.Endodontics

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Endodontic Diagnosis

Diagnosis: It is the procedure that:

1- Accepts the patient.

2- Recognizes that he/she has a problem.

3- Determine the cause of the problem.

4- Develop a treatment plan to treat the problem.

Requirements of a diagnostician

1 **Knowledge:** A dentist must depend on himself and his scientific background.

2- **Interest and curiosity**: The dentist must be interested in solving the problem of the patient and curios about the result of the diagnosis.

3- **Patience:** The dentist needs time and patience to understand the reasons of the problem which not always are visible and needs some time and investigations to reveal the cause of the problem.

- **History**

  - **Chief complain.** It is a description of the dental problem of the patient.
  - **Medical history.** The clinician is responsible for taking a proper medical history from every patient who presents for treatment. It is very important in patients with medical problems that may interfere with the dental treatment as history of bleeding, heart diseases, diabetes. Any medications taken by the patient may affect the dental procedure as aspirin. Several medical conditions have oral manifestations and clinical presentations that mimic oral pathologic lesions. For example, tuberculosis involvement of the cervical and submandibular lymph nodes can lead to a misdiagnosis of lymph node enlargement secondary to an odontogenic infection. Immunocompromised patients and patients with uncontrolled diabetes mellitus respond poorly to dental treatment and may exhibit recurring abscesses in the oral cavity that must be differentiated from abscesses

of dental origin. Acute maxillary sinusitis is a common condition that may create diagnostic confusion because it may mimic tooth pain in the maxillary posterior quadrant. In this situation the teeth in the quadrant may be extremely sensitive to cold and percussion, thus mimicking the signs and symptoms of pulpitis.

- **Present dental illness**. Pain is the main reason for the patient's complain. It ranges from dull to severe which indicates the severity of the problem. It may indicate the source which may be dental or the surrounding structures.

- **Pain history**

Initially, information on pain is obtained by asking questions regarding the current problem(s). This examination is subjective, frequently asked questions include:

• *Location.* Occasionally a patient may identify the location of the pain; however, one must be cautious as pulpal pain may be referred to a different area. Pain may be felt in any of the orofacial structures.

• *Type and intensity of pain.* The patient may describe pain in many ways. Examples include sharp, dull, throbbing, stabbing, burning, electric shock like, deep or superficial. The more the pain disrupts the patient's lifestyle because of its intensity, the more likely it is to be irreversible in origin.

• *Duration*. For how long after removal of the stimulus does the pain continue? The longer the pain continues after the stimulus, the more likely it is to be irreversible.

• *Stimulus.* Many different stimuli may initiate the pain, for example hot, cold, sweet, biting, posture. Alternatively the pain may be spontaneous. Special tests may be selected on the basis of what causes the main complaint.

• *Relief.* Pain-relieving factors, especially type and frequency of analgesics, antibiotics, sipping cold drinks.

❖ Clinical examination

Examining the patient clinically with the patient's history will make the diagnosis of the problem.

o Extraoral examination

Basic diagnostic protocol suggests that a clinician observe patients as they enter the operatory. Signs of physical limitations may be present, as well as signs of facial asymmetry that result from facial swelling. Visual and palpation examinations of the face and neck are warranted to determine whether swelling is present. Palpation allows the clinician to determine whether the swelling is localized or diffuse, firm or fluctuant.

Palpation of the cervical and submandibular lymph nodes is an integral part of the examination protocol. Painful and/or enlarged lymph nodes indicate the spread of the inflammation or possible malignancy. If the nodes are found to be firm and tender along with facial swelling and an elevated temperature, there is a high probability that an infection is present.

Sinus tracts of odontogenic origin may also open through the skin of the face. These openings in the skin will generally close once the offending tooth is treated and healing occurs leaving a scar on the skin surface. Many patients with extraoral sinus tracts give a history of being treated by general physicians, dermatologists, or plastic surgeons with systemic or topical antibiotics or surgical procedures. In these particular cases, after multiple treatment failures, the patients may finally be referred to a dental clinician to determine whether there is a dental cause.

The extent and manner of jaw opening may give a sign of possible myofascial pain and dysfunction.

o Intraoral examination

The oral vestibules and buccal mucosa should be examined for localized swelling and sinus tract or color changes. The lingual and palatal soft changes should be then checked. Finally the teeth should be inspected for a carious lesion, faulty restoration, loss of teeth, and presence of deciduous or supernumerary teeth.

- **Periodontal evaluation**

Periodontal probing is an important part of any intraoral diagnosis. Using a calibrated periodontal probe, the clinician should record the periodontal pocket depths on the mesial, middle, and distal aspects of both the buccal and lingual sides of the tooth, noting the depths in millimeters. The periodontal probe is "stepped" around the long axis of the tooth, progressing in 1-mm increments. Periodontal bone loss that is wide is generally considered to be of periodontal origin and is typically more generalized in other areas of the mouth. However, isolated areas of vertical bone loss may be of an endodontic origin, specif,ically from a nonvital tooth whose infection has extended from the peri-apex to the gingival sulcus.

- **Pulpal evaluation**

There are many tests that indicate the pulpal health state. These tests obtain the condition of the tooth's pulp and supporting structures. These tests reveal the extent of the problem and give a clue about the treatment as irreversible pulpitis needs endodontic treatment whereas reversible pulpitis may need a normal filling.

Clinical endodontic tests

One test is not enough for a decisive diagnosis therefore a combination of tests is necessary.

Thermal tests.

It is divided to cold and hot test. The baseline or normal response to either cold or hot is a patient's report that a sensation is felt but disappears immediately upon removal of the thermal stimulus. Abnormal responses include a lack of response to the stimulus, a lingering or intensification of a painful sensation after the stimulus is removed, or an immediate, severe painful sensation as soon as the stimulus is placed on the tooth.

1- Cold testing.

It differentiates between reversible and irreversible pulpitis and identifying necrotic teeth. If a tooth is sensitive to a cold stimulus which subsides after removal of stimulus then the condition is reversible. If the sensitivity takes time more than few seconds then the condition may be irreversible. Teeth with calcified canals need more time for the

cold stimulus to reach the pulp. Cold testing may be done by air blast, cold drink, ice stick or ethyl chloride.

The cold test is especially useful for patients presenting with porcelain jacket crowns or porcelain-fused-to metal crowns where no natural tooth surface is accessible to perform electric pulp test. If a clinician chooses to perform this test with sticks of ice, then the use of a rubber dam is recommended, because melting ice will run onto adjacent teeth and gingiva, yielding potentially false-positive responses.

2- Hot testing. The use of a hot stimulus can help locate symptomatic tooth with necrotic pulp; when a patient's chief complaint is intense dental pain on contact with any hot liquid or food, but the patient is unable to identify which tooth is sensitive. The effect tends to be lingering, and the main reason for using the test is to localize which tooth is symptomatic. Heated gutta percha stick or hot water may be used.

Electric pulp test:

It provides limited but useful information about the response of the nerve fibers in the pulp. Many factors affect the level of response as enamel thickness, area of probe placement, dentin calcification, restorations and patient's level of anxiety.

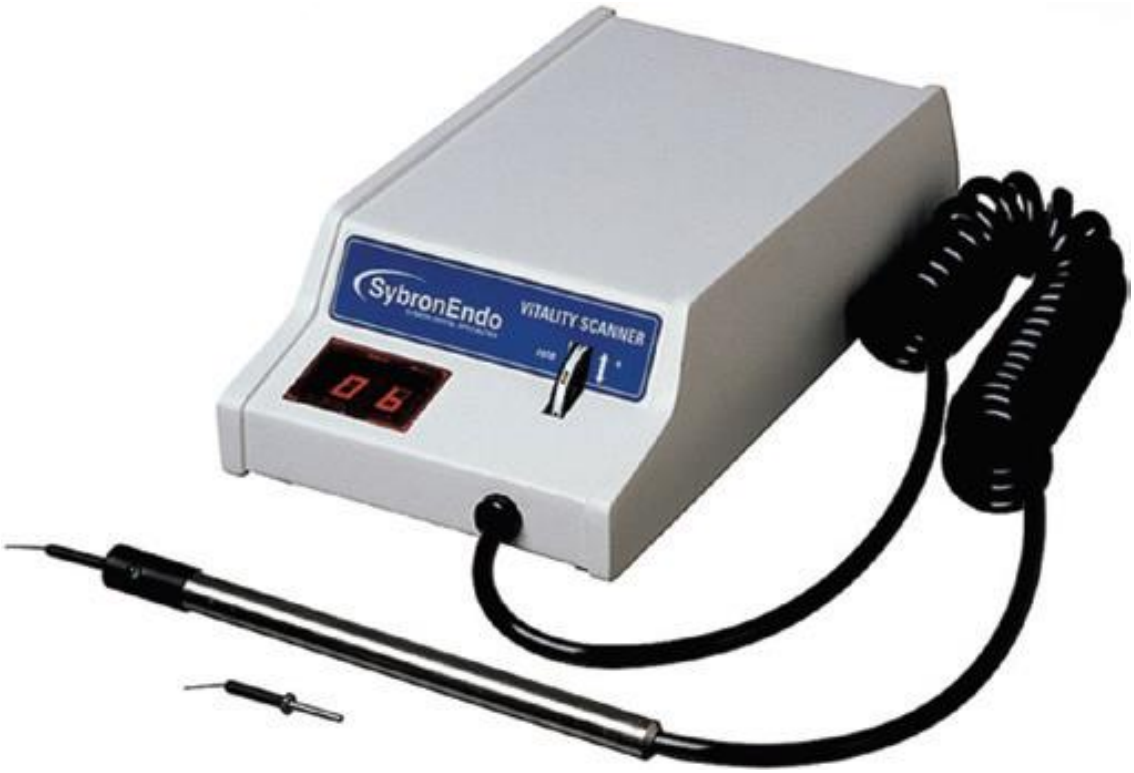
Numeric readings on the pulp tester have significance only if the number differs significantly from the readings obtained from a control tooth tested on the same patient with the electrode positioned at a similar area on both teeth. However, in most cases, the response is scored as either present or absent.

The electric pulp tester will not work unless the probe can be placed in contact with or be bridged to the natural tooth structure. Some pulp testers may require the patient to place a finger, or fingers, on the tester probe to complete the electric circuit; however, the use of lip clips is an alternative to having patients hold the tester. Proper use of the electric pulp tester requires the evaluated teeth to be carefully isolated and dried. A control tooth of similar tooth type and location in the arch should be tested first in order to establish a baseline response and to inform the patient as to what a "normal" sensation is. The suspected tooth should be tested at least twice to confirm the results. The tip of the testing probe that will be placed in contact with the tooth structure must be coated with a water- or petroleum-based medium. The most commonly used medium is toothpaste. The coated probe tip is placed in the incisal third of the facial or buccal

area of the tooth to be tested. Once the probe is in contact with the tooth, the patient is asked to touch or grasp the tester probe, unless a lip clip is used. This completes the circuit and initiates the delivery of electric current to the tooth. The patient is instructed to remove his or her finger(s) from the probe when a "tingling" or "warming" sensation is felt in the tooth. The readings from the pulp tester are recorded and evaluated.

Potential Common Interpretation Errors of Responses Obtained from Electric Pulp Testing:

False-Positive Responses
Partial pulp necrosis
Patient's high anxiety
Ineffective tooth isolation
Contact with metal restorations
False-Negative Responses
Calcific obliterations in the root canals
Recently traumatized teeth
Immature apex
Drugs that increase patient's threshold for pain
Poor contact of pulp tester to tooth



Laser Doppler Flowmetry

Laser Doppler flowmetry (LDF) is a method used to assess blood flow in microvascular systems. Attempts are being made to adapt this technology to assess pulpal blood flow. Several studies have found LDF to be an accurate, reliable, and reproducible method of assessing pulpal blood flow. One of the great advantages of pulp testing with devices such as the LDF is that the collected data are based on objective findings rather than subjective patient responses. This technology, however, is not being used routinely in the dental practice.

Pulse Oximetry

The pulse oximeter is another noninvasive device. Widely used in medicine, it is designed to measure the oxygen concentration in the blood and the pulse rate. Custom-made form of this device has been developed and was found to be more accurate than electric and thermal pulp tests. This device has been especially useful in evaluating teeth that have been subjected to traumatic injuries as such teeth tend to present with questionable vitality using conventional pulp testing methods. This device, however, has been found to be too complicated to be used on a routine basis in a dental practice.

Percussion:

If the patient is experiencing acute sensitivity or pain on mastication, this response can typically be duplicated by individually percussing the teeth, which often isolates the symptoms to a particular tooth. Pain to percussion does not indicate that the tooth is vital or nonvital but is rather an indication of inflammation in the periodontal ligament (i.e., symptomatic apical periodontitis). This inflammation may be secondary to physical trauma, occlusal prematurities, periodontal disease, or the extension of pulpal disease into the periodontal ligament space. Any hard instrument may be used to tap the incisal/occlusal surface of the tooth. The contralateral tooth should first be tested as a control, as should several adjacent teeth that are certain to respond normally, then the suspected tooth.

Palpation:

A palpation test is performed by applying firm digital pressure to the mucosa covering the roots and apices. The index finger is used to press the mucosa against the underlying cortical bone. This will detect the presence of periradicular abnormalities or specific

areas that produce painful response to digital pressure. A positive response to palpation may indicate an active periradicular inflammatory process spreaded to the periosteum overlying the bone. This test does not indicate, however, whether the inflammatory process is of endodontic or periodontal origin.

Mobility:

Like percussion testing, an increase in tooth mobility is not an indication of pulp vitality. It is merely an indication of a compromised periodontal attachment apparatus. This compromise could be the result of acute or chronic physical trauma, occlusal trauma, parafunctional habits, periodontal disease, root fractures, rapid orthodontic movement, or the extension of pulpal disease, specifically an infection, into the periodontal ligament space. Often the mobility reverses to normal after the initiating factors are repaired or eliminated. To determine the degree of mobility the back ends of two mirror handles should be used, one on the buccal aspect and one on the lingual aspect of the tooth. Pressure is applied in a facial-lingual direction as well as in a vertical direction and the tooth mobility is scored: up to 1 mm scores 1, over 1 mm scores 2 and vertically mobile teeth score 3. Any mobility that exceeds 1 should be considered abnormal. However, the teeth should be evaluated on the basis of how mobile they are relative to the adjacent and contralateral teeth.

Occlusal analysis:

It is important to examine suspected teeth for interferences on the retruded arc of closure, intercuspal position and lateral excursions. Interferences in any of these positions could result in a degree of occlusal trauma and institute acute apical periodontitis.

Sinus tract exploration or tracing:

Where a sinus tract is present, it may be possible to insert a small gutta-percha point to trace the sinus tract, a size #25 or #30 gutta-percha cone is threaded into the opening of the sinus tract. Although this may be slightly uncomfortable to the patient, the cone should be inserted until resistance is felt. After a periapical radiograph is exposed, the origin of the sinus tract is determined by following the path taken by the gutta-percha cone. This will direct the clinician to the tooth involved and, more specifically, to the root of the tooth that is the source of the pathosis. Once the causative factors related to

the formation of the sinus tract are removed, the sinus tract will close within several days.

Transillumination:

Transillumination with a fiber optic light show cracks in teeth. These cracks cause stretching of the pulp tissues when a lateral pressure is exerted on the tooth therefore causing pain.

Bite Test

Percussion and bite tests are indicated when a patient presents with pain while biting. On occasion, the patient may not know which tooth is sensitive to biting pressure, and percussion and bite tests may help to localize the tooth involved. The tooth may be sensitive to biting when the pulpal pathosis has extended into the periodontal ligament space, creating a *symptomatic apical periodontitis,* or the sensitivity may be present secondary to a crack in the tooth. If periradicular periodontitis is present, the tooth will respond with pain to percussion and biting tests regardless of where the pressure is applied to the coronal part of the tooth. A cracked tooth or fractured cusp will typically elicit pain only when the percussion or bite test is applied in a certain direction to one cusp or section of the tooth. A variety of devices have been used for bite tests, including cotton tip applicators, toothpicks, orangewood sticks, and rubber polishing wheels. There are several devices specifically designed to perform this test. The Tooth Slooth (Professional Results, Laguna Niguel, CA) and FracFinder (Hu-Friedy, Oakbrook, IL) are just two of the commercially available devices used for the bite test.

Selective anaesthesia:

Selective anaesthesia can be useful in cases of referred pain to distinguish whether the source of pain is mandibular or maxillary in origin. It is less useful for distinguishing pain from adjacent teeth, as the anaesthetic solution may diffuse laterally.

Test cavity:

Occasionally, as a last resort, an access cavity is cut into dentine without local anaesthesia as an additional way of sensitivity testing.

Radiographs

Radiographs should be taken using film holders and a paralleling technique and be viewed using an appropriate viewer with magnification as necessary. They will not show early signs of pulpitis as there is no periodontal widening at this stage of pulpal degeneration. Radiographs may provide important information to help to confirm a diagnosis, but they should not be used alone. Radiographic findings may include the loss of lamina dura (laterally or apically) or a periradicular radiolucency indicative of pulp necrosis. Alternatively, radiographs may show pulp chamber or root canal calcification, which may explain reduced responses to pulp sensitivity testing. This emphasizes the need for considering using more than one test.