/15/10 sequences
- Try rotary path files (eg HyFlex 15/03)

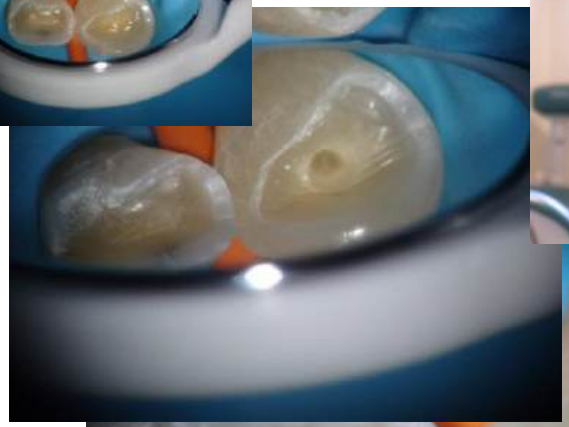


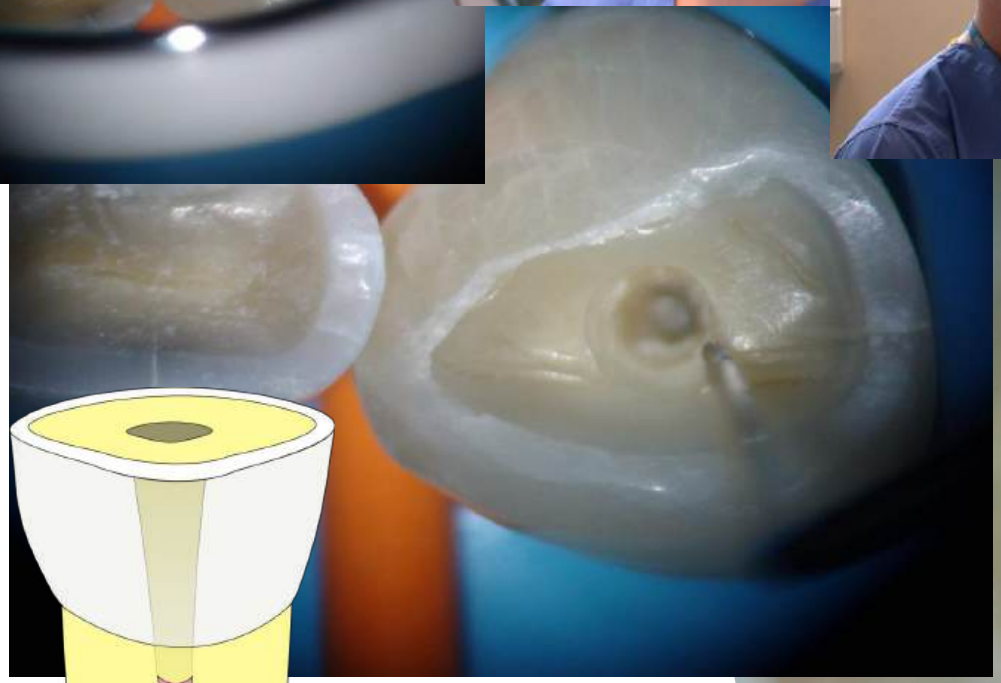


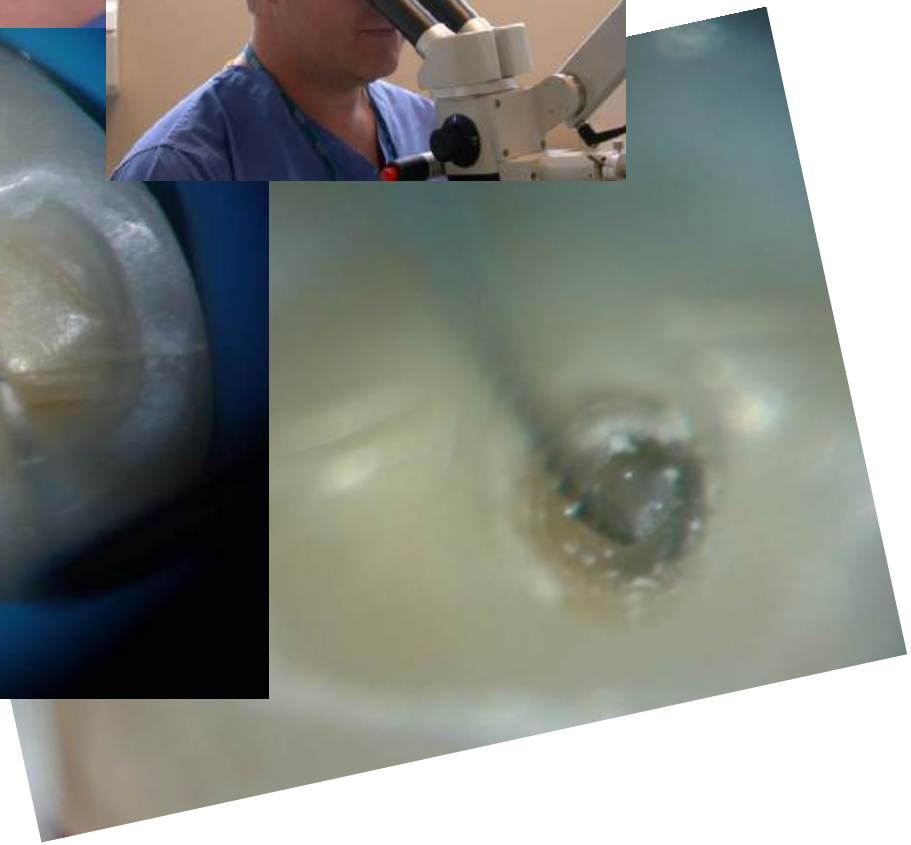


Gani & Visvisian (1999) Apical canal diameter in the first upper molar at various ages *J Endod* 25: 689-91

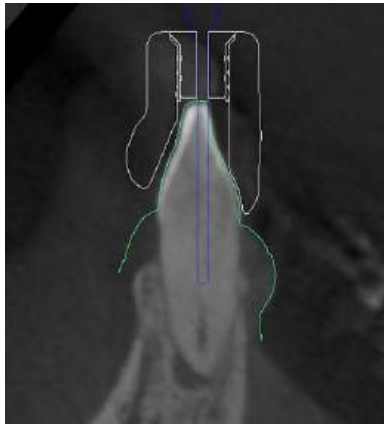
Skills refined over decades

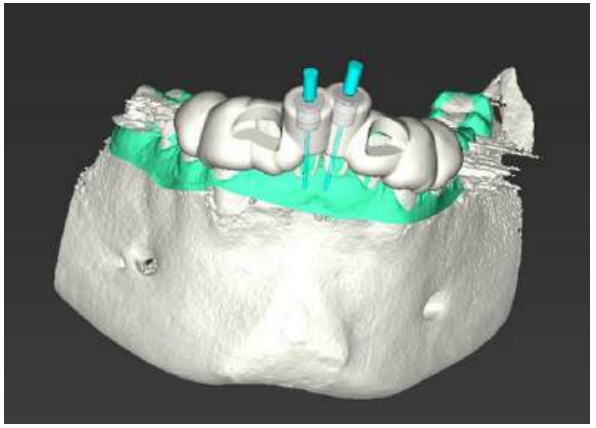


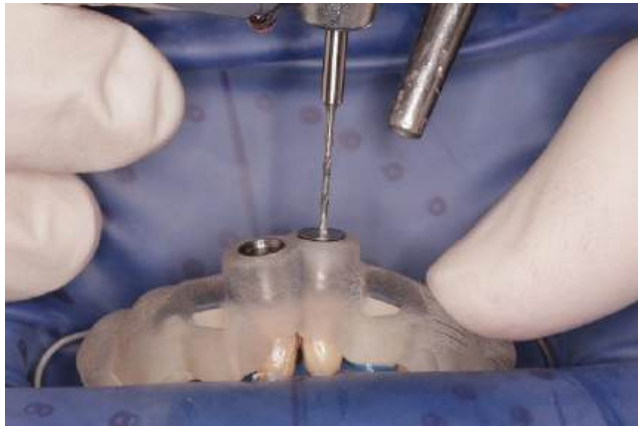


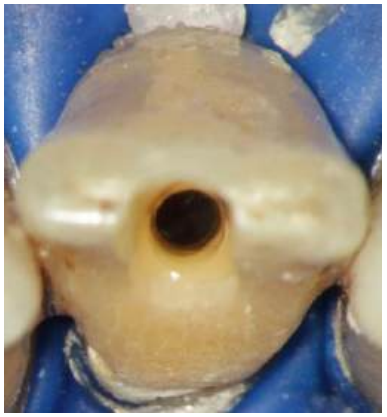


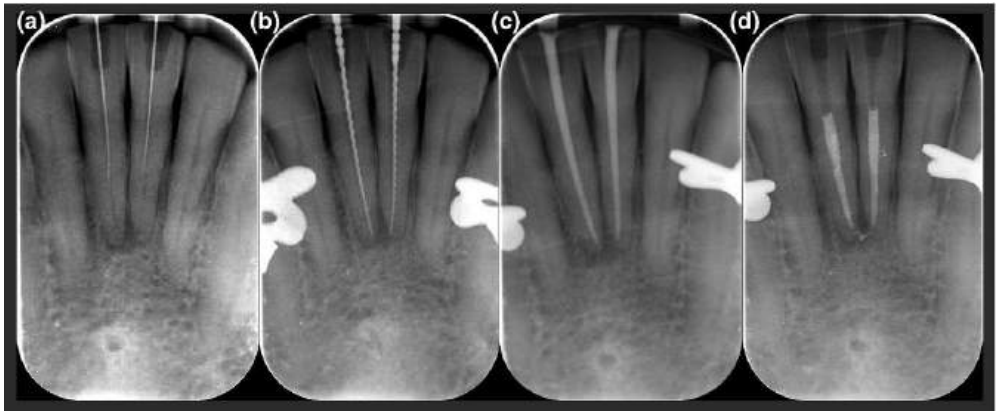
Maybe the technical challenges are over?











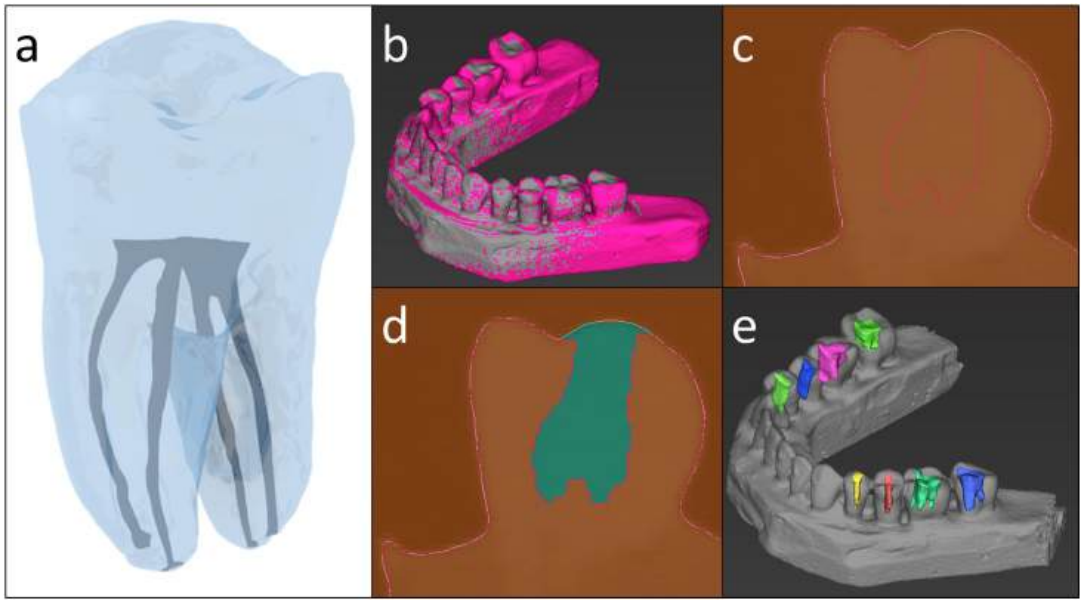
Technicians or robotic dentistry?

– quick, safe, efficient?

Connert *et al* (2018) *Int Endod J* 51:247-255
Zehnder *et al* (2016) *Int Endod J* 49:966-72
Krastl *et al* (2016) *Dent Traumatol* 32:240-6

Hirt *et al* (2025)

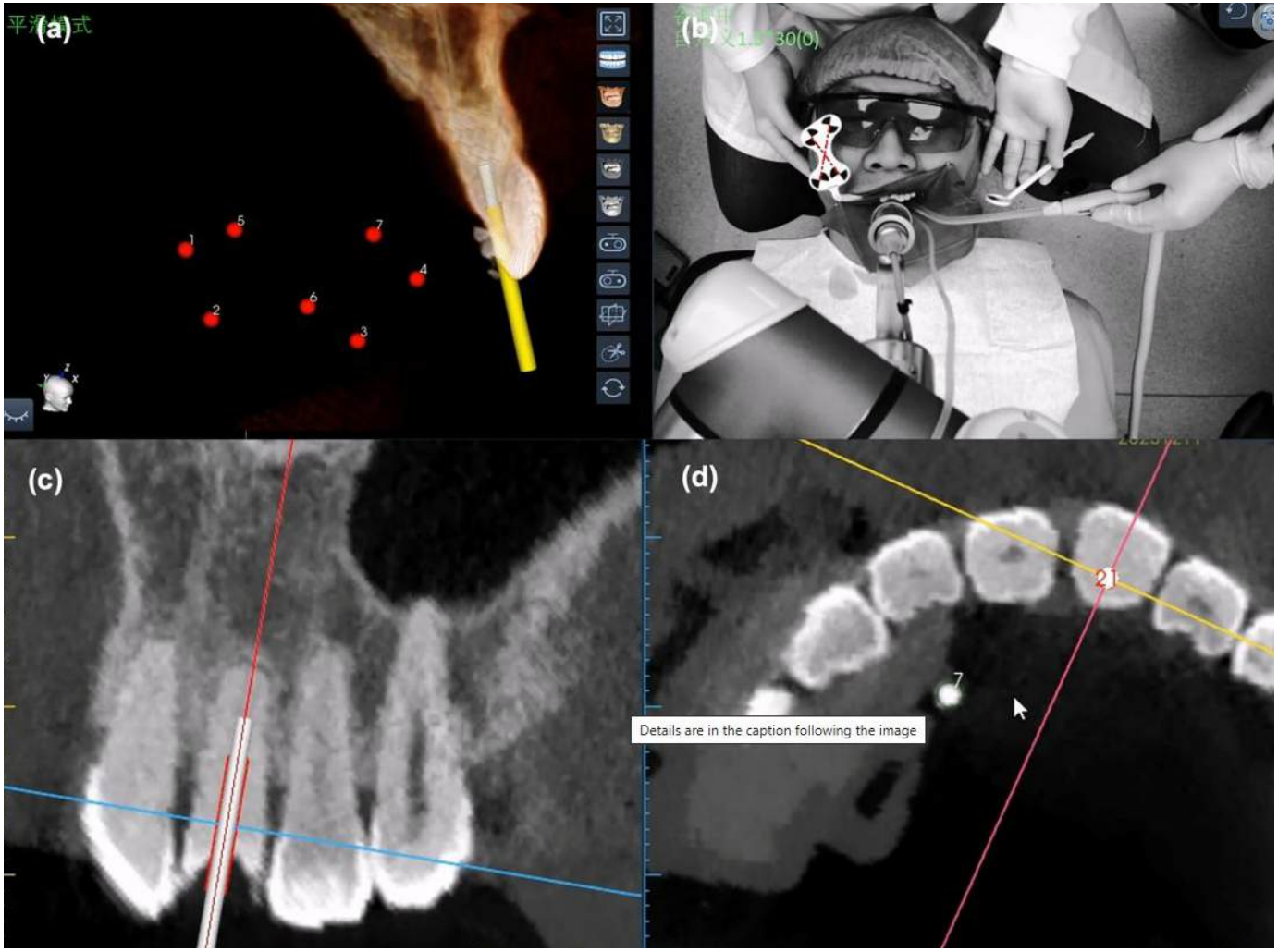
Real-Time Guided Endodontics with a Miniaturized Dynamic Navigation System in Calcified Posterior Teeth: Performance in Regard to the Operator's Level of Experience *J Endod* (*in press*)



Dynamic navigation

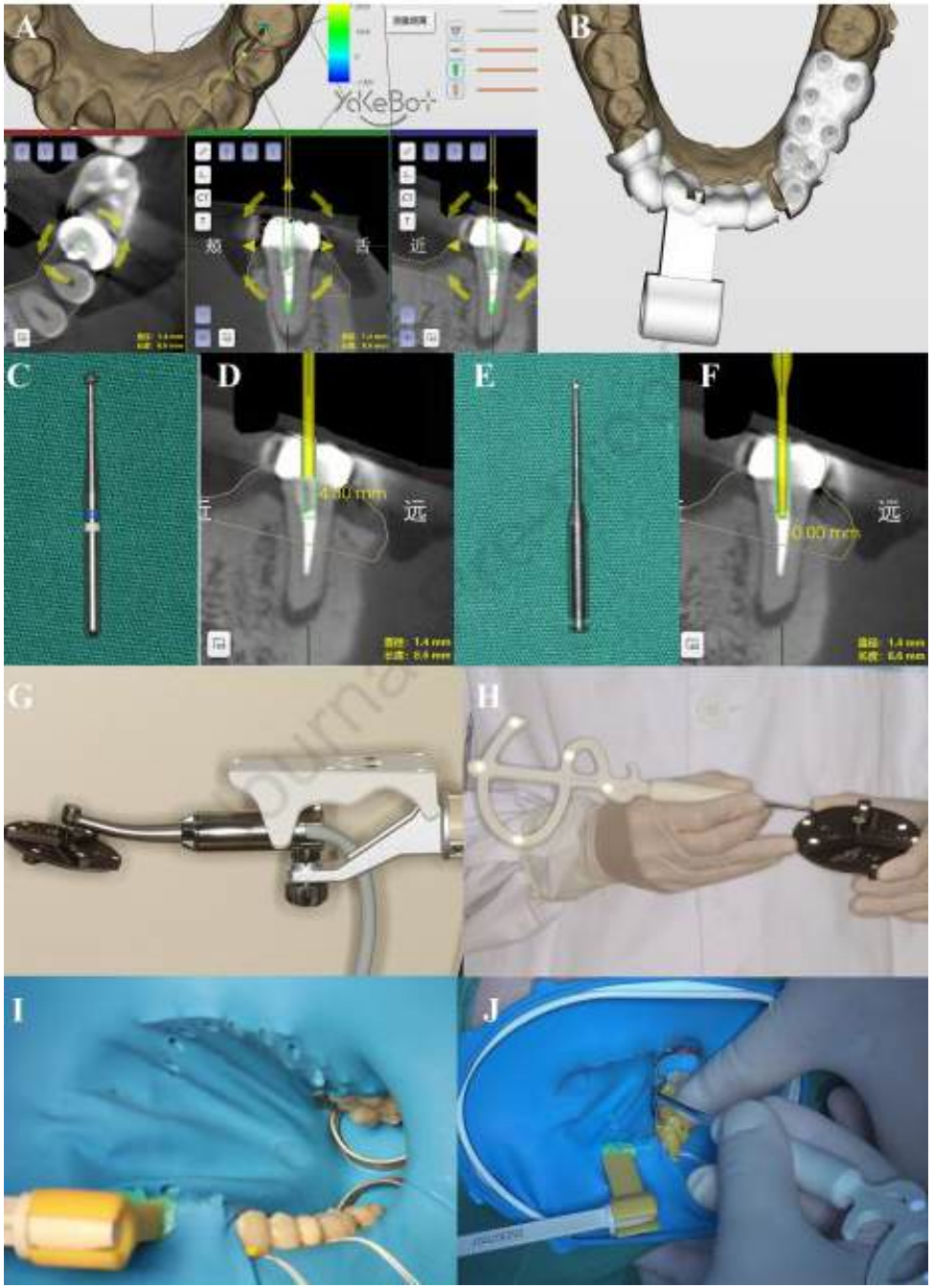
- reliable for access to posterior teeth and preserves tissue
- inexperienced generalists perform as well as experienced endodontists

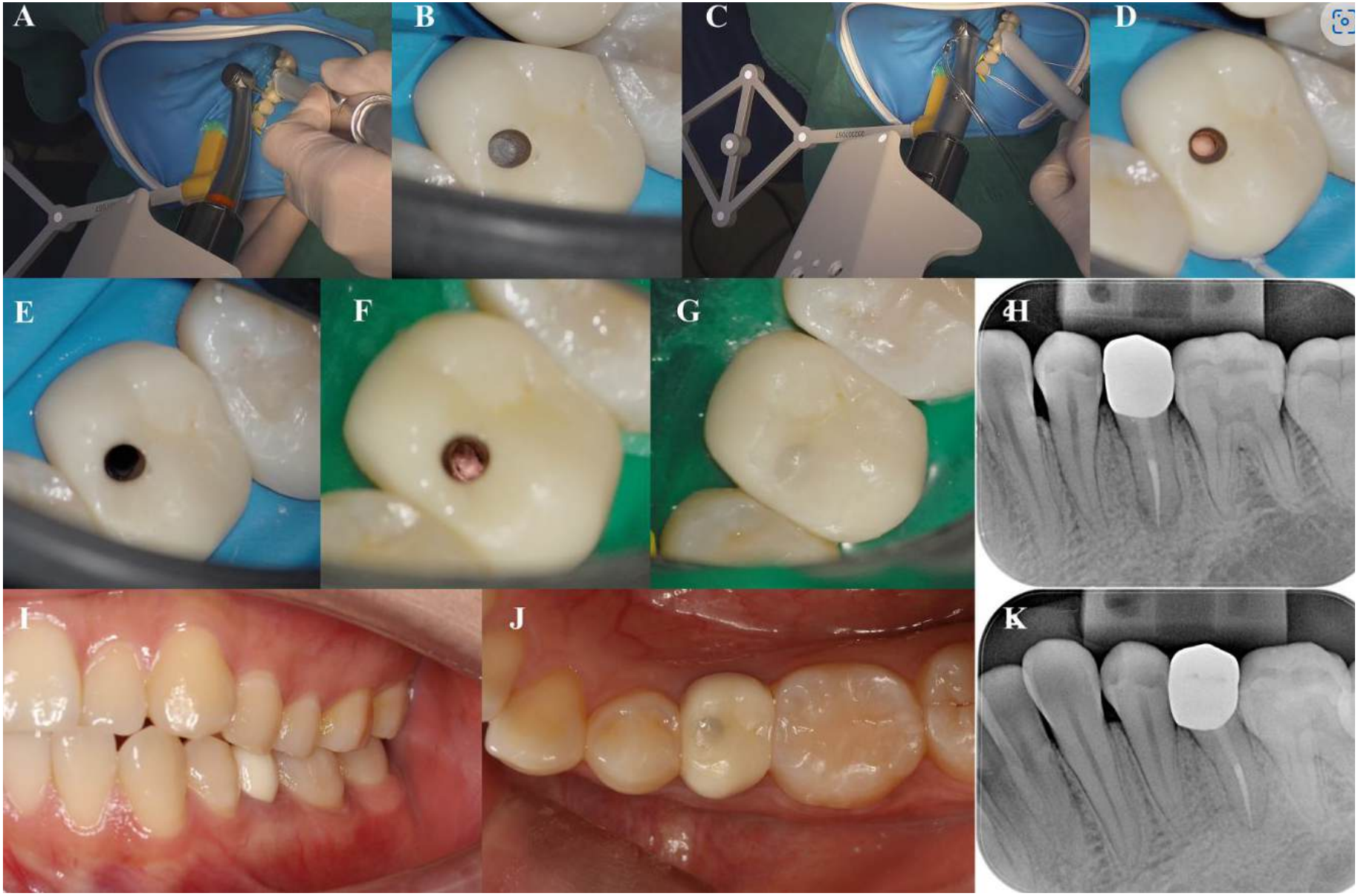
Robotic navigation system for management of pulp canal obliteration: A case report. Yu *et al* (2025) *Int Endod J* (*in press*)



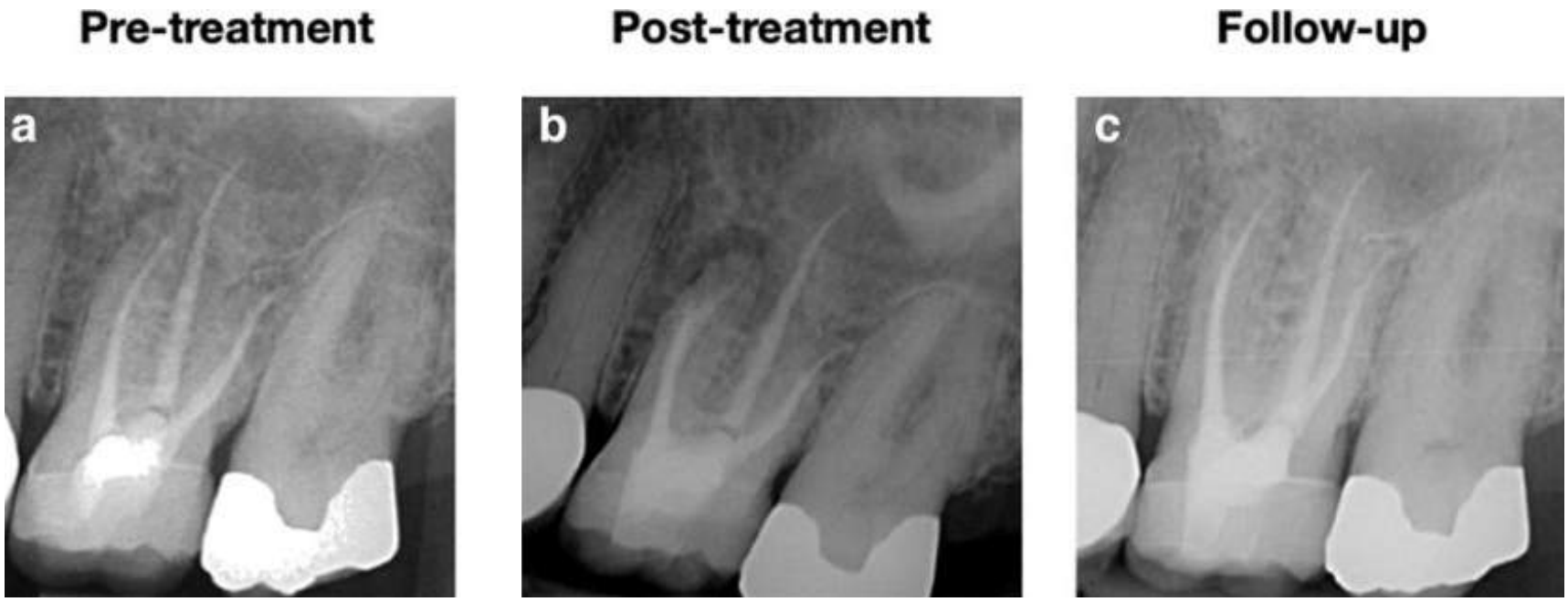
Digital workflow for retreatment

Li Qin *et al* (2025)
Robot-assisted endodontic retreatment: A case report with clinical considerations
J Endod (in press)




A
B
C
D
E
F
G
H
I
J
K

Consider selective root canal retreatment



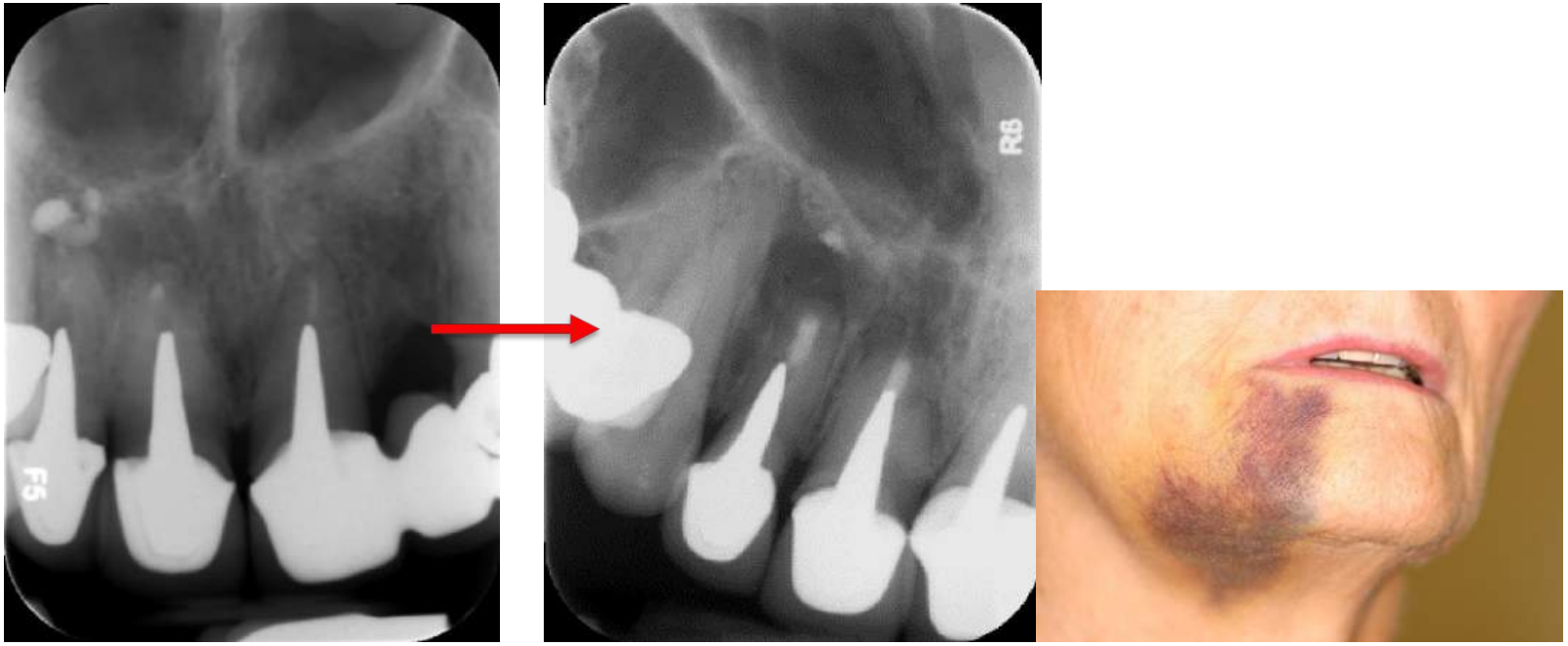
Buccal canals only

Brochado Martins *et al* (2023) Outcome of selective root canal retreatment—A retrospective study. *Int Endod J* 56: 345-55

Consider surgery

Simpler, expedient, predictable, age not a factor

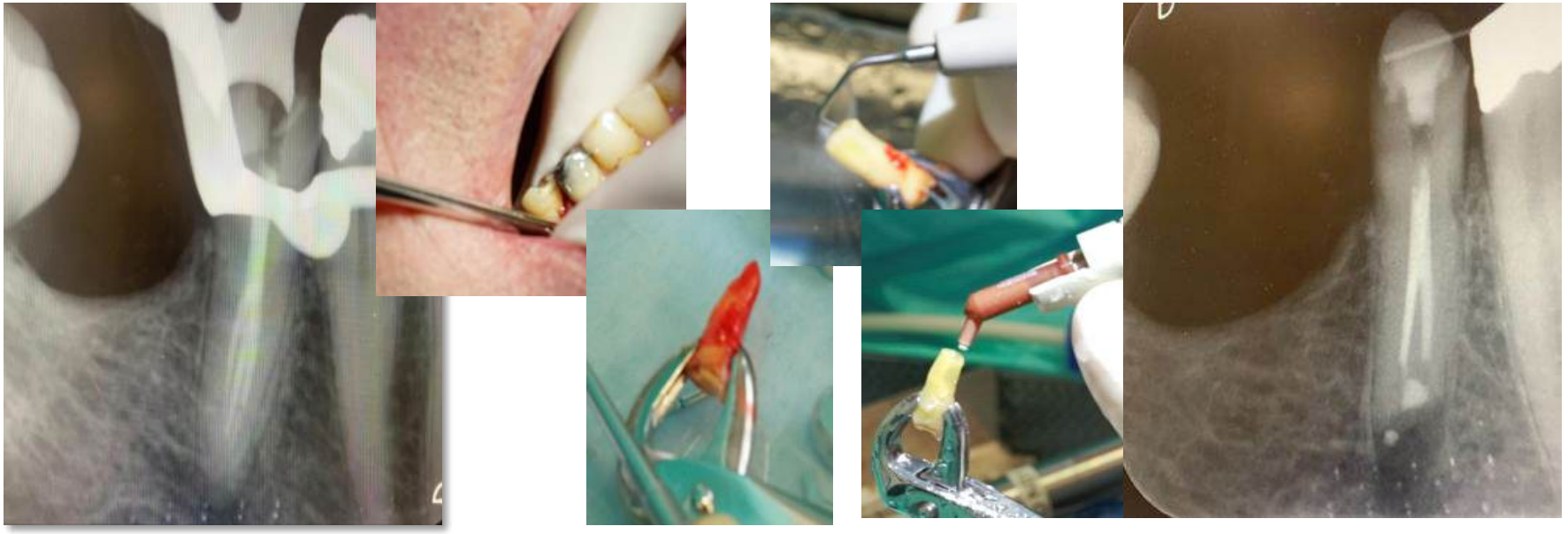
Stueland *et al* (2023) *Int Endod* J 56: 686-96



Avoiding risky, costly, destructive, time consuming dis-assembly and restoration

Setzer & Kratchman (2022) Present status and future directions: Surgical endodontics. *Int Endod* J 55 Suppl 4: 1020-58

Consider intentional reimplantation



66 no dependency

Less traumatic?

Realistic option for older patients?

Reduced MRONJ risk?

Plotino *et al* (2021) European Society of Endodontology position statement: Surgical extrusion, intentional replantation and tooth autotransplantation. *Int Endod J* 54: 655-9

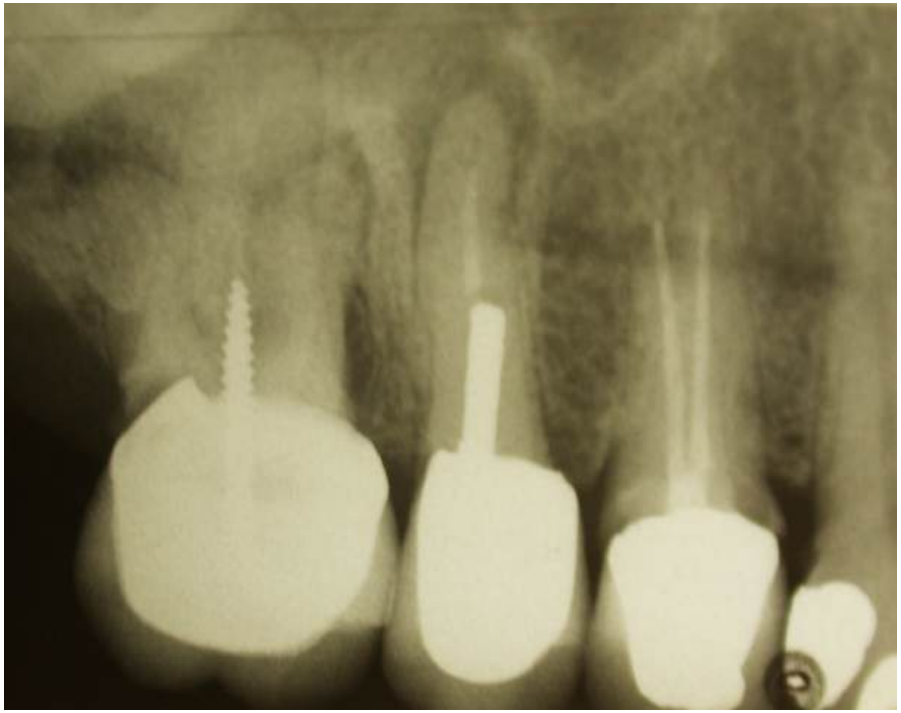
Are the real challenges in decision-making?

Monitor

Treat

Endo

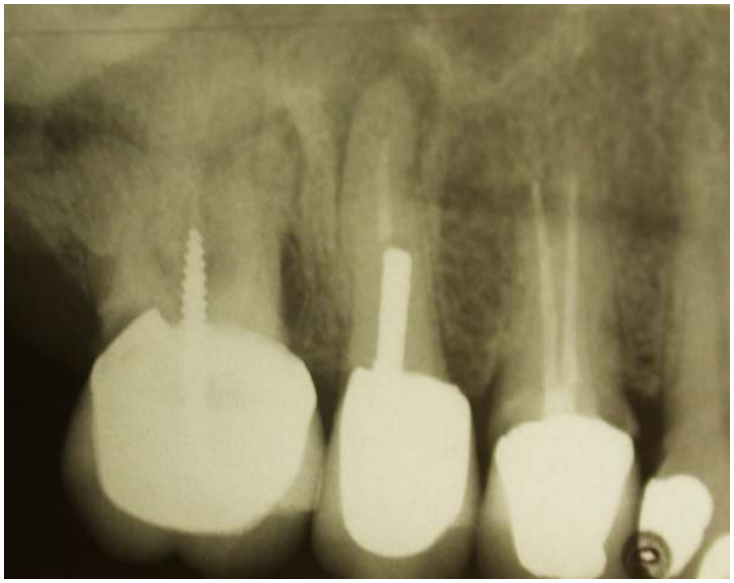
Extract



We all face uncertainty

Pigg *et al* (2022) How do we and how should we deal with uncertainty in endodontics? *Int Endod J* 55: 282-9

What makes it difficult?



- Unknown *probability* of exacerbation & infectious sequelae
- Increased *complexity* of risk-assessment with underlying medical conditions or patient frailty
- Capacity/will of patient to tolerate care
- Confidence in our own skills/armamentarium

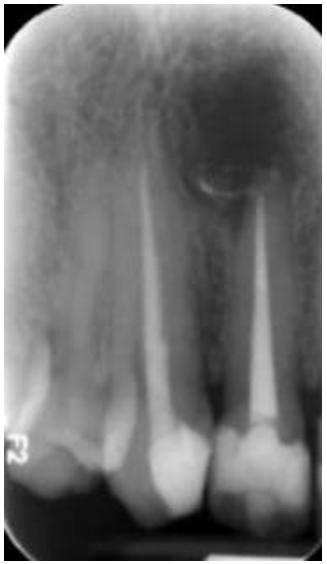
Olsson *et al* (2023)
Pre-medical assessment of root–canal–filled teeth with asymptomatic apical periodontitis – A multifaceted balancing act. *Int Endod J*: 56: 1063-76

Dentists had funding to:

- Eliminate infectious foci
- Reduce risks of infection-related complications

In patients facing possible

- Heart valve surgery
- Chemotherapy
- Radiotherapy of head/neck
- High dose antiresorptive treatment
- Solid organ transplantation



Decisions to intervene were variable & subjective

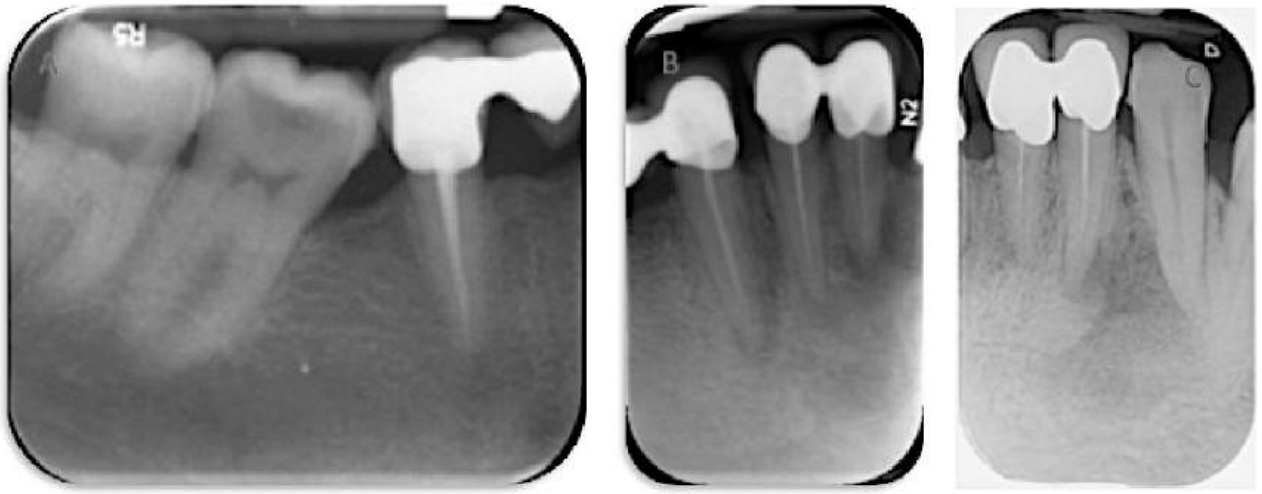
- Large, highly radiolucent, poorly circumscribed lesions considered to pose higher risk and have a greater treatment need

Extent of patient impairment, or expected level of immunosuppression from planned treatment considered

Dentists were helped by collaborative decision making

Lindström *et al* (2025)
Why do dentists refrain from intervention in cases of persistent asymptomatic apical periodontitis in root canal filled teeth? An interview study among general dental practitioners *Int Endod J* 58: 225-38

Factors in refraining from intervention

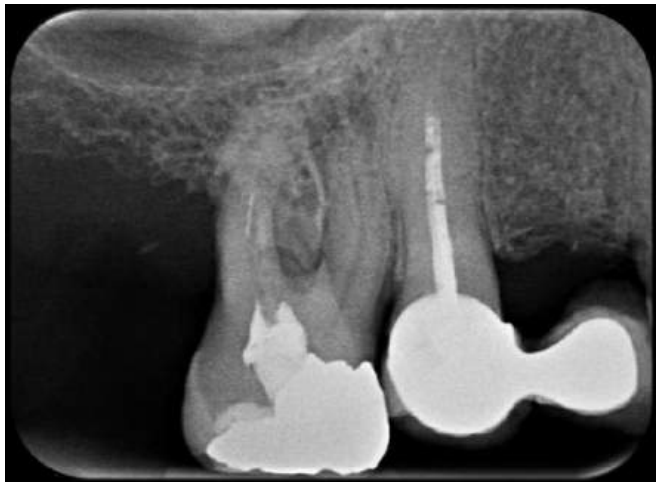


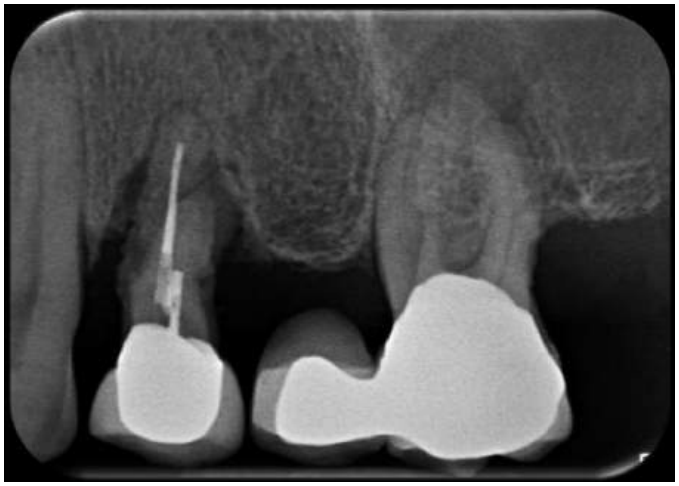
Uncertainty of diagnosis
Uncertainty of risks

Patient wishes, age of patient & lesions can be factors – don't interfere?

Helped by second opinions and reflection

Factors promoting intervention?





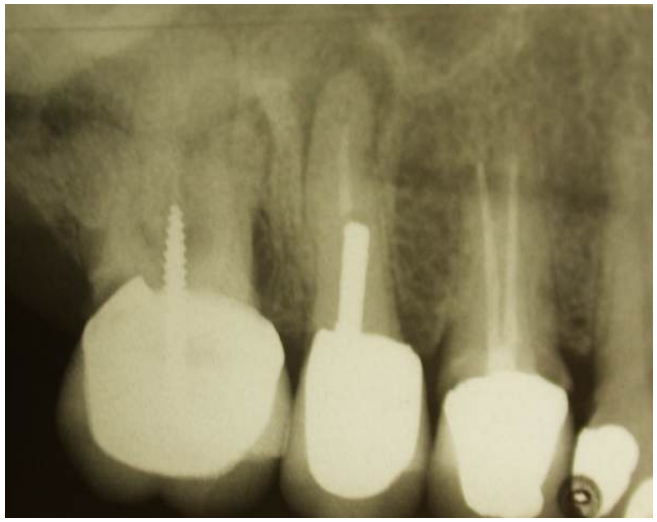
Symptoms
Perceived risk *of* infection (size of lesion)
Perceived risks *from* infection (immunocompromise)
Avoiding risk of MRONJ from extractions
Retention of restorable, strategic teeth
Other options being more complex/risky
Patient wishes

Reit & Kvist (1998) Endodontic retreatment behaviour. Int Endod J 31: 358-63

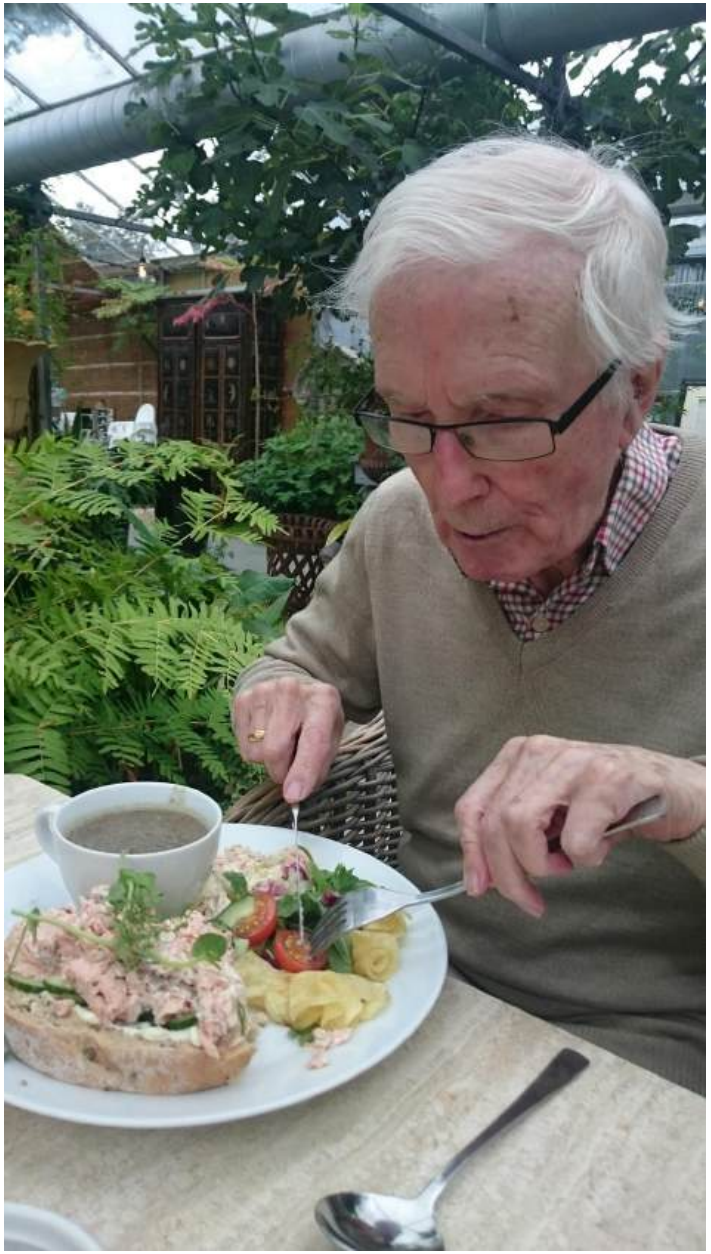
Kytridou *et al* (2023) A literature review of local and systemic considerations for endodontic treatments in older adults. *Gerodontology* 40: 410-21

The outcome of endodontic treatment either nonsurgical or surgical is not affected by older age

Endodontic treatment can be the treatment of choice in older patients with pulpal/periapical disease



Yet there is a place for watchful waiting



Until we know better

Simpler interventions and observation may be justified


SWAN SONG
SSK 89402
STEREO
℗ 1970 (2) 1971 (1)
1973 (3, 4)
© 1976 (1—4)
Superhype
Music (1—4)
SIDE ONE
LED ZEPPELIN
THE SOUNDTRACK FROM THE FILM
THE SONG REMAINS THE SAME
1. ROCK AND ROLL (4.03)
J. Bonham/J. P. Jones/J. Page/R. Plant
2. CELEBRATION DAY (3.43)
J. P. Jones/J. Page/R. Plant
3. THE SONG REMAINS THE SAME (5.00)
J. Page/R. Plant
4. RAIN SONG 8.24
J. Page/R. Plant
PRODUCED BY JIMMY PAGE
Executive Producer: Peter Grant
SSK 89402 A
ALL RIGHTS OF THE MANUFACTURER AND OF THE OWNER OF THE RECORDED WORK RESERVED · UNAUTHORISED COPYING PUBLIC PERFORMANCE AND BROADCASTING OF THIS RECORD PROHIBITED · A WARNER COMMUNICATIONS COMPANY


Jimmy Steele
Finbar Allen
Graham Walton
Rebecca Wassall
Andrew Geddis-Regan
Jim Gillespie
Anas Mahdee
And many others