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Original Research

Evaluation of the periapical status of teeth with irreversible pulpitis by using cone-beam computed tomography scanning and periapical radiographs

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ABSTRACT:
Background: The biologic goal is to prevent or cure apical periodontitis (AP), whereas the endodontic goal is to keep the treated tooth functioning normally. The present study was conducted to evaluate the periapical status of teeth with irreversible pulpitis by using cone-beam computed tomography scanning and periapical radiographs.**Materials &Methods:**118 teeth of both genders were selected. Thermal (cold and/or heat) testing was used to evaluate pulp vitality, and the existence or lack of root canal bleeding was used to confirm the results. All teeth were subjected to periapical radiographs taken with Carestream X- ray machine and CBCT scan with Planmica machine.**Results:**Teeth were incisors 44, canine 30, premolar 28 and molar 16. Apical periodontitis was detected in 15% in CBCT and 9% in periapical radiographs and absent in 85% in CBCT and 91% in periapical radiographs. The difference was significant (P< 0.05).**Conclusion:** This study shown that CBCT is more accurate in identifying periapical lesions when comparing the presence and absence of these lesions in CBCT and PAradiography. As a result, it might be used in routine clinical practice to get precise diagnosis and treatment planning.
Keywords: CBCT, cone-beam computed tomography, irreversible pulpitis, periapical radiographs.

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INTRODUCTION

The biologic goal is to prevent or cure apical periodontitis (AP), whereas the endodontic goal is to keep the treated tooth functioning normally. Periapical (PA) radiographs, whether digital or conventional, are currently utilized both during and after endodontic therapy to evaluate treatment results. On the other hand, PA imaging offers a two-dimensional representation of a three-dimensional (3D) structure. AP lesions that are contained within the cancellous bone could not be visible on PA radiographs. Whereas lesions of a particular size can be found in areas with a thin cortex, they cannot be found in areas with a thicker cortex.[1]

Radiographic evidence of AP localized to the cancellous bone can be identified with cone-beam computed tomography (CBCT) because it produces 3D images that do not superimpose anatomic features.[2]With the use of CBCT, AP lesions can be found, and a highly accurate non-invasive differential diagnosis can be made. PA radiographs and CBCT scans have been used to compare the prevalence of AP. Studies conducted both in vivo and in vitro have demonstrated that CBCT scanning is superior to PA radiography in identifying AP lesions.[3]

The majority of these research were on teeth that had unsuccessful root canal therapy. According to Levin et al., pulp exposure, cracks, severe cavities or restorations, or any other pulpal irritants may be the cause of irreversible pulpitis.[4] With the exception of the existence of the etiologic etiology, teeth with irreversible pulpitis may seem unremarkable on PA radiographs. Occasionally, a thickening of the periodontal ligament space may be apparent if the inflammatory process has extended to the periapical region.[5,6]The present study was conducted to evaluate

the periapical status of teeth with irreversible pulpitis by using cone-beam computed tomography scanning and periapical radiographs.

MATERIALS & METHODS

The study was carried outon 118 teeth of both genders.

Data such as name, age, gender etc. was recorded. Thermal (cold and/or heat) testing was used to evaluate pulp vitality, and the existence or lack of root canal bleeding was used to confirm the results. All teeth were subjected to periapical radiographs taken with Carestream X- ray machine and CBCT scan with Planmica machine. Results thus obtained were subjected to statistical analysis. P value < 0.05 was considered significant.

RESULTS

Table IType of teeth

Teeth	Number	P value
Incisors	44	0.29
Canine	30	
Premolar	28	
Molar	16	

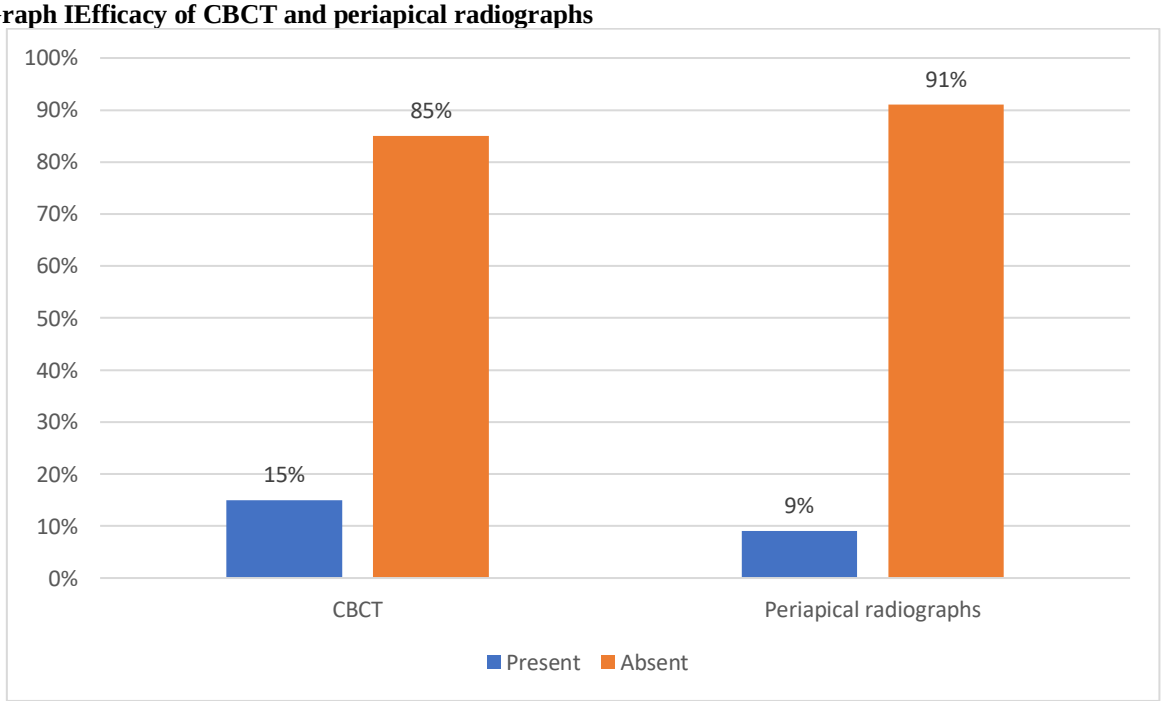
Table I shows that teeth were incisors 44, canine 30, premolar 28 and molar 16.

Table II Efficacy of CBCT and periapical radiographs

Detection of AP	Present	Absent
CBCT	15%	85%
Periapical radiographs	9%	91%
P value	0.01	0.05

Table II, graph I shows that apical periodontitis was detected in 15% in CBCT and 9% in periapical radiographs and absent in 85% in CBCT and 91% in periapical radiographs. The difference was significant (P< 0.05).

Graph IEfficacy of CBCT and periapical radiographs



DISCUSSION

Periapical disease is an inflammatory disorder that affects the tissues around the tooth's apex for a variety of reasons, including necrosis and pulp infection. An intra-oral, two-dimensional (2D) mesio-distal radiograph called a periapical (PA) radiograph is used to identify periapical disorders. It offers helpful details about the presence and magnitude of peri-radicular lesions.[7,8] Due of the limited information provided by PA radiographs, dentists may misidentify or misdiagnose a possible pathology.[9]To get the best possible treatment result, a PA radiograph must be applied at every stage of the process.It provides us with a summary of the anatomical details, canal length, obturation quality, and tooth and bone disease.[10] The diagnosis of periapical lesions may be hampered by the limits of standard radiography techniques, such as digital and film radiography, when

it comes to seeing anatomical structures. It was found that between 30% and 45% of periapical lesions are not visible on the PA radiograph.[11]The present study was conducted to evaluate the periapical status of teeth with irreversible pulpitis by using cone-beam computed tomography scanning and periapical radiographs.

We found that teeth were incisors (44), canine (30), premolar (28) and molar (16).Alsaikhan et al[12]compared the periapical status of different teeth by using the Periapical (PA) and the cone beam computed tomography (CBCT) radiographs. The absence and presence of periapical lesions were investigated using both PA and CBCT radiographs. Periodontal conditions other than periapical lesions were also observed by using both radiographs and recorded. A total of 204 teeth from 72 patients (29 female and 43 male) were assessed via CBCT and PAradiographs. Inter-observer and intra-observer reliability showed the absolute level of agreement. T-test showed there is significant difference between PAand CBCT radiographs regarding detecting periapical lesions. Chi-square test showed no significant differences between the gender and apical pathosis.

We observed that apical periodontitis was detected in 15% CBCT and 9% periapical radiographs and absent in 85% CBCT and 91% periapical radiographs. Abella et al[13]compared the prevalence of apical periodontitis (AP) onindividual roots of teeth with irreversible pulpitis viewedwith periapical (PA) radiographs and cone-beamcomputed tomography (CBCT) scans. PAradiographs and CBCT scans were taken of 138 teethin 130 patients diagnosed with irreversible pulpitis(symptomatic and asymptomatic). Two calibrated examiners assessed the presence or absence of AP lesions byanalyzing the PA and CBCT images. A comparison of the 307 paired roots revealedthat AP lesions were present in 10 (3.3%) and absent in297 (96.7%) pairs of roots when assessed with PA radiography. When the same 307 sets of roots were assessed with CBCT scans, AP lesions were present in42 (13.7%) and absent in 265 (86.3%) paired roots.The prevalence of AP lesions detected with CBCT wassignificantly higher in the symptomatic group comparedwith the asymptomatic group (P< .05). An additional 22roots were identified with CBCT alone.

Alamri et al[14] stated that apical periodontitis could observe on CBCT, which was not the case with PAradiographs. This study proved that the CBCT radiographs are not only highly precise at recognizing periapical lesions but also had more clarity on contrast with PAradiographs.

The shortcoming of the study is small sample size.

CONCLUSION

Authors found that CBCT is more accurate in identifying periapical lesions when comparing the presence and absence of these lesions in CBCT and PA radiography. As a result, it might be used in routine clinical practice to get precise diagnosis and treatment planning.

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