Dr wafa’a AL-Faleh, BDS, MS*

Abstrac

There are several errors encountered during patients preparation and positioning, this study focus on six of these errors, including palatoglossal air space above the apices of the root of maxillary teeth, slumped position, chin tipped up, or down, as well as the patient placed either too far backward or forward, the presence of any of these errors alone or in combination with each other will affect the diagnostic usefulness of the panoramic radiograph. 500 panoramic radiographs were randomly selected from inactive files of adult dentate patients seen at the dental school taken by trained technician. The radiographs were numbered and reviewed by the author under standard viewing conditions to identify the presence of these six errors. Out of 500 panoramic radiographs examined, 468 (93.6 %) showed one or more than one errors. The most common positioning error encountered was palatoglossal air space above the apices of the root of maxillary teeth 81.8 %, followed by slumped position 17.2 %. The percentage is dropped in the others errors to be between 10 –11.6 %. The high rate of errors occurred in this study can be attributed to the lake of verbal communication between the patients and the technicians. This dictate a need of continuing education program for the technicians in panoramic dental radiography.

* Lecture, Department of Oro-maxillofacial Surgery and Diagnostic Oral Science, Division of Oromaxillofacial Radiology, College of Dentistry King Saud University, Riyadh.KSA
wafaalfaleh@hotmail.com  PO Box 5967 Riyadh 11432 Saudi Arabia
INTRODUCTION

Since the introduction of panoramic radiography into general practice of dentistry in the early 1960’s, it has gained considerable popularity as a diagnostic tool. The panoramic film is used alone or in combination with other radiographic views (1). It is a simple extra-oral procedure that visualizes the entire maxillomandibular region on a single film. The simplicity of operation, the broader scope of examination, ability to project anatomic structures and their intervening parts, as well as the low radiation dose are reasons for its continuously growing popularity. The equipment available for panoramic radiography has had rapid development during the last two decades. A variety of machines using different principles of x-ray beam rotation are available for the dental profession (2-6).

The value of panoramic radiograph is reduced when they are of poor diagnostic quality. This poor quality usually is not a result of an inherent limitation with the equipment but rather is a result of errors made by the operators during patient positioning (7).

The aim of this study is to identify the most common positioning errors encountered in dental school made by the well-trained dental radiology technicians.
MATERIAL AND METHODS:

500 panoramic radiographs were examined from inactive patients files made by trained technicians, at the dental school, King Saud University, Riyadh.

The radiographs were made using two panoramic machines, the first, panoramic machine* with exposure parameters of 57-90 KV, 5-12 mA and total filtration of 2.5 mm Al / 80 IEC-522 using cronex intensifying screen HI plus regular speed and Kodak X-OMAT RP pan DF 75. The second panoramic X-ray machine ** with a total filtration 2.5 mm aluminum and fixed magnification of 1.2 using Kodak lanex regular screen and Kodak films T-Mat L/ RA), performed by several trained dental radiology technicians, the films processed in the same processing machine. No attempts were made to identify which panoramic machine the film was made. However, radiographs of children and edentulous patients were excluded from the study.

The radiographs were chosen at random, and then were numbered and reviewed by the author to identify the most common panoramic positioning errors described by langland (7). The presence or absence of the following errors was identified: patients too far forward, patients too far backward, chin tipped too low, chin raised too high, slumped position, tongue not contacting the palate. Other factors, such as processing and handling artifacts were not considered.

* orthopantomograph 10 machine ( siemens Germany).

**PM 2002 cc proline panoramic X-ray machine (PlanMeca, finland)
The statistical Package for the Social Sciences (SPSS) was used for the statistical analysis, the significance of differences between different types of errors was analyzed by chi-square test; the level of statistical significance was $P<0.05$ otherwise denoted as not significant.

**RESULTS**

Out of the 500 panoramic radiograph viewed, 468 (93.6 %) radiographs have shown one or more positioning errors. The most common positioning error observed in the radiographs taken by trained technicians was a radiolucent shadow over the roots of the maxillary teeth (fig 2). It was detected in 409 radiographs (81.8%), which represent the palatoglossal air-space due to that the patient’s tongue was not contacting the palate during the exposure. Another error, which was a radiopaque ghost shadow of the cervical spine superimposed on the symphyseal region, was found in 86 panoramic views (17.2%) fig (3). The errors in relation to antro-posterior plane, as well as in relation to the occlusal plane were found but in lesser degree. however, fig (4&5) reflect the improper vertical alignment of the occlusal plane. The errors encountered during patients positioning for panoramic radiography are presented in table (1) and the histogram in Fig (1).

There was a statistical significant difference between both the tongue space and slumped position error and the other errors investigated in this study ($P < 0.05$). However, no significance difference was found between the errors related to the horizontal plane or those pertinent to the antero-posterior positioning of the patients, which determines placement of the jaws inside the focal trough ($P > 0.05$).
Table 1. The incidence of errors in 500 panoramic radiographs.

<table>
<thead>
<tr>
<th>Radiographic error</th>
<th>No of errors</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tongue not in the palate</td>
<td>409</td>
<td>81.8</td>
</tr>
<tr>
<td>Slump position</td>
<td>86</td>
<td>17.2</td>
</tr>
<tr>
<td>Chin too high</td>
<td>58</td>
<td>11.6</td>
</tr>
<tr>
<td>Too far Backward</td>
<td>56</td>
<td>11.2</td>
</tr>
<tr>
<td>Chin down</td>
<td>51</td>
<td>10.2</td>
</tr>
<tr>
<td>Too far Forward</td>
<td>50</td>
<td>10</td>
</tr>
</tbody>
</table>

Some radiograph showed more than one error.

fig (1). common errors encountered in panoramic radiographs examined.
Figure (2). The tongue was not positioned in the palate leading to a radiolucency obscuring the apices of maxillary teeth.

Figure (3). Ghost image of cervical spine superimposed on the anterior region due to slumped position.
Figure (4). Excessive curving of the occlusal plane, with loss of the image of the roots of the lower anterior teeth due to chin tipped to low.

Figure (5). The chin tipped too high leading to flat occlusal plane,
DISCUSSION

The use of panoramic radiography has shown a marked increase in private practice, in hospitals and within the community dental services. Panoramic radiography is a screening tool in children, adults and edentulous patients as well as for pre-treatment and post-treatment evaluation tool that proved to be very valuable \(^{(8)}\). The scope of panoramic radiography includes orthodontics, implantation, and surgical treatment provided that diagnostic radiographs with optimum quality are obtained to give the dentist sufficient information to build up his diagnosis \(^{(1)}\). Therefore, this study was performed to evaluate the common panoramic errors encountered during patients positioning, which may interfere with the establishment of proper diagnosis and decision-making.

Not all panoramic errors compromise the diagnostic value of the panoramic radiograph. Therefore, in this study only six positioning errors were considered because of their marked influence on the diagnostic quality of radiographs. The palatoglossal airspace shadow appears as a radiolucent area over the apices of the maxillary teeth and, thus, renders the interpretation of the periapical region difficult or even non-diagnostic.

Panoramic images are generally show magnification at a ratio that ranges from 10 to 30 %. However, with panoramic imaging the degree of horizontal magnification varies considerably, depending upon the relationship of the structure to the image layer, Therefore inaccuracies in patients positioning lead to discrepancies between vertical and horizontal magnification of teeth, with consequent distortion of their shape \(^{(8)}\).
Considering the antero-posterior position of the patients, distortion and blurring of the anterior region of the mandible occurs when the patient is positioned too far forward or too far backward. Also, considering the slumping error, a radiopaque shadow, the ghost image of the spine, can prevent identification of any pathological lesion that may occurred in the anterior region of both jaws.

Panoramic radiography may not be suitable for some patients because of their physical stature, facial asymmetry, or their inability to follow properly the instructions. These hinder their proper positioning of the patients inside the machine. Here, the panoramic error is inevitable (9).

The diagnostic quality of a panoramic radiograph is heavily dependent upon careful attention to technical and processing factors. In this study, from the 500 panoramic radiographs evaluated, the tongue wrong positioning in the palate during exposure was the most common error identified; this result is in acceptance with the result obtained in the studies done by many investigators (9-12). In this study, it has been found in 81.8% of radiographs, which is higher than the result obtained by those investigators (9-12). The possible explanation for this error may be a lack of communication between the dental technicians and the patients, as they are not communicating together easily because of their different language. The technician may find difficulty to instruct the patients to swallow and to keep the tongue on the roof of the mouth. Another explanation is that the patients sometime may misunderstand the instructions, putting only the tip of the tongue on the palate, or the patients do not pay much attention to the instruction given by the technician.

Slumping of the patients and that ghost shadow on the symphsis may be attributed to that, there is an inherent tendency for patients when holding the hands of the machine
The dental technician need to make sure before taking the radiograph that, the patient’s back and spine are erect with the neck extended. In this study, the slumped position is the second error encountered as far as the incidence is considered. It has been found in 86 radiographs, which is less than the result obtained by Akarslan et al (10), and Brezden et al (12).

Forward and backward position of the teeth on the notched bite block may be attributed either to a misunderstanding of the patients or even to his/her underestimation the importance of proper positioning, the result of this study differ relatively from that of Akarslan et al and Schiff et al (9,10) where their finding is less than this study. This difference is due to that panoramic radiographs were taken only by two trained technicians. Whereas, in this study the panoramic radiographs were taken by several technicians. In addition, these errors were less frequently incident than those detected in the radiographs assessed by Brezden et al (12). Rushton et al (8) combined the backward and forward position together, so he had 58.8% in his study sample, which is consider higher than the result obtained in this study.

There was agreement between this study and the study done by Akarslan et al and Schiff et al (9,10) for the errors encountered in relation to the occlusal plane. (chin up, chin down).

In many instances multiple errors occurred in one image, this could be due to that an inadequate time was spent for patient preparation and positioning.
**Conclusion**

The value of any diagnostic procedure depends upon the amount of information gained by its utilization. In panoramic radiography, there are numerous factors only pertinent to panoramic radiography, which can reduce the diagnostic quality of radiographs. Ahead of these factors is the improper patient positioning. The dentist should be aware enough to monitor the quality of panoramic radiographs making sure they are free of positioning errors.

**Acknowledgment.**

The author gratefully acknowledges Professor Mohammed Ekram the head division of oral and Maxillofacial Radiology, dental college, King Saud University for reviewing this manuscript.
REFERENCES


