Pulpal Diagnosis of Primary Teeth: Guidelines for Clinical Practice

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Abstract

Diagnosis of pulp status is an important clinical step to achieve success in pulp therapy technique or endodontic treatment in children. In pediatric dentistry, history of symptoms given by a child may not be reliable. Assessment of dental pulp status plays an important role. It is hoped that these guidelines will facilitate pulpal diagnosis, good decision-making and evidence-based practice for pediatric patients.

Key words: *pulpal diagnosis, guidelines, primary teeth*

Introduction

Accurate diagnosis of the pulp status is an important step to achieve success in endodontic therapy. Frequently, this is overlooked in pediatric patients by clinicians. This can result in incorrect treatment plan. The diagnosis should be based on present clinical symptoms, history of symptoms, diagnostic tests and clinical findings. Various tests have been used for a variety of different pulpal diagnostic terms in the past[1]. While doing this procedure, we should remember that responses given by patients are subjective as some children may exaggerate the symptoms due to fear and anxiety[2]. The indications, objectives, and type of pulpal therapy depend on whether the pulp is vital or non-vital, based on the clinical diagnosis of normal pulp (symptom free and normally responsive to vitality testing), reversible pulpitis (pulp capable of healing), symptomatic or asymptomatic irreversible pulpitis (vital inflamed pulp is incapable of healing), or necrotic pulp[3].

Clinical classification of pulpal conditions

According to diagnostic chart4 of the department of Periodontics and Endodontics, University at Buffalo, pulpal conditions may be of five types:

1. Normal Pulp

A pulpal condition, usually called normal, in which the pulp responds to thermal and electrical tests in a manner similar to that of a corresponding control tooth.

2. Hypersensitive Dentin

A pulpal condition, with no apparent histologic

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3. Reversible Pulpitis

(Syn: hyperemia, inflamed-reversible)

A pulpal condition is commonly induced by dental caries and operative procedures, in which the patient responds to thermal or osmotic stimuli, but the symptoms disappear when the etiology is eliminated.

4. Irreversible Pulpitis

a) Irreversible pulpitis without periapical pathosis

A pulpal condition, usually caused by deep dental caries or restorations, in which spontaneous pain may occur or be precipitated by thermal or osmotic stimuli.

Radiographs show no periapical changes. The pain lasts for several minutes to hours.

b) Irreversible pulpitis with periapical pathosis

A pulpal condition similar to above, but in which periapical or lateral radiographic changes are evident.

5. Necrotic Pulp

a) Necrotic pulp without periapical pathosis

A pulpal condition in which there may or may not be spontaneous, moderate to severe

pain or pain elicited by various stimuli. Response to various testing modalities is usually absent. Radiographic changes are not evident.

b) Necrotic pulp with periapical pathosis

A pulpal condition similar to above, except that in this category periapical or lateral lesions are evident in radiographs.

Pulp Management Options:

Pulpal pathology or conditions of primary teeth can be managed either by extraction or by following treatment options as:-

" Direct pulp capping (only for non-carious exposures

to maintain coronal and radicular pulp vitality)

" Pulpotomy (removal of coronal pulp tissue with maintenance of vitality of radicular pulp) and

" Pulpectomy (removal of coronal and radicular pulp and root canal filling)

Outline for diagnosis of pulpal status:

An outline5 for determining the pulpal status of cariously involved teeth in children involves the following:

1. Visual and tactile examination of carious dentin and associated periodontium
2. Radiographic examination of
   a. periradicular and furcation areas
   b. pulp canals
   c. periodontal space
   d. developing succedaneous teeth
3. History of spontaneous unprovoked pain
4. Pain from percussion
5. Pain from mastication
6. Degree of mobility
7. Palpation of surrounding soft tissues
8. Size, appearance, and amount of hemorrhage associated with pulp exposures

From the diagnostic factors, the pulpal condition of deciduous tooth may be diagnosed as in Table 1.

Guidelines for diagnosis:

Table 1: Diagnostic factors related to pulpal status

Diagnostic factors	Pulpal Status		
	Reversible Pulpitis	Irreversible Pulpitis	Pulpal Necrosis
Increased mobility	No	Yes	Yes
Tenderness on percussion	No	Yes	Often
Sensitivity	Yes	Yes	Unlikely
Radiographic or pathologic changes (thickened periodontal ligament space, or subclinic disease)	No	Often	Yes
Excessive bleeding at the pulp stumps	No	Often	No
Toothache	Sometimes upon stimulation	Yes	Often
Sinus	No	No	Possible
Swelling	No	Possible	Possible

The examination should begin with a thorough history and characteristics of any pain, because these are often important in helping to determine pulpal status and eventual treatment whereas pain usually accompanies pulpal inflammation, extensive problems might arise without any history of pain. If possible, a distinction between provoked and spontaneous pain should be ascertained. Provoked pain that ceases after removal of the causative stimulation is usually reversible and indicative of minor inflammatory changes. Stimuli 66 include thermal, chemical, and mechanical irritants and many times are due to deep caries, faulty restorations, soreness around a primary tooth nearing exfoliation, or an erupting permanent tooth. Spontaneous pain is a constant or throbbing pain that occurs without stimulation or continues long after the causative factor has been removed. In a well-controlled histologic study of primary teeth with deep carious lesions, Guthrie et al. 1965,[6] demonstrated that a history of spontaneous toothache is usually associated with extensive degenerative changes extending into the root canals. Primary teeth with a history of spontaneous pain should not receive vital pulpal treatments and are candidates for pulpectomy or extraction.

The clinical examination might produce evidence of pulpal pathosis. Redness, swelling, fluctuance, severe dental decay, defective or missing restorations, and draining parulis might indicate pulpal involvement (Fig. 1).

Percussion sensitivity might be valuable to the diagnosis, but it is complicated by the reliability of the child's response because of the psychological aspects involved. Tooth mobility might be present normally because of physiologic resorption, and many pulpally involved teeth have no mobility.

Electric pulp tests are not valid in primary teeth.[7] Laser Doppler flowmetry might be of greater help in determining vitality, but this equipment has not been perfected, and the price is prohibitive.[8] Thermal tests are usually not conducted on primary teeth because of their reliability.[2]

After the clinical examination, radiographs of good quality are essential. Like permanent teeth, periapical radiolucencies appear at the apices in primary anterior teeth. In primary molars, pathologic changes most often apparent in the bifurcation or trifurcation areas. Consequently, bite-wing radiographs are often best to observe pathologic changes in posterior primary teeth. Pathologic bone and root resorptions are signs of advanced pulpal pathosis that has spread into the periapical tissues and is usually treatable only with extraction.

Internal resorption (Fig. 2) in primary teeth is always associated with extensive inflammation.[6] Because of the thinness of primary molar roots, if internal resorption can be seen radiographically, a perforation usually exists, and the tooth must be extracted. Interpretation of radiographs of primary teeth is always complicated by the presence of the succedaneous tooth and surrounding follicle. Misinterpretation of the follicle can easily lead

to an erroneous diagnosis of periapical pathology. Superimposition of the permanent tooth might obscure visibility of the furca and roots of the primary tooth, causing misdiagnosis.

Pulpal exposure may be clinical (Fig. 3) or radiographical (Fig. 4). The size of a pulpal exposure and the amount and color of hemorrhage have been reported as important factors in diagnosing the extent of inflammation under a carious lesion. Although all carious exposures are accompanied by pulpal inflammation, the larger the exposure, the more likely it is to be widespread or necrotic. Excessive[9,10] or deep purple colored[10] hemorrhage is evidence of extensive inflammation, and these teeth are candidates for pulpectomy or extraction. Hemorrhage that cannot be controlled within 1-2 minutes by light pressure with a damp cotton pellet at an exposure site indicates more extensive treatment. The same is true after removal of tissue when doing a pulpotomy. A pulpectomy or extraction is then indicated.

The guidelines for diagnosis and treatment plan for primary teeth are summarized in Table 2.

Conclusion:

Diagnosis of pulpal condition is very much important in

Fig. 1: Redness and fluctuant swelling

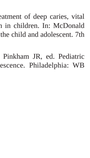

Fig. 2: Internal resorption

Fig. 3: Clinically exposed pulp

Fig. 4: Radiographic pulp exposure

the determination of most appropriate treatment for primary tooth. For proper pulpal diagnosis, thorough history, clinical and radiographic examinations should be done. These guidelines may facilitate pulpal diagnosis and good decision-making in clinical practice.

Table 2: Summary of pulpal diagnosis and treatment plan

Clinical presentation	Signs or symptoms	Condition of the pulp	Treatment plan
Traumatic non carious exposure of tooth	None	Healthy	Direct pulp capping
Asymptomatic non-carious exposure	No symptoms or pain on direct stimulation	Healthy or mild pulpitis	Pulpotomy
Caries – no exposure	None	Healthy	Restoration only
Deep caries - no exposure	None	Microscopic pulpitis	Pulpotomy
Caries – exposure	Minimal history of pain Pain on stimulation No mobility No radiographic evidence of pathology Bleeding of pulp stump is controllable	Reversible pulpitis	Pulpotomy
Caries	Spontaneous pain Mobility Swelling Bleeding of pulp stump is not controllable Tenderness to percussion	Irreversible pulpitis	Pulpectomy Extraction
Caries	Draining sinus Swelling Mobility Pathology on radiograph (radiolucency in furcation, periapically, root resorption) Tenderness to percussion	Pulpal necrosis	Pulpectomy Extraction
Gross caries	Tooth not able to be restored Extensive periapical pathology	Pulpal necrosis	Extraction
Facial swelling or significant intraoral swelling	Facial swelling at distinct from buccal swelling Associated systemic symptoms, fever, malaise	Pulpal necrosis	Extraction Decision on antibiotic therapy

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