

# Revascularization

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- Forerunner of pulpal revascularization of the pulp space in necrotic, infected teeth in the 1970s (Nygaard-Ostby & Hjortdal (1971))
- Collagen solutions as artificial scaffolds in canal space (Nevins et al. 1976/1977)

# Main criteria

[ Revascularization ]

- Disinfection of the canal
- Placement of matrix to allow tissue in-growth
- Bacterial tight seal of access cavity

(Windley et al. 2005)

# Triple antibiotic paste

- Metronidazole
- Ciprofloxacin
- Minocycline

*In vitro* antimicrobial susceptibility to combinations of drugs of bacteria from carious and endodontic lesions of human deciduous teeth

Sato T, Hoshino E, Uematsu H, Noda T. *In vitro* antimicrobial susceptibility to combinations of drugs of bacteria from carious and endodontic lesions of human deciduous teeth. *Oral Microbiol Immunol* 1993; 8: 172-176. © Munksgaard, 1993

*International Endodontic Journal* (1996) 29, 118-124

**Sterilization of infected root-canal dentine by topical application of a mixture of ciprofloxacin, metronidazole and minocycline *in situ***

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***In-vitro* antibacterial susceptibility of bacteria taken from infected root dentine to a mixture of ciprofloxacin, metronidazole and minocycline**

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# Protocol for preparation

- Antibiotics (3Mix)
  - Ciprofloxacin 200mg
  - Metronidazole 500mg
  - Minocycline 100mg
- Carrier (MP)
  - Macrogol ointment
  - Propylene glycol
- Antibiotics (3Mix) – be sure to not cross-contaminate
  - Remove sugar coating from tablets with surgical blade, crush individually in separate mortars
  - Open capsules, crush in individually in separate mortars
  - Grind each antibiotic to a fine powder
  - Combine equal amounts of antibiotics (1:1:1) on mixing pad
- Carrier (MP)
  - Equal amounts of macrogol ointment and propylene glycol (1:1)
  - Using clean spatula, mix together on pad
  - Result should be opaque
- Separate out small portions of 3Mix and incorporate into MP using the following:
  - 1:5 (MP:3Mix) → creamy consistency
  - 1:7 (standard mix) → smears easily but does not crumble
  - If result is flaky or crumbly, then too much 3Mix has been incorporated
- Storage
  - Antibiotics must be kept separately in moisture-tight porcelain containers
  - Macrogol ointment and propylene glycol must be stored separately
    - Discard if mixture is transparent (evidence of moisture contamination)

# Metronidazole

## [ Revascularization ]

- broad spectrume against protozoa & anaerobic bacteria
- Strong antibacteril activity vs. anaerobic cocci; gram neg& pos. bacilli
- Permeates bacterial cell membranes; binds to DNA & disrupting helical structure : cell death

# Minocycline

- semisynthetic derivative of tetracycline antimicrobial
- bacteriostatic antimicrobial
- Broad spectrum vs. gram neg & pos. microorganisms
- Effective vs. most spirochaetes and many anaerobic and facultative bacteria.
- passive diffusion through outer membrane, then active transport through inner membrane; inhibition of protein synthesis on surface of ribosomes



# Ciprofloxacin

## [ Revascularization ]

- synthetic fluoroquinolone
- bactericidal mode of action
- gram neg. pathogens (little vs. gram pos.)
- Not only during multiplication phase, but also during resting phase of bacterium bactericidal active
- side effects have been reported; but low dose in root canal should minimize side effects

# Regeneration vs. Revascularization

## [ Considerations ]

- Pulp space has returned to vital state
- Tissue in pulp space more similar to periodontal ligament than to pulp tissue

(Thibodeau et . 2007)

- 30% chance of true pulp tissue re-entering the pulp space (Ritter et al. 2004)