OCCULT PATHOLOGIES DISCLOSED IN PANORAMIC RADIOGRAPHS- A RETROSPECTIVE STUDY

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ABSTRACT

Background: Panoramic radiograph serves as an indispensable screening and diagnostic tool in oral and maxillofacial imaging. This study was designed to detect the frequency of occult pathologies using the panoramic radiograph.

Aim and Objective: To estimate the occult pathologic findings in panoramic radiographs unrelated to the chief complaint and clinical diagnosis.

Methodology: This study was conducted at the Department of Oral Medicine and Radiology in a teaching dental hospital using 1032 panoramic radiographs retrieved from May 2015 to October 2015. The images were evaluated for the presence of occult pathologic findings which were unrelated to the chief complaint and clinical diagnosis. Statistics was calculated with simple percentage analysis was done.

Result: Out of 1032 panoramic radiographs examined, occult lesions unrelated to the chief complaint and clinical diagnosis were observed in 165 (15.98%) panoramic radiographs. The percentage of the incidental findings in 165 panoramic radiographs were periapical pathologies (26.67%), periodontal pathologies (23.6%), tooth anomalies (4.84%), congenitally missing teeth (5.45%), supernumerary teeth (3.63%), generalized rarefractions (9.7%), carotid artery calcifications (1.81%), cysts and tumors (7.89%), TMJ pathologies (9.1%), and styloid process elongation (3%). The study reiterates on the diagnostic utility of panoramic radiograph in routine clinical situations, school health program and forensics.

INTRODUCTION

In recent times, imaging techniques has evolved significantly to provide specific diagnosis of diseases and plays a major role in treatment planning. However conventional radiographs such as Panoramic radiograph is one such depicts the entire maxilla, mandible and TMJ on a single exposure. Hence, it allows wide range of visualization of structures which may not be seen on other conventional radiographic techniques. Panoramic radiographs serves as an indispensible diagnostic tool in patients with trismus, trauma, exaggerated gag reflex. (Colquhoun et al., 2002) Numerous asymptomatic unsuspected pathological conditions are routinely detected on panoramic radiographs, which may continue to remain dormant or eventually develop into soft or hard tissue swellings. Carotid artery calcifications being a life threatening predisposing factor for stroke is also being diagnosed in panoramic radiographs. Delayed diagnosis affects the prognosis of the lesion, which necessitates early intervention. (Levy and Mandel, 2010; Sisman et al., 2007; Bayer et al., 2011) Hence, this study was designed to detect the frequency of occult pathologies in maxilla, mandible, and adjacent structures visualized in panoramic radiograph.

MATERIALS AND METHODS

The study was conducted after obtaining clearance from Institutional Review Board and Institutional Ethical Committee. This retrospective study was conducted at a dental teaching hospital using 1032 panoramic radiographs retrieved from the Department of Oral Medicine and Radiology during May 2015 to October 2015. Radiographs were evaluated for the presence of occult pathologic findings, which were unrelated to the chief complaint and clinical diagnosis. Patient’s dental case sheets were retrieved from the Medical Records Department to correlate the chief complaint and clinical diagnosis with the panoramic findings. The panoramic radiographs were taken with OrthophosXG, Sirona (Bensheim, Germany) with80kVp and 12 mA. The pathologic findings which were not related to the chief complaint and clinical diagnosis were recorded. Assessment of the digital panoramic radiographs was performed directly on the monitor screen (HP Pavilion w2408 LCD, 24 inch wide screen, 1920x1200). The images were
exported and saved in Joint Photographic Experts Group (JPEG) file and no adjustment of contrast, brightness and magnification were performed. In order to reduce radiographic misinterpretation and error caused by fatigue, only 15 panoramic radiographs were evaluated per day. A systematic approach for examining the panoramic radiographs including methodical evaluation of all radiographs, looking at each anatomical region carefully and evaluation of potential lesions including location, size, borders, opacity and texture, and its impact on adjacent structures were followed. Three observers who were a professional radiologist analyzed the radiographs as per the method described by White and Pharaoh and recorded the incidental findings. (White and Pharaoh, 2004) Panoramic radiographs which were correlating with the chief complaint, clinical diagnosis and radiographic diagnosis were excluded. Missing teeth due to extraction, third molar impaction, thickening of sinus floor were excluded since all these were frequently observed as non-pathologic findings. (Geist and Katz, 1990) Since dental caries may not be clearly evident due to proximal overlaps in panoramic radiographs, it was also excluded as a pathology finding in this study. The statistical analysis done was percentage analysis. SPSS (version19) was used to analyse the data. All radiographs with pathological findings or abnormalities were re-examined by an oral and maxillofacial radiology specialist. (Friedlander, 1995) Agreement percentages and kappa indices for intra and intraexaminer variations were calculated. (Fleiss and Cohen, 1969)

RESULTS
The intraexaminer agreement percentages and kappa indices were 0.92, 0.96 and 0.98 for three observers and the mean intraexaminer reliability was 0.95. Among 1032 panoramic radiographs, occult pathologies were observed in 165 (15.98%) radiographs. The occult pathologies observed in panoramic radiographs are listed in Table 1.

Table 1. Frequency of incidental pathologies detected in panoramic radiographs (n=165)

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Pathologies</th>
<th>Number and percentage (%)</th>
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<tbody>
<tr>
<td>1</td>
<td>Periapical pathology</td>
<td>44 (26.67%)</td>
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<tr>
<td>2</td>
<td>Periodontal pathology</td>
<td>39 (23.64%)</td>
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<tr>
<td>3</td>
<td>Tooth anomalies</td>
<td>8 (4.84%)</td>
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<tr>
<td>4</td>
<td>Congenitally missing</td>
<td>9 (5.45%)</td>
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<tr>
<td>5</td>
<td>Supernumerary</td>
<td>6 (3.63%)</td>
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<tr>
<td>6</td>
<td>Generalised rarefactions</td>
<td>16 (9.70%)</td>
</tr>
<tr>
<td>7</td>
<td>Cysts and tumours</td>
<td>13 (7.89%)</td>
</tr>
<tr>
<td>8</td>
<td>Idiopathic osteosclerosis</td>
<td>04 (2.42%)</td>
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<tr>
<td>9</td>
<td>Impaction</td>
<td>03 (1.81%)</td>
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<tr>
<td>10</td>
<td>Temporomandibular joint pathologies</td>
<td>15 (9.1%)</td>
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<tr>
<td>11</td>
<td>Styloid process elongation</td>
<td>05 (3.0%)</td>
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<tr>
<td>12</td>
<td>Carotid artery calcifications</td>
<td>03 (1.81%)</td>
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</table>

Most of the occult lesions were commonly seen among the female patients (62.1%) than in male patients (37.5%) and were noticed in the mandible without any significant variation between right and left side. Styloid process elongation was an interesting occult lesion which was found in five cases (3%). Carotid artery calcification was yet another important finding observed in three cases (1.8%) Figure 1, which is an indicator for subsequent stroke. (Lumbreras et al., 2010; Cohen et al., 2002; Pornprasertsuk-Damrongrsi et al., 2006; Carter et al., 1997; Friedlander and Baker, 1994; Friedlander et al., 1994; Friedlander et al., 1999; Freymiller et al., 2000; Yoon et al., 2008; Friedlander et al., 2000) These occult findings would be of significant value and an eye opener to provide a niche in diagnosing an underlying pathologic condition with a lesser radiation exposure dosage. (Freeman and Brand, 1994)

DISCUSSION
In our study, every sixth patient who was subjected to panoramic radiograph was observed to have occult pathologies, which was unrelated to the chief complaint and clinical diagnosis. The most occult lesions were periapical and periodontal pathologies and the least common were carotid artery calcification. Periapical pathologies, periodontal pathologies, cysts and tumours required immediate management. Carotid artery calcification is one important occult pathology which will be of help in diagnosing an underlying systemic disease including cardiomyopathy, hypertriglyceridemia, etc, which requires immediate medical attention. (Ohba et al., 2003; Bayram et al., 2006; Tamura et al., 2005; Ertas and Sisman, 2011) In order to minimize the visualization error, re-examination were observed by an experienced maxillofacial radiologist. The kappa indices for intra examiner variability evaluated showed agreement ranging from 0.92-0.98 which shows a good to excellent agreement, which indicates that the results were highly reliable. A study by Bondemark et al showed 8.7% of patients with occult pathology in panoramic radiographs among patients indicated for orthodontic treatment. Among the incidental findings, 32.1% of the pathologies including periapical inflammatory lesions, dentigerous cysts and other cysts within alveolar bone, marginal bone loss, and odontomas required additional management regardless of the orthodontic treatment. High frequency of periapical inflammatory lesion (17.6%) and the presence of occult lesions in females (64.4%) in their study are consistent with the present study. (Bondemark et al., 2006) Pekiner et al. observed incidental findings in 72 (14.4%) of the 500 panoramic radiographs. The lesions were found in patients ranging from 2 years to 14 years old. The results with respect to apical osteitis, missing teeth, and supernumerary tooth were consistent with the present study. (Pekiner et al., 2011) According to a study done by Ignelzi MA, supernumerary teeth were detected as occult lesion in 2.4% of individuals which is comparable with the present study. (Ignelzi et al., 1989) Antonio Gracco et al in their study detected the percentage of pseudocyst and mucosal thickening using Cone Beam Computed Tomography; however dental and alveolar features were not recorded in that study. (Gracco et al., 2012)
Gokce et al observed carotid artery calcifications in panoramic radiographs among end stage renal disease patients. In a total of 26 patients, 11 (34.4%) had carotid artery calcifications on the right side and 21 (65.6%) on the left side. Carotid artery calcifications may be seen on panoramic radiographs adjacent to the cervical vertebrae at the level of C3 – C4 as radiopaque mass or line inferior to the angle of the mandible. Carotid artery calcifications require additional investigations with cervical spine radiographs, angiography or Doppler ultrasound analysis and imaging. (Gokce et al., 2008) A review by Lumbereras et al summarised the frequency and management of incidental findings in imaging diagnostic tests. They observed the mean frequency of incidental finding which was 23.6% and stated that the frequency of incidental findings was higher in studies involving CT. (Lumbereras et al., 2010) The frequency on incidental findings in panoramic radiographs were consistent to our study which is 15.98%. Jose et al presented a series of case reports were he insists that panoramic radiographs should be advised prior to any dental procedures since it is helpful in detecting the hidden lesions which are unrelated to chief complaint. (Jose and Varghese, 2011) Friedlander et al observed greater prevalence of calcified carotid artery atheromas in panoramic radiographs of individuals with dilated cardiomyopathy (DCM) compared to controls and concluded that calcified atheromas were seen in nine of 27 patients with DCM which is again coincides with our findings. (Sung et al., 2004)

In our study the limitation was that we have utilized panoramic radiograph which is a very basic radiographic technique. And to visualize the details accurately we need to rely upon intra oral periapical radiographs and other higher imaging modalities. Panoramic radiographs despite its limitations, still serves as an indispensable screening tool from which we can obtain myriad information. The radiological findings are not only useful for planning the dental treatment protocol, they even give us an insight of patients general health status for which appropriate investigations and treatment can be done prior to any serious complications. As part of our study, patients with occult lesions were recalled and appropriate treatment was rendered.

Conclusion

Though Panoramic radiography is a conventional mode of imaging, it is routinely carried out in most of dental health care centres. In our study out of 1032 panoramic radiographs re-examined, 15.9% images showed occult lesions, which throws light on a possible fact that every sixth person exposed to panoramic imaging might have an occult pathology, being vigilant about such occult pathologies is extremely important as it can be a serious cause of concern and timely intervention can be lifesaving.

REFERENCES


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