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Diagnosis in Endodontics

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Abstract

Diagnosis is the most important part of the treatment planning. A wrong diagnosis means wrong treatment resulting in unnecessary treatment and incomplete elimination of the disease. The treating dentist must use all the latest diagnostic tools to avoid the minimal damage to the patient and come to a reasonable diagnosis so that the patient is totally cured. This article highlights the various diagnostic techniques in endodontics.

Keywords: CBCT; Diagnosis; Pulse Oximetry; Vitality Tests.

Introduction

Definition

The act of identifying a disease, illness, or problem by examining someone or somethingfrom its signs and symptoms / a statement or conclusion that describes the reason for a disease, illness, or problem (Merriam Webster).

Clinical Diagnosis

Diagnosis based on signs, symptoms, and laboratory findings during life.

Differential Diagnosis

The determination of whic h one of several diseases may be producing the symptoms. D etermination of which one of two or more diseases with similar symptoms is the one from which the patient is suffering. Also called differentiation.

Endodontic Diagnosis [1]

Diagnosis of the disease involves many criteria to be followed before we come to a final diagnosis.

All clinical and radiographic examinations must be performed to come to a definitive diagnosis.

The clinical tests include pulpal tests (sensitivity and sensibility tests), examination of the soft and hard tissues, palpation of the tissues, percussion tests.

The clinician should observe for any swelling, sinus or changes in the soft tissue at the site of chief complaint.

The most commonly used subjective and objective data for making an appropriate diagnosis is:

Subjective Data

Patient derived Patient's chief complaint (eg: 'My tooth hurts when taking cold foods') History of present complaint Patient response to stimuli testing (cold, percussion, palpation, bite) based on reproducing the patient's chief complaint

Objective Data

Clinician derived relevant dental and medical history (eg recent pulp exposure, trauma, etc) Examination findings (eg quality of the restoration, periodontal pocketing, presence of swelling, sinus tract) Radiographic findings.

The diagnosis can be pulpal and periapical. According to ADA.

Pulpal Diagnoses [2,3]

Normal Pulp A clinical diagnostic category in

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which the pulp is symptom-free and normally responsive to pulp testing.

Reversible Pulpitis A clinical diagnosis based on subjective and objective findings indicating that the inflammation should resolve and the pulp return to normal.

Symptomatic Irreversible Pulpitis A clinical diagnosis based on subjective and objective findings indicating that the vital inflamed pulp is incapable of healing. Additional descriptors: lingering thermal pain, spontaneous pain, referred pain.

Asymptomatic Irreversible Pulpitis A clinical diagnosis based on subjective and objective findings indicating that the vital inflamed pulp is incapable of healing. Additional descriptors: no clinical symptoms but inflammation produced by caries, caries excavation, trauma.

Pulp Necrosis A clinical diagnostic category indicating death of the dental pulp. The pulp is usually nonresponsive to pulp testing.

Previously treatedA clinical diagnostic category indicating that the tooth has been endodontically treated and the canals are obturated with various filling materials other than intracanal medicaments.

Previously treatment started A clinical diagnostic category indicating that the tooth has been previously treated by partial endodontic therapy (eg, pulpotomy, pulpectomy).

Apical Diagnoses [1,2,3]

Normal Apical Tissues Teeth with normal periradicular tissues that are not sensitive to percussion or palpation testing. The lamina dura surrounding the root is intact, and the periodontal ligament space is uniform.

Symptomatic Apical Periodontitis Inflammation, usually of the apical periodontium, producing clinical symptoms including a painful response to biting and / or percussion or palpation. It might or might not be associated with an apical radiolucent area.

Asymptomatic Apical Periodontitis Inflammation and destruction of apical periodontium that is of pulpal origin, appears as an apical radiolucent area, and does not produce clinical symptoms.

Chronic Apical Abscess An inflammatory reaction to pulpal infection and necrosis characterized by gradual onset, little or no discomfort, and the intermittent discharge of pus through an associated sinus tract.

Acute Apical Abscess An inflammatory reaction to pulpal infection and necrosis characterized by rapid onset, spontaneous pain, tenderness of the tooth to pressure, pus formation, and swelling of associated tissues.

Condensing Osteitis Diffuse radiopaque lesion representing a localized bony reaction to a low-grade inflammatory stimulus, usually seen at apex of tooth.

Examination Procedures Required to Make an Endodontic Diagnosis [2,4]

The molecular methods for endodontic diagnosis are [5]:

Medical/dental history	Past/recent treatment, drugs
Chief complaint	How long, symptoms, duration of pain, location, onset, stimuli, relief, referred, medications
Clinical exam	Facial symmetry, sinus tract, soft tissue, periodontal status (probing, mobility), caries, restorations (defective, newly placed?)
Clinical testing: pulp tests	Cold, electric pulp test, heat
periapical tests	Percussion, palpation, Tooth Slooth (biting)
Radiographic analysis	New periapicals (at least 2), bitewing, cone beam-computed tomography
Additional tests	Transillumination, selective anesthesia, test cavity

1. Hybridization
2. Amplification
3. Sequencing
4. Enzyme digestion of nucleic acid

Use of CBCT in diagnosing endodontic lesions [2,6]

Lesions of Endodontic Origin

CBCT has been paramount in our ability to evaluate and diagnose the presence and extent of endodontic disease.

Microfractures and Vertical Root Fractures

CBCT has greatly helped with the question of the elusive microfracture's presence as well as its extent, both of which are significant factors related to treatment planning.

Detect Extra Canals

Laser Doppler Flowmetry [6]

Laser Doppler flowmetry Laser Doppler flowmetry (LDF) is a technique first used for the noninvasive measurement of surface blood flow velocity. LDF uses

a continuous wave helium-neon (He-Ne) laser, at 640 nm, as a light source that passes through a fiber-optic cable to carry the light to the surface to be measured. This light is reflected from both the nonmoving skin surface and moving red blood cells, resulting in a Doppler shifted signal.

There are numerous applications of LDF in dental research as well as in dental practice, in particular, this method is used for the investigation of microcirculation and vitality of the dental pulp , periodontal ligament, gingival or sulcular blood flow in health and disease, the effect of orthodontic

Diagnostic outcome	Diagnostic criteria
Absence of adverse outcome	absence of symptom
Type I	loss of sensitivity
Type II	loss of sensitivity and presence of periapical radiolucency
Type III	loss of sensitivity, periapical radiolucency, and grey discoloration of crown

treatment, the injection of vasoconstrictive anaesthetics in blood flow or assessing bone vascularity in the human mandible during implant insertion.

The method is considered to be highly efficient in assessing pulpal vitality in healthy and traumatised teeth. LDF proved to be the most effective and early indicator for revascularisation of the pulp (3 weeks).

Drawbacks of Laser Doppler Flowmetry [7,8]

1. Detects movement of erythrocytes in a small volume of tissue that is about 1 mm3. That is why it cannot analyse different variables, in particular, the flow in individual microvessels, the number of vessels with an active flow and changes in vessel diameter.
2. Poor reproducibility of the results because a minimal displacement of the probe will lead to a change in the investigated area because of the density of the vascular network of the gum

Pulse Oximetry

The term 'oximetry' is defined as the determination of the percentage of oxygen saturation of the circulating arterial blood. Pulse oximetry is a relatively inexpensive procedure which is commonly used in anaesthetic procedures. Pulse oximetry readily differentiates between vital and non-vital teeth.

The prerequisites for using pulse oximeter are [4,6,9]:

1. Sensor should conform to the size, shape, and anatomical contours of teeth.
2. Light-emitting diode sensor and the photoreceptor should be as parallel as possible to each other so that the photoreceptor sensor receives the light-emitted from LED.
3. The sensor holder should allow firm placement of the sensor onto the tooth to obtain accurate measurements.

Advantages

1. Effective and objective method of evaluating dental pulp vitality.
2. Useful in cases of impact injury where the blood supply remains intact but the nerve supply is damaged.
3. Pulpal circulation can be detected independent of gingival circulation.
4. Pulp pulse readings are reproducible.
5. Smaller and cheaper commercial oximeters are now available for routine clinical use in an average dental office.

Drawbacks

1. Background absorption associated with venous blood and tissue constituents is not differentiated [7,8,10].
2. Probes should be specific for the anatomy of a tooth as the oxygen saturation values from the teeth routinely register lower than the readings from the patient's finger.

Dual Wavelength Spectrophotometry [5,6,11]

This technique is independent of a pulsatile circulation. This method measures oxygenation changes in the capillary bed rather than in the supply vessels and hence does not depend on a pulsatile blood flow.

Ultrasound in Endodontic Diagnosis [3,12]

Ultrasound is based on the reflection (echoes) of US waves at the interface between tissues which have different acoustic properties. The US beam of energy is emitted and reflected back to the same probe (i.e. the probe acts as both the emitter and detector). As the probe is moved over the area of interest, a new image is generated. Up to 50 images can be created per second, resulting in moving images on the screen.

Conclusion

Proper diagnosis will eventually result in proper treatment. This can't be overemphasized. The status of the tooth and the chief complaint should be taken into consideration along with the radiographic and clinical finding to arrive at a definitive diagnosis to give the best treatment for that particular disease state.

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