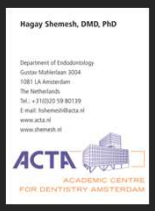
Retreat or not retreat ?
An exercise in forming a guideline



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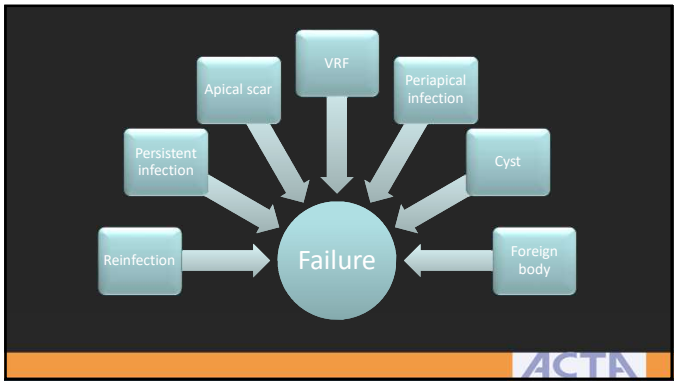
- Reasons for failure
- VRF
- What are the goals of root canal treatment?
- A new crown – a new endo ?
- Decision tree
- Limitations

2



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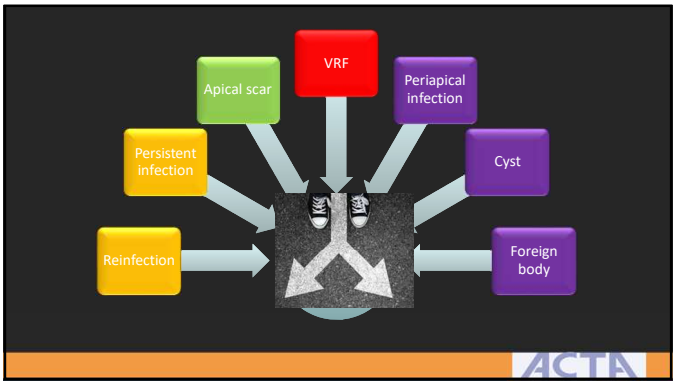

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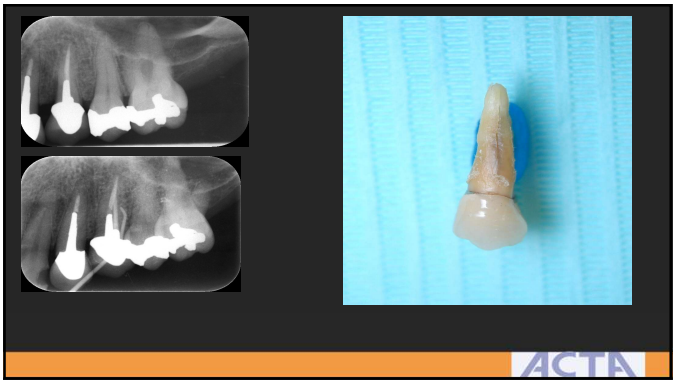

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- An evaluation of endodontically treated VRF teeth: impact of operative procedures. Fuss Z et al. 2001
- An evaluation of endodontically treated VRF teeth. Tamse A et al. 1999
- Prevalence of VRF in extracted endodontically treated teeth. Fuss Z et al. 1999
- Radiographic features of vertically fractured, endodontically treated maxillary premolars. Tamse A et al. 1999

Tamse, Fuss 1999-2001

8

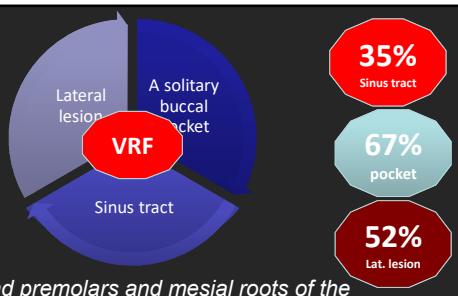
An evaluation of endodontically treated vertically fractured teeth.

- Survey of 92 teeth with VRF evaluated before and after extraction .
- Most fractured : maxillary 2nd premolars and mesial roots of the mandibular molars

- 67.4% -solitary buccal pocket
- 34.8% -sinus tract
- 52% -lateral radiolucency (with or without periapical radiolucency)

Tamse et al. JOE 1999

9

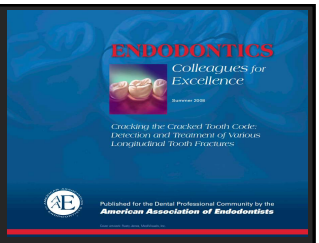


- *Maxillary second premolars and mesial roots of the mandibular molars*

Tamse et al. JOE 1999

10

"Having a sinus tract and a narrow, isolated periodontal probing defect in association with a tooth that has had root canal treatment, with or without a post placement, is considered to be pathognomonic for the presence of a VRF. "



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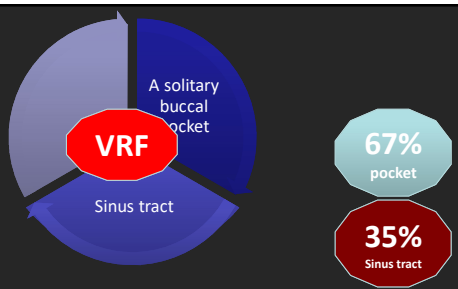

AAE 2008

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When suspecting a VRF, when are we really sure ?

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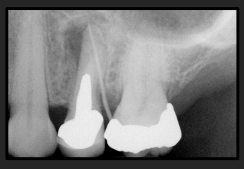
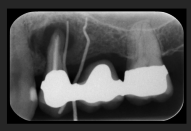


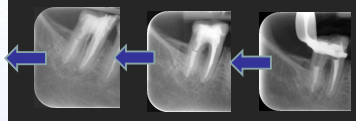
- Sinus tract
- Endodontically treated tooth
- Premolar with a post
- Lateral lesion

14



- "high" sinus tract
- "double" sinus tract

15



O. Guerreiro Viegas

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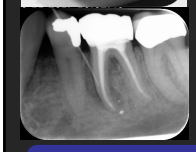

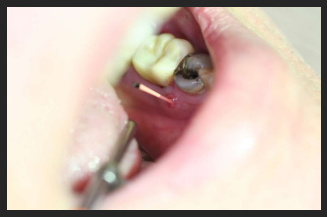

- "high" sinus tract

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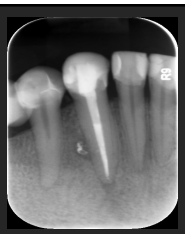

M. Lindtof

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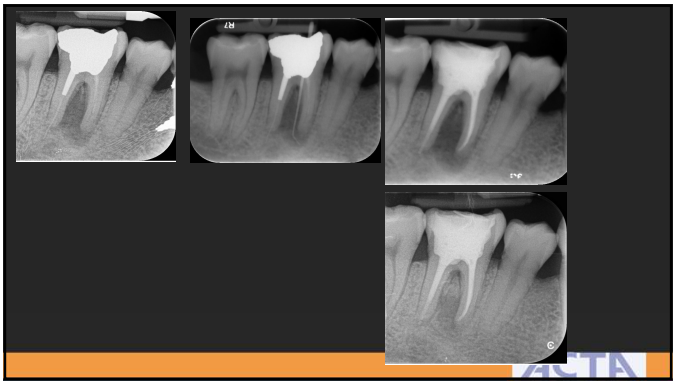

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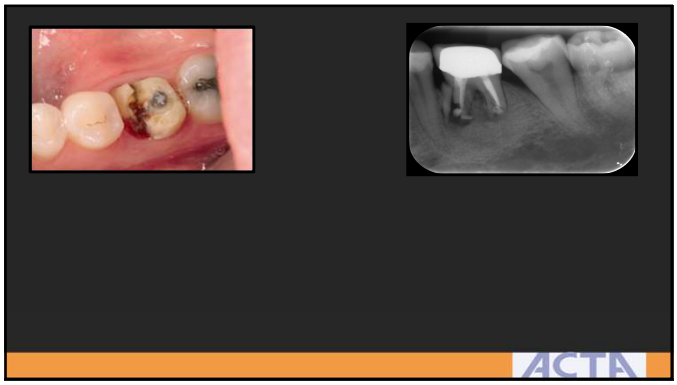


21

Diagnosis of VRF in endodontically treated teeth based on clinical and radiographic indices: a systematic review.

" There is no substantial evidence regarding the accuracy of the clinical and radiographic indices for the diagnosis of VRF in endodontically treated teeth" .

Tsesis et al. JOE 2010

22

Review
Risk Factors for and Clinical Presentations Indicative of Vertical Root Fracture in Endodontically Treated Teeth: A Systematic Review and Meta-analysis

Conclusions: Four clinical presentations were identified to be the most significant signs or symptoms for a VRF : presence of sinus tracts, increased probing depths, swelling/abscess, and tenderness to percussion.

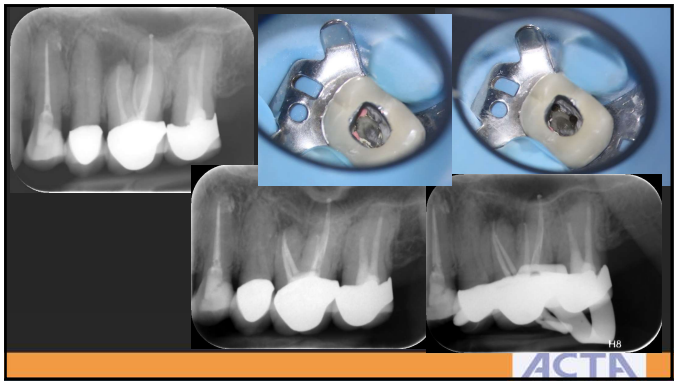
Haupt et al. JOE 2023

23

Summary- Typical clinical and radiographic features

Feature	Additional characteristics
Direct visualization of a fracture	Microscope, illumination
Deep pocket	But not from a periodontal problem!
Sinus tract	Usually coronal or multiple sinus tracts
Mobility	Not always
Radiographic lateral lesion	In a tooth with a well executed root canal treatment

24



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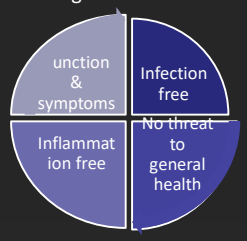
- What are our goals when we treat AP ?



26

- What are our goals when we treat AP ?

27

Function & Symptoms

97% of 1.4 million teeth were functional 8 years following non-surgical root canal treatment

Salehrabi & Rotstein 2004 JOE

28

The success of endodontic therapy-healing and functionality.
Friedman S, Mor C.

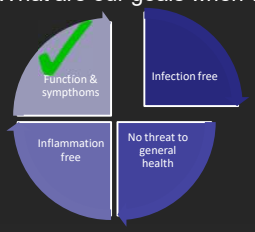
Functionality = 86-92%

Friedman & Mor 2004 J Calif Dent Assoc

29

30

- What are our goals when we treat AP ?



31

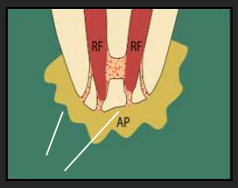
Bacteria recovered from teeth with AP after antimicrobial endodontic treatment.

Once established, nonmutans streptococci, enterococci and lactobacilli appear to survive commonly following root-canal treatment of teeth with clinical and radiographical signs of AP.

Chavez de Pas et al. 2003 IEJ

32

In 90% of the infected canals, bacterial biofilm remained in the apical 3 mm after root canal treatment.



Nair et al. 2005 OOOOE

33

Courtesy Dr. Frank Paqué

Current procedures are not effective in eliminating root infection.

34

- What are our goals when we treat AP ?

35

Lesions of endodontic origin and risk of coronary heart disease.

"These findings are consistent with research that suggests relationships between chronic periodontal inflammation and the development of CHD, especially among younger men."

Caplan et al. 2006 JDR

36

Endodontic variables and coronary heart disease.

" This cross-sectional study did not reveal a significant association between endodontically treated teeth and CHD nor between teeth with periapical disease and CHD."

Frisk et al. 2003 ACTA odontol Scand

37

The impact of Endodontic Infections on the pathogenesis of Cardiovascular disease : A systematic review with meta- analysis

"Whether the presence of a lesion of endodontic origin may or may not have some impact on cardiovascular disease, the level of evidence is low, and our confidence in the assessment is low".

Aminoshariae et al. 2018 JOE

38

Association Between Periodontal Disease and Erectile Dysfunction: A Systematic Review

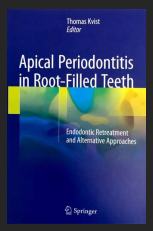
It is emphasized that physicians should refer patients with ED to oral health care providers for a comprehensive oral evaluation and treatment.

There are several confounders, such as age and the type of ED, that failed to be adjusted and that generate bias and affect the correlation between the incidence of ED and PD.

Kellesarian et al. 2016 Am J Mens Health

39

- ' At present time the association between endodontic disease and different systemic conditions rests on shaky grounds."



Frisk & Kvist 2019 AP in root-filled teeth

40

- What are our goals when we treat AP ?

41

Outcome is determined clinically (lack of signs & symptoms) and radiographically

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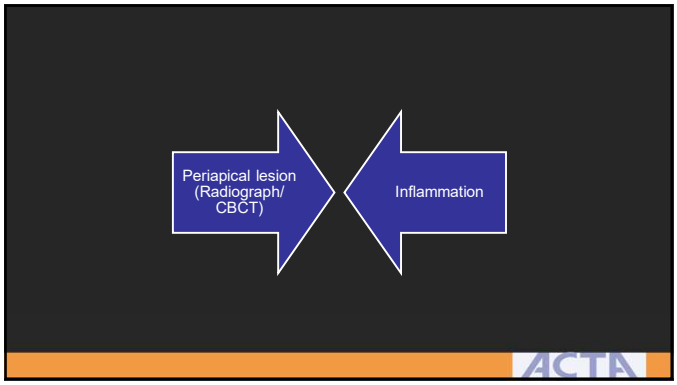

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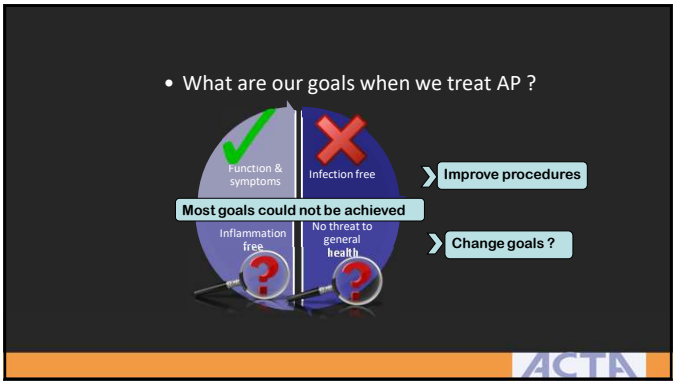

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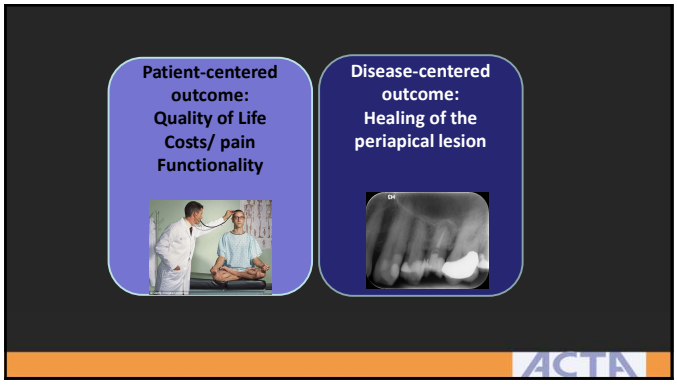

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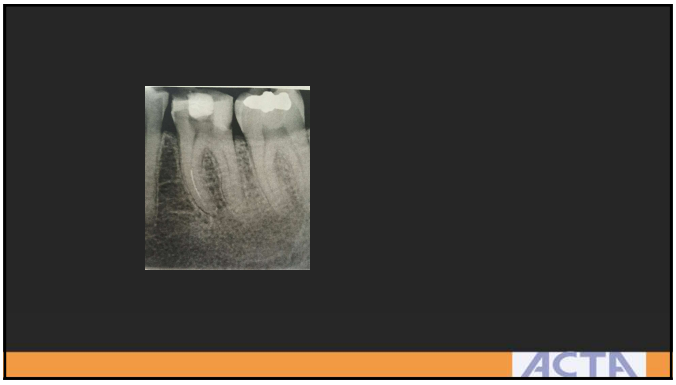

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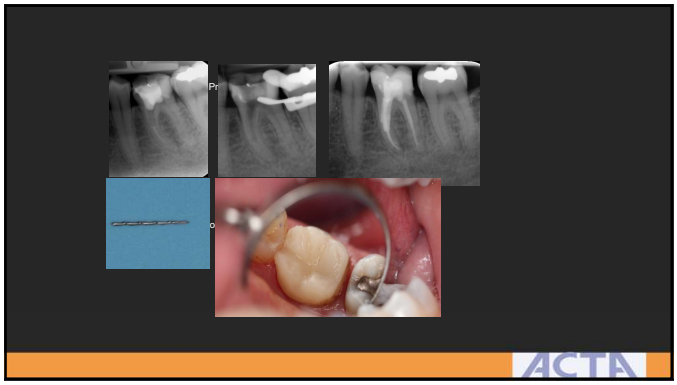

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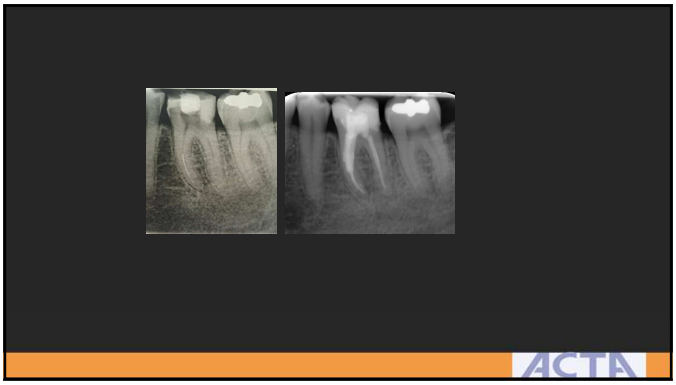

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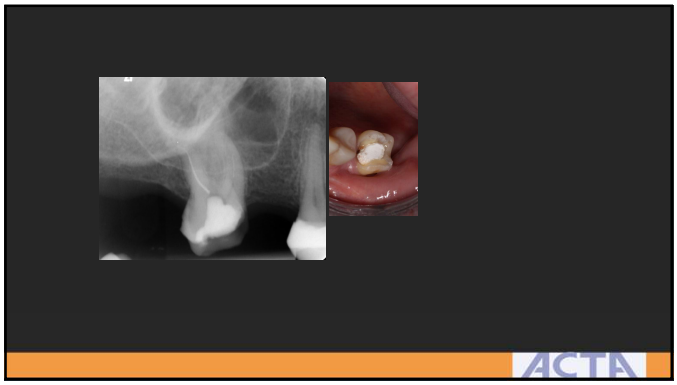

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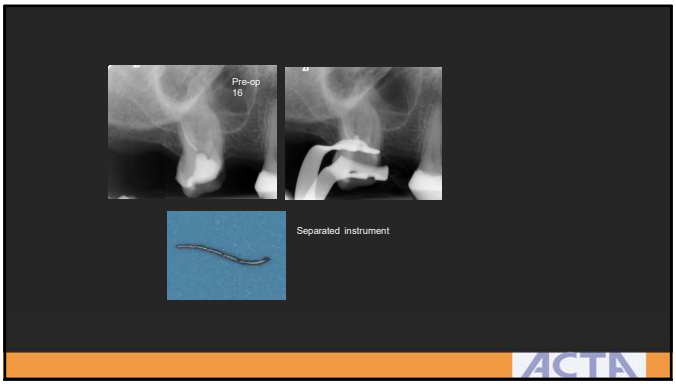

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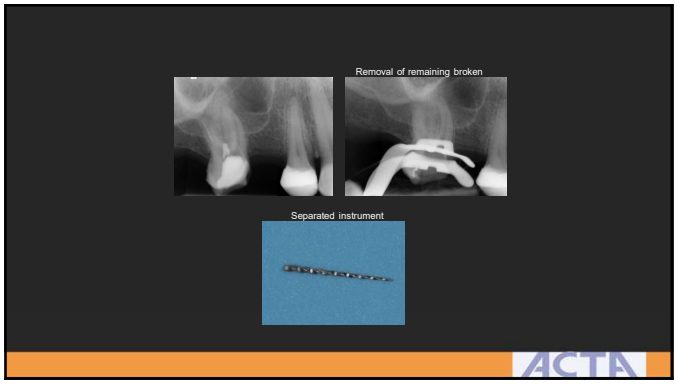

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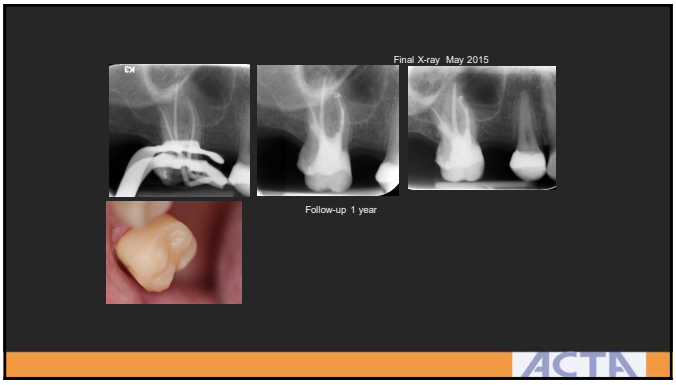

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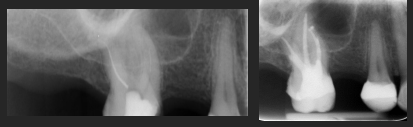

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Periapical periodontitis is an inflammation process that results from infection. Basically we want to get rid of the infection.

However, our ability to do so is limited, and financial factors could also play a role.
In already endodontically treated teeth, the possibility of not-treating a lesion is a relevant option, that we must present to the patient.

56

A new crown- a new endo ?

1. Retreatment
2. Surgery
3. Just a crown immidiately

57

What did we do in the past ?

Until 10 years ago, we based our decision mainly on "leakage concepts"
If the coronal restoration was damaged → retreatment!

58

Previous attempts **for a guideline**

- Paul Abbott Endodontic topics 2011
- Victoria Yu et al. J Dent Res 2014

59

How to make the decision?

1. Complaints
2. Quality of the root canal filling
3. Quality of the coronal restoration
4. Presence of a periapical lesion

Descision tree

J Am Dent Assoc. 2011 Is endodontic re-treatment mandatory for every relatively old temporary restoration? – a review. Keinan D, Moshonov J, Smidt A.

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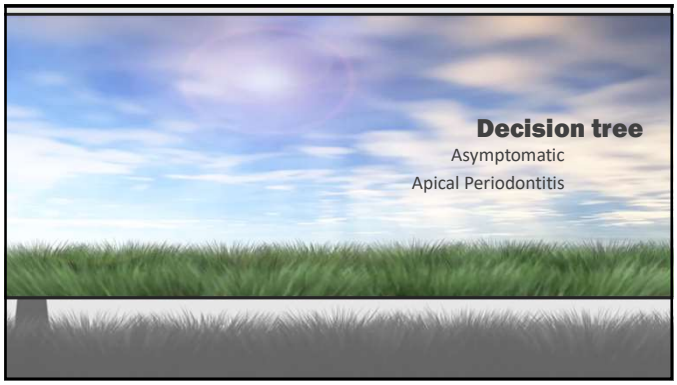

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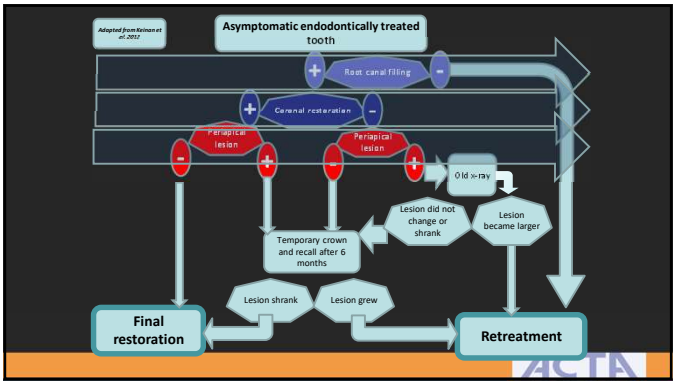

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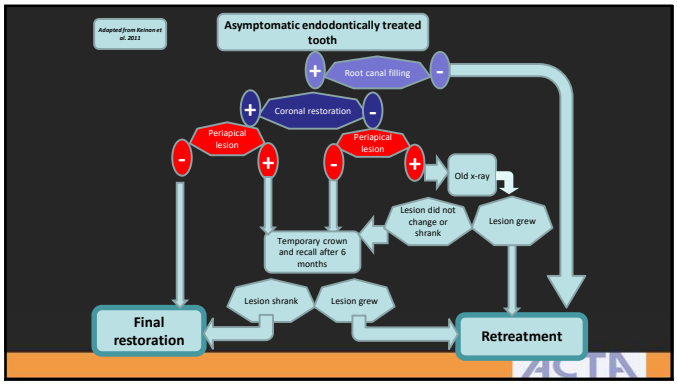

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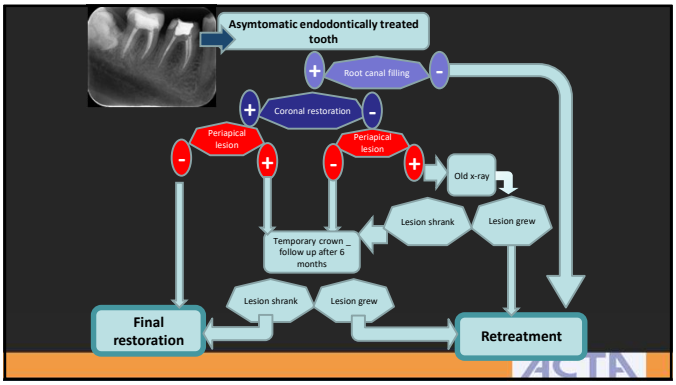

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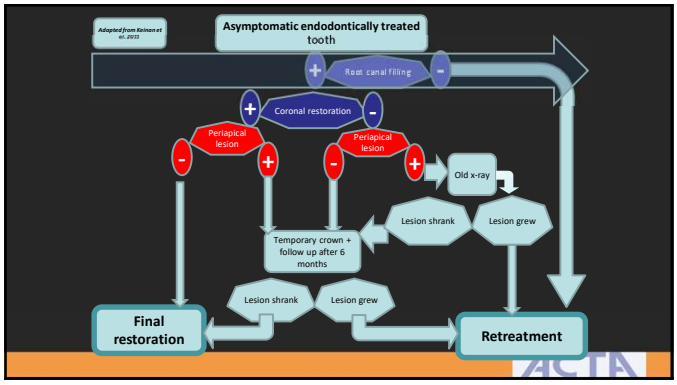

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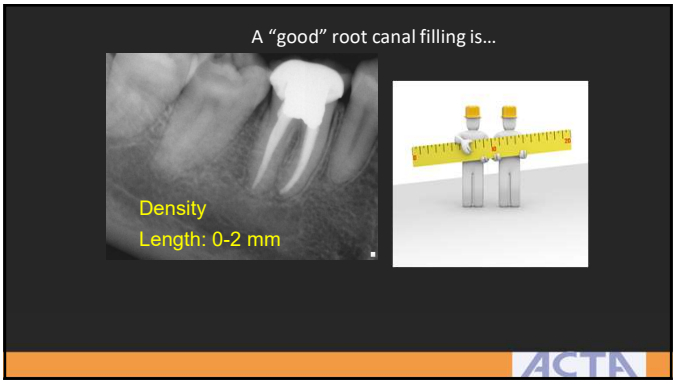

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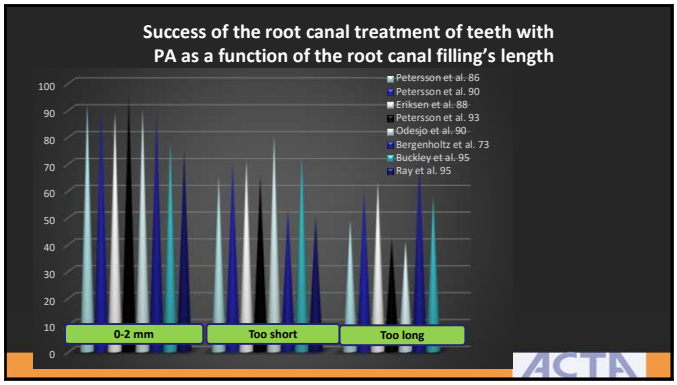

67

Clinical outcome studies show a consistent preference for root canal fillings that are 0-2 mm from the radiographic apex

(Ng et al. 2008)

IEJ 2008. Outcome of primary root canal treatment: systematic review of the literature -- Part 2. Influence of clinical factors. Ng, Mann, Rahbaran, Lewsey, Gulabivala

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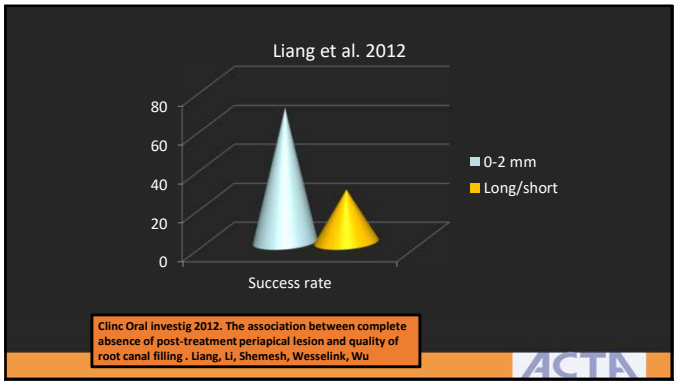

Clinc Oral investig 2012. The association between complete absence of post-treatment periapical lesion and quality of root canal filling . Liang, Li, Shemesh, Wesselink, Wu

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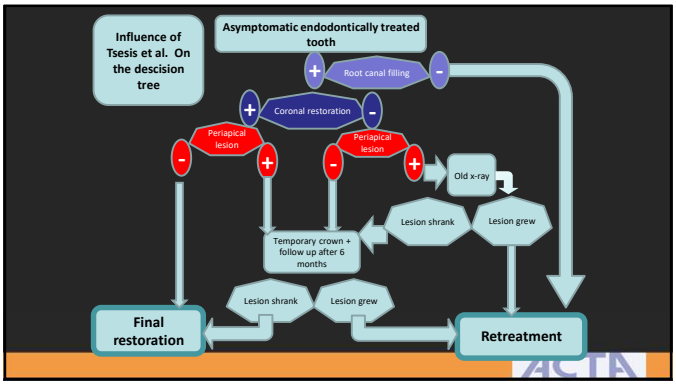

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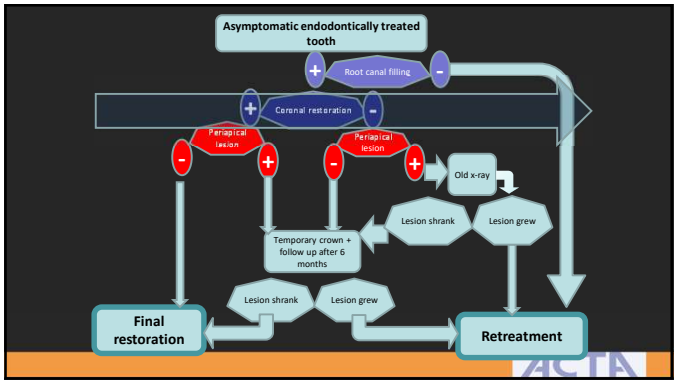
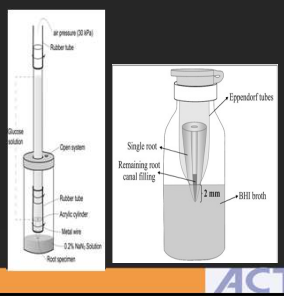


71

- Leakage !

- In vitro leakage models : All root canal fillings leak after a few months (Shemesh et al. 2006)

In other words: Leaking coronal restoration means that the whole root canal csystems will be reinfected after a few months



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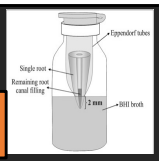
- Leakage ?



Int Endodo J 2003 Bacterial status in root-filled teeth exposed to the oral environment by loss of restoration and fracture or caries--a histobacteriological study of treated cases. Ricucci & Bergenholtz

Int Endodo J 2008. Potential systematic error in laboratory experiments on microbial leakage through filled root canals: an experimental study. Rechenberg, Thurnheer, Zehnder

73

Int Endodo J 2003 Bacterial status in root-filled teeth exposed to the oral environment by loss of restoration and fracture or caries--a histobacteriological study of treated cases. Ricucci & Bergenholtz

Conclusion: Well-prepared and filled root canals resist bacterial penetration even upon frank and long-standing oral exposure by caries, fracture or loss of restoration.

Coronal 1/3 ALL TEETH INFECTED

Mid 1/3 2 INFECTED TEETH

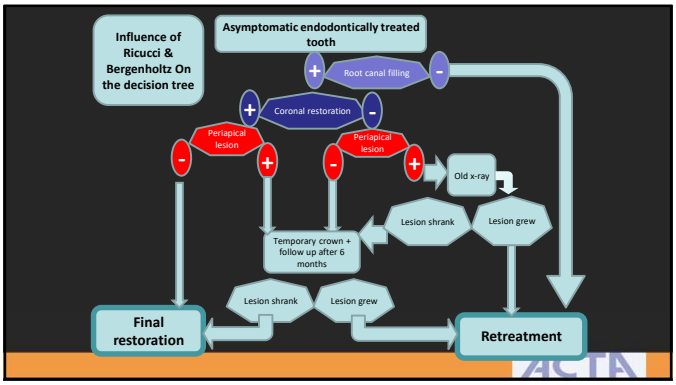
Apical 1/3 NO

74

Int Endodo J 2008. Potential systematic error in laboratory experiments on microbial leakage through filled root canals: an experimental study. Rechenberg, Thurnheer, Zehnder

Conclusion: Bacterial leakage models are unsuitable for assessing leakage through root filled teeth.

75



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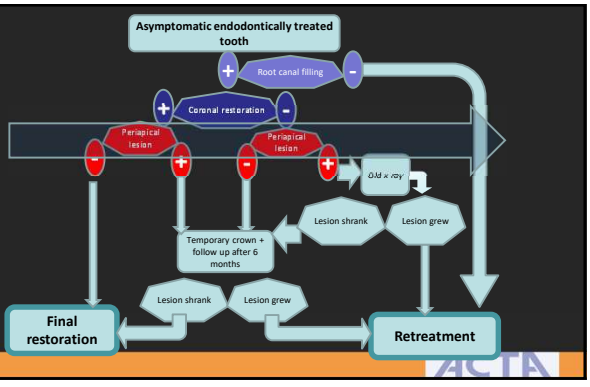

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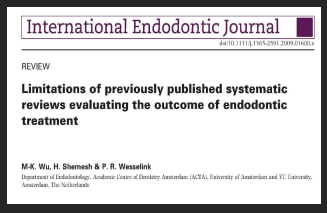
- How reliable are x-rays in detecting periapical lesions?



"The outcomes of root canal treatment should be re-evaluated in long-term longitudinal studies using CBCT and stricter evaluation criteria."

78

Should we treat all periapical lesions?

1. General health?
2. "the accidental finding"
3. Dynamics of the healing process

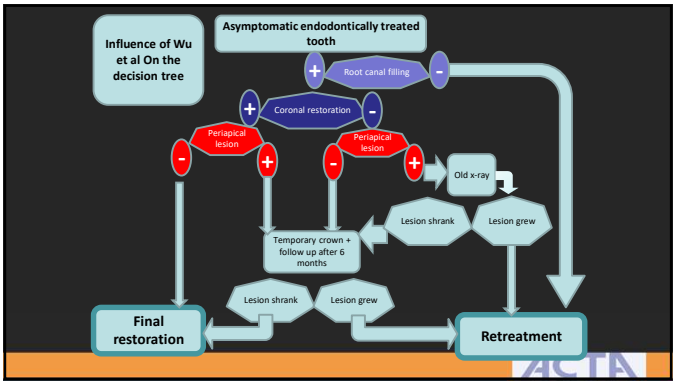
Int J Cardiol. 2011 Can a chronic dental infection be considered a cause of cardiovascular disease? A review of the literature. Cotti E et al .

J Endod. 2011 Association of endodontic infection with detection of an initial lesion to the cardiovascular system. Cotti E et al.

Apical periodontitis as an accidental finding Wesselink P.R 2010

Int Endod J. 2008 Outcome of secondary root canal treatment: a systematic review of the literature. Ng YL et al.

79



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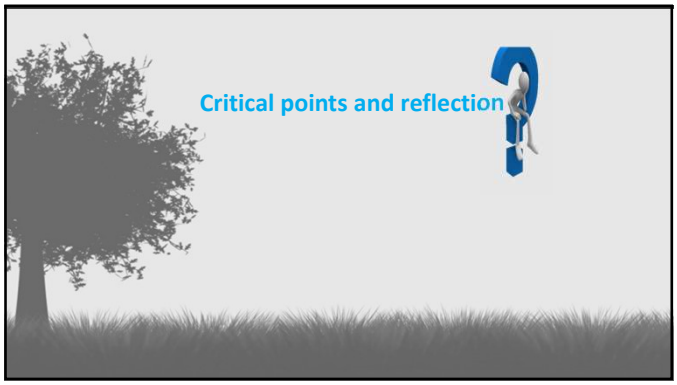

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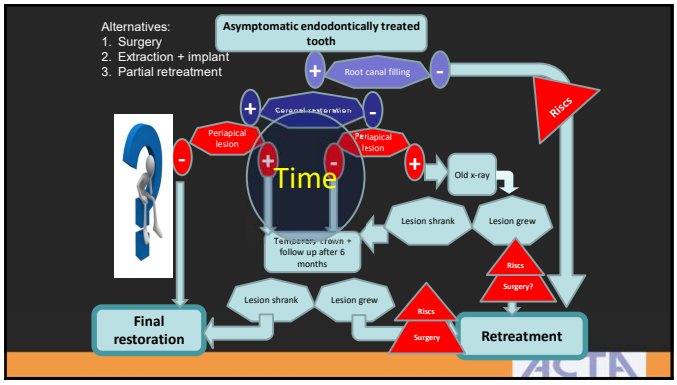

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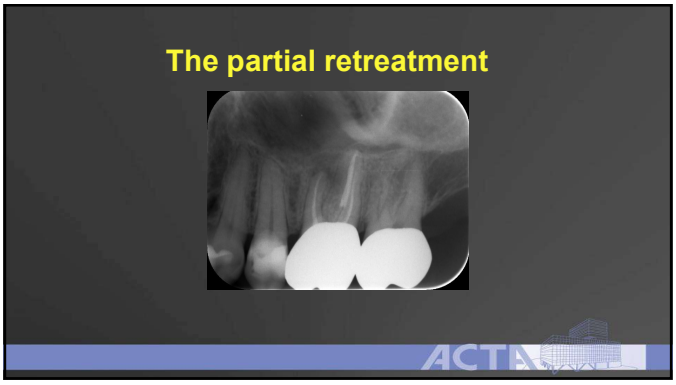

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The partial retreatment

- When we preform apical micro-surgery we only treat the " involved" root. Why then can't we do that with orthograde retreatment?

85

The partial retreatment

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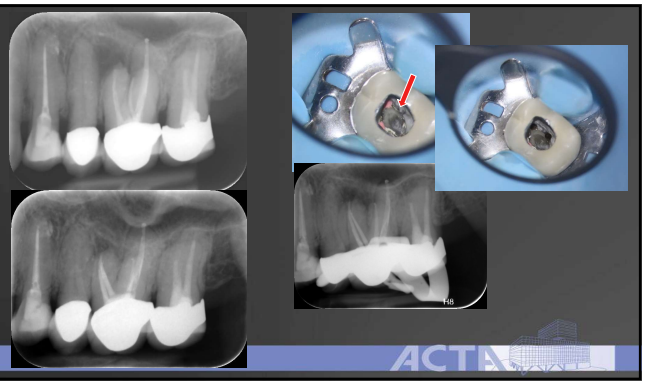
The partial retreatment

Outcome of selective root canal retreatment-A retrospective study.
Brochado Martins JF, Guerreiro Viegas O, Cristescu R, Diogo P, Shemesh H.
Int Endod J. 2023

87



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Artificial Intelligence in healthcare

- Virtual
- Physical

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Artificial Intelligence in healthcare

- Virtual
- Physical

- Detection of periapical lesions (CBCT?)
- Detection of root fractures (CBCT?)
- Length determination (CBCT)
- Morphology of the root and root canal system (CBCT)
- Predictions (retreatments, vital pulp therapies)

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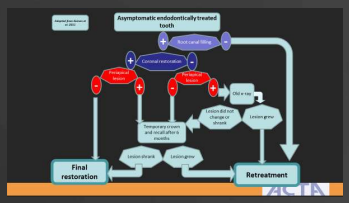
Artificial intelligence (AI) has the potential to replicate human intelligence to predict and aid in difficult decision making in healthcare



Artificial Intelligence in Endodontics: Current Applications and Future Directions.

JOE 2021 : Aminoshariae et al.

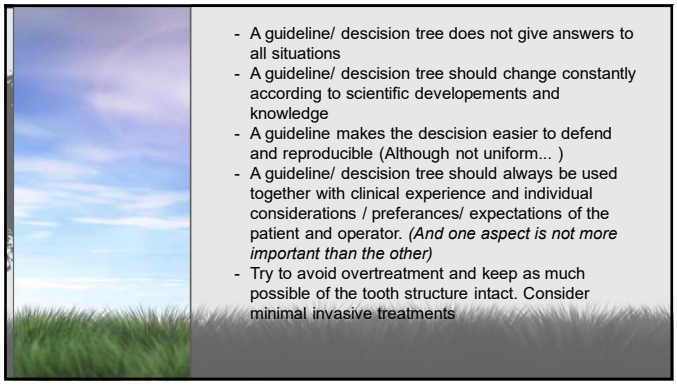
91

Association between patient-, tooth- and treatment-level factors and root canal treatment failure: A retrospective longitudinal and machine learning study.

Predicting failure was only limitedly possible, also with more complex Machine Learning.

J Dent 2022 : Herbst et al.

92



- A guideline/ descision tree does not give answers to all situations
- A guideline/ descision tree should change constantly according to scientific developements and knowledge
- A guideline makes the descision easier to defend and reproducible (Although not uniform...)
- A guideline/ descision tree should always be used together with clinical experience and individual considerations / preferances/ expectations of the patient and operator. *(And one aspect is not more important than the other)*
- Try to avoid overtreatment and keep as much possible of the tooth structure intact. Consider minimal invasive treatments

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