

**Review of Basic of Endodontics**



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Year 4  
10/9/2019

08/09/2019



## Endodontic Lectures, 1<sup>st</sup> semester

- Review of Basic of Endodontics
- Review of clinical procedures
- Rotary Endodontics and latest advances
- Obturation and Latest advances
- Latest advancements in Endodontics- I
- Latest advancements in Endodontics- II
- Single Visit Endodontics
- Laser in Endodontics
- Bleaching of Vital And nonvital teeth

**References**

- Cohen's Pathways of the pulp. 11<sup>th</sup> edition, 2016.
- Garg, Nisha, and Amit Garg. Textbook of endodontics. Boydell & Brewer Ltd, 2010.
- Some articles on the Blackboard.

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## Introduction

### Endodontics

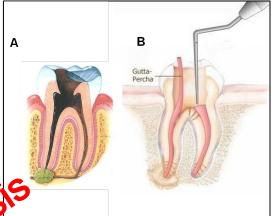
- Indirect pulp capping
- Direct pulp capping
- Pulpotomy
- Root canal treatment (RCT)
- Apexogenesis
- Apexification
- Root canal revascularisation
- Pulp regeneration
- Pulp engineering

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**Introduction**

**RCT procedures**

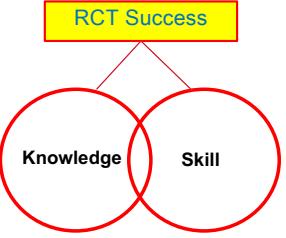
- ❖ Anesthesia (if needed)
- ❖ Rubber dam placement
- ❖ Caries removal (if exists)
- ❖ Access cavity
- ❖ Canal preparation
- ❖ Obturation
- ❖ Restoration
- ❖ Follow up



**Diagnosis**

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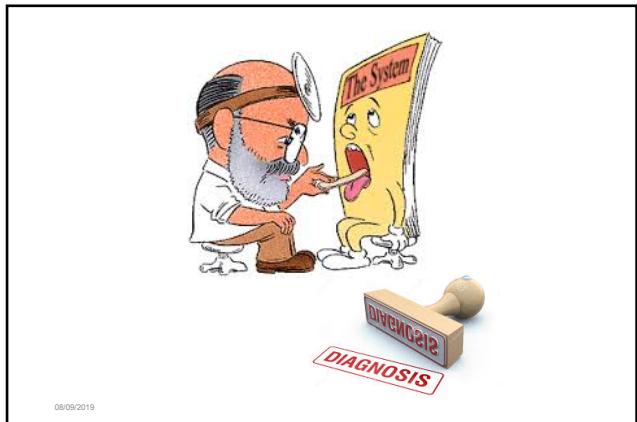
**Introduction**



**RCT Success**

**Knowledge**      **Skill**

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### Importance of Diagnosis

- Is it tooth pain or not? (sinus, cardiac pain etc.)
- Which tooth?
- What is the condition of the pulp?  
(reversible or irreversible)
- Periapical diagnosis?
- Endo or extraction? (restorability/periodontal)



### Importance of Diagnosis

Be careful... non-odontogenic toothache

1. Inadequate local dental cause for the pain
2. Stimulating, burning, non pulsatile toothaches
3. Constant, unremitting, non variable toothaches
4. Persistent, recurrent toothaches over months or years
5. Spontaneous multiple toothaches



### Steps for diagnosis

- Medical and dental history
- Chief Complaint
- Symptoms
- Visual Exam
- Clinical exam and radiographs

} subjective  
} objective



### History

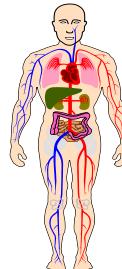
- Medical History
- Dental History



### Medical History

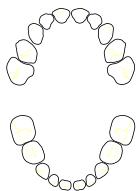
In general, there are no medical contraindications to endodontic therapy,  
But there is limitation

Periapical lesions in  
- kidney transplant patients?  
- patients who are going have cardiac surgery?



## Dental History

- ❖ Present Signs and Symptoms (Chief Complaint)
- ❖ Past Signs and Symptoms
- ❖ Past Dental Treatment
- ❖ Past Dental Experiences



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## Chief Complaint

- ❖ Reason why patient is here
- ❖ Provides a starting point
- ❖ Explained in patient's own words



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## Patient interrogation

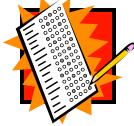
- Is pain spontaneous?
- Severity
- duration
- Is there something that makes it feel worse or better?
- Do you take pain medication and does it work?



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## Subjective Symptoms

- Where is pain?
- Type of Pain?
- What makes better or worst?
- Duration?
- When does it start?



+ chief complaint



initial tentative diagnosis

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## Tentative diagnosis

- ✓ The pain source is: Pulp, dentin, or Periradicular



- ✓ Determine urgency of treatment!



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## Objective signs

What the dentist is able to observe



- Visual examination
- Clinical tests
- Radiographs

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### Visual examination

- Extroral exam
- Intraoral exam
- Dentition exam



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### Visual examination

#### Extraoral exam



Swelling

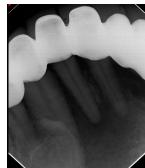


Sinus tract

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### Visual examination

#### Extraoral exam



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### Visual examination

#### Extraoral exam



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### Visual examination

#### Intraoral exam

- Swelling
- Sinus Tracts
- Discolorations
- Caries
- Defective fillings
- Fractures (tooth or cusps)
- Occlusal trauma (wear facets)



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### Visual examination

#### Transillumination light tool

- Useful for cracked teeth and small proximal caries
- Crack lines block light with transillumination
- Some cracked teeth shows irreversible pulpitis and need RCT



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### Clinical tests

- Evaluate the condition of pulp and periodontal tissues
- Attempt to reproduce the patient's symptoms!
- Confirm your tentative diagnosis and arrive at a final diagnosis

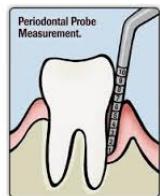


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### Clinical tests

#### Why periodontal condition?

- Perio and Endo mimic each other and are often interrelated
- Endo or Perio or both?
- Prognosis (is endo worth it?)



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### Clinical tests

#### Why periodontal condition?

- The more endo and less perio the better the prognosis and vice versa



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### Clinical tests

#### Why periodontal condition?

- ❖ The mobility might be of **endodontic** origin
- ❖ Usually such mobility is dramatically **improved** after RCT
- ❖ marked mobility of **periodontal** origin has **poor** prognosis



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### Clinical tests

#### Periodontal exam

- Probing pockets depths
- Mobility
- Inflammation



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### Clinical tests

#### Periradicular tests

1- Percussion

2- Palpation

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### Percussion

- ❖ A test of the periodontal ligament not of the pulp!
- ❖ Tells you if there is inflammation of the periodontal ligament
- ❖ Should use a control tooth



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### Percussion

- First with finger
- If not sensitive use mirror handle



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### Palpation

- Apply pressure with finger over apex
- Determines extent of inflammation



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### Pulp tests

The assessment of pulp health is commonly done:

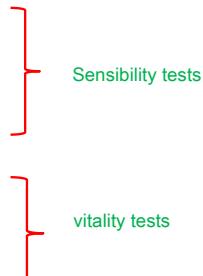
- (i) Prior to restorative, endodontic, and orthodontic procedures
- (ii) As a follow-up and for monitoring the pulp after trauma to the teeth
- (iii) In differential diagnoses, such as excluding periapical pathosis of pulp origin



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### Pulp tests

- Cold Test
- Heat Test
- Electrical Test
- Other Tests: cavity test, anesthetic test
- Laser Doppler flowmetry
- Pulse oximetry



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### Cold test

- ❖ Ice stick
- ❖ Ice water
- ❖ Carbon Dioxide ( $\text{CO}_2$ ) snow:  $-56^\circ \text{ C}$  to  $-98^\circ \text{ C}$ ; ( $-69^\circ \text{ F}$  to  $-119^\circ \text{ F}$ )
- ❖ Ethyl chloride spray
- ❖ Dichlorodifluoromethane (DDM), (Endo ice):  $-26.2^\circ \text{ C}$



### Cold test

#### Endo Ice

Manufacturers have replaced DDM with other gases, including tetrafluoroethane (TFE) or a propane/ butane/ isobutane gas mixture stored in a pressurized can.



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### Cold test

- When ice is used the **most posterior teeth** should be tested first
- If retesting allow five minutes to obtain more accurate test



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### Cold test interpretation

- Severe and prolonged response to cold indicative of **irreversible pulpitis**
- No response could indicate **pulpal necrosis** but beware of calcified teeth (this is why control teeth are important)
- Do not interpret by itself!



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### Heat test

- Not used routinely
- Useful when offending tooth is difficult to localize and the major symptom is heat sensitivity
- Exaggerated and lingering response is indicative of **irreversible pulpitis**



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### Heat test

- Guttapercha pellets
- Hot water
- Ball burnisher
- Rubber wheel



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### Electric Pulp Test (EPT)



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### Electric Pulp Test (EPT)

- Make sure tooth is dry
- Use toothpaste as electrolyte
- Use a control tooth



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### Electric Pulp Test (EPT)

#### Limitations

- ❖ Not used in crowned teeth
- ❖ Does not tell you if pulp is healthy or not
- ❖ Can give **false negatives** or **false positives**

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### Electric Pulp Test (EPT)

#### Limitations

##### **False-positive responses**

- Partial pulp necrosis
- Patient's high anxiety
- Ineffective tooth isolation
- Contact with metal restoration

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### Electric Pulp Test (EPT)

#### Limitations

##### **False negative responses**

- Calcific obliterations in the root canal
- Recently traumatised teeth
- Immature teeth
- Drugs that increase patients threshold for pain
- Poor contact of the tip of tester to tooth

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### What is the best sensibility test?

	Sensitivity	Specificity	Overall
Cold	83%	93%	86%
EPT	72%	93%	81%
Hot	86%	41%	71%

Sensitivity = able to identify teeth with disease

Specificity = ability to determine teeth without disease

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Cohen, Stephen; *Pathways of the Pulp*; 9th edition, pgs 16-21, 2006

### Bite test

- Wood stick
- Tooth slooth (better)
- One cusp at a time
- Pain occurs when releasing (cracked tooth)



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### Cavity Test

- Explain to patient
- Drill into dentin with no anesthetic
- If pain experienced stop immediately
- Useful in situations when all other tests are inconclusive



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### Anesthetic Test

- Useful to identify the possible source of pain
- The IDN block can localize pain to one arch
- Ability to anesthetize a single tooth has been questioned
- Start from **front** to back



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### Clinical tests

#### Limitations

- ❖ Cannot be used in all situations
- ❖ Tests are often inconclusive
- ❖ Can be technique sensitive
- ❖ Can get false negatives and positives

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### Radiographic Interpretation

#### Periapical film

- Very **useful** before, during and after RCT
- Many **limitations**:
  - Two dimensional images
  - Most **pulp pathology** not visible
  - **Periapical pathology** many times not visible



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### Radiographic Interpretation

#### Benefits of pre-operative film

- **Crown:** caries/fillings/pins
- **Pulp chamber:** size, pulp stones
- **Root:** length/size/position, curvature
- **Canals:** numbers/ size/position



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### Radiographic Interpretation

#### Benefits of pre-operative film

- Calcifications
- Resorption

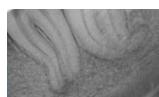


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### Radiographic Interpretation

#### Benefits of pre-operative film

- Lateral Canals
- Apex (closed/open)
- Abnormal anatomy

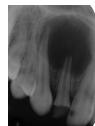


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### Radiographic Interpretation

#### Benefits of pre-operative film

- Periradicular **lesions**: size, location, shape, radiolucent/radiopaque
- Sinus **tract**: traced with guttapercha



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### Radiographic Interpretation

#### Benefits of pre-operative film

- Periodontal **bone loss**
- Anatomic landmarks



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### Radiographic Interpretation

#### Periradicular Lesions of Endodontic Origin

- Loss of lamina dura
- Radiolucency remains at apex even when x-ray angles are changed
- Usually etiology is evident



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### Radiographic Interpretation

#### Periradicular Lesions of Endodontic Origin

A well developed radiolucent lesion at the apex of a tooth with a vital pulp??

**Could be:**

- 1- traumatic bone cyst
- 2- developmental bony defect
- 3- periapical cementoma
- 4- early ossifying fibroma

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#### Diagnostic Categories

##### A) Pulpal tissue

- Normal
- Reversible pulpitis
- Irreversible pulpitis
- Necrotic

##### B) Apical tissue

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## Pulpal Tissue

### Normal

- Asymptomatic
- Respond normally to pulp testing
- Free of caries, defective restoration,.....
- **Radiographically:** p.a. tissues normal + an intact lamina dura.



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## Pulpal Tissue

### Reversible pulpitis

- Tooth asymptomatic or have **mild** to moderate symptoms
- Pain is for short time and **subside** with removal of stimuli
- Under **mild caries** and restorations or **after** cavity preparation
- **Radiographically:** p.a. tissues appears normal



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## Pulpal Tissue

### Irreversible pulpitis

- Pulp testing is **+**
- Symptoms: **Continuous** or **prolonged** pain after a stimulation  
The pain may be **spontaneous**
- **Radiographically:** p.a. tissues normal / **widened** lamina dura



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## Pulpal Tissue

### Necrotic pulp

- No response to pulp testing
- Symptoms: (**YES**: acute vs **NO**: chronic)
- May or may not have p.a. pathosis

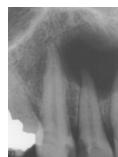


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## Diagnostic Categories

**B) Apical tissue**

- Normal
- **Apical Periodontitis:** - Symptomatic (Acute)  
- Asymptomatic (Chronic)
- **Apical Abscess:** - Symptomatic (Acute)  
- Asymptomatic (Chronic)



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## Apical Periodontitis

Acute

Chronic

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### Acute Apical Periodontitis

Pain: yes

Pulp test:

- vital
- necrotic

X-ray: radiolucency:

- yes
- no

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### Acute Apical Periodontitis

#### Etiology

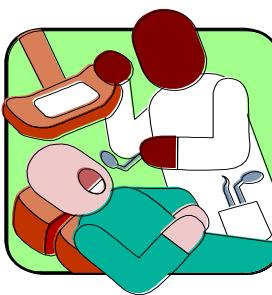
- Hyperocclusion (vital pulp, no radiolucency)
- Inflammatory mediators (inflamed vital pulp)
- Microbial toxins (necrotic pulp)
- Mechanical Irritants (Endo)
- Chemical Irritants (Endo)

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### Acute Apical Periodontitis

#### Treatment

Remove the cause!



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### Chronic Apical Periodontitis

• Pain: no

• Pulp test: negative (necrotic)

• X-ray: wide PDL to large radiolucency (or radiopacity)



### Chronic Apical Periodontitis

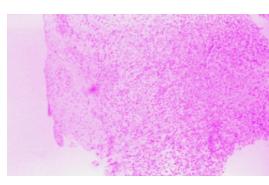
#### Histology: Granuloma Vs Cyst

##### Granuloma

Fibrous collagenous tissue with budding capillaries and chronic inflammatory cell infiltrate



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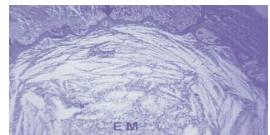


### Chronic Apical Periodontitis

#### Histology: Granuloma Vs Cyst

##### Cyst

- Cavity filled with fluid and lined with epithelium
- In turn this lesion is surrounded by granulomatous tissue (A CYST WITHIN A GRANULOMA)



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### Chronic Apical Periodontitis

#### Treatment

Endodontic therapy



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### Chronic Apical Periodontitis

#### Condensing osteitis

- Reaction to a dental related **infection**
- Radiopaque** area at apex of tooth
- Increased **density** in trabecular bone



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### Chronic Apical Periodontitis

#### Condensing osteitis

- Response to long standing **irritant**
- Chronic inflammatory cell infiltrate
- Can be associated with either **vital** inflamed pulps or **necrotic** pulps

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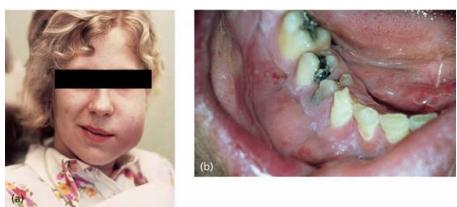
### Apical Abscess

Acute      Chronic

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### Acute Apical Abscess

- Associated with necrotic pulps
- Can be localized or diffuse



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### Acute Apical Abscess

#### Signs and Symptoms

- Spontaneous pain
- Pain to percussion/palpation
- SWELLING**
- Systemic manifestations



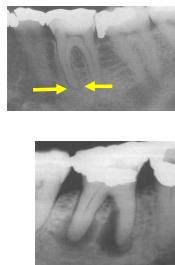
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### Acute Apical Abscess

#### Signs and Symptoms

- Spontaneous pain
- Pain to percussion/palpation
- SWELLING
- Systemic manifestations
- Variable radiographic appearance

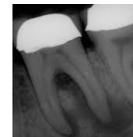
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### Acute Apical Abscess

#### Phoenix Abscess

- Exacerbation of previous chronic lesion
- Large radiolucency



### Acute Apical Abscess

the most diagnostic sign is



**Swelling**

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### Acute Apical Abscess

#### Treatment

- Release pressure: Drainage
- Systemic support: Antibiotics
- Remove cause : Endodontic Therapy

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### Chronic Apical Abscess

- **Pain:** usually no
- **Pulp test:** negative (necrotic)
- **X-ray:** variable



Presence of sinus tract is the most diagnostic sign/symptom

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### Chronic Apical Abscess

#### Treatment

- Remove cause : Endodontic Therapy

