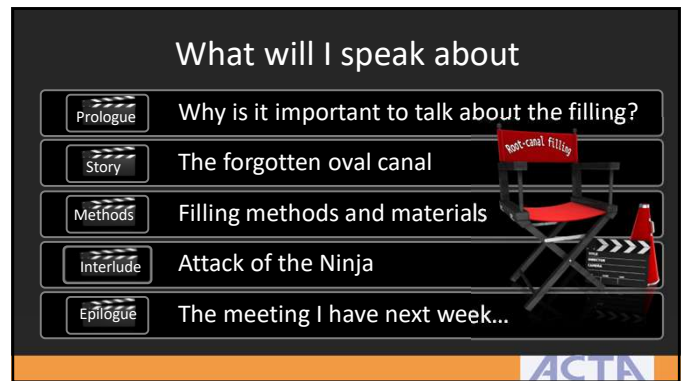
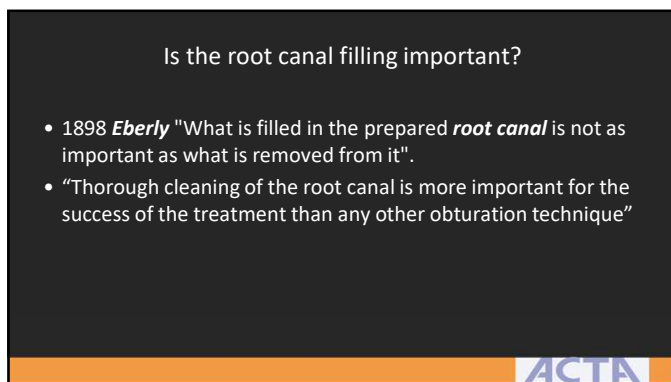




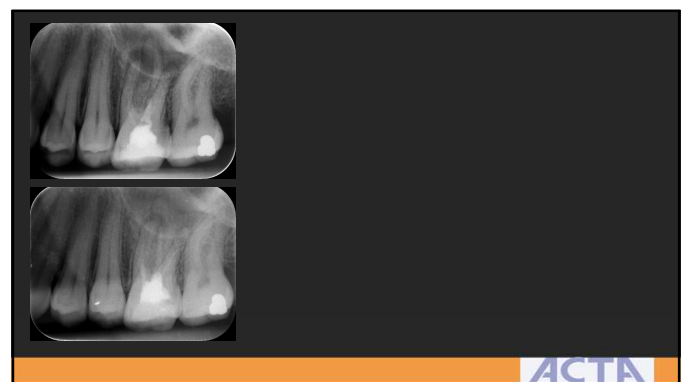
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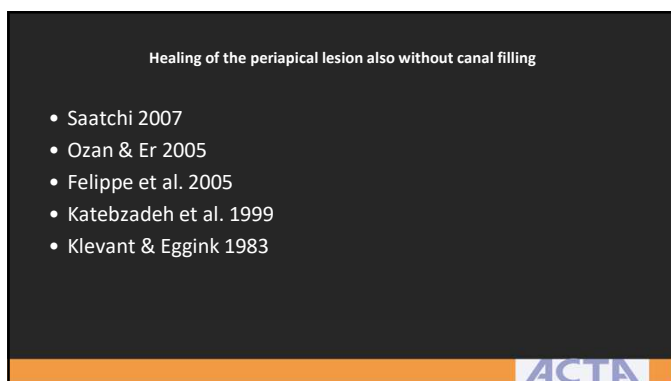
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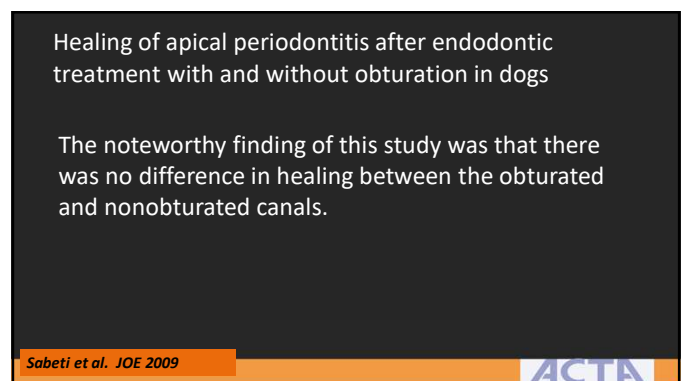
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4



5



6

Maybe the root canal filling is not so important at all ???



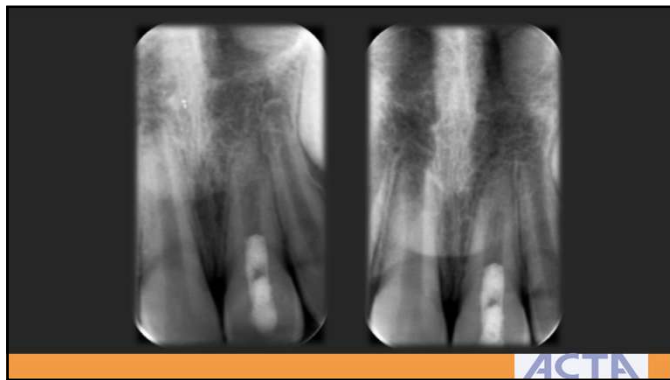
ACTA

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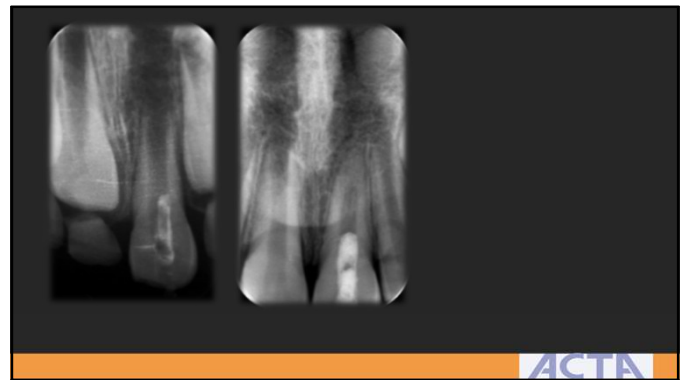
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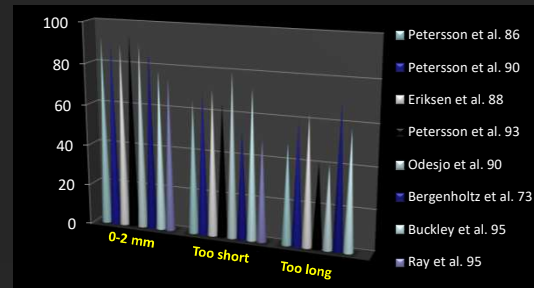
Maybe the root canal filling is not so important at all ???



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11

Success rate as function of the length



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12

- The quality of the endodontic treatment was the most important factor for success, although the quality of the coronal restoration also influenced the treatment outcome

#### Clinical Research

Prevalence of Apical Periodontitis in Root Canal-Treated Teeth From an Urban French Population: Influence of the Quality of Root Canal Fillings and Coronal Restorations

Paula B.L. Tavares, MSc,\* Eric Bonte, DDS,<sup>†</sup> Tótilado Bonaparte, DDS,<sup>‡</sup> José E. Siqueira, Jr, PhD,\* and Jean-Jacques Leinfengue, PhD<sup>§</sup>

Tavares et al. JOE 2009

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#### Ten-year follow-up of root filled teeth: a radiographic study of a Danish population.

The root filling quality primarily affected the risk of persistent AP and to a smaller extent the risk of extraction...

Kirkevang et al. IEJ 2014

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Prevalence of apical periodontitis relative to endodontic treatment in an adult Dutch population: a repeated cross-sectional study.

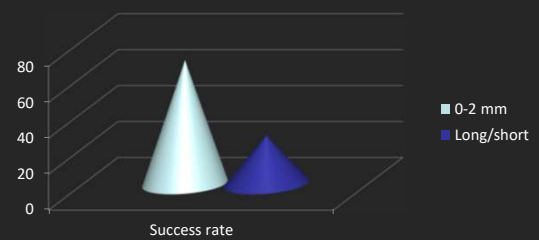
- A total of 178 radiographs were evaluate
- Inadequate root canal fillings were frequent (55.8%). *Apical radiolucency was significantly higher in these teeth than in adequately root-filled teeth.*

Peters et al. 2011

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#### Clinical studies with CBCT



Liang et al. 2011-2012

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- “An adequate root filling had a more substantial impact on the outcome of treatment than the quality of the coronal restoration”

#### Periapical status and quality of root fillings and coronal restorations in an adult Spanish population

J. J. Segura-Egea, A. Jiménez-Piñón, M. Poyato-Ferrera, E. Velasco-Ortega & J. V. Ríos-Santos  
Department of Stomatology, School of Dentistry, University of Seville, Seville, Spain

Segura-Egea et al. IEJ 2004

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#### Ng et al. 2008 (IEJ)

4 conditions improve the outcome :

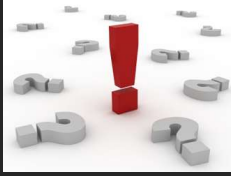
1. pre-op absence of periapical radiolucency
2. root filling with no voids
3. root filling length
4. satisfactory coronal restoration

Ng et al. IEJ 2008

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- How come the quality of the filling is important but there is healing also WITHOUT a filling???

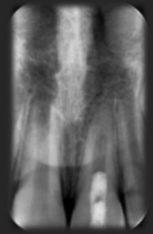


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## The filling dilemma

- Long/short term
- Prevention of re-infection
- Coronal restoration (Post, core)
- Over-filling causes irritation
- We introduce infection



Patel et al. IEJ 2012

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- The root-canal filling *IS* important for the outcome of the root-canal treatment (but the coronal restoration is probably equally important)



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## The story of the oval canal...

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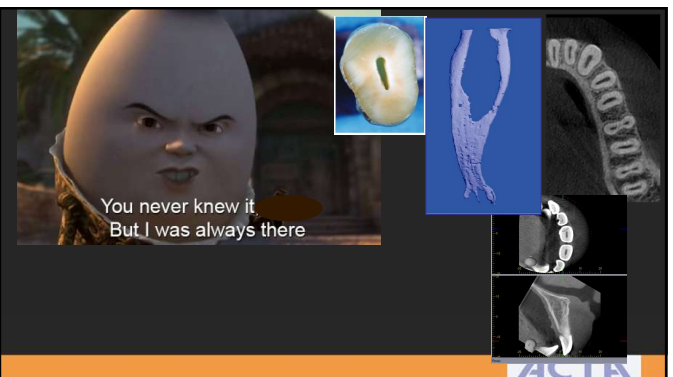
Look at me!

- Can't you see I am oval ???



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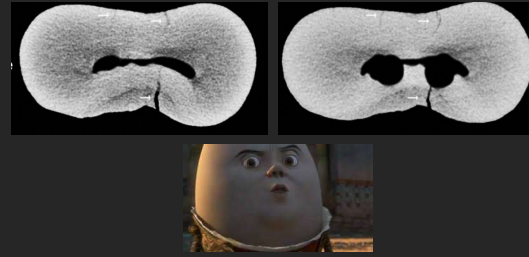
24

- Prevalence and extent of long oval canals in the apical third
- Quality of cold and warm gutta-percha fillings in oval canals in mandibular premolars
- A primary observation on the preparation and obturation of oval canals

Wu et al OOOE, IEJ 2000-2001

ACTA

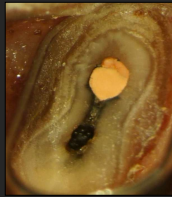
25



De-Deus et al. JOE 2014

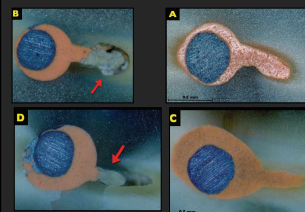
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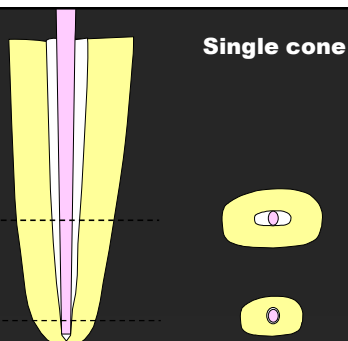


Canals containing debris cannot be properly filled

De-Deus et al. JOE 2012

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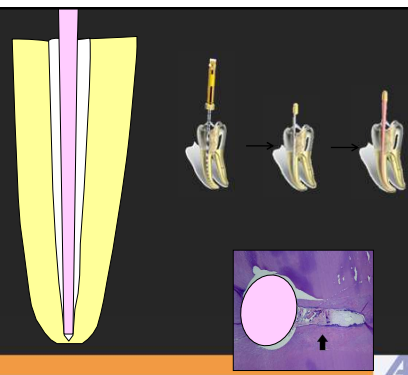
28



Single cone

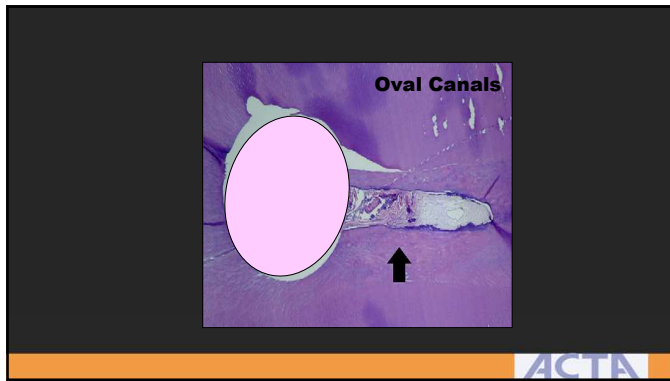
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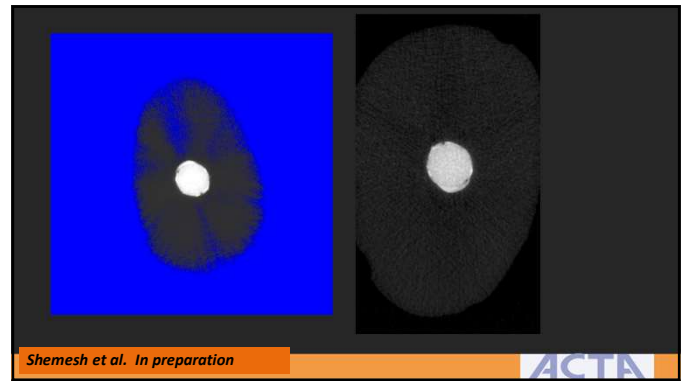


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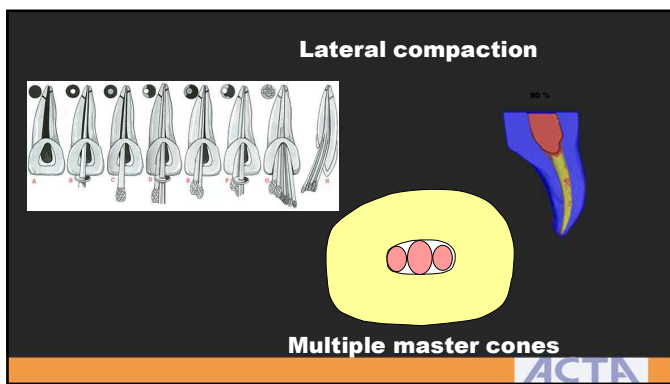
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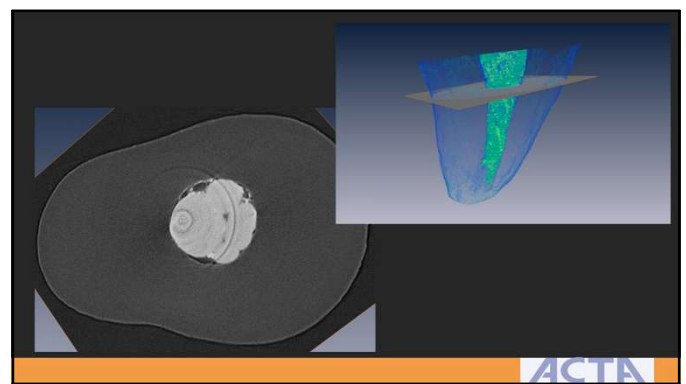
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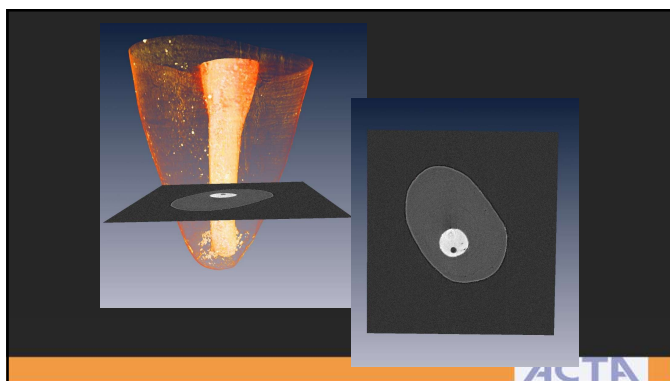
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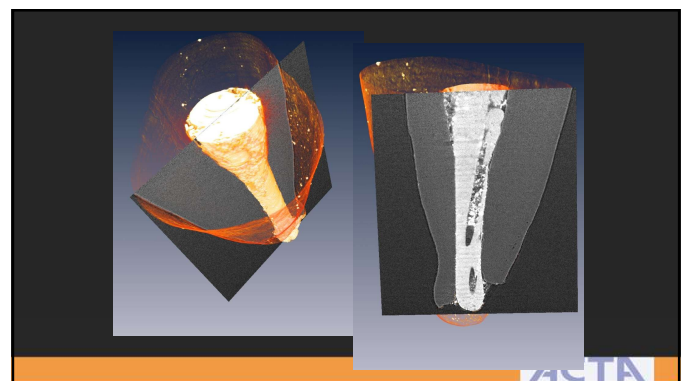
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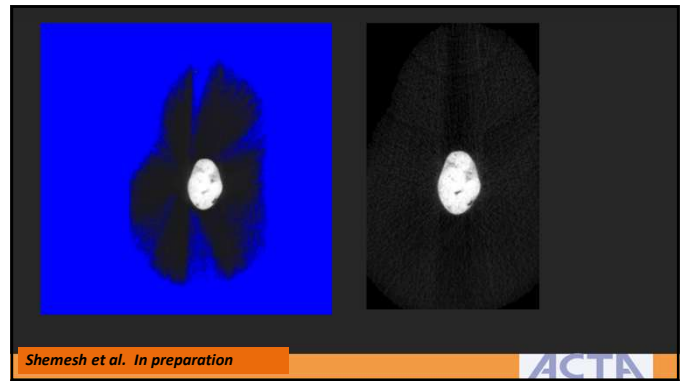
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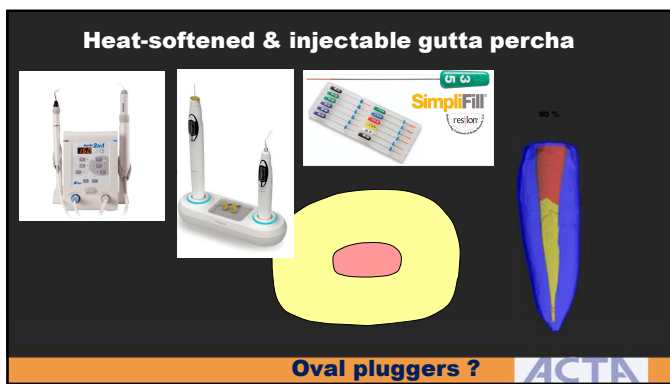
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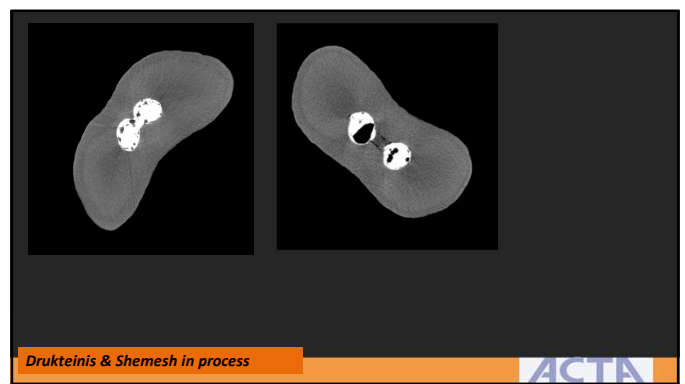
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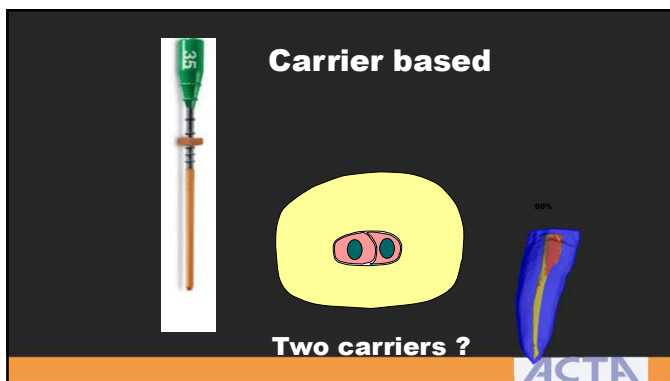
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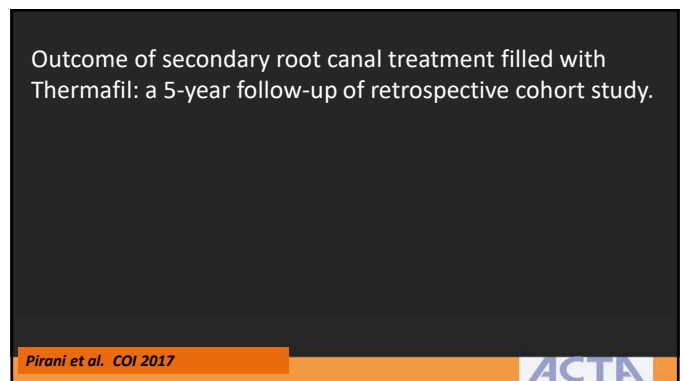
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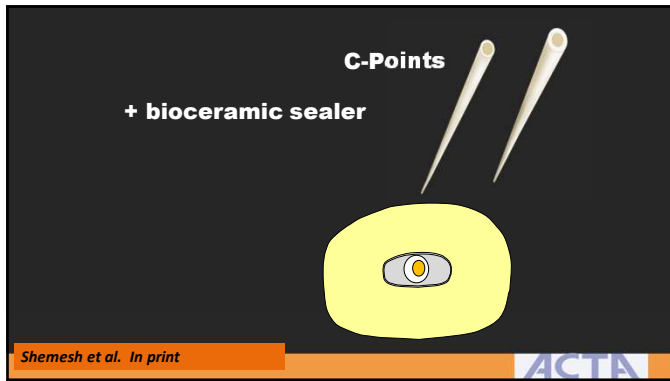


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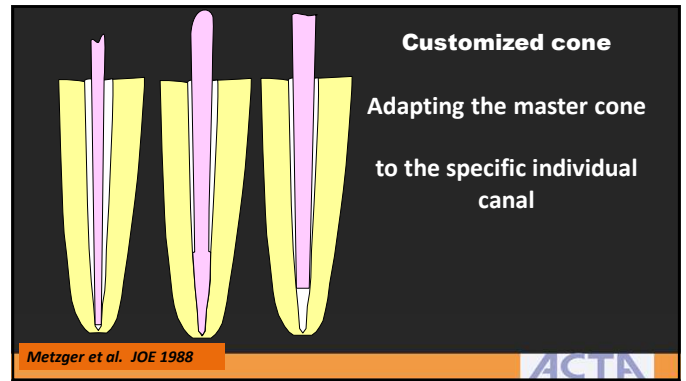


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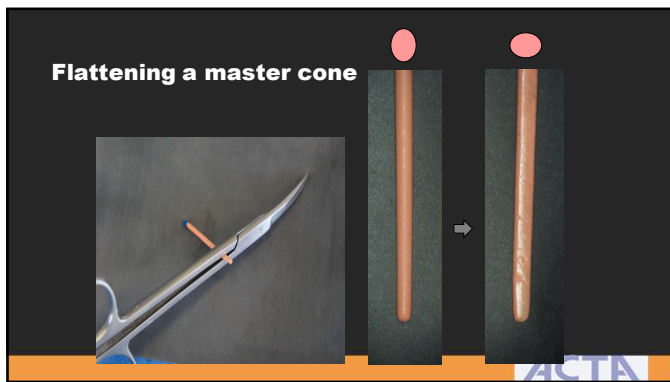




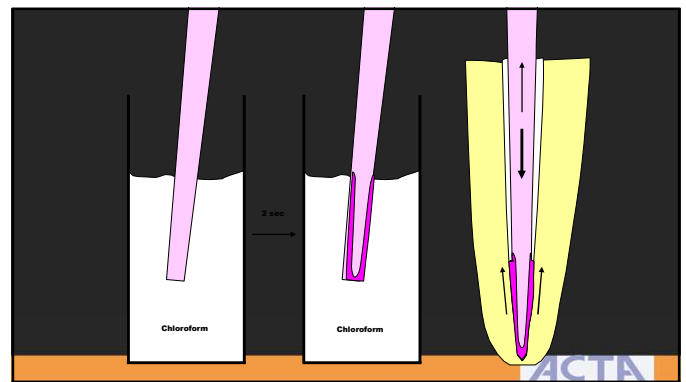
43



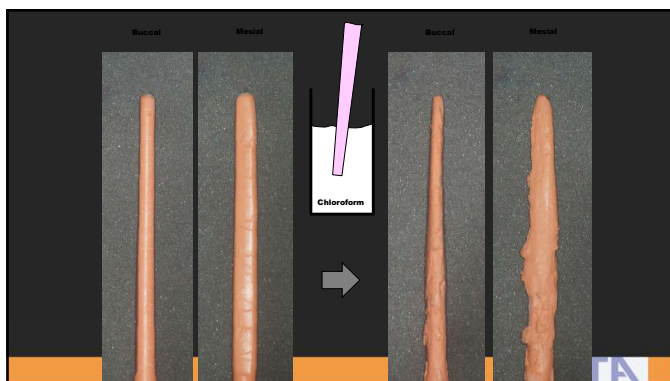
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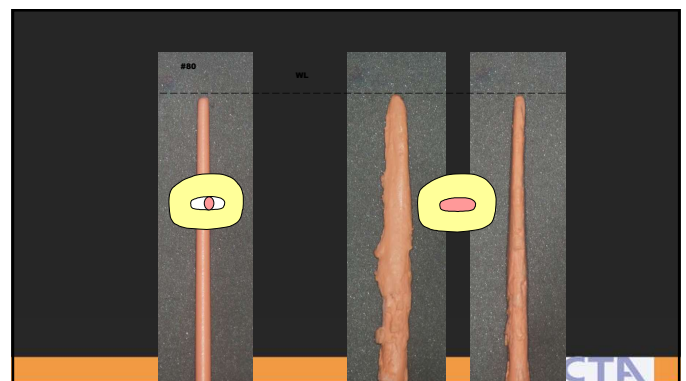
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46

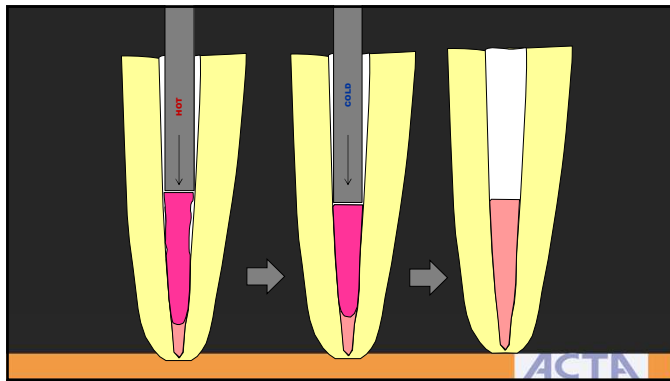


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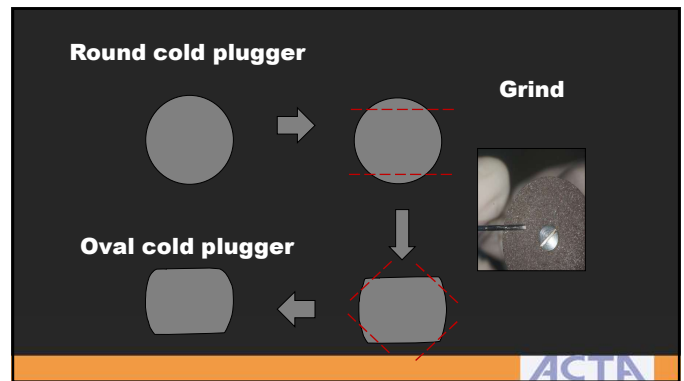


48

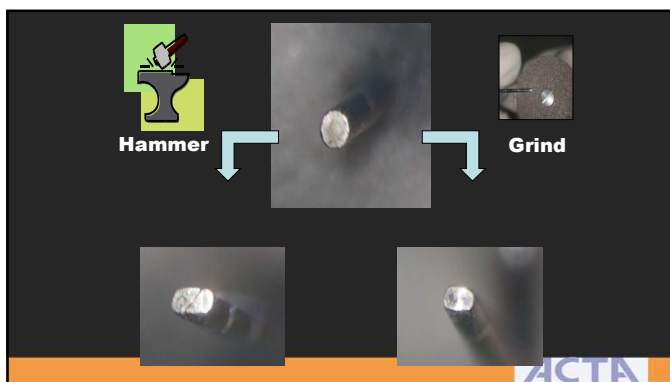




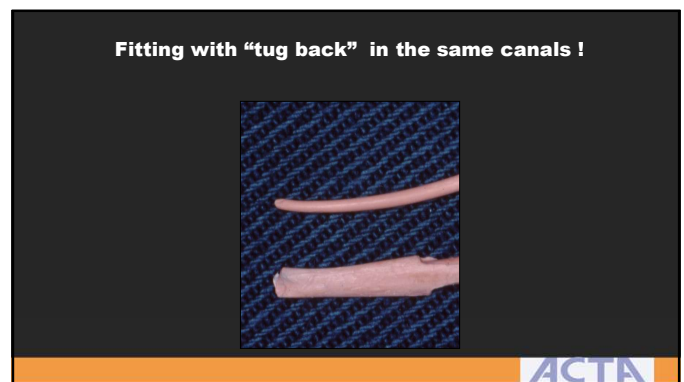
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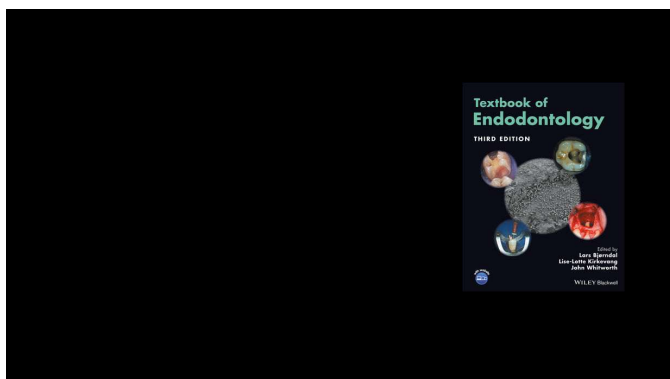
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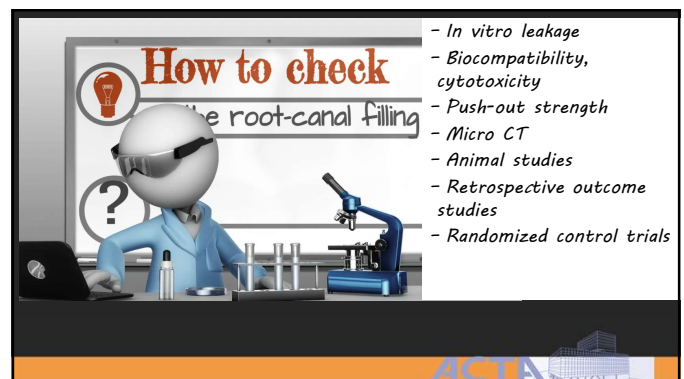
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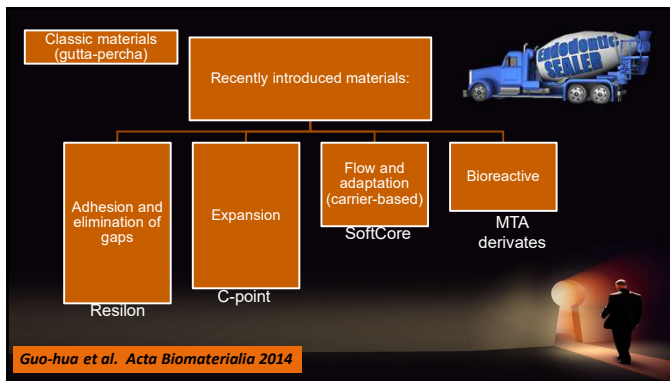
52



53



54



55

## Adhesive materials

- The most extensively studied
- Surge of enthusiasm in the early '2000s
- Monoblock concept
- C-factor
- Biodegradation
- Clinical studies available

56

- "On the basis of the in vitro and in vivo data available to date, there appears to be no clear benefit with the use of methacrylate resin-based sealers in conjunction with adhesive root canal filling materials at this point in their development."

Kim et al. JOE 2010

57

## Price €

- Gutta percha points (20) = 3.-
- AH26 = 64.-
- Resilon Points (20) = 25.-
- Epiphany = 130.- (incl. primer)

58

## Expanding materials

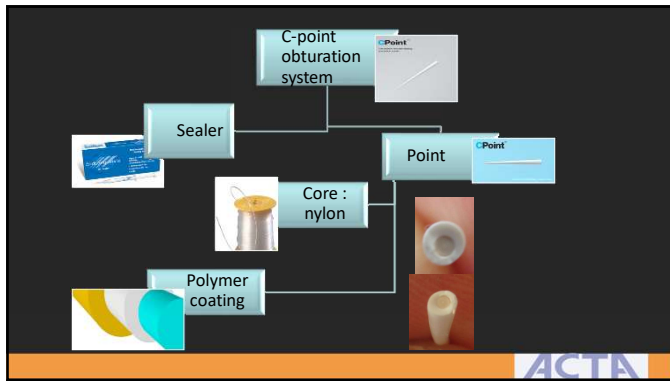
- Water expandable polymer
- Radially expansion
- Pushing sealer into close contract with canal wall.
- Very limited information available
- Clinical validation needed

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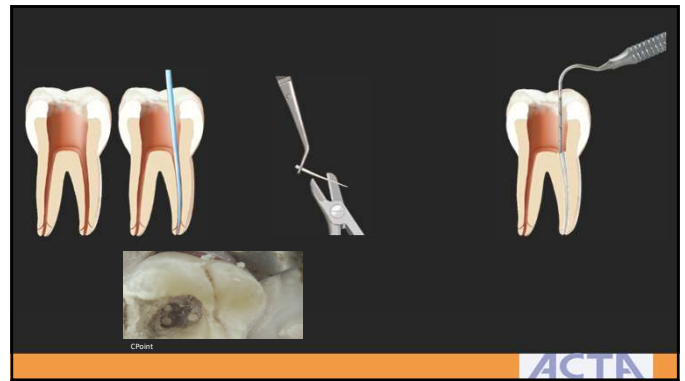
## What's in a name?

- Smart Seal (SmartPoint, SmartSeal...)
- ProSmart (ProPoint, ProSeal...)
- C-Point
- Sealer : Smart Past, Smart Paste bio (Europe)
- Sealer : Not sold together with points (Endosequence)

60



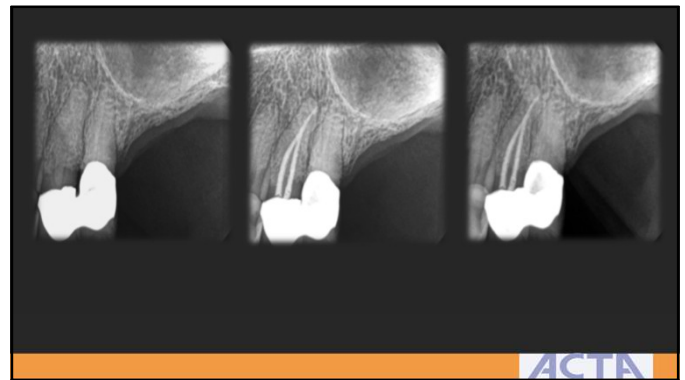
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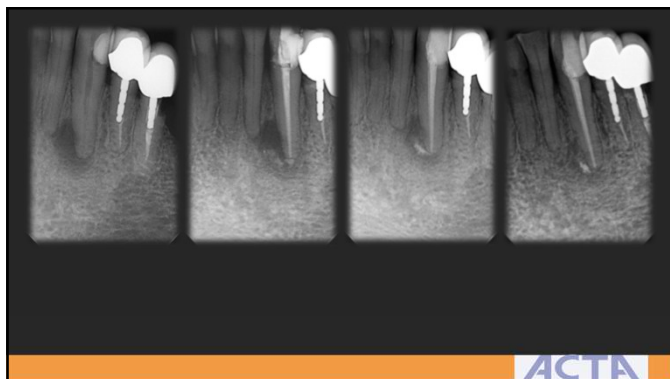
62

- Economides et al. An ex vivo comparison of the **push-out** bond strength of a new endodontic filling system (Smartseal) and various gutta-percha filling techniques. Odontology. 2012
- Eid et al. In Vitro **biocompatibility** evaluation of a root canal filling material that expands on water sorption. J Endod. 2013
- Didato et al. Time-based lateral **hygroscopic expansion** of a water-expandable endodontic obturation point. J Dent. 2013

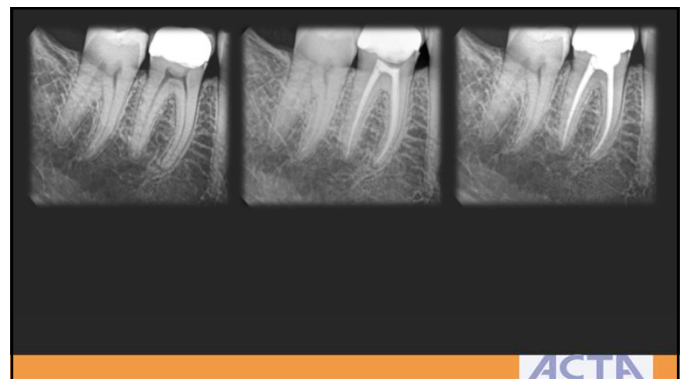
63



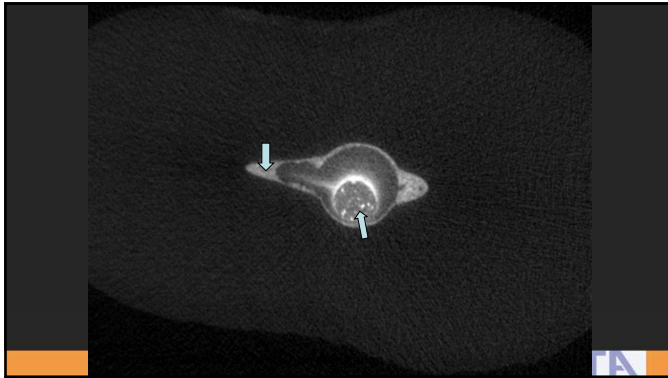
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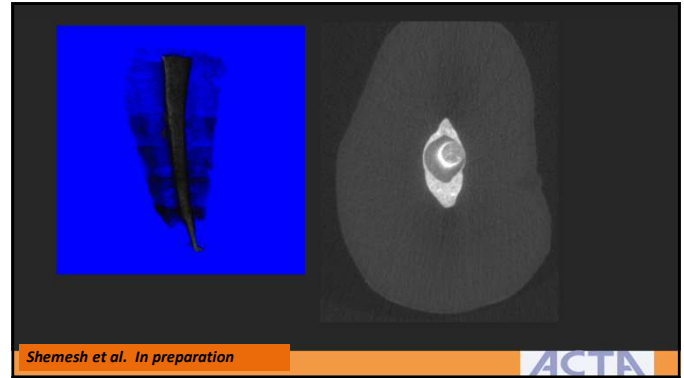
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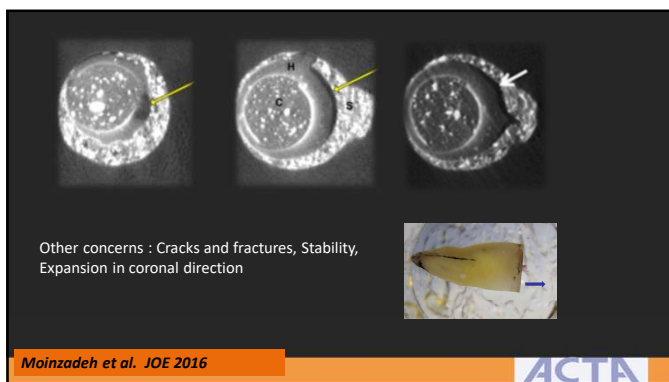
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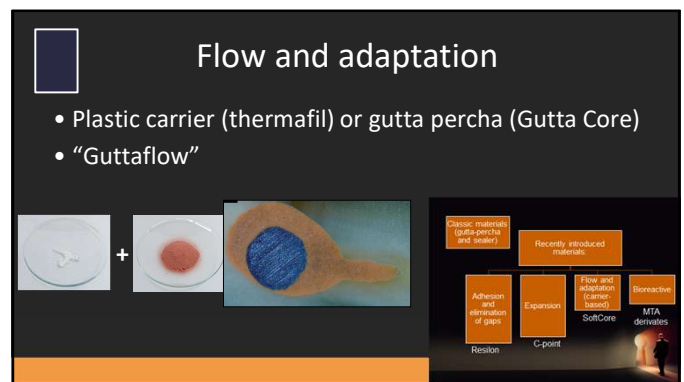
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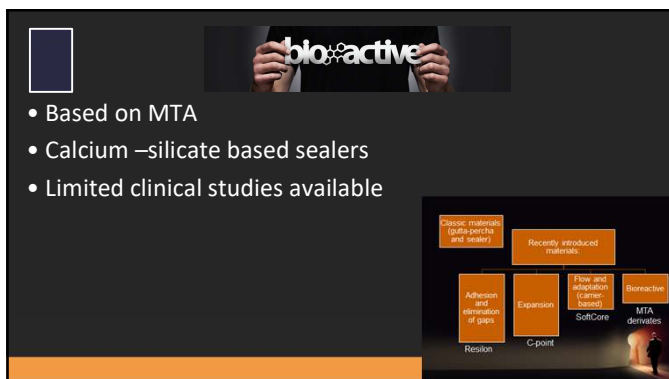
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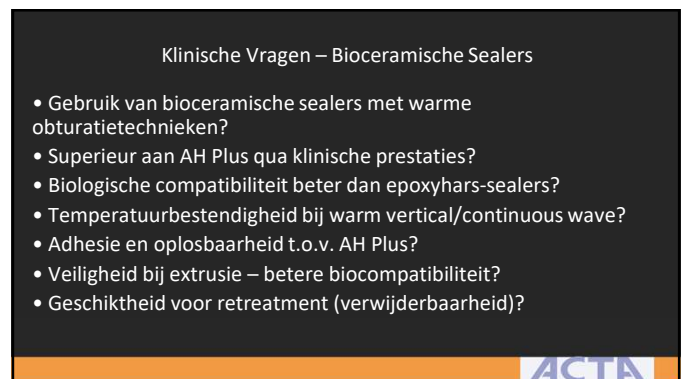
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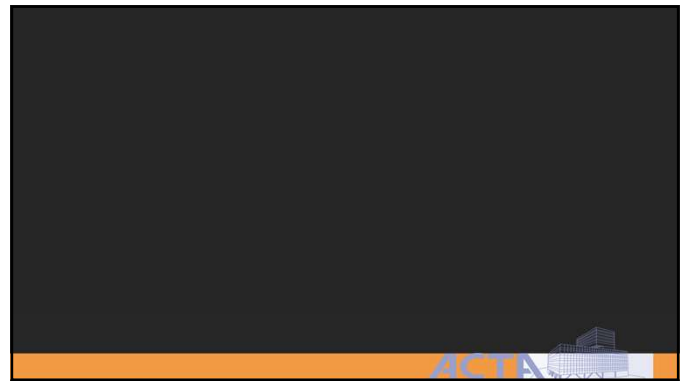
## Outcome

- Very few outcomes study checked the difference between different materials/ sealer.
- Those that did , did not find any difference on outcome between the various materials / methods to fill the canal

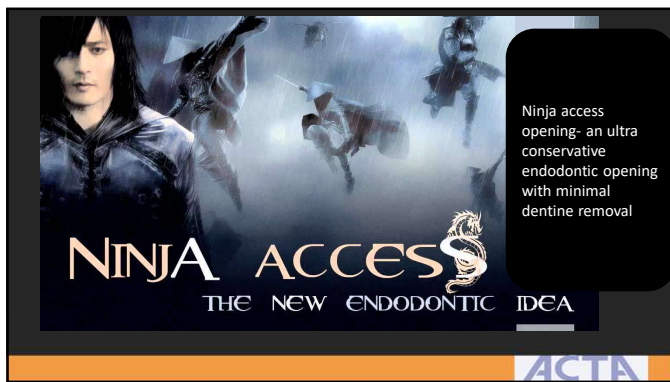
$$\text{DISAPPOINTMENT} = \frac{\text{EXPECTATION}}{\text{REALITY}}$$

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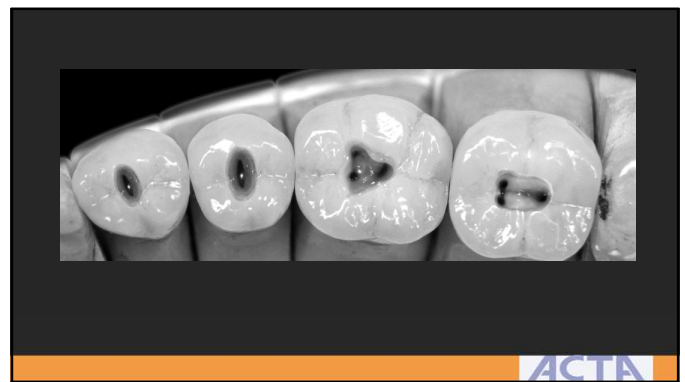
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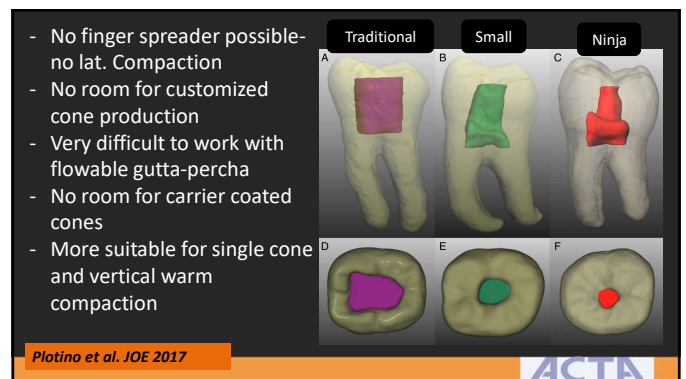
76



Gluskin et al. BDJ 2014

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- No finger spreader possible- no lat. Compaction
- No room for customized cone production
- Very difficult to work with flowable gutta-percha
- No room for carrier coated cones
- More suitable for single cone and vertical warm compaction

Plotino et al. JOE 2017

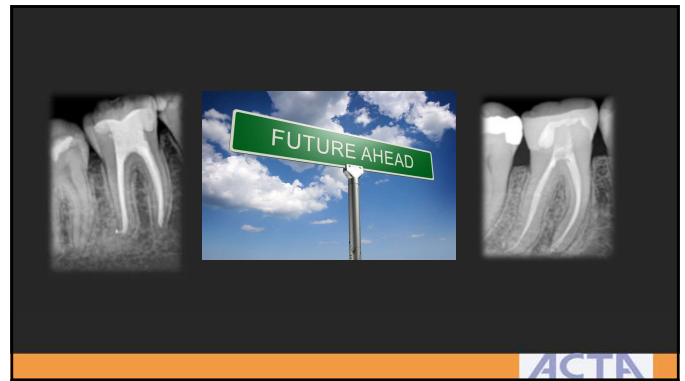
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- The “Ninja opening” limits the filling methods we can use and leave us no other choice than single cone obturation

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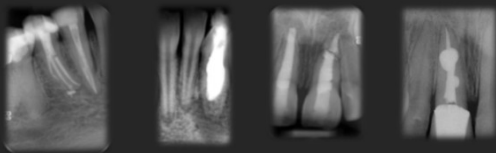
79



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“As no technique or material was shown superior, descision may be based on other factors such as speed, simplicity, economics and personal preferences”

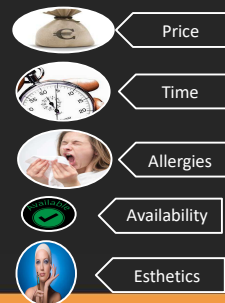


J. Whitworth Endodontic Topics 2005

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Additional factors to decide which material/method

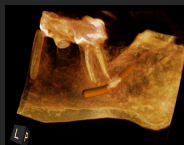


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### What should we do as clinicians ?

- Do our best to seal the canal according to our experience and capabilities- *understanding the principles, using professional integrity and correct motivation*
- Do our best to achieve a well-condensed filling at the correct length (0-2 mm from the radiographic apex).
- Remember that the filling is not the only important part of the treatment *and concentrate on cleaning, shaping and irrigation*



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