Endodontic Instrumentation:

Cleaning & Shaping

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Endodontic Instrumentation

- Tooth Morphogenesis
- Endodontic Disease

- Coronal Cavity Preparation
- Chamber Location
- Access to Root Canal System

- Radicular Preparation
- Root Canal Shape
- Instrumentation
- Cleaning
In the beginning....
Embryology and Morphogenesis

- **Soft Tissue → Hard Tissue**
- Oral Ectoderm → Enamel
- Mesoderm → Pulp, Dentin, Cementum
• Soft tissue of mesenchymal origin
• Low-compliance environment
• Lacks collateral circulation
• Decreases progressively with age
Dentin

- Odontoblasts
- Odontoblastic Processes
- Dentinal Tubules:
  - Peritubular Dentin or Intratubular Dentin
  - Intertubular Dentin
Root Canal Morphology

- Hess 1925
- Pineda & Kuttler 1972
- Kulild and Peters 1990
- Stropko 1999
- Krasner and Rankow 2004
- Tooth Atlas: Brown and Herbranson (eHuman.com)
Root canal: an enigma?

- Pulp Chamber
- Points of Negotiation (PON’s)
- Portals of Exit (POE’s)
Canal Classifications

Weine

Vertucci

See any problems?
Only 60% of root canals could be classified using the classification of Weine et al. (1969) and 70% using the classification of Vertucci (1984).
Access to the root canal system must be based on visual information, not averages.
Root Canal Therapy

“The prevention and treatment of apical periodontitis”

-Martin Trope
Root Canal Therapy

• **Eliminate** irritants

• **Eliminate** potential irritants

• **Obliterate** any space irritants could occupy

• **Entomb** anything not eliminated

*biofilms can survive 150+ years!*
Keep the tooth in healthy function in the mouth
5 Phases of Root Canal Therapy

- Access
- Shaping
- Cleaning
- Obturation
- Restoration (coronal
Winning the Battle but Losing the War
Tooth Needs

1. Restorative
2. Periodontal
3. Endodontic

Procedure Needs

- Tooth
- Materials
- Operator

BALANCE
Instrumentation
Coronal Access Principles

• Goal 1: create access to the pulp system

• Goal 2: strategically extend the access to accomplish proper shaping/cleaning

• Goal 3: maintain structural integrity of the tooth, especially the cervical area
Access Design

- Tooth dependent
- Pt age
- Current damage of coronal structure
Pre-operative considerations

- Periapical and Bitewing radiographs
- Pulp chamber location/size
- Crown shape
- CEJ shape
Coronal Access Armamentarium

- Any end-cutting high speed bur
- Special considerations for porcelain and metal
- Round burs more difficult to maintain orientation
- Square-end burs are rarely beneficial in dentistry
- Tapered fissure-like burs give better angulation feedback
Stepped Access

- Remove materials according to a hierarchy of importance

- Can always remove:
  
  - Caries
  
  - Restorative material

  - Coronal 1.5-2mm of tooth (posterior)

-David Clark & John
“SEE” Access:
Strategically Extended Endodontic Access

- Deliberate excellence
- Locate the chamber in the most predictable way
- Extend the access to facilitate the treatment
- Straight line access
Deliberate Excellence

• "There are countless ways of attaining greatness. But any road to reaching one's maximum potential must be built on a bedrock of respect for the individual, a commitment to excellence, and a rejection of mediocrity."

-- Buck Rodgers, IBM
“SEE” Access: Chamber Location

• Preoperative: “RPC” and “FPC”

• Law of Centrality

• Law of Centricity

....at the Level of the CEJ
Radicular Access

- Gates Glidden Drills
- Peeso Reamers (dangerous)
- Mueller and LN burs
- Munce Discovery Burs
Instrumentation of the Root Canals

- Hand Files (K and H-type)
- Barbed Broaches
- Engine Driven
- NiTi files (rotary or reciprocating)
- 3D Adjusting (SAF)
Root Canal Therapy

- **Eliminate** irritants
- **Eliminate** potential irritants
- **Obliterate** any space irritants could occupy
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*biofilms can survive 150+ years!*
Goal of Canal Instrumentation

- Physically Remove Tissue and Irritants
- Create Space for Irrigants
- Facilitate Obturation

Procedure Needs
- Tooth
- Materials
- Operator

BALANCE

Remember this?
...irrigants clean...

- NaOCl
- EDTA
- Chlorhexidine
- MTAD
Dr. Herb Schilder

- 1967 & 1974 Papers
- Dental Clinics North America
- Laid foundation of modern techniques

- Vertically Compacted Warm Gutta Percha
- Tapering Funnel
- Small Apical Opening
- Recapitulation
- Envelope of Motion
Current shaping techniques

- Tooth dependent
- Root dependent
- Canal dependent

- Enlargement of canals
- Mechanical cutting of dentin (except lasers)
- Adjunct irrigation
- Maintain “true” canals
- Avoid instrumenting past apex
- Overenlargement weakens teeth
Current irrigation (cleaning) techniques

Full Strength NaOCl

- Dissolves Tissue
- Kills Microbes
- Inactivates irritants

Needs Time
- Imparts lubricity to files
- Clears debris
- *Time starts when shaping complete

Needs Volume
- Chemistry gets “used up”
- Replenish often
Tying it all together...

Richard

- 12 y.o. hispanic male
- initial presentation

### Assessment
- **pulp necrosis**
- **symptomatic apical periodontitis**
- **etiology: caries**
- **prognosis: good**

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Working...
Final
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