

Clinical diagnostic procedure

Pathways of the Pulp, Cohen 10th edition
Chapter 1, 4

Dr. Kholod Al-Manei

Lecture Outline

- Chief complaint, medical and dental history.
- Examination and testing.
 - Pulp test
 - Special test
 - Radiographic examination and interpretation.
 - Root fracture
 - Referred pain
- Clinical classification of pulpal and periradicular diseases.
- Treatment planning and case selection.

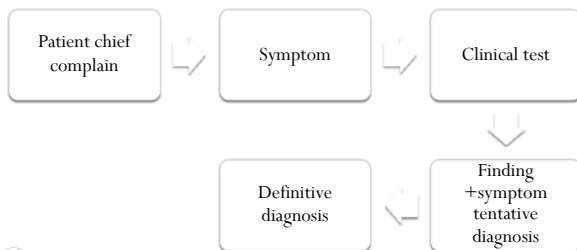
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Diagnosis

To determine what problem the patient is having and • why the patient is having that problem.



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Chief Complaint

> Patient's own words

Medical History

- > Baseline blood pressure and pulse should be recorded
- > Temperature of patients presenting with fever or any sign or symptom of dental infection should be taken
- > Patient allergy
- > Oral soft tissue changes related to medication(eg: stomatitis , xerostomia, lechnoid lesion, bleeding of the oral soft tissue)
- > Patients with the following medical condition may require either modification in the dental care or treatment plan:

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Cardiovascular:	High-moderate risk of endocarditis, pathologic heart murmurs, hypertension, unstable angina pectoris, recent myocardial infarction, cardiac arrhythmias, poorly managed congestive heart failure.
Pulmonary:	Chronic obstructive pulmonary disease, asthma, TB
GI and Renal:	End-stage renal disease, hemodyalisis, viral hepatitis, alcoholic liver disease, peptic ulcer disease, inflammatory bowel disease, pseudomembranous colitis
Hematologic:	Sexually transmitted disease, HIV, ADIS, diabetes mellitus, pregnancy, hyperthyroidism and hypothyroidism, bleeding disorders, cancer, leukemia, osteoarthritis and rheumatoid arthritis, systemic lupus erythematosus.
Neurologic:	Cerebrovascular accident, seizer, anxiety, alcohol abuse, Alzheimer's disease, multiple sclerosis

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> Several medical conditions have oral manifestation such as

Medical condition	Oral manifestation
Tuberculosis lymphoma	Lymph node enlargement
Immunocmpromised patients Uncontrolled diabetic patients	Recurring abscesses
Iron deficiency anemia Precious anemia Leukemia	Parasthesia of soft tissue
Sickle cell anemia	Bone pain
Multiple myeloma	Tooth mobility
Radiation therapy	Osteoradionecrosis
Trigeminal neuralgia Multiple sclerosis Pain from cardiac angina	Mimic dental pain
Acute max. sinusitis	Mimic tooth pain

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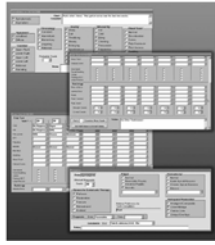
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Dental History

- Documentation of past and present symptom as well as any procedure or trauma.
- SOAP(subjective, objective, appraisal and plan)
- Software package allow digital entries into the patient's electronic file
- Chronologically depicts all information about the patient's symptoms

The dental history is divided into 5 basic directions of questioning:

1. Localization
2. Commencement
3. Intensity
4. Provocation and relief of pain
5. Duration



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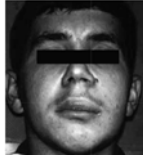
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Examination and Testing:

Extraoral Examination:

- Facial asymmetry
- Visual and palpation examination of head and neck
- Palpation of swelling to determine if it is localized or diffuse, firm or fluctuant
- Loss of definition of nasolabial fold on one side may be the earliest sign of canine space infection(canine and central incisor infection)
- Sinus tracts may open through the skin



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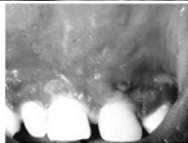
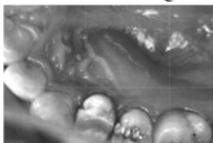
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Examination and Testing:

Intraoral Examination:

- Intraoral swelling



Intraoral sinus tracts



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Palpation:

Percussion:

- Pain to percussion dose indicate that the tooth is vital or nonvital but is indication of PDL inflammation
- Gloved finger Vs Blunt end of an instrument



Mobility:

- +1 mobility: the first distinguishable sign of movement greater than normal
- +2 mobility: horizontal tooth movement no greater than 1 mm
- +3 mobility: horizontal tooth movement greater than 1 mm, with or without the visualization of rotation or vertical depressability

Any mobility over +1 mobility should be considered abnormal.

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Periodontal Examination:

Deep pockets indicate horizontal or vertical bone loss

Wide and generalized boon loss → periodontal

Isolated vertical bone loss → endodontic

Vertical root fracture cause a localized narrow pocket

Furcation defects should also be recorded as follows:

- Class I furcation defect: The furcation can be probed, but not to a significant depth.
- Class II furcation defect: The furcation can be entered into but cannot be probed completely through to the opposite side.
- Class III furcation defect: The furcation can be probed completely through to the opposite side.

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Pulp Tests

Thermal

Heat

- Heat test is appropriate for patient that is unable to identify which tooth sensitive
- Delayed response with heat testing
- GP or compound stick, dry rubber polishing wheel run at high speed and syringe filled with water



1,1,1,2-tetrafluoroethane

Cold

- Used in conjunction with the electric pulp tester
- CO2(dry IC)
- Extreme cold temp of CO2(-56°C to -98°C) can cause burning of soft tissue
- Refrigerant spray(temp.-26.2°C) applied on large #2 cotton pellet
- Cold test has accuracy of 86%



BUTAN 30-50%
PROPAN 30-50%
ISOBUTAN 10-20%

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Electric

- Electric pulp tester has limitation in providing information about the vitality of the pulp
- The response of the pulp to electric testing does not reflect the histologic health or disease status of the pulp.
- The tip of the testing probe must be coated with a water- or petroleum-based media.
- If a complete coverage crown or extensive restoration is present, a bridging technique can be attempted
- *Cold tests are more reliable than electric pulp tests in younger patients. However, unlike electric pulp testing, cold testing can reveal the health and integrity of pulp tissue*



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Laser Doppler Flowmetry

- LDF is accurate, reliable, reproducible method of assessing pulpal blood flow
- The infrared light beam is scattered through the pulp and frequency shifted by moving RBCs, but it will remain unshifted as pass through static tissue
- The Doppler frequency shift will measure the velocity at which the RBCs are moving.
- LDF recordings took approximately 1 hour

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Pulse Oximetry

- Design to measure O₂ concentration of the blood and pulse rate
- Is not predictive diagnostic value for diagnosing pulp vitality
- The two wavelengths of light transmitted by a photoelectric diode detect oxygenated and deoxygenated hemoglobin. The difference between the light emitted and the light received is calculated



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Special Tests

Bite Test

- Tooth sensitive to biting → Periradicular periodontitis
- Crack
- Periradicular periodontitis → tooth respond with pain to percussion regardless of where the pressure is applied
- A cracked tooth → elicit pain only when the percussion is applied in a certain direction to one cusp
- A variety of devices for bite tests, including cotton applicators, toothpicks, orangewood sticks, and rubber polishing wheels
- Tooth Slooth and FracFinder are used for the bite test.
- Cracked tooth is the frequent presence of pain upon release of biting pressure



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Test Cavity

- Used only when all other test methods are impossible or the results of the other tests are inconclusive (e.g. full coverage crown)
- With a high-speed #1 or #2 round bur
- No anesthesia
- If the patient fails to feel any sensation, it is a good indication that the pulp is necrotic

Staining and Transillumination :

- In the presence of a crack in tooth surface, the application of a stain to the area is often of great assistance
- Shining a very bright light on tooth surface is also very helpful

Selective Anesthesia:

- When symptoms are non localized or referred, patient is not able to specify whether the symptoms are emanating from the maxillary or mandibular arch
- First anesthetize the maxillary arch
- Most posterior tooth
- If the pain is not eliminated, repeat this technique on the mandibular teeth

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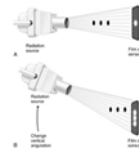
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Radiographic Examination and Interpretation

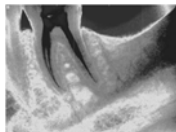
Intraoral radiograph:

- Changes in the horizontal or vertical angulation may help elucidate valuable anatomic and pathologic information
- Radiographic changes from bone loss will not be observed if the bone loss is only in cancellous bone.



Digital Radiography

- Has the advantage over conventional film in that there is no diminution in diagnostic quality caused by developing and processing errors, and it has the ability to enhance, magnify, store, and electronically send the images, as well the ability to duplicate the original radiograph as a perfect copy



Cone-beam computerized tomography (CBCT)

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Root Fractures and Cracks

Craze lines

- Crack not extend to the dentine
- Adult teeth
- More in posterior
- Fine line with transillumination
- No symptoms no treatment

Fractures

- Extend to dentine and extend mesially to distally
- Symptom rang from non to sever pain
- Tx by simple restoration, endodontics or even extraction
- Early detection, prevention and proper informed consent

Split roots:

- Fracture extend from on surface to another surface of tooth, so tooth separate into two segments
- If split extend below the osseous level or involve the pulp → tooth will be not restorable

Vertical Root Fractures

Etiology

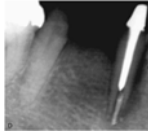
- Physical traumatic injury, occlusal prematurities, repetitive parafunctional habits of heavy stressful chewing, or resorption-induced pathologic root fractures, the most common cause iatrogenic dental treatment
- Most common dental procedure contributing to vertical root fractures is endodontic treatment(decrease in hydration, excessive canal shaping, excessive pressure during obturation)

Determination of a Vertical Root Fracture

- Periodontal, and radiographic examinations may be at best only suggestive of a vertical root fracture.
- The tooth is typically painful, with symptoms ranging from mild to severe in intensity
- Mandibular second molars have a higher incidence of vertical root fractures, followed by maxillary first molars and maxillary premolars
- **Medical History:**
 - History of facial trauma
 - Seizure disorders
 - Stroke, heart attack, or any other ailment that might have resulted in lack of consciousness
- **Dental History:**
 - chewing or other parafunctional habits
 - An endodontic procedure that was performed well but does not result in healing may also be suggestive of a vertical root fracture

Radiographic Evaluation of a Vertical Root Fracture

- A vertical root fracture or a split tooth may be an obvious diagnosis based on radiographic findings
- Another interesting way is from a CAT scan.
- **Cement Trail**, confused with the obturation passing through accessory canals, but the appearance is more diffuse in cases of vertical root fractures
- **Halo-like Bone Loss**: The radiolucent area travel almost completely up one side of the root, this pattern termed a "J-type" lesion
- **Isolated Bone Loss**
- To make a diagnosis of a vertical root fracture look for the following:
 - ✓ A widened canal space which is inconsistent with the canal spaces
 - ✓ A radiolucent space presenting between the long axis of the obturation material
 - ✓ An associated bone loss mesial and distal to the root



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Periodontal Evaluation of a Vertical Root Fracture:

- Generally isolated, narrow, and deep
- **Prognosis of a Vertical Root Fracture:**
 - Good Prognosis with non movable segments and the patient does not have symptoms,
 - Fair Prognosis: sensitive upon probing with the opposing segments non movable,
 - Poor Prognosis: movable segments, tooth is non vital, with a minimal caries and restorative, deep, narrow, isolated periodontal pocket extraction
- **Referred Pain:** Since referred pain can complicate a dental diagnosis, accurate diagnosis to protect the patient from unnecessary dental or medical treatment.



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CLINICAL CLASSIFICATION OF PULPAL AND PERIAPICAL DISEASES

Pulpal Disease

- Normal Pulp(No spontaneous symptoms)
- Reversible Pulpitis(uncomfortable irritation)
- Irreversible Pulpitis
 - Symptomatic Irreversible Pulpitis
 - Asymptomatic Irreversible Pulpitis
- Pulp Necrosis(nonfunctional pulpal nerves)
- Previously Treated
- Previously Initiated Therapy

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Apical (Periapical) Disease

Normal pulp

Symptomatic Apical Periodontitis

Asymptomatic Apical Periodontitis

Acute Apical Abscess

Chronic Apical Abscess

	Symptom	Vitality	PA RL
Symptomatic AP	painful	vital or non	Non
Asymptomatic AP	Non	Non	Yes
Acute AA	Painful	Non	Yes
Chronic AA	Non	Non	Yes

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Treatment

- **Irreversible pulpitis**

- Pulpal necrosis

- **Cracked teeth**

Vital tooth	Non vital
Sharp pain, short duration, during chewing and release of food	Difficult to locate the pain, tender to percussion and palpation
Detection by bite stick	J shape RL, periodontal probing
Tx. Full coverage	Tx. Depend on the location and exposing the crack surgically

- **Pharmacological Treatment of pulpal and periapical pain**

- NSAIDs

- Ibuprofen superior to aspirin, acetaminophen or combination of opioids

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Common medical finding that may influence endodontic treatment planning

- Cardiovascular Disease
- Diabetes
- Pregnancy
- Malignancy
- Bisphosphonate Therapy
- HIV
- End-stage renal disease and dialysis
- Prosthetic Implant

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Cardiovascular Disease

- ✓ Consult patient's physician
- ✓ Myocardial infarction
- ✓ Unstable angina pectoris
- ✓ Uncontrolled hypertension
- ✓ Refractory arrhythmias
- ✓ Recent coronary bypass graft
- ✓ Recent stroke
- ✓ Uncontrolled congestive heart failure
- ✓ Uncontrolled hyperthyroidism

Vasoconstrictor should not be administered

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Cardiovascular Disease

- ✓ Prosthetic heart valves
- ✓ History of infective endocarditis
- ✓ Congenital heart abnormalities

Antibiotic Prophylactic Regimens for Dental Procedures

Situation	Agent	Regimen—Single Dose 30-60 minutes before procedure	
		Adults	Children
Oral	Amoxicillin	2 g	50 mg/kg
Unable to take oral medication	Ampicillin OR	2 g IM or IV*	50 mg/kg IM or IV
	Cefazolin or ceftriaxone	1 g IM or IV	50 mg/kg IM or IV
	Cephalexin**†	2 g	50 mg/kg
Allergic to penicillins or ampicillin—Oral regimen	OR		
	Clindamycin	600 mg	20 mg/kg
	OR		
Allergic to penicillins or ampicillin and unable to take oral medication	Azithromycin or clarithromycin	500 mg	15 mg/kg
	Cefazolin or ceftriaxone†	1 g IM or IV	50 mg/kg IM or IV
	OR		
	Clindamycin	600 mg IM or IV	20 mg/kg IM or IV

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Diabetes

- ✓ Consult patient's physician
- ✓ Pretreatment glucose level (normal fasting 80-120 mg/dl---4-6 mmol/L, after meal 140 mg/dl---7.8 mmol/L)
- ✓ Controlled without serious complication
- ✓ Controlled with serious complication

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Pregnancy

- Elective dental treatment is best avoided during the first trimester
- The second trimester is the safest period to provide routine dental treatment
- Dental drug compatible with both pregnancy and breast feeding
 - ✓ Local anesthetics including lidocaine, etidocaine, and prilocaine
 - ✓ Many antibiotics including penicillin, clindamycin, and azithromycin
 - ✓ Acetaminophen
 - ✓ Acyclovir
 - ✓ Prednisone
 - ✓ Antifungals including fluconazole and nystain

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Malignancy

- Malignancies may metastasize to the jaw and mimic endodontic pathosis
- Radiation therapy reduced the number of osteocytes, osteoblasts and endothelial cells thus decreasing blood flow

Bisphosphonate Therapy

- Risk of osteonecrosis
- Surgical treatment should be avoided

HIV

- The effect of HIV on long term prognosis of endodontic therapy is unknown.

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End-stage renal disease and dialysis

- Endodontic treatment is best scheduled on the day after dialysis.
- Drug doses should be adjusted
- Hemodialytic patient should be covered with prophylactic antibiotics

Prosthetic Implant

Not indicated for prophylactic antibiotic except in case of high risk patients.

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Other factors that may influence endodontic case selection

- Calcification
- Dilaceration
- Inability to isolate the tooth
- Extra root and canal

AAE Endodontic Case Difficulty Assessment Form and Guidelines

RECENT INFORMATION DEPARTMENT
Name: _____ Room or Office: ____ No: ____ No: ____
Address: _____ Area Name for: _____
Phone: _____ Date: _____

Guidelines for Using the AAE Endodontic Case Difficulty Assessment Form
The AAE designed the Endodontic Case Difficulty Assessment Form for use in endodontic control. The assessment form should not be used for research, case selection, or as a case selection tool. It is designed to be used in endodontic control to help with better decision making and record keeping.
This form should be filled out by the endodontic practitioner only. It is not intended to be filled out by the patient. It is not intended to be used as a case selection tool. It is intended to be used as a record keeping tool.
The assessment form enables a practitioner to assign a level of difficulty to a particular case.
LEVELS OF DIFFICULTY
MINIMAL DIFFICULTY Reproducible condition indicates routine complexity (uncomplicated). These types of cases should include only those factors listed in the MINIMAL DIFFICULTY category. Achieving a predictable treatment outcome should be attainable by a competent practitioner with limited experience.
MODERATE DIFFICULTY Reproducible condition is complicated, indicating one or more factors in treatment factors listed in the MODERATE DIFFICULTY category. Achieving a predictable treatment outcome will be challenging for a competent, experienced practitioner.
HEAVY DIFFICULTY Reproducible condition is exceptionally complicated, indicating several factors listed in the MODERATE DIFFICULTY category or a factor not in the MODERATE DIFFICULTY category. Achieving a predictable treatment outcome will be challenging for even the most experienced practitioner with an extensive range of flexible techniques.
Make your assessment of each case to determine the level of difficulty. If the level of difficulty exceeds your experience and control, you might consider referral to an endodontist.

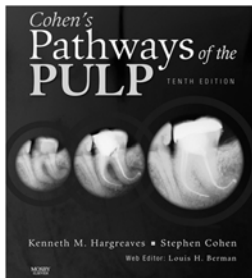
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AAE Endodontic Case Difficulty Assessment Form

Category	Factor	Yes	No	
A. PATIENT CONSIDERATIONS	Medical history	(1) No history of disease	(2) Current or past disease	
	Endocrine system	(1) No endocrine disease	(2) Current or past disease	
	Drugs, anesthesia	(1) No current or past use	(2) Current or past use	
	Isolation	(1) Adequate isolation	(2) Inadequate isolation	
	Root retention	(1) Adequate retention	(2) Inadequate retention	
	Endodontic treatment	(1) No previous endodontic treatment	(2) Previous endodontic treatment	
	B. DIAGNOSTIC AND TREATMENT CONSIDERATIONS	Periapical	(1) No periapical radiolucency	(2) Apical radiolucency
		Periapical extension	(1) No extension beyond root tip	(2) Extension beyond root tip
		Root curvature	(1) No curvature	(2) Curvature
		Root fracture	(1) No fracture	(2) Fracture
		Root resorption	(1) No resorption	(2) Resorption
		Root length	(1) No length variation	(2) Length variation
C. ADDITIONAL CONSIDERATIONS		Root curvature	(1) No curvature	(2) Curvature
		Root fracture	(1) No fracture	(2) Fracture
		Root resorption	(1) No resorption	(2) Resorption
		Root length	(1) No length variation	(2) Length variation

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