

UNIVERSITY
of
OTAGO



Te Whare Wānanga o Otāgo

NEW ZEALAND

Current Advances In Irrigation

Dr Ala Al-Dameh

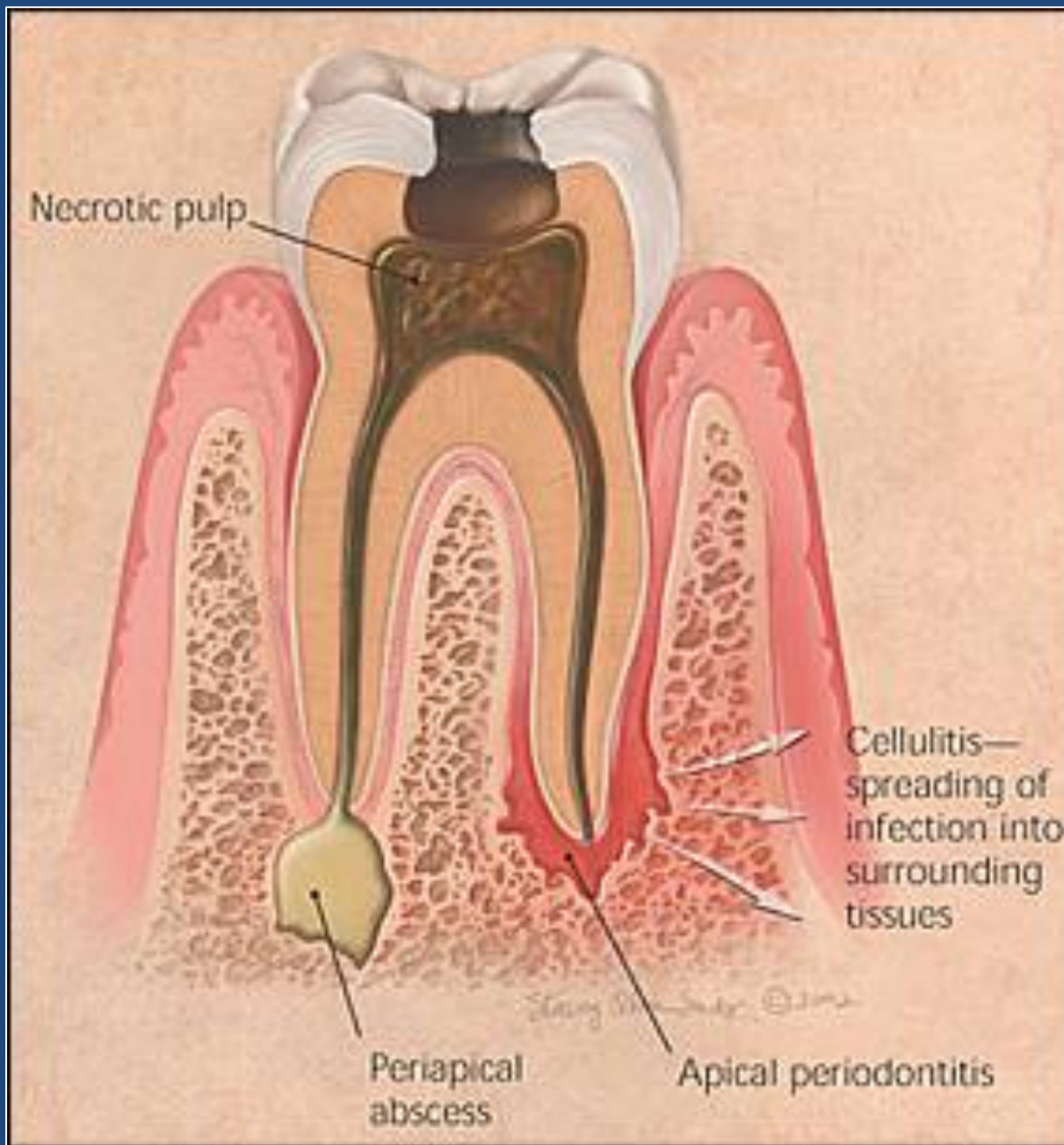
DCLINDENT (Otago, NZ) BDS (Otago, NZ)

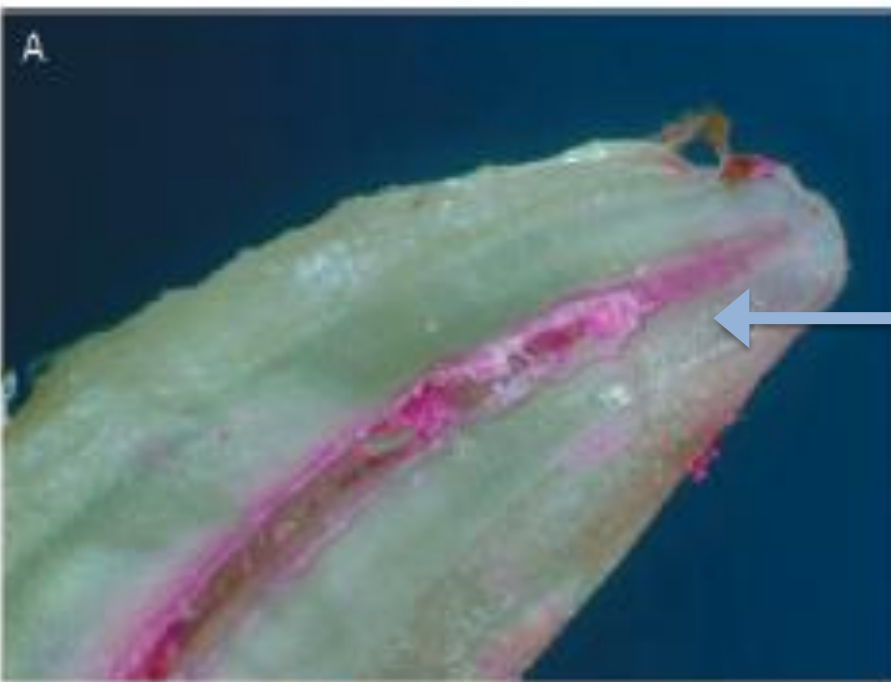
Specialist Endodontist – Al Noor Hospital



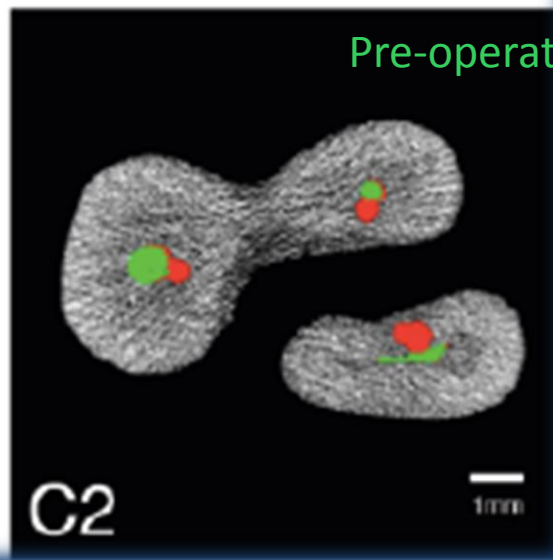
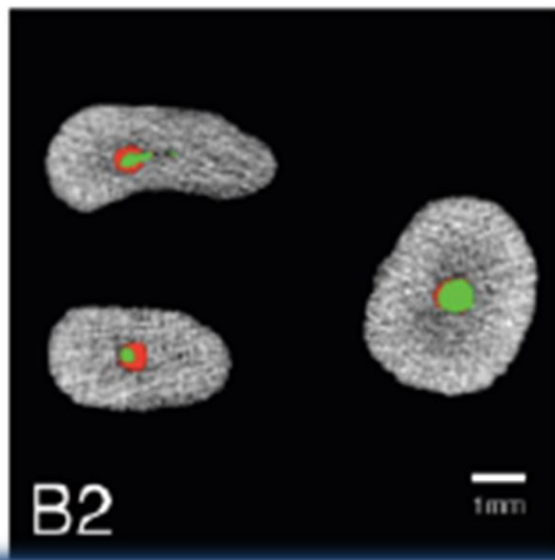
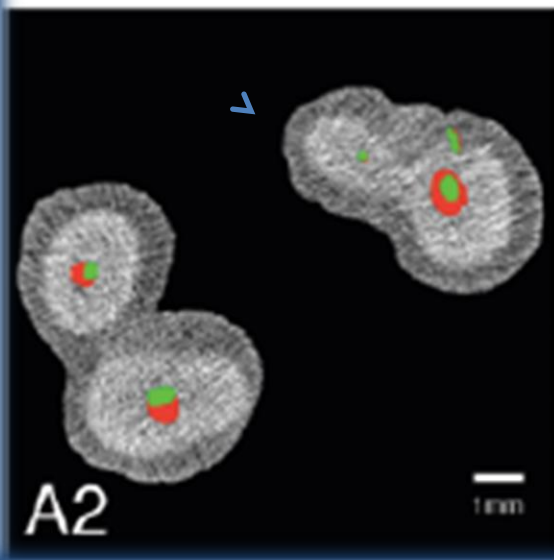
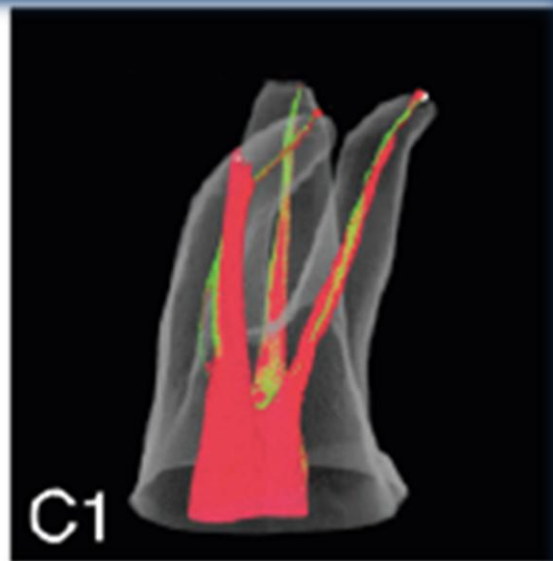








Post-operative



2.02kX

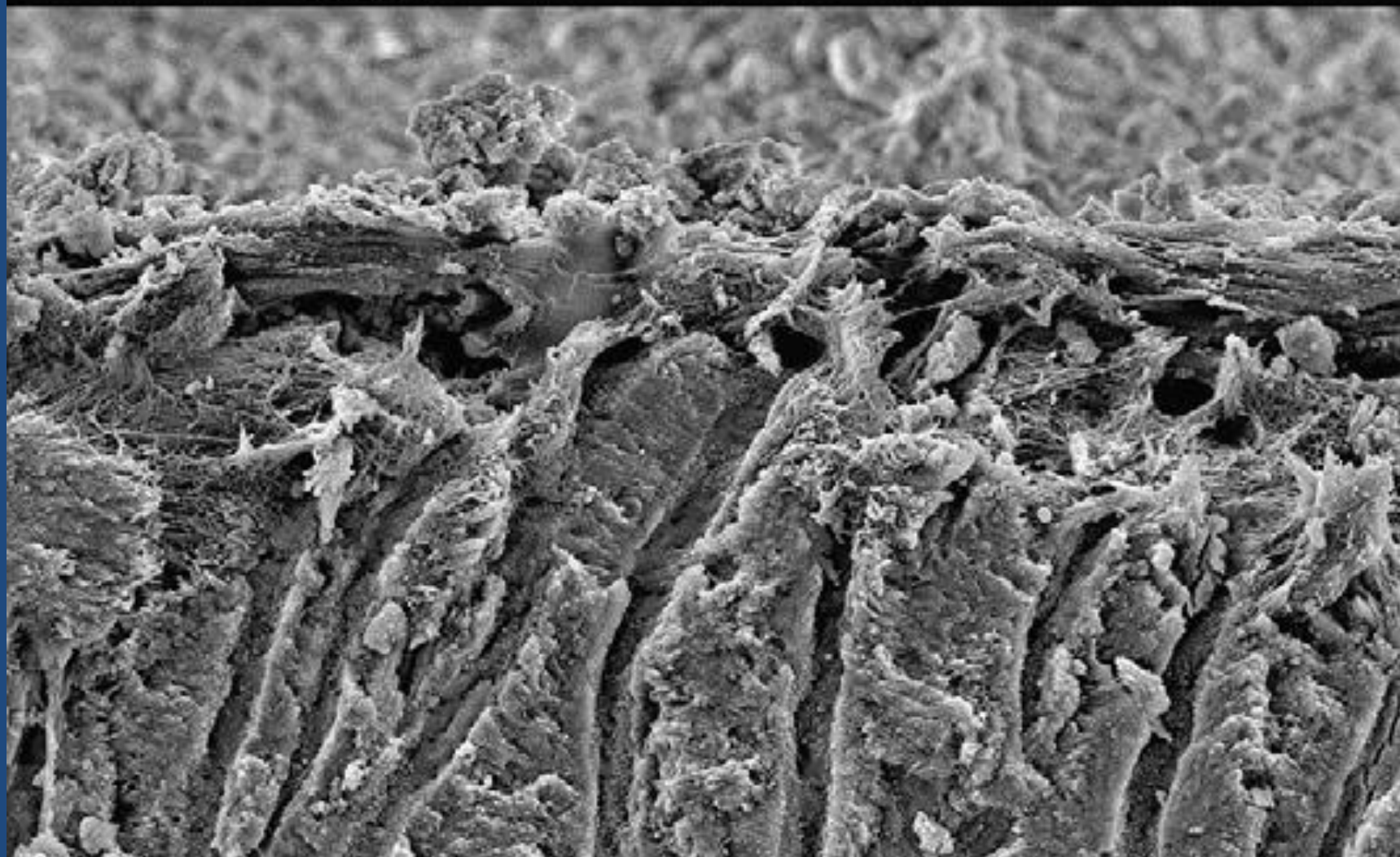
8kV WD:9mm

S:

6 P:

5

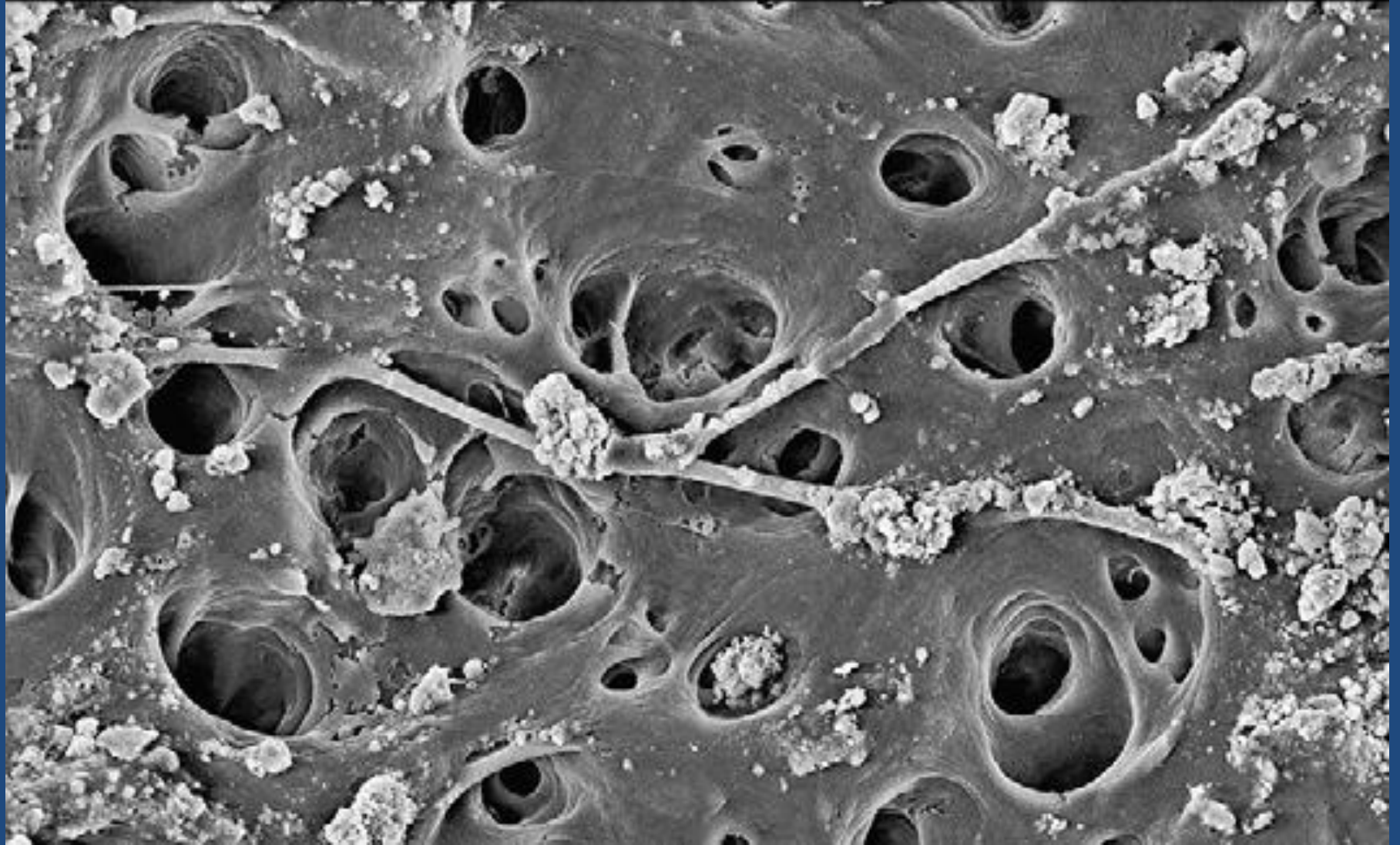
20um



1.44kX
20um

8kV WD:9mm

S: 2 P: 6



Desired functions of irrigating solutions

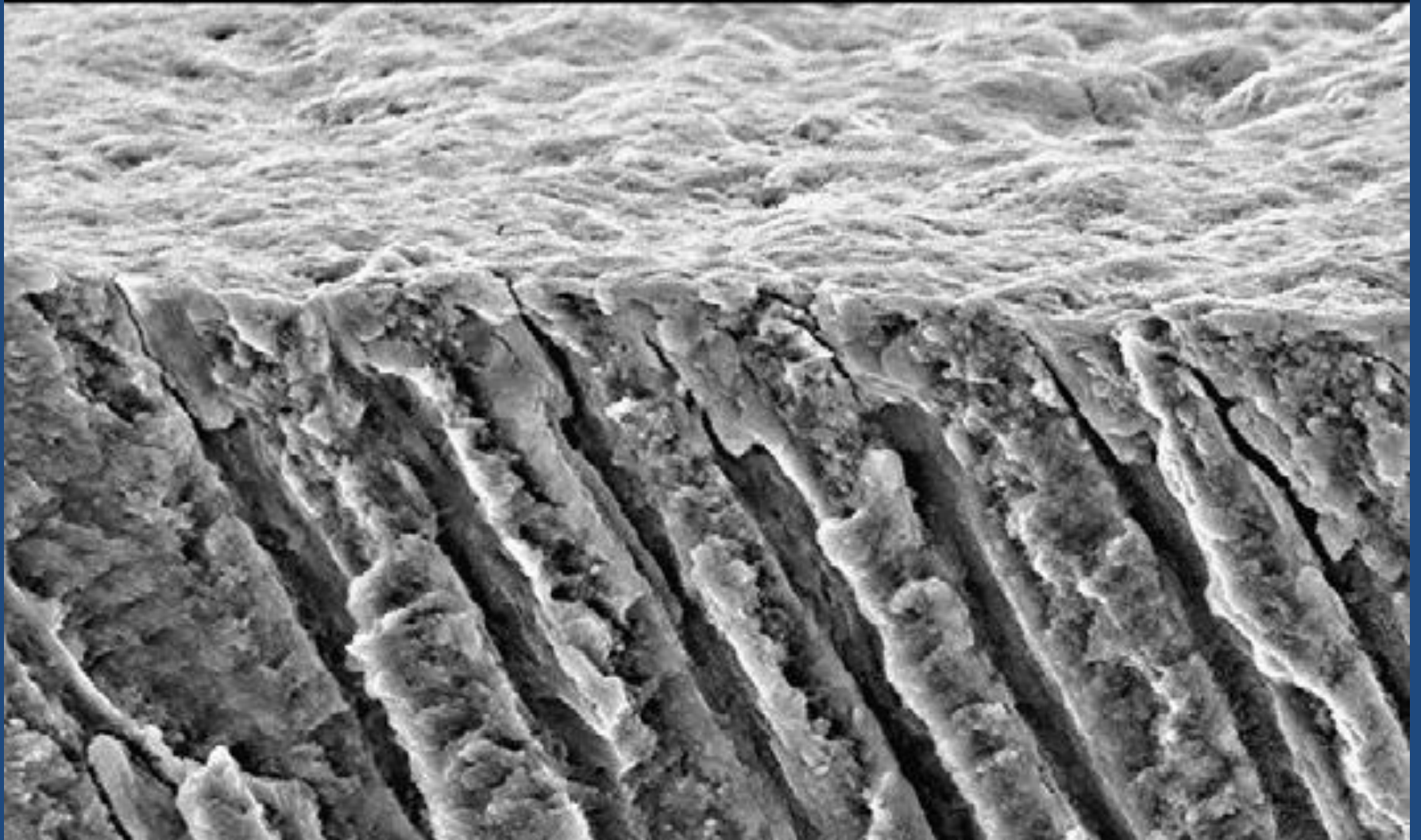
- Washing action
- Lubricant
- Dissolve inorganic tissue (dentine)
- Dissolve organic matter (dentine collagen, pulp tissue, biofilm)
- Kill bacteria and yeasts (in biofilm)
- No caustic or cytotoxic effects
- Do not weaken tooth structure

Irrigation Solutions

Sodium Hypochlorite

- HOCl is responsible for the antibacterial activity
- Commonly used in concentrations between 0.5% and 6%
- Potent antimicrobial agent
- It effectively dissolves pulpal remnants and collagen
- It is the *only* root-canal irrigant of those in general use that dissolves necrotic and vital organic tissue

3.00kX 10kV WD:28mm S:00000 P:00005
10um



Smear Layer

Irrigation Solutions

Weaknesses of Sodium Hypochlorite

- Unpleasant taste & toxicity
- It affects only the organic part of the smear layer
- Presence of inflammatory exudate, tissue remnants & microbial biomass consumes NaOCl and weakens its effect
- Can have a detrimental effect on dentine elasticity & flexural strength???

Irrigation Solutions

EDTA & CA

- Dissolve inorganic material including hydroxyapatite
- They have little or no effect on organic tissue and alone they do not have antibacterial activity
- EDTA and CA are used for 2 to 3 minutes at the end of instrumentation & after NaOCl

Irrigation Solutions

Chlorhexidine Digluconate (CHX)

- Continued antimicrobial effect (Substantivity)
- No bad smell or strong irritation to periapical tissues
- It has no tissue-dissolving capability
- CHX 2% may be a good choice for maximized antibacterial effect at the end of the chemomechanical preparation

Irrigation Solutions

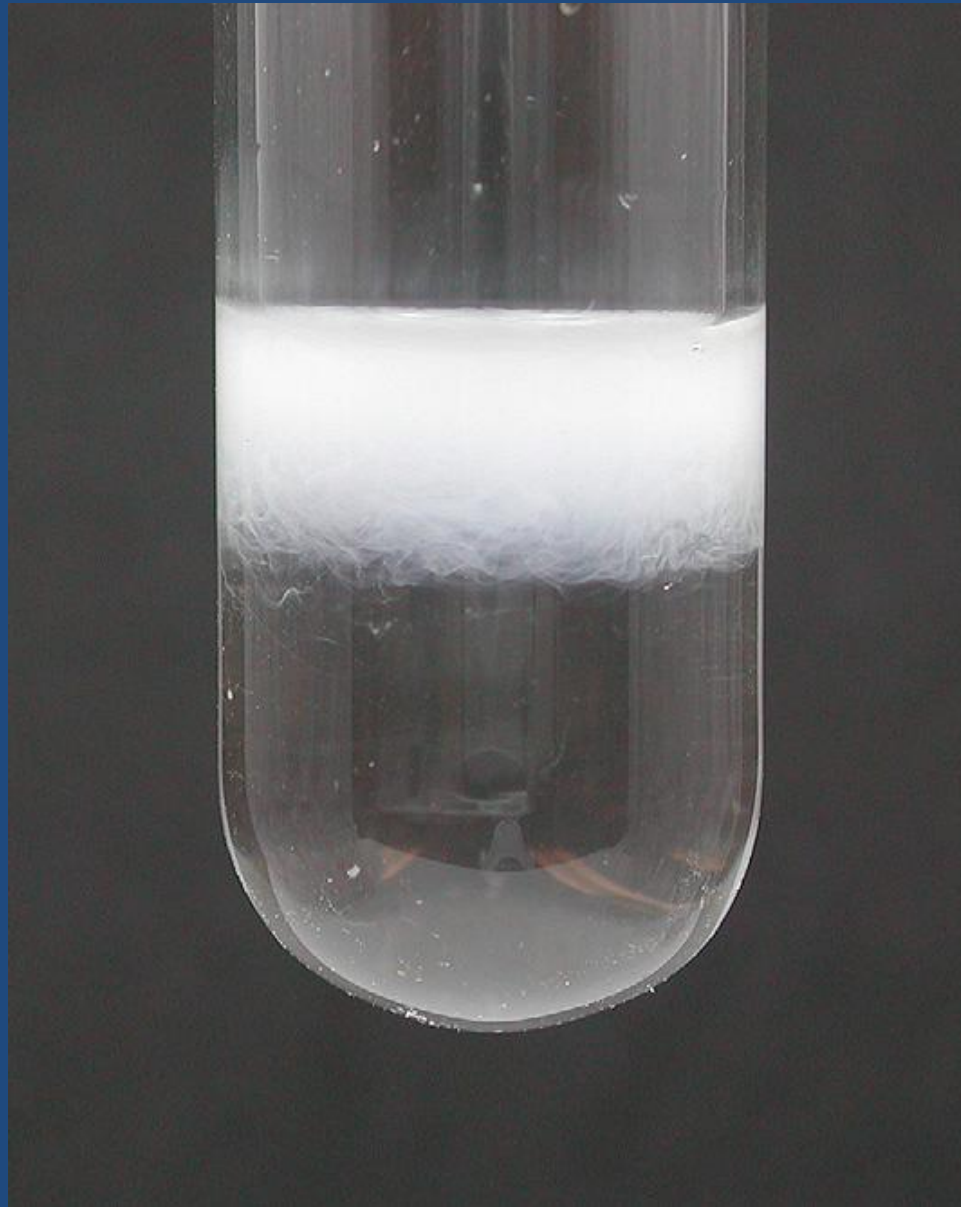
Interactions Between Irrigating Solutions

Hypochlorite & EDTA

CHX & NaOCl



CHX & EDTA



Irrigation Solutions

Combination Products



Irrigation Solutions



Irrigation Solutions



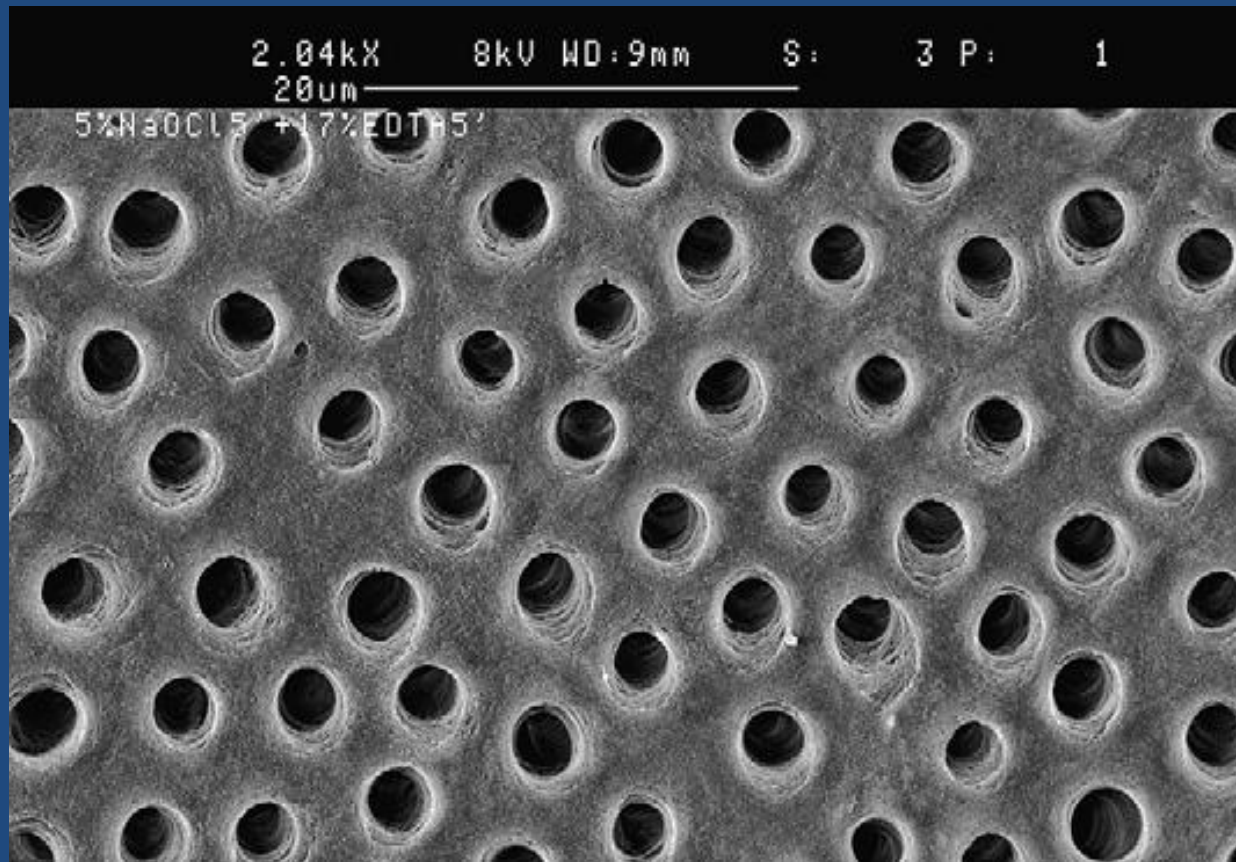
Irrigation Solutions



Challenges of Irrigation

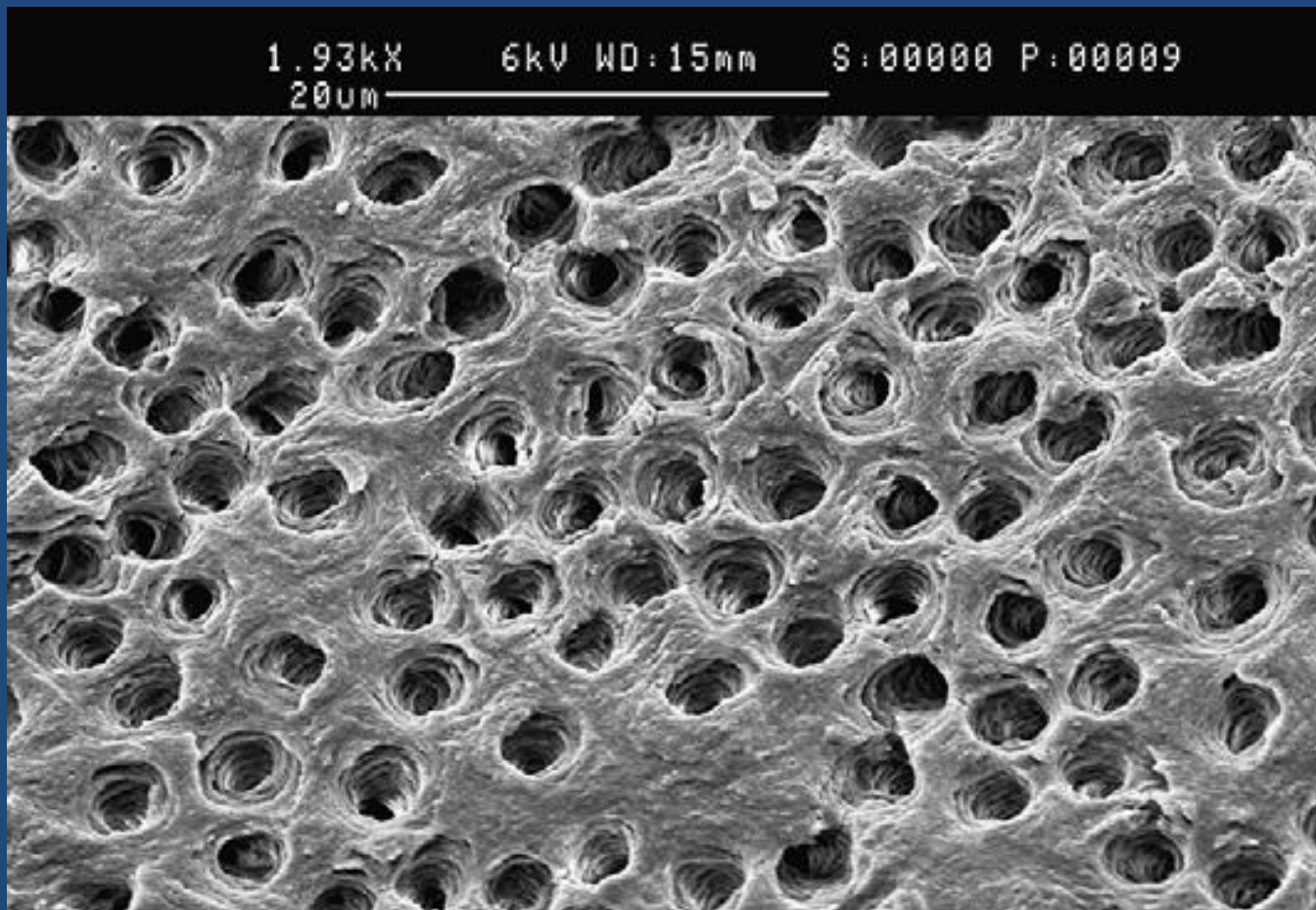
Smear Layer

NaOCl + EDTA



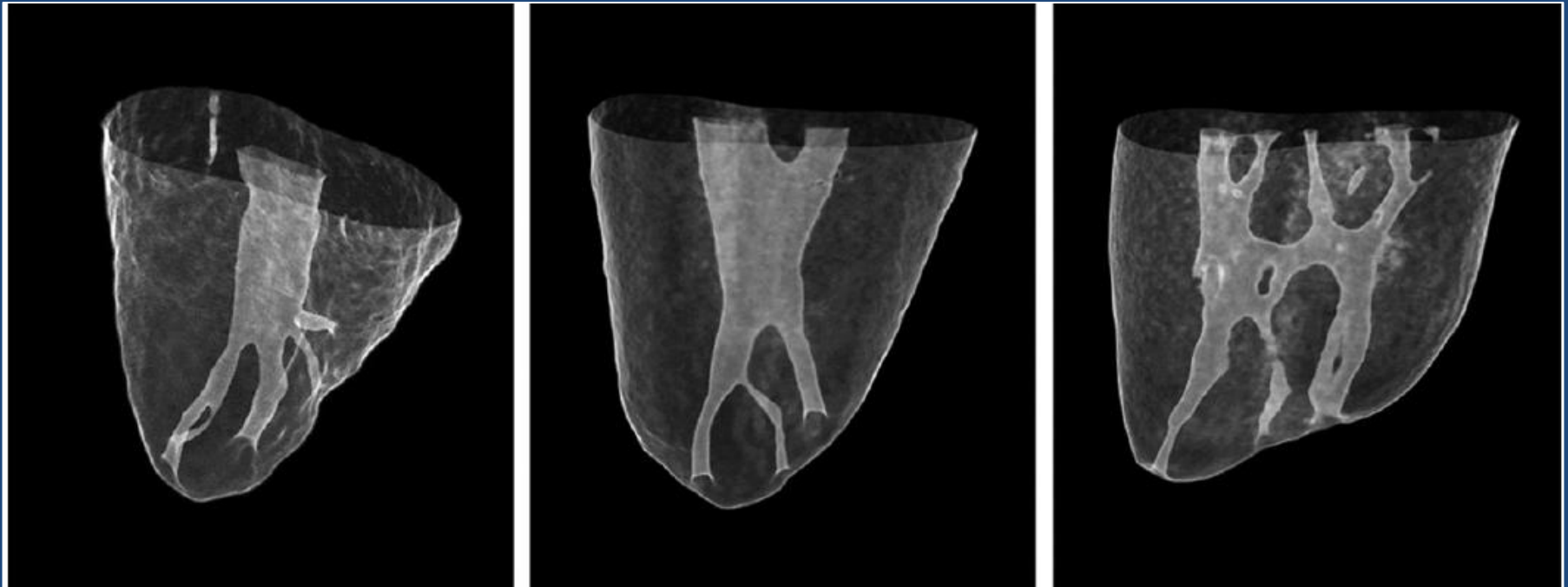
Challenges of Irrigation

Dentine Erosion



Challenges of Irrigation

Cleaning of Uninstrumented Parts of the Root-canal System



A



B



C



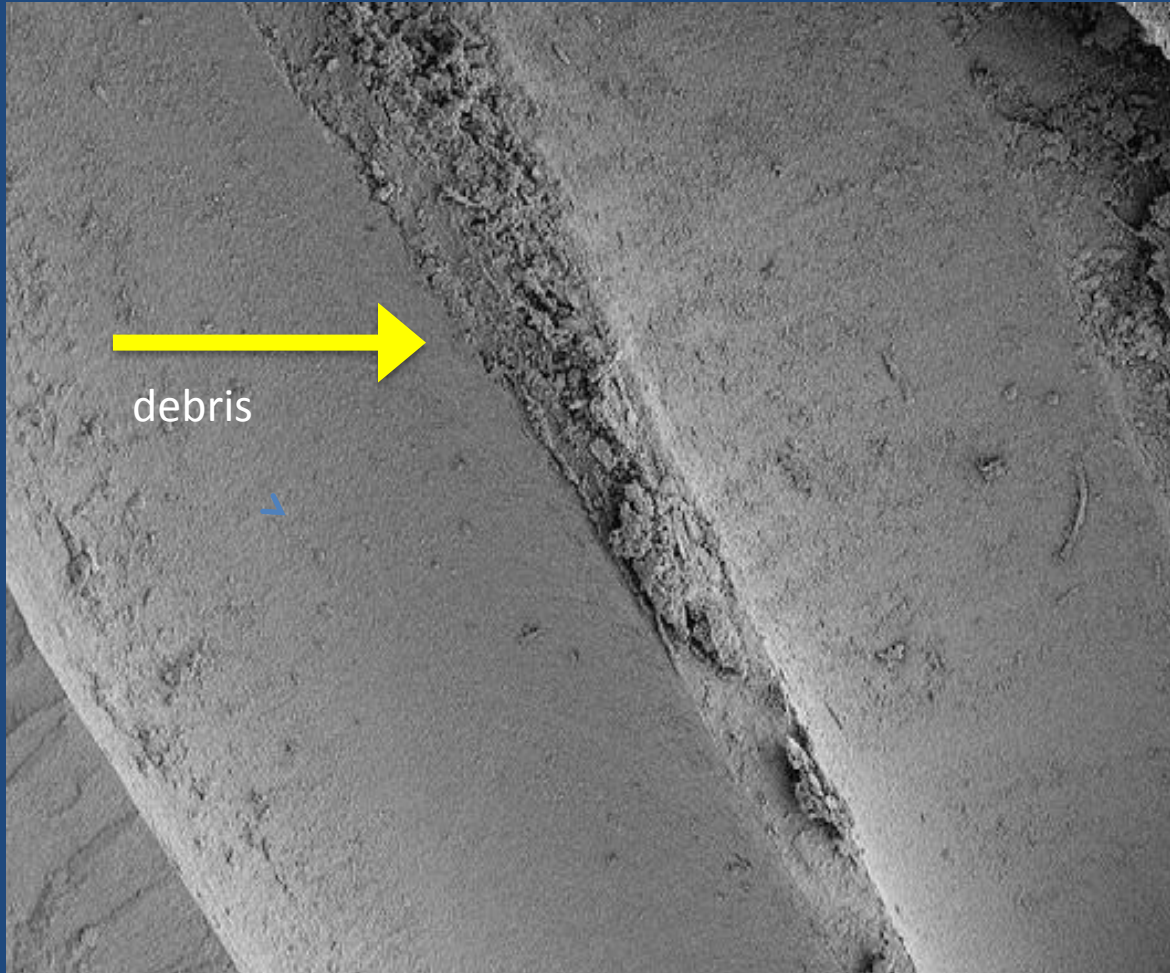
D



E

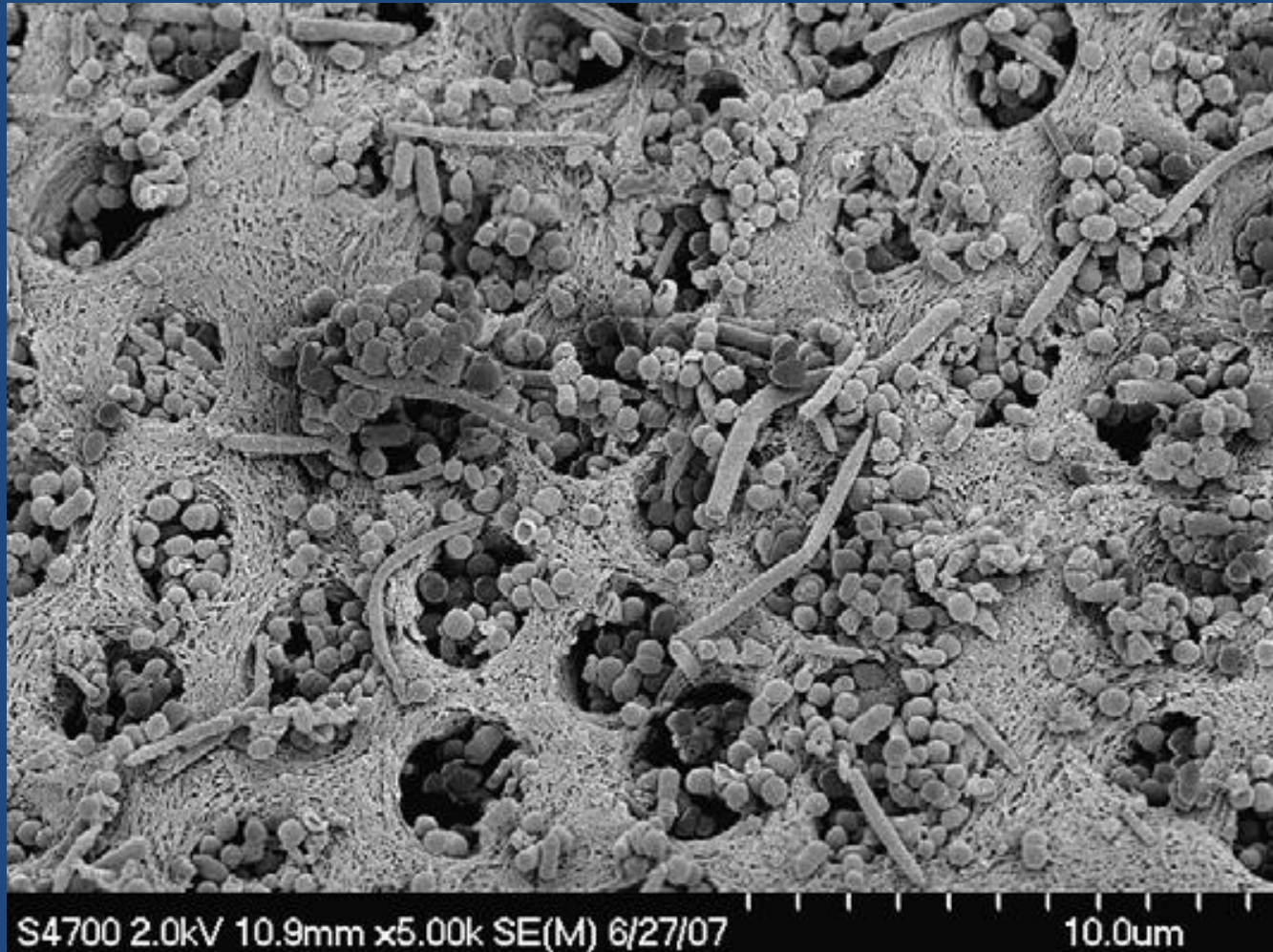


Challenges of Irrigation



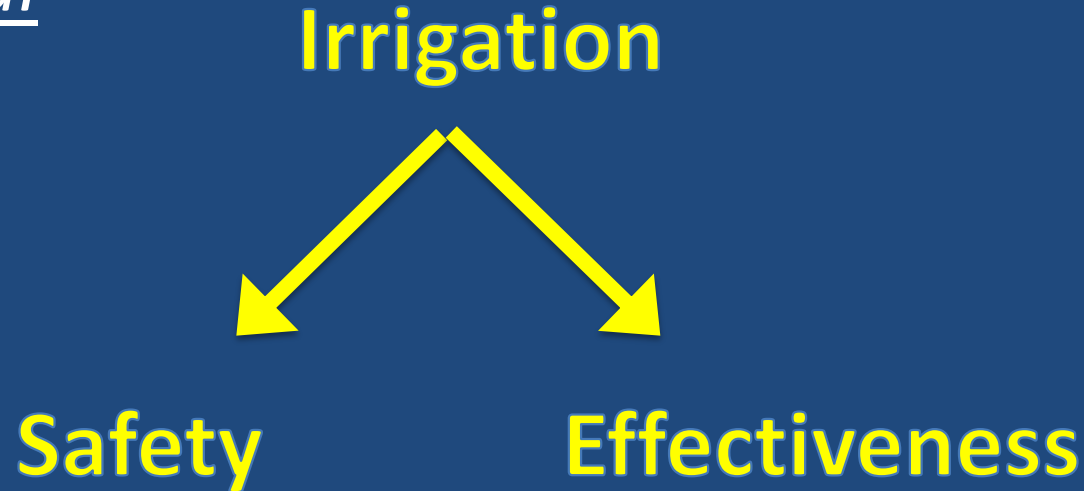
Challenges of Irrigation

Biofilm



Challenges of Irrigation

Safety versus Effectiveness in the Apical Root Canal



COMPUTATIONAL FLUID DYNAMICS IN THE ROOT-CANAL SPACE

Computational fluid dynamics (CFD) is a new approach in endodontic research to improve our understanding of fluid dynamics in the special anatomic environment of the root canal.

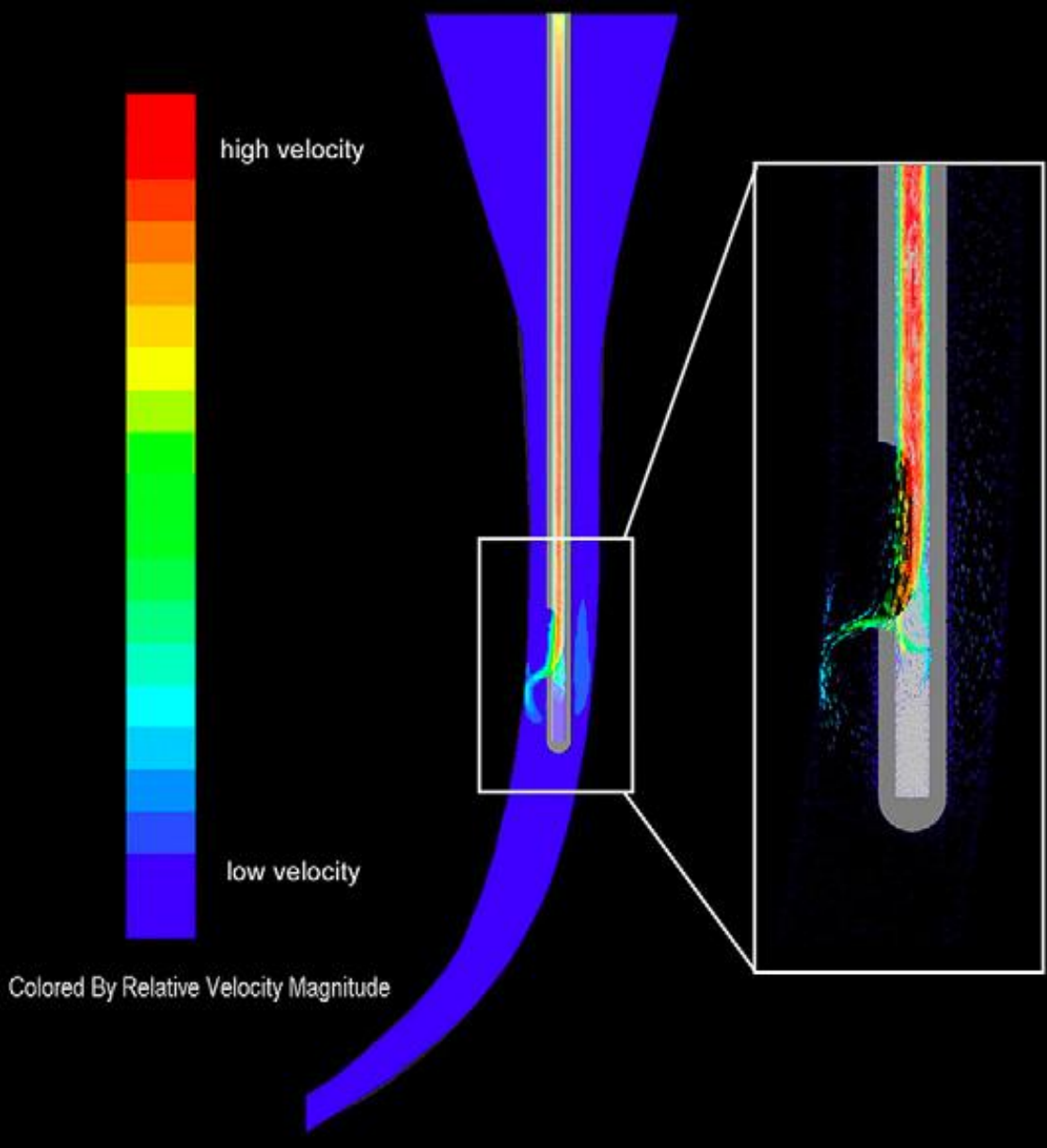


Particle Tracking



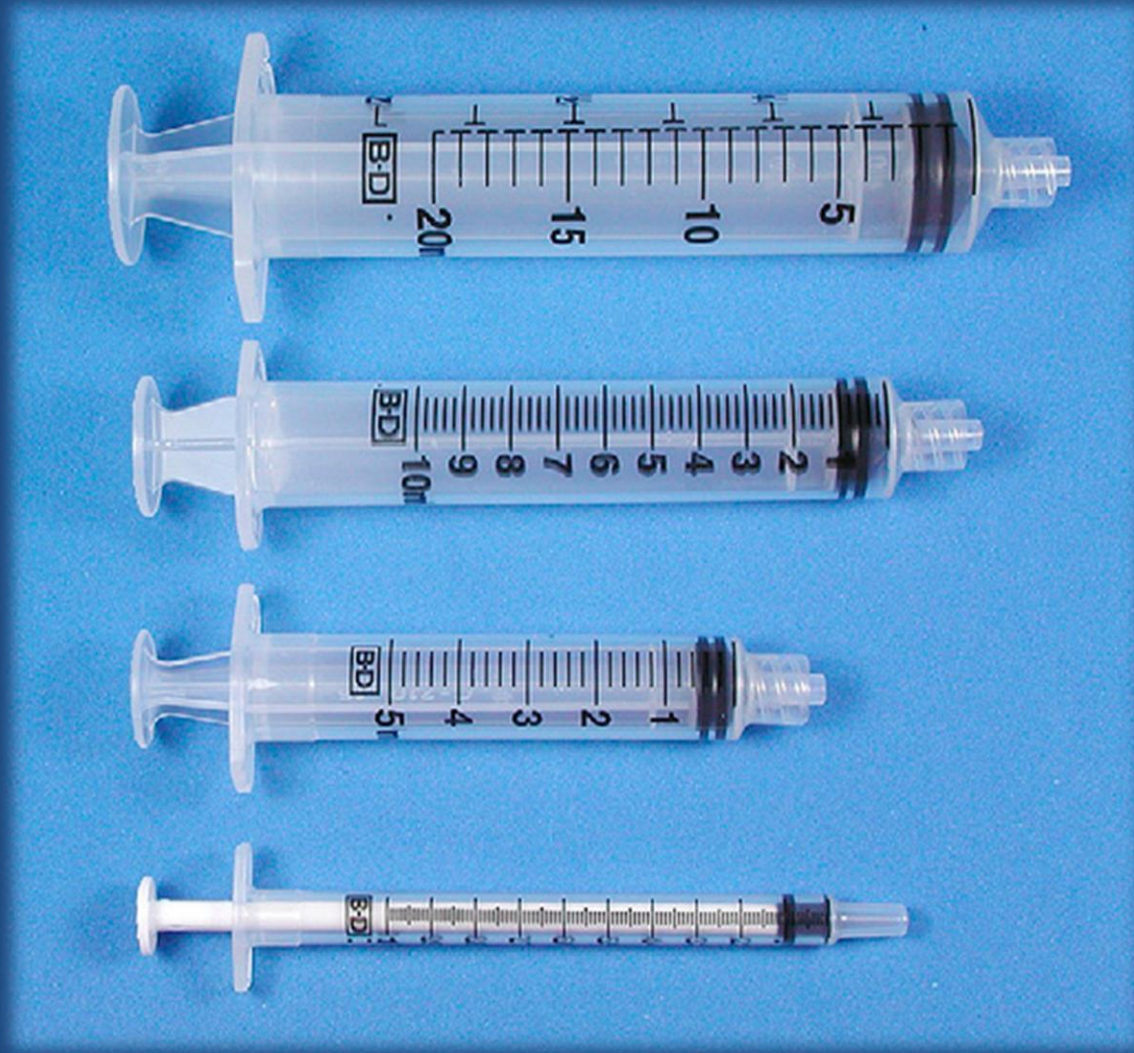
Streamline

Velocity distribution of irrigant flow

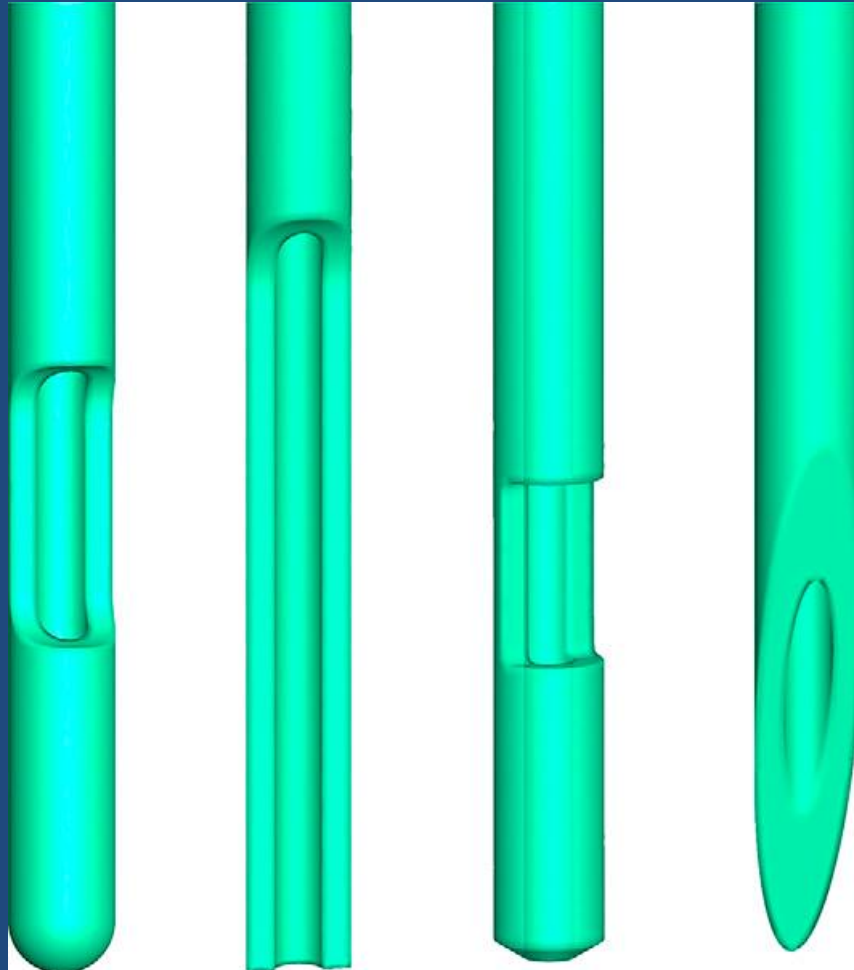


Irrigation Devices & Techniques

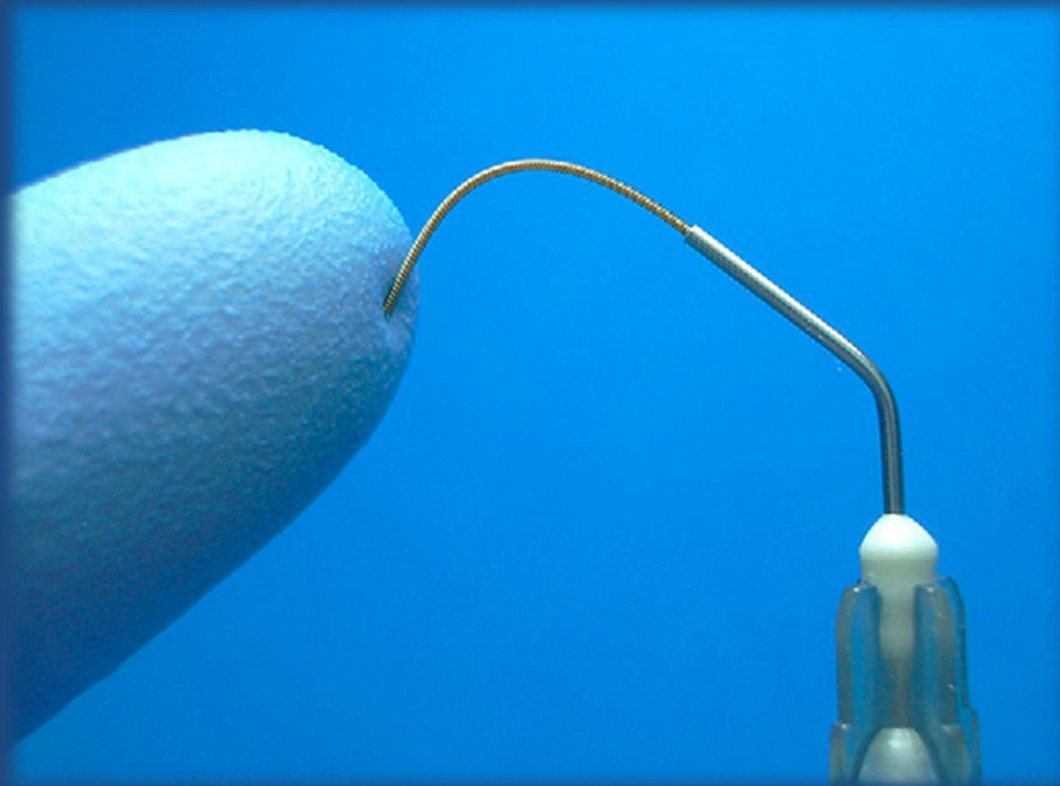
Irrigation Devices & Techniques



Irrigation Devices & Techniques



Irrigation Devices & Techniques

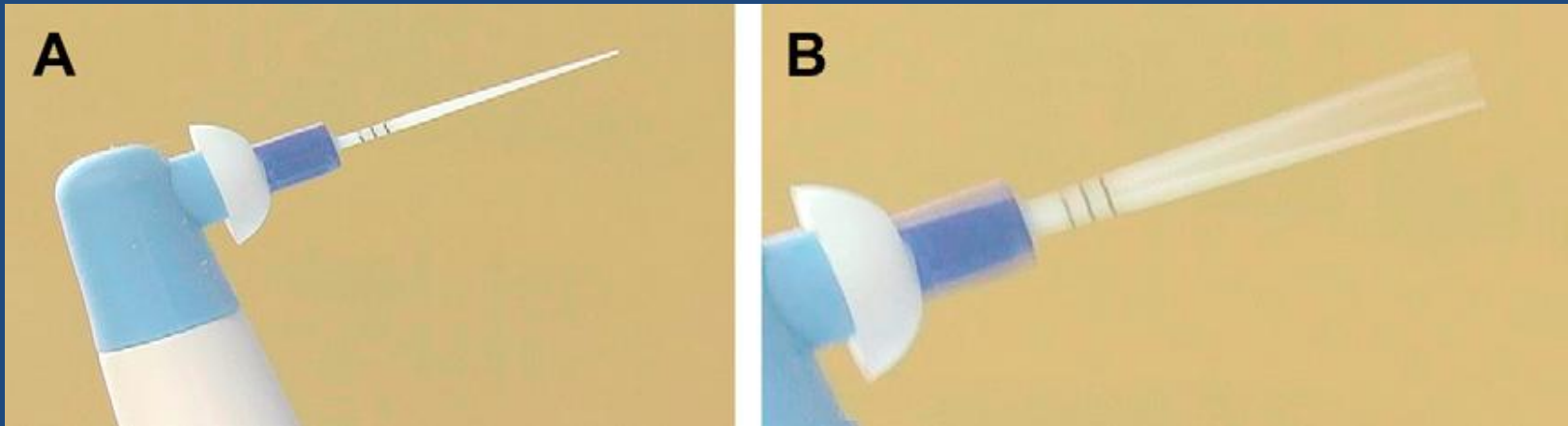


Irrigation Devices & Techniques

Gutta-percha points

Irrigation Devices & Techniques

EndoActivator



(Advanced Endodontics, Santa Barbara, CA, USA)

Irrigation Devices & Techniques

Vibringe



(Vibringe BV, Amsterdam, The Netherlands)

Irrigation Devices & Techniques

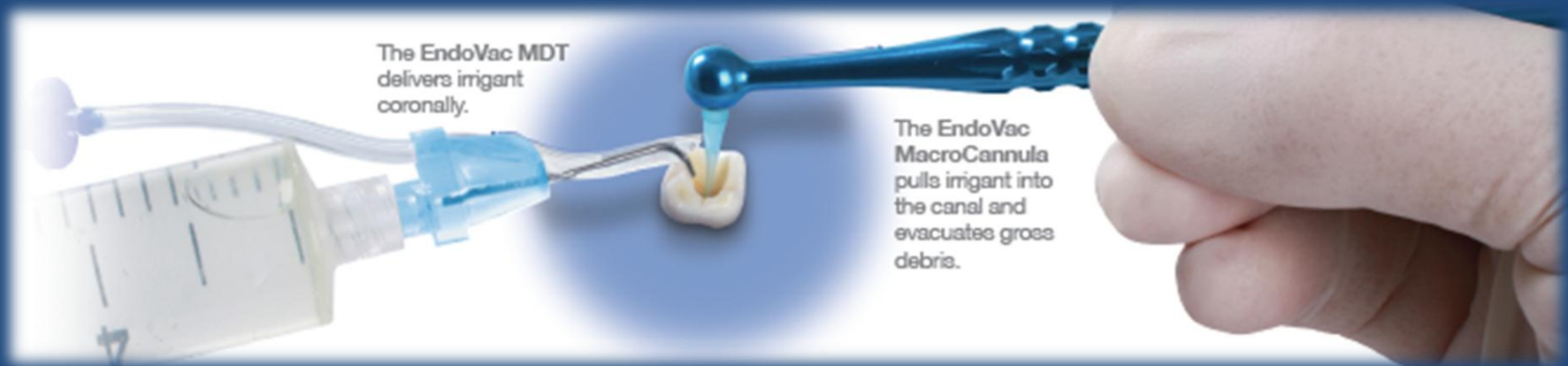
RinsEndo



(Durr Dental Co)

Irrigation Devices & Techniques

EndoVac



(Discus Dental, Culver City, CA, USA)



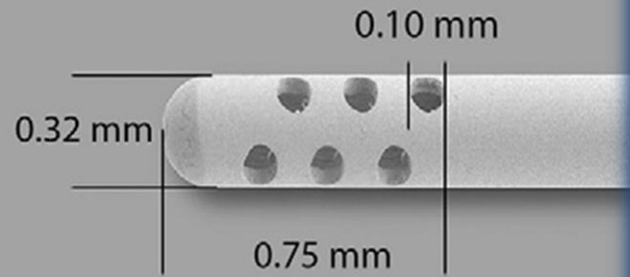
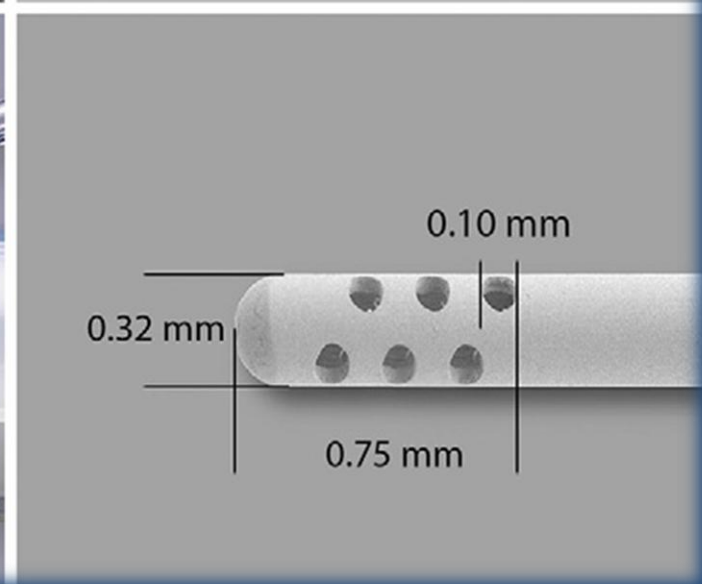
Macro cannula



Micro cannula



Master Delivery Tip



Negative Pressure Irrigation



Irrigation Devices & Techniques

Ultrasound



Conclusion

- Irrigation has a key role in successful endodontic treatment
- Although NaOCl is the most important irrigating solution, no single irrigant can accomplish all the tasks required by irrigation. Detailed understanding of the mode of action of various solutions is important for optimal irrigation
- New developments such as CFD and mechanical devices will help to advance safe and effective irrigation

