

Endodontology

The dental pulp and surrounding tissues

AND NOT ONLY root canal treatments!



Prof. dr. H. Shemesh
Division of Endodontology

1

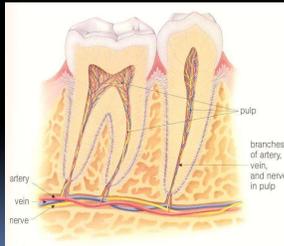
Endodontology for non-dentists

- Definition
- Healthy conditions
- Infection
- Treatment
- Dental trauma

2

- **Endodontics** (from the Greek *endo* "inside"; and *odons* "tooth") a division of dental science that deals with the tooth pulp and the tissues surrounding the root of a tooth.

Periodontics
Pedodontics
Prostodontics
Orthodontics



3

Endodontists

- perform a variety of procedures including endodontic therapy (commonly known as "root canal therapy"), endodontic retreatment, surgery, treating cracked teeth, and treating dental trauma. Root canal therapy is one of the most common dental procedures.

4

Healthy condition



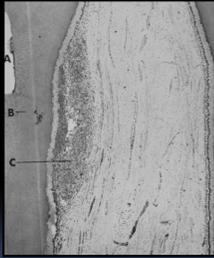
1. Dentin
2. Predentin
3. Odontoblast layer
4. Cell-poor zone
5. Cell-rich zone
6. Pulp proper

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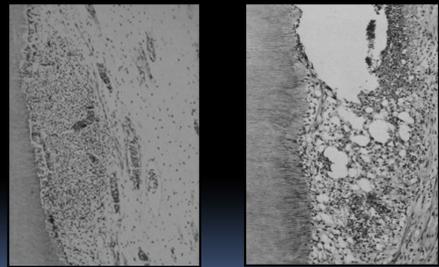
Restorative procedures



inflammation

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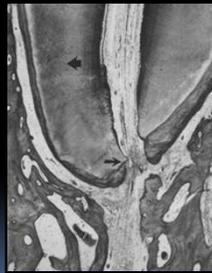
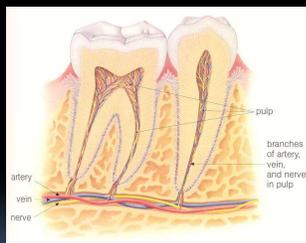
Bacterial invasion



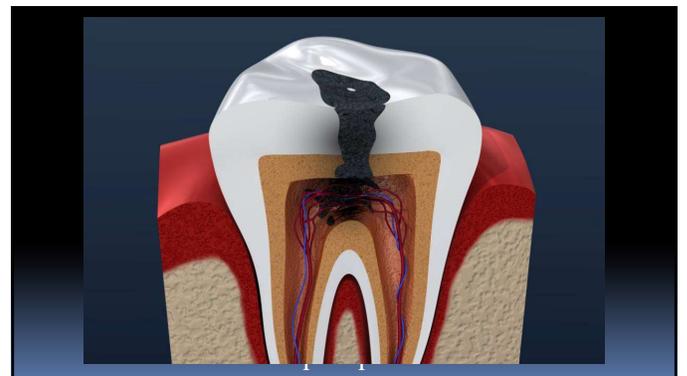
infection pulp

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Periapical status



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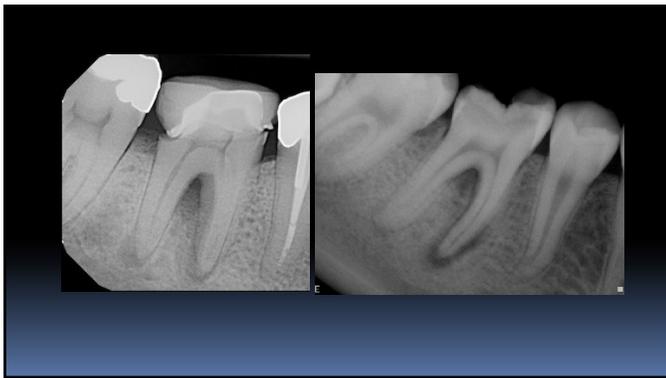
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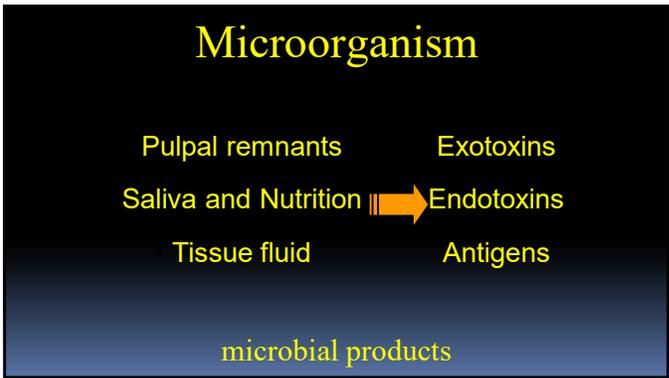
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Cellular reaction

- Polymorphonuclear leukocytes
- Macrophages
- Lymphocytes
- Plasma cells
- Mast cells

intracellular enzymes & inflammatory mediators

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Root canal treatment

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The root canal treatment

1. Opening and instrumentation
Irrigation and disinfection
2. Root canal filling
3. Follow-up

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18

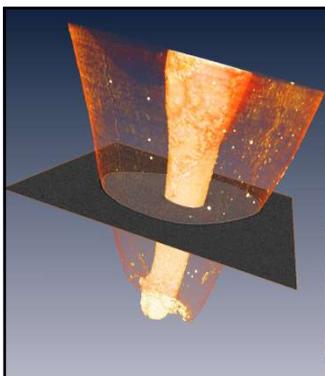
The success of the treatment is high



Meta-Analysis J Endod . 2025 CBCT-Assessed Outcomes and Prognostic Factors of Primary Endodontic Treatment and Retreatment: A Systematic Review and Meta-Analysis
João Filipe Brochado Martins, Athina Christina Georgiou, Patrícia Diogo Nunes, Ralph de Vries, Vera Mónica Almeida Afreixo, Paulo Jorge Rocha da Palma, Hagay Shemesh

19

The success of the treatment



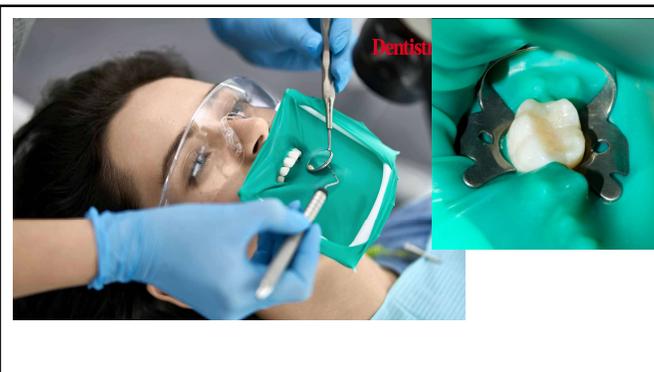
- Success rates depend on:
- Definition of success (radiographic vs functional)
 - Follow-up duration
 - Operator
 - Tooth type
 - Long-term tooth survival may be higher than healing rates suggest.
- Survival ≠ Healing
- A tooth with a small radiolucency may still function for decades.

20

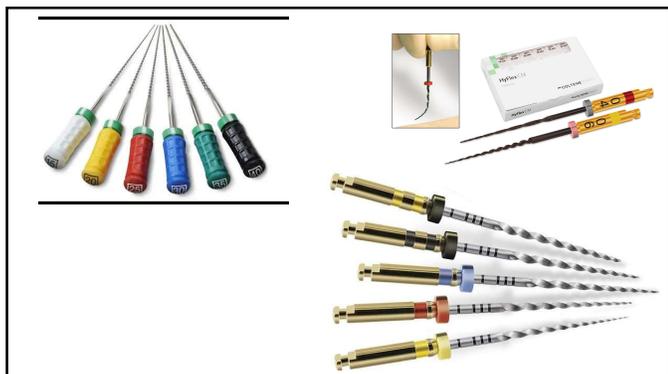
Instruments

- Rubber-Dam
- Files
- Microscope
- Obturation materials
- Restorations

21



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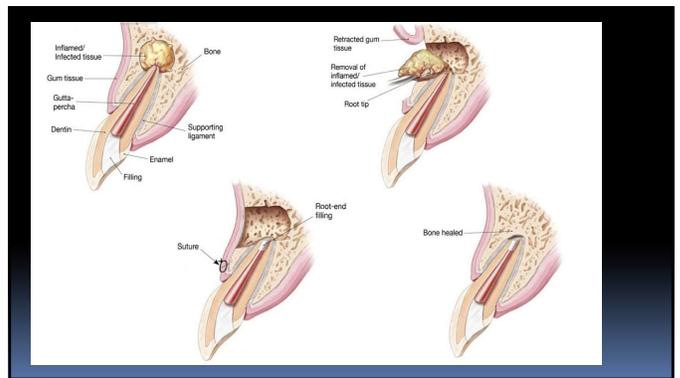
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http://www.youtube.com/watch?v=ZNIHCHGwoY&list=P_L058539E23C97771E
<http://www.youtube.com/watch?v=az7Zo3pjX2E>

27



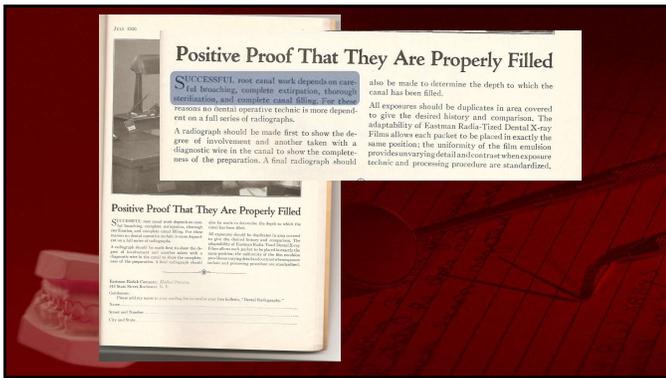
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In the last 50 year the success of the treatment did not improve
 Ng et al. 2009

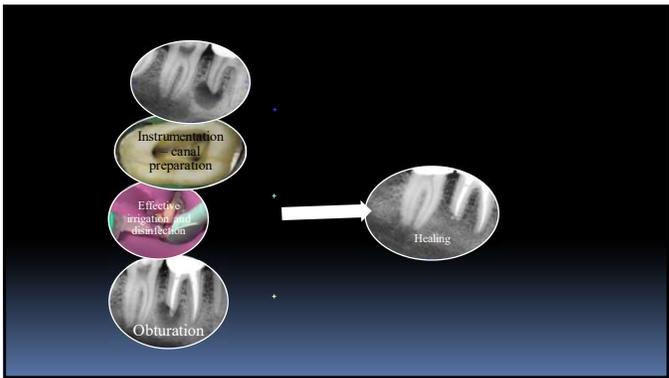
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Are we treating more Challenging cases?

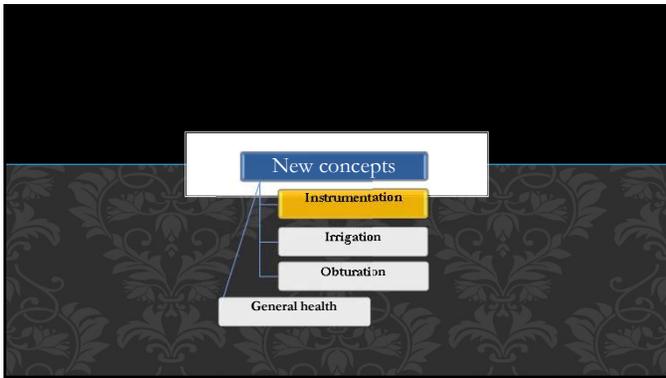
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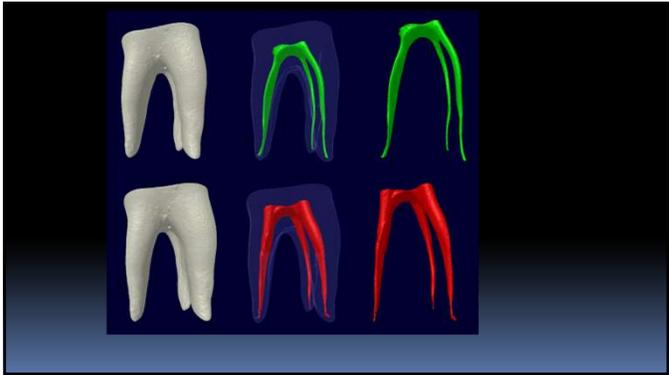
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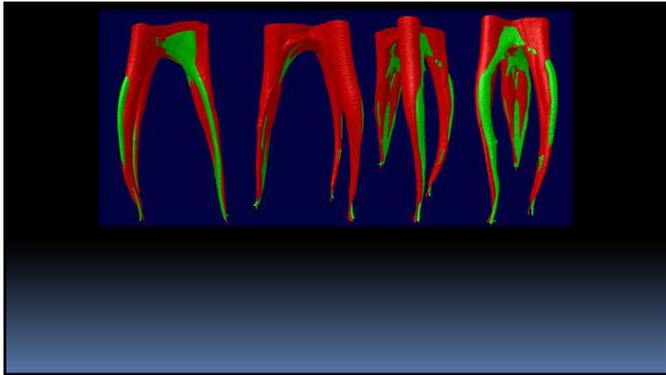
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- Paqué F, Zehnder M, De-Deus G. J Endod. 2011
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- Paqué F, Boessler C, Zehnder M. Int Endod J. 2011
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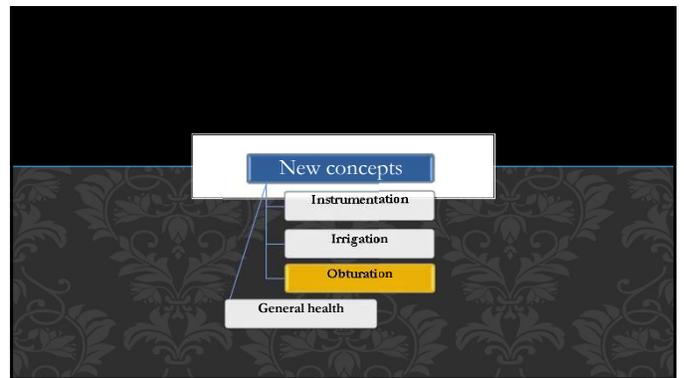
- High percentage of unaffected root canal walls (60% +/- 14%) and areas untouched by the root canal filling (45% +/- 15%).
- Our preparation methods are usually not effective in approaching most of the canals
- Out files are usually not designed for complex canal anatomy

38

Challenge No. 1

- How to effectively disinfect the root canal system

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Ng *et al.* 2008 (IEJ)

4 conditions to improve the outcome :

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

41

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

42

doi:10.1111/j.1365-2191.2007.01323.x

REVIEW

Outcome of primary root canal treatment: systematic review of the literature – Part 2. Influence of clinical factors

Y.-L. Ng¹, V. Mann², S. Rahbaran³, J. Lewsey² & K. Gulabivala¹

¹Unit of Endodontology, UCL Eastman Dental Institute, University College London, London; ²Department of Medical Statistics, London School of Hygiene and Tropical Medicine, London; and ³Clinical-epidemiology Unit, The Royal College of Surgeons in England, London, UK

Most of the studies which have investigated the effects of root filling materials/ techniques on treatment outcome, did not find any significant influence

- The effects of root filling techniques, materials and type of sealers were not investigated further because of insufficient data.

43

Challenge No. 2

- How to effectively obturate the root canal system

44

How to check a new root canal filling material?

✓	✗	In vitro leakage
✓	✓	Biocompatibility, cytotoxicity
☹	✓	Push-out strength
✓	✓	Micro CT
☹	✗	Animal studies
✓	✓	Retrospective outcome studies
✓	✓	Randomized control trials

45

How to check a new root canal filling material?

	In vitro leakage
	Biocompatibility, cytotoxicity
	Push-out strength
	Micro CT
	Animal studies
	Retrospective outcome studies
	Randomized control trials

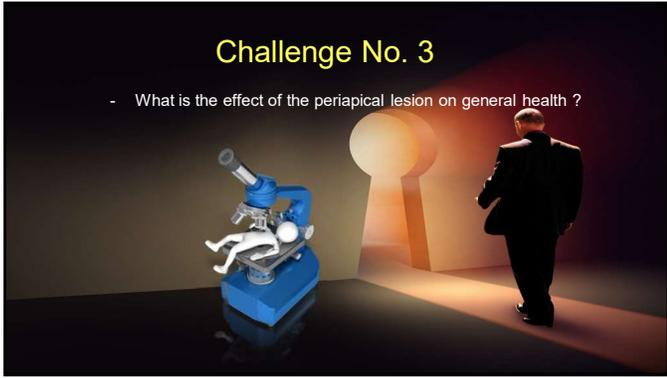
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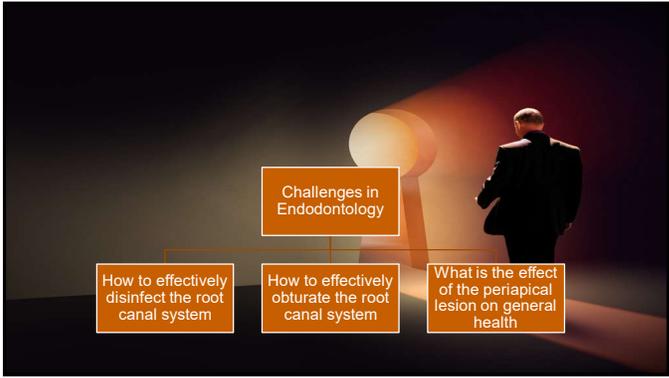
graph TD
    A[New concepts] --- B[Instrumentation]
    A --- C[Irrigation]
    A --- D[Obturation]
    E[General health] --- B
    E --- C
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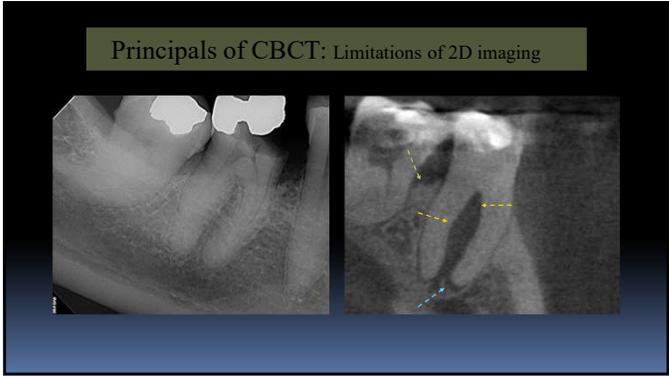


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Other challenges:

- Imaging, the “forgotten” 3rd dimension

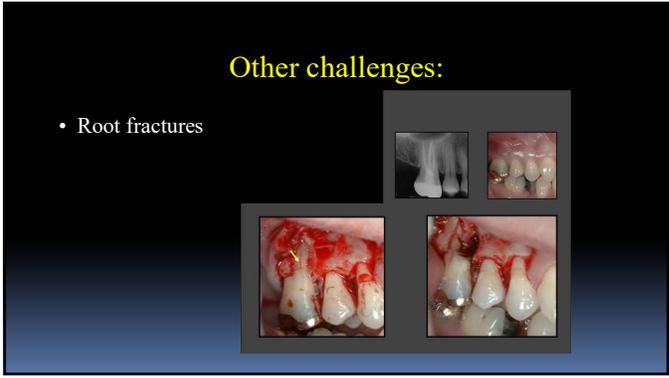
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54

Other challenges

- Traumatic injuries

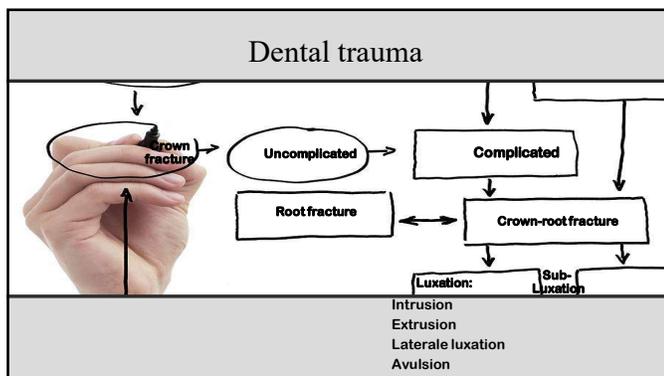
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Traumatic injuries

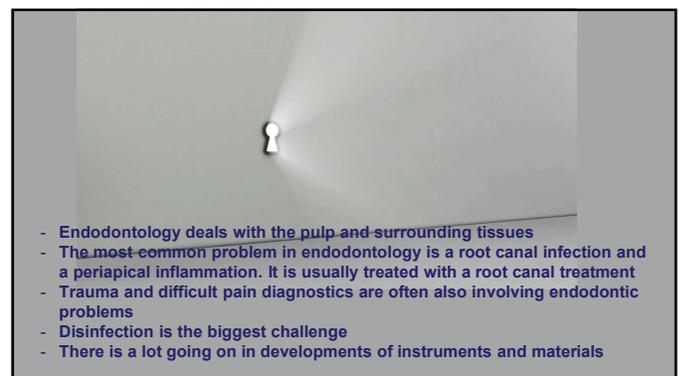
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https://youtu.be/n2t7_jXN77M

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58