



Pulpal and periradicular diagnostic terminology

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Purpose

Military dental officers come from a wide variety of training backgrounds. The purpose of this Clinical Update is to standardize terminology for the diagnoses of pulpal and periradicular tissues and to facilitate effective communication between dental officers.

Diagnostic procedures

Diagnosis is defined as “the art of distinguishing one disease from another” (1). In endodontics, diagnostic procedures should follow a consistent and logical order and include review of medical and dental histories, radiographic examination and clinical examination. The clinical examination consists of extraoral and intraoral evaluation and diagnostic tests (2-7). During the examination procedures, assessment and reproduction of the patient’s chief complaint are imperative. The results of the examination and diagnostic tests should culminate with a two-part endodontic diagnosis, that is, a pulpal and a periradicular diagnosis.

Pulpal diagnoses

Normal Pulp. A normal pulp will produce a positive response to the electric pulp tester (EPT). When evaluated by thermal testing, the normal pulp produces a normal response that is mild and subsides immediately when the stimulus is removed. Percussion and palpation testing produce a non-sensitive response. Radiographs demonstrate an intact lamina dura and uniform periodontal ligament (PDL) space (i.e. within normal limits).

Reversible Pulpitis. Caries, cracks, restorative procedures or trauma may cause a pulp to become inflamed. The patient complains of an exaggerated response to thermal stimulus but once the stimulus is removed, the discomfort does not linger. EPT results are positive. Percussion and palpation testing produce a non-sensitive response. Radiographically, the lamina dura and PDL space are within normal limits.

Irreversible Pulpitis. If the inflammatory process progresses, irreversible pulpitis can develop. Patients may have a history of spontaneous pain and complain of an exaggerated response to hot or cold that lingers after the stimulus is removed. EPT results are positive. The involved tooth will usually present with an extensive restoration and/or caries. Percussion and palpation testing may or may not produce sensitive results. Radiographically, the PDL space may be within normal limits or widened.

In certain cases of irreversible pulpitis, the patient may arrive at the dental clinic with a glass of cold/ice water. In these cases, cold actually alleviates the patient’s pain, and thus, can be used as a diagnostic test. Cooling of the dentin and the resultant contraction of the fluid in the tubules relieves the pressure on pulpal nerve fibers caused by edema from pulpal inflammation (8).

Irreversible pulpitis can present as an asymptomatic condition. Internal resorption and hyperplastic pulpitis (pulp polyp) are examples of asymptomatic irreversible pulpitis.

Pulpal Necrosis. Necrosis is a histologic term that denotes death of the pulp. Teeth with total pulpal necrosis are generally asymptomatic unless the periradicular tissues become involved. The pulp will not respond to the EPT and this result should be reported as no response (NR) over 80, if using a digital EPT. The pulp will not respond to thermal tests. The dental record entry for this pulpal diagnosis should be necrotic pulp.

Pulpless Tooth. This pulpal diagnosis is used when root canal therapy has been either initiated or completed. For example, a tooth with previous pulpotomy/pulpectomy/root canal debridement or previous root canal therapy should be recorded in the dental record as a pulpless tooth.

Periradicular diagnoses

Normal Periradicular Tissues. Normal periradicular tissues will be non-sensitive to percussion and palpation testing. Radiographically, the lamina dura is intact and the PDL space uniform.

Acute Periradicular Periodontitis. Acute periradicular periodontitis occurs when pulpal disease extends into the surrounding periradicular tissues. However, acute periradicular periodontitis may also occur as the result of occlusal traumatism. The patient will generally complain of discomfort to biting or chewing. Sensitivity to percussion testing is a hallmark diagnostic test result of acute periradicular periodontitis. Palpation testing may or may not produce a sensitive response. The PDL space may or may not be widened on the radiographic examination.

Acute Periradicular Abscess. If the bacteria from a necrotic pulp progress into the periradicular tissues and the patient’s immune response cannot defend against the invasion, the patient will demonstrate signs and symptoms of an acute periradicular abscess. The patient will complain of moderate to severe pain usually with a slight to large swelling. Depending upon the location of the apices of the tooth and muscle attachments, a swelling will present in the buccal vestibule, on the lingual/palatal, or as a fascial space infection. Percussion testing produces a response that is exquisitely sensitive and this exaggerated response can help differentiate

between acute periradicular periodontitis and the acute periradicular abscess. Palpation testing produces a sensitive response. Since the abscess is acute, the radiographic appearance may be normal or the PDL space may be slightly widened. This periradicular pathosis can also occur with a pulpless tooth frequently as a result of bacterial contamination from coronal microleakage.

Chronic Periradicular Periodontitis. When bacteria or bacterial products from a necrotic pulp or pulpless tooth slowly ingress into the periradicular tissues, the patient's immune system may be involved in a chronic conflict. The resultant inflammatory process causes periradicular bone resorption that manifests as a periradicular radiolucency on the radiograph. Clinically, the patient is asymptomatic. Percussion and palpation testing produce a non-sensitive response.

Chronic Periradicular Periodontitis With Symptoms. The patient will present with mild to moderate symptoms that may include spontaneous pain or discomfort on biting or chewing. The pulpal diagnosis could be necrotic or pulpless. Percussion testing produces a sensitive response and palpation testing may or may not be sensitive. Radiographically, the tooth will present with a periradicular radiolucency. These patients must receive endodontic treatment in a timely manner because they can quickly progress into a phoenix abscess.

Phoenix Abscess. If there is an increase in the virulence of the bacteria in a necrotic pulp and/or a decrease in the patient's resistance, a patient with chronic periradicular periodontitis or chronic periradicular periodontitis with symptoms will experience an acute exacerbation of their periradicular disease. Clinically, the patient will present with the same acute signs and symptoms of an acute periradicular abscess; but on radiographic examination, the involved tooth will demonstrate a periradicular radiolucency. This periradicular pathosis can also occur with a pulpless tooth frequently as a result of bacterial contamination from coronal microleakage.

Chronic Suppurative Periradicular Periodontitis. When a chronic periradicular lesion breaks through the cortical plate and mucosa to establish drainage, it manifests as a sinus tract. Clinically, the patient is usually asymptomatic because the sinus tract allows drainage of any exudate from the periradicular tissues. EPT and thermal testing are negative. Percussion and palpation testing produce non-sensitive responses. Radiographically, a periradicular lesion is associated with the involved tooth.

Condensing Osteitis (Chronic Focal Sclerosing Osteomyelitis). This entity may be considered a true lesion of endodontic origin (LEO). The involved tooth will have an etiologic factor for low-grade, chronic inflammation such as a necrotic pulp, extensive restorative history or a crack. EPT and thermal tests may or may not be positive. Percussion and palpation testing may or may not be sensitive. Radiographically, the involved tooth will present with increased radiodensity and opacity around one or all of the roots. Evidence supporting consideration as a LEO is that 85% of the periradicular radiodensities resolve after endodontic therapy (9).

Periapical Osteosclerosis (Focal Osteopetrosis). This entity is not considered a LEO. The patient will be asymptomatic. EPT and thermal testing will be positive. Percussion and palpation testing will be non-sensitive. The involved tooth will probably be a virgin tooth with a normal pulp. Radiographically, the tooth will present with increased radiodensity and opacity around one or all of the roots. The tooth should simply be monitored at periodic recall.

Summary

Determination of the etiology of the patient's chief complaint and a correct diagnosis are paramount prior to the recommendation of endodontic therapy for our patients. The diagnostic terminology presented in this Clinical Update and summarized in the table at the end, provides for a more accurate description and communication of the health or pathological conditions of both pulp and periradicular tissues.

References:

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PULPAL AND PERIRADICULAR DIAGNOSES

<i>Pulpal Diagnosis</i>	Chief Complaint	History	Radiographic Findings	EPT	Thermal Testing	Percussion	Palpation	Mobility	Other
Normal Pulp	None		Normal PDL	+	Normal, NL				
Reversible Pulpitis	Hot &/or Cold Sensitivity		Normal PDL	+	Exaggerated, NL				Caries, Cracks, Restorative Procedures, or Trauma
Irreversible Pulpitis	Lingering Hot &/or Cold Sensitivity	Spontaneous Pain	Variable	+	Exaggerated, L				
Necrotic Pulp		Variable	Variable	-	-				
Pulpless Tooth		Previous Pulpotomy/ Pulpectomy/ RCT	Variable	-	-				

<i>Periradicular Diagnosis</i>	Chief Complaint	History	Radiographic Findings	EPT	Thermal Testing	Percussion	Palpation	Mobility	Other
Normal Periradicular Tissues	None		Normal PDL			NS	NS	WNL	
Acute Periradicular Periodontitis	Discomfort When Biting or Chewing	Recent Restoration?	Normal or Widened PDL			S	S or NS	+ / -	Occlusal Traumatism
Acute Periradicular Abscess	Pain with Slight to Large Swelling	Coronal Microleakage?	Normal or Widened PDL	-	-	Exquisitely S	S	+ / -	Necrotic or Pulpless
Chronic Periradicular Periodontitis	None	Asymptomatic	Radiolucency	-	-	NS	NS		Necrotic or Pulpless
Chronic Periradicular Periodontitis With Symptoms	Spontaneous or Discomfort When Biting / Chewing		Radiolucency	-	-	S	S or NS	+ / -	Necrotic or Pulpless
Phoenix Abscess	Pain with Slight to Large Swelling	Coronal Microleakage?	Radiolucency	-	-	Exquisitely S	S	+ / -	Necrotic or Pulpless
Chronic Suppurative Periradicular Periodontitis	Bad Taste or "Gum Bump"		Radiolucency	-	-	NS	NS	WNL	Necrotic or Pulpless with <i>Sinus Tract</i>
Condensing Osteitis / Chronic Focal Sclerosing Osteomyelitis	Asymptomatic	Extensive Restorative History /Crack	Increased Radiodensity/ Opacity	+ / -	+ / -	S or NS	S or NS	WNL	
Periapical Osteosclerosis / Focal Osteopetrosis	Asymptomatic	Virgin Tooth	Increased Radiodensity / Opacity	+	+ and WNL	NS	NS	WNL	

WNL = Within Normal Limits

L = Lingering

NL = Non-lingering

S = Sensitive

NS = Non-sensitive