Clinical Assessment of Pulp Status
Study objective

• Discuss the clinical and radiographic criteria necessary to diagnose the aetiology of the problem and to determine the indicated pulp treatment.
Introduction

• It is important to conduct a thorough clinical assessment of the patient to help determine the right form of pulp therapy.
• Clinical assessment requires knowledge and skills on the part of the operator and patience on the path of the child.
Assessment of pulp status of deciduous and young permanent teeth is divided into four categories:

- Patient history
- Clinical examination
- Radiograph examination
- Direct pulpal evaluation
• An accurate history must be obtained of the type of pain, duration, frequency, location, spread, aggregating and relieving factors.
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- **Mode**: is the onset spontaneous or provoked?
- **Periodicity**: do symptoms have temporal pattern or are they sporadic or occasional? Early pulpitis-symptoms seen in evening or after meal.
- **Frequency**: have the symptoms persisted since they began/ have they been intermittent?
Clinical Assessment of Pulp Status - 4

- **Duration**: how long do symptoms last when they occur?
Clinical Assessment of Pulp Status - 5

- **Postural change**: pain accentuates by bending over
- **Time of day**: pain in the masticatory muscles on working may indicate occlusal disharmony or TMJ dysfunction or possible acute pulpalgia.
• **Hormonal**: menstrual tooth ache due to increase in body fluid retention. Teeth may ache and may become tender on percussion, symptoms disappear when cycle ends.
• **Momentary pain**: Immediate stresses to hot or cold that disappear on the removal of the stimulus indicate that the pathosis is limited to the coronal pulp.
• **Spontaneous pain**: throbbing, constant pain that may keep the patient awake at night. This type of pain indicates pulpal damage—irreversible pulpitis. It suggests that pulpal disease has progressed too far and treatment confined to pulp chamber would be inadequate.
• **Provoked pain**: stimulated by thermal, chemical or mechanical irritant, and is eliminated when noxious stimulus is removed. This sign indicates dentin sensitivity due to deep carious lesion or faulty restoration. The pulp is in the transition state and the condition is usually reversible.
• **Persistent pain**: pain from thermal stimuli would indicate widespread inflammation of the pulp, extending into the radicular pulp.
This is one of the simplest tests, but most often is done casually during examination and as a result valid information is lost.

A thorough visual, tactile examination of hard and soft tissue relies on checking of the color, contour and consistency (the 3 Cs’).
Tooth mobility

- Mobility in the primary tooth may result from physiological or pathological cause.
- Tooth mobility is directly proportional to the integrity of the attachment apparatus.
Clinician should use two digits to apply alternating lateral forces in the facial lingual direction to observe the degree of mobility of the tooth.

A measure of mobility is >2mm vertically and (a) Horizontal 1-2mm (b) Horizontal 0.2-1cm (c) Horizontal <1 cm
Miller’s classification of tooth mobility

• Class 1 when the tooth moves less than 1mm in the buccolinguatul or mesiodistal direction; class II when tooth moves 1mm or more in the buccolinguatul or mesiodistal direction and there is no vertical mobility; Class III when tooth moves 1mm or more in the buccolinguatul or mesiodistal direction and there is also vertical mobility.
Palpation

• Simple test done with fingertips using light pressure to examine tissue consistency and pain response.
• It determines presence, intensity and location of pain and presence of bony crepitus.
Percussion

- Pain from pressure on a tooth indicates that periodontal ligament is inflamed.
- A useful clinical test is to apply finger pressure to the tooth and check the child’s response by watching the eyes.
- This is applicable in the permanent dentition.
Restorability

- Only a tooth which can be restored after endodontic therapy should be considered for pulp therapy.
• Indicates a non vital pulp (or an irreversibly diseased pulp) and should be considered for non vital pulp therapy.
Changes in colour

- Discoloured teeth may indicate a necrotic pulp.
Recent pre-operative radiographs are requisites to pulp therapy in primary and young permanent teeth. It demonstrates pathological conditions and position of suceedaneous permanent tooth. These will dictate the decision on performing pulp therapy for primary tooth.
• **Pulp calcification**: represents the pulp response to long standing lesion and is associated with pulp degeneration. This contraindicates vital pulpotomy.

• **Internal resorption**: it is associated with spontaneous pain at night and inflammation extending into radicular pulp. This contraindicates vital pulpotomy.
• **External resorption**: pathologic resorption is invariably associated with no vital pulp and extensive inflammation in the supporting tissues. The only viable treatment is pulpectomy or extraction.
Bone resorption: if minimum, pulpectomy is the choice but when the bone loss is extensive, extraction is indicated.
• Interpretation of radiographs is complicated by physiologic root resorption of primary teeth and by incompletely formed roots of permanent teeth in children.
Pulp testing is widely used to assess vitality of mature permanent teeth but these are not reliable in deciduous teeth as fear of the unknown makes the child patient apprehensive of the electric vitalometer and may result in them giving inaccurate results.
Another reason these are not reliable in deciduous teeth is that newly erupted teeth may have incomplete innervations and therefore may not give correct results.

The vitalometer also measures nerve sensitivity and not blood flow. A tooth may be sensitive and not vital following disruption of blood flow to the tooth. This affects the accuracy of the result.
• **Cold test**: It can be applied in several different ways like stream of cold air, cold-water bath, ethyl chloride, dry ice, pencil of ice. Agent is kept on the middle third of the facial structure of crown for 5 seconds and the response is determined.
• **Heat test:** These include warm sticks of temporary stopping, rotating dry prophylcup, heated water bath, hot burnisher, hot gutta - percha and hot compound.
Pulp testing – thermal (3)

• No response- non vital pulp.
• Mild-moderate pain subsides in 1-2sec - normal.
• Strong-momentary pain subsides in 1-2sec reversible pulpitis.
• Moderate to strong painful response that lingers for several seconds or longer after the stimulus has been removed- irreversable pulpitis.
• If the patient continues to have vague, diffuse, strong pain and prior testing has been inconclusive, intra ligamentary anesthetic may be used to identify the source of pain.
• This test is performed when other methods have failed.
• The test cavity is made by drilling the enamel dentin junction of an un-anesthetized tooth using a slow speed hand piece without water coolant. If patient feels sensitivity it is indication of pulp vitality.
• It describes such tests that assess the state of the pulpal circulation, rather than the integrity of the nervous tissue thus providing valuable information.
• Example is the use of the Doppler flowmeter.
Photoplethysmography

• This method involves passing light on the tooth and measuring the existing wavelength using a photocell and galvanometer.
• If a tooth with an intact blood supply is warmed there should be vascular dilatation, and this would register as a current from the photo cell.
A hot object emits infrared radiation in proportion to its temperature.
Measurement of this radiation may provide information on pulpal circulation.
• It was suggested that taking the first drop of blood from an exposed pulp and subjecting it to differential white cell count might be useful in diagnosis of pulpal conditions.
Dual Wavelength Spectrometry

- Measures blood oxygenation changes within the capillary bed of dental tissue and thus is not dependent on a pulsatile blood flow.
Huges Probeye Camera

- This is used in detecting temperature changes as small as 0.1°C hence can be used to measure pulp vitality experimentally.
• Cholesteric fluid crystals have been used to show the difference in tooth temperature with vital pulp being hotter and necrotic pulp being cooler.
Laser Doppler Flowmetry

- The laser doppler flowmeter, developed in 1970s to measure the velocity of red blood cells in capillaries, is a non invasive, objective, painless alternative to traditional neural-stimulation methods, and therefore is a promising test for young children.
Pulse Oximetry

• It is proven atraumatic method of measuring vascular health by evaluating oxygen saturation.
• Arterial blood is placed between a light source and a detector. Light source diode emits both infrared and red light, which is received by a photo-detector diode. Blood pulsating through the vessel changes the light path, which modifies the amount of detected light.
Pulp testing in deciduous teeth

- Percussion Testing is most reliable in primary teeth.
- Thermal sensitivity Testing is also reliable in primary teeth.
- Electrical Pulp Testing is **NOT** reliable in primary teeth (due to the unreliable patient’s response).
The four categories of clinical assessment are:

- Patient history
- Clinical examination
- Radiograph examination
- Visual examination
Possible pulp pathologies:
- Bone calcification
- Internal root resorption
- External root resorption
- Fusion of the roots.
Pulp testing in deciduous teeth:

• Percussion Testing is most reliable in primary teeth.
• Thermal sensitivity Testing is also reliable in primary teeth.
• Laser doppler flowmeter is promising in children.
• Vitalometer testing is also reliable in primary teeth.
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