RUTGERS
Office of Research Commercialization

Contact:
Leon Segal, PhD
Office of Research Commercialization
Rutgers, The State University of New Jersey
Tel: 848-932-4464 email: segal@rutgers.edu

Primary Inventor:
Jay Sureshbhal Patel
Biomedical informatics

RU Tech ID #: 2016-027

Detection, Diagnosis, & Prediction of Dental Periapical Diseases Using Image Processing Techniques (Digital pixel intensity software/technology)

Why it is important to provide a differential diagnosis

Significance of differential diagnosis of periapical lesions

Periapical lesions such as apical periodontits and periapical abscess/granuloma cysts are prevalent dental conditions. Accurate and timely diagnosis and treatment is crucial in order to treat these conditions at the right level, and to salvage teeth. Misdiagnosis consequences could occur in under- or over- treatment. When disease severity is underestimated, progression of the conditions into more serious state can ensue. For instance, if periapical granuloma is diagnosed as periapical abscess the dental clinican may not consider enough follow up for the patient, leading to lesion progression to a serious periapical cyst. Overtreatment or aggressive management can lead to loss of tooth structure and increased costs. For instance, when periapical granuloma is misdiagnosed as periapical cyst, the clinician may perform unnecessary apicectomy even though granuloma can be treated without surgery. Correct diagnosis can aid with correct prognosis and treatment, e.g., prognosis for treated apical periodontits will be improved vs. periapical granuloma. These lesions are treated differenly and root canal is just one process among many other required treatments. Detailed information on the treatment planning for each of these condition is described below.

Apical periodontitis

Correctly diagnosed apical periodontitis is typically treated with SINGLE SITTING ROOT CANAL because many times the tooth is at least partially vital. These patients do not require follow up visits, as apical periodotits is mostly an acute condition and can be treated immediately by eliminating the cause. Low-dose basic antibiotics can be effective.

Periapical abscess

Periapical abscess is typically a collection of pus, classified as draining or non-draining periapical abscesses. Typically periapical abscess is treated with MULTIVIST ROOT CANAL TREATMENTS. First, access opening is required (opening of the tooth and draining until apical foramen). Additonally, these patients are prescribed HIGH DOSE AND COMBINATION ANTIBIOTICS, as there is often a presence of anaerobic microflora. Pateints generally require daily dressing changes (weeping canal) and enhanced pus drainage until all the pus is eliminated from the periapical lesion, in conjunction with effective irrigants. In a non weeping canal change in dressing is unnecessary, the root canals are filled with the $Ca(OH)_2$ dressing. Patient is generally seen after 7-10 days and will be asymptomatic. Last, the final root canal treatment with permanent crown is placed.

Periapical granuloma

Typically, periapical granuloma has a collection of granulomatous material within the lesion and necrosed root canal. These lesions are treated with HIGHER DOSE OF ANTIBIOTICS, MULTI-VISIT ROOT CANAL TREATMENTS, and follow up at 3 - 5 weeks and at 3 months. This lesion is first treated with the surgical access opening followed by filling root canals with DOUBLE OR TRIPLE ANTIBIOTIC PASTE which has been known to show better results compared to traditional intra-canal medication. This provide faster healing and quick recovery after root canal.

Periapical cyst

Periapical cysts cavities are filled with air (chronic) or pus (acute), with ossious bony margins and well defined cystic lining. Treatment decisions are made based on size of the cystic lesion. If more than 50% bone is resorbed due to the presence of cyst, then tooth extraction is a treatment of choice. If less than 50% bone is resorbed then apicetomy along with cystic enucleation is the surgical treatment of choice along with root canal. The amount of cortical bone left, proximity to vital neighboring structures, and number of roots are the determining factors for treatment planning.

As described above, all of the periapical lesions require a conservative approach to treat the nidus of infection and the methodology followed is variable, from the dose of antibiotic to the follow up. Therefore, it is critical to diagnose these lesions correctly, as soon as possible, and to select the appropriate treatment plan.