ULTRASONOGRAPHY AND COMPUTED TOMOGRAPHY IN THE DIAGNOSIS OF PERIAPICAL LESIONS - A CASE REPORT

Tilakchand Mahima*, Rao R Nageshwar**, V Ravi S***

Recent developments in imaging sciences have enabled dental researchers to visualize structural and biophysical changes effectively. Accurate diagnosis of periapical lesion solely based on clinical and radiographic examination is a difficult task and has its own limitations. To circumvent these limitations, new approaches for the accurate diagnosis of periapical lesion have been attempted using advanced imaging techniques such as ultrasonography and computed tomography. Dental literature evidences the effectiveness of these imaging techniques in the differential diagnosis as well as to assess the outcome of healing lesions of periapical origin. These newer advances in the periapical diagnostics may help to rule out the need for surgical intervention thus helping the clinician to accurately plan the treatment. These case reports compare the efficacy of two imaging techniques, ultrasonography and computerized tomography in the diagnosis of periapical lesions.

Key Words: Periapical lesions, Computed tomography, Ultra sonography.

Periapical lesions of endodontic origin are induced by bacteria residing in the root canal system. Egress of the irritants into the periradicular tissues activates non specific host resistance factors and triggers specific immunologic reactions. When the irritants are persistent and numerous these reactions extend from the periodontal ligament to the periradicular tissues[1].

In the diagnosis, treatment and follow-up of periapical lesions, radiographs are the most accurate aid in endodontics[1]. Clinical examination and radiograph alone cannot differentiate between cystic and non cystic lesions. Being able to distinguish between the two may be of importance in predicting treatment failure[2,3]. In order to overcome these shortcomings it is important that new imaging techniques are evaluated for their ability to diagnose periapical lesions[4]. The use of computed tomography (CT) has been shown to be of help in the management of extensive lesions and it has been suggested that CT is a non invasive method that could be used to make a differential diagnosis between a cyst and a granuloma[5]. Ultrasound real time imaging (also known as sonography or echography) has wide application in various diagnostic fields of medical sciences. Ultrasound is a real time imaging technique recently introduced to periapical diagnostics. It is based on the phenomenon of reflection of ultrasound waves (echoes) at the interface between two tissues that have different acoustic properties. Sound waves do not pass through bone, but are reflected back to the sensor on the surface. Therefore, only lesions uncovered by bone can be examined. It is possible to discriminate the physical nature of the content of the lesion whether it is fluid, soft tissue or calcifications and blood flow in cases of vascularization of the lesion[6].

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CASE REPORT 1

A Male patient aged 45 years reported to the department of Conservative Dentistry and Endodontics, S.D.M College of Dental Sciences with the complaint of pain and swelling in the upper left anterior region. Patient recalled a history of trauma 7 years back. He had observed a swelling in the oral mucosa approximately 2 months back before the present clinical evaluation. Clinical examination revealed discolored maxillary left central and lateral

incisors and a swelling on the labial mucosa of vestibular obliteration was also evident. Teeth were not responsive to vitality tests (dry ice, heat or electric pulp test). Teeth were tender on vertical percussion. IOPA revealed extensive periapical radiolucency extending from mesial surface of maxillary left central incisor to mesial surface of maxillary left canine. Differential diagnosis was done using CT scan and Ultrasound. Axial CT Scans of the jaws were obtained using a high resolution scanner using following settings: standardized technique with straight gantry; 20contiguous axial scans parallel to the hard palate of 1m.m thickness: 2.7s exposure time; 70 to120 ma at 133 KVp. Bone window was 2800 Hannsfields (Hu) with a 400 Hu center; soft tissue window was 250 Hu center.

The cross-sectional image running through the centre of the lesion was used to measure the width of the jaw, width of the lesion and distance from the outer rim of the lesion and the inner border of the buccal, and lingual cortical plates. The lesion width and its distance from the cortical plate on the CT were measured and corrected using the reference scale printed on the CT. All measurements were performed by two specialists (a radiologist and endodontist) by consensus.

The CT scan study revealed a hypo-dense lesion in the left maxillary alveolus measuring about 1 x 1 cm in greatest diameter. The borders were well defined and sclerotic. No intra-lesional calcification was seen, the rest of the areas appeared normal. The lesion had central CT values of about 50 to 70 Hu and at one place 3 to 12 HU- suggesting thick soft tissue density all around with central small fluid loculus. Diagnosis with CT scan would be considered as periapical granuloma with central necrosis in relation to the maxillary left central and lateral incisor. An ultrasound examination was then performed using the diagnostic ultrasound machine with color Doppler function, incorporating a multi-frequency, high definition, 40 mm linear foot print, ultrasonic Probe (Hd-11 Phillips ultrasound machine with 3D, 4D) operating at a frequency of 7.5-12 MHz. The Ultrasound probe was first covered with disposable cling film for control of infection, and then covered with a layer of ultrasound gel. The probe was positioned extra-orally on the skin overlying the periapical area. The probe was moved several times in order to obtain an adequate number of scans in axial plane and saggital plane to define the bony defect. Intraoral scanning was not possible because the larger size of the probe used and the shallow vestibule.

The thin anterior buccal bone and possible fenestration allowed ultrasound images to be obtained in all cases and the echo characteristics (hypoechoic / anechoic) of the apical lesions to be determined. All lesions were measured in three planes, i.e. antero-posterior, superio-inferior and mesio-distal and the dimensions recorded. Hard copy images were obtained using a thermal printer. Color Doppler was applied to each examination to detect blood flow.

High resolution ultrasound study revealed well defined soft tissue contents of the lytic lesion having good Doppler flow signals along with small central hypoechoic fluid locculus. Diagnosis with ultrasound would be considered as a periapical granuloma. Root canal treatment was performed. Post obturation IOPA radiograph was taken. The patient was recalled after 1½ month and IOPA radiograph and ultrasound was repeated. Both revealed that healing was in rapid progress.

Case report 2

A male patient age 20 years reported to the department with the complaint of severe pain and swelling with the upper anterior teeth region. On clinical examination and radiographic investigation suggested periapical abscess in relation to maxillary left central and lateral incisor. Tooth was tender on percussion with grade II mobility.

Other investigations such as CT Scan, ultra-sonography and histopathologic examination was carried out was carried in same manner as first case. CT Scan investigations revealed that there was a hypodense lesion seen in the periapical region of to 21, 22 measuring about 1.6 x 1.4 x 1.8 in greatest diameter. Ultra sonography revealed that the lesion

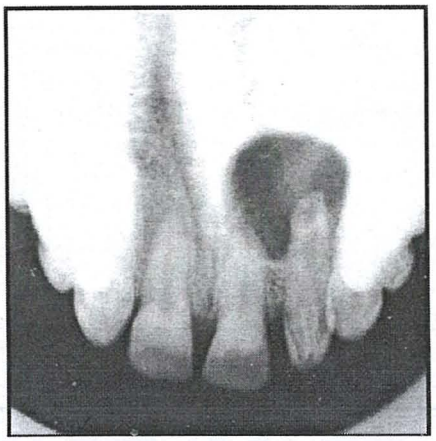


Fig 1: Intra oral periapical radiograph revealed extensive periapical radiolucency extending from mesial surface of maxillary left central incisor to mesial surface of maxillary left canine.

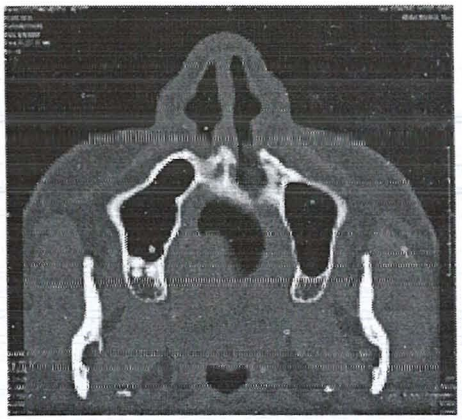


Fig 2: C.T Scan images: revealed a hypo-dense lesion in the left maxillary alveolus measuring about 1 x 1 cm in greatest diameter. The borders were well defined and sclerotic.

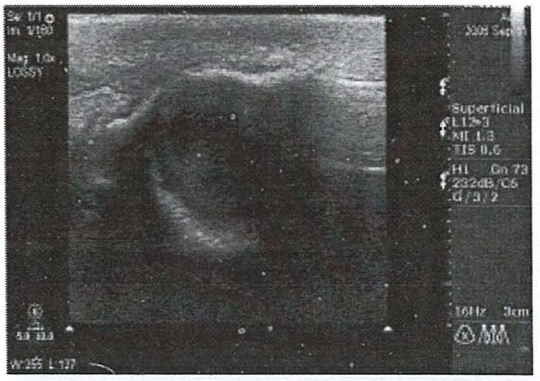


Fig 3: An ultrasound examination revealed well defined soft tissue contents of the lytic lesion having good Doppler flow signals along with small central hypoechoic fluid locculus.

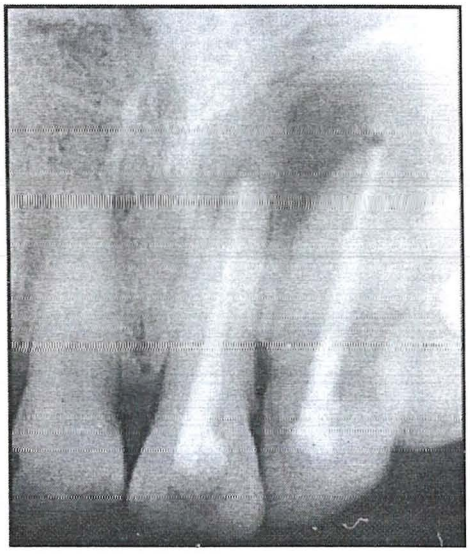


Fig 4: One & half month evaluation (IOPA radiograph).

had central CT values of about 25 to 106 HU and at one place 15 to 80 Hu, suggesting thick soft tissue density all around with central fluid loculus.

The margin of the lesion are distinct. No intra-lesional calcification is seen. The labial and palatal cortical plates were intact. Diagnosis with both the CT scan an ultrasound confirmed the lesion as periapical cyst. Root canal treatment was performed and periapical curettage was done after which the tissue was sent for histo-pathologic examination which confirmed the diagnosis of radicular cyst.

Discussion

Imaging techniques constitute an important part of endodontic therapy especially in the diagnosis of

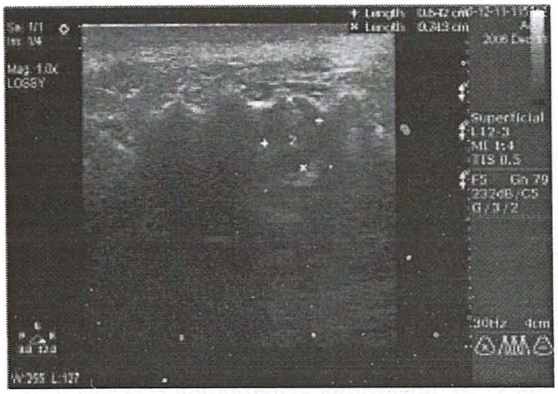


Fig 5: One & half month evaluation (high resolution ultrasound).



Fig 6: IOPA radiograph revealed a well defined periapical radiolucency in relation to 21, 22.

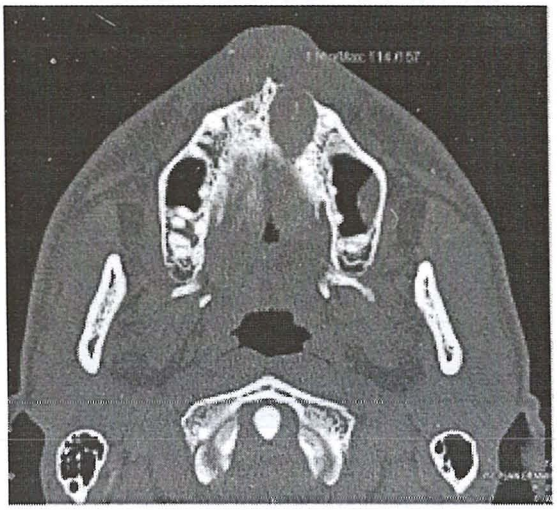


Fig 7: C.T Scan images: revealed central CT values of about 25 to 106 HU and at one place 15 to 80 HU.



Fig 8: An ultrasound examination revealed lesion with large central fluid locculus.

periapical lesions and the patient can often be exposed to repeated radiographs[7]. However, in spite of multiple exposures, the nature of the underlying disease is difficult to determine from radiography alone as they do not reveal the content of the periapical lesion. The differential diagnosis between cystic and non cystic lesion is also difficult to diagnose and the ability to differentiate between cyst and granuloma will help in the prediction of treatment outcome in non-surgically treated teeth[7]. Many newer methods for diagnosis in these situations have been suggested and prominent among them are ultrasonography and computed tomography.

The evolution of computed tomography (CT) has been proved as a non invasive tool in endodontic diagnosis. It has been reported that CT could be used to differentiate between a cyst and a non cystic granuloma as well as an extensive periapical lesion[8].

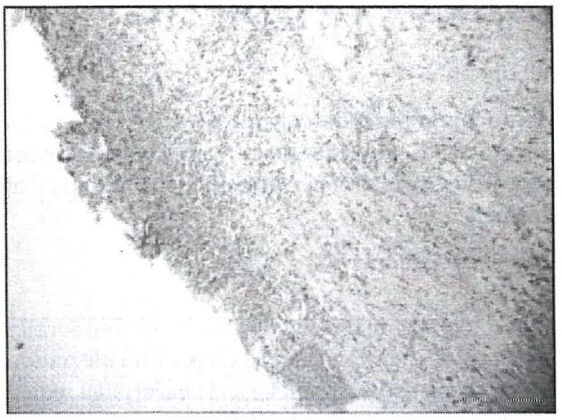


Fig 9: A histopathologic examination showing the epithelial lining.

However, routine use o CT for diagnosing periapical lesions would expose patients to unnecessary high doses of radiation, which cannot be easily justified[9]. Cost factor should also be considered.

Ultrasonography or echography is a relatively safe and accurate tool to identify the underlying disease process with reasonable accuracy, and can give significant diagnostic information in relation to periapical lesions in the anterior region where the buccal bone is thin., if only clinical findings were available, an endodontist trained to use ultrasound should be able to diagnose a periapical lesion with least difficulty and confirm the nature of underlying lesion[7].

Ultrasound real-time imaging is convenient, reproducible and easy to use. The equipment is relatively cheap compared with other advanced imaging modalities. These are also simple to store and retrieve and easy to interpret once the clinician is trained. The technique enables an instantaneous working diagnosis and may prevent unnecessary exposure of the patient to ionizing radiation. No harmful effects of ultrasound waves have been observed in the tissues as a result of ultrasound examination, though this area is very less probed by the researches.

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