

Original Research Article

## Evaluation of Frequency of Periapical Radiographic errors in Dental Radiology Department in Zahedan in 2014- 2015

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**Abstract:** Dental radiography plays an important role in the diagnosis of the mouth and teeth diseases. Different methods are used for improving the quality of radiographic images of patient and for limiting the contact with ionization radiation. The aim of this study is to evaluate the frequency of radiographic errors of periapical. In this study, a number of 2292 periapical radiographic films taken by bisector method were examined to determine the frequency of the errors. The X-ray films were produced by dental students from patients then they were classified based on the type of the error. Among the 2292 X-ray radiography films in this work, a number of 296 had errors (12.9%), 4 cases of the greatest errors in this study were Elongation (19.6 %), improper placement of films (18.9 %), Cone cut (14.6%) and cut of the apex in the radiography (13.9 %). Considering the importance of reducing the risk of exposure to ionizing radiation, as well as decreasing the time and cost, organizing appropriate plans for academic and practical training of dental students is proposed to reduce the radiography errors.

**Keywords:** Dental Radiology, Periapical Radiographic, Diagnosis

### INTRODUCTION

Radiography plays an important role in the diagnosis of pathological circumstances. The low quality of dental radiographs containing errors resulted from darkroom or techniques is one of the greatest and the main diagnostic problems of dentists[1, 2]. Dentist's diagnosis will affect the treatment plan of the patient. Repeating the radiographs in order to fix the error, results in re- exposure of the patient and thus increases the radiation dose received by patient[3]. Although some standards have been defined for grading the quality of dental radiographs recently, many dentists have some difficulties in attainment it. To avoid misinterpretation, the dentist must provide an acceptable radiograph and thereby provide proper clinical services to the patients. Therefore, the dentist should improve his/ her ability regard to this technique[4].

Some part of the dentistry training courses is related to Maxillofacial Radiology in which the ability

to recognize and interpret of radiographs errors is an important part of training in this course in many reasons[5]. One of the most important safety principles in the radiography is using methods for reducing the radiation exposure to patients[1]. Repeating of radiographs errors results to waste the time, film and processing solutions as well as to increase the dose to the patient[6].

Developing the science and technology, public awareness of the dangers of ionizing radiation has been increased and dental patients always request them. The goal of physical health is preventing certain effects, reducing the occurrence of potential effects and minimizing the contact of staffs and patients with radiation during radiographic examination. The factors that cause repeated radiography and exposure of the patient and technicians with the radiation is a part of the monitoring of environmental protection against radiation[7].

**MATERIALS AND METHODS**

This cross - sectional study was performed in the Department of Oral Medicine, Dental School, Zahedan. The students of 7th semesters in two- credit practical radiology entered in clinical section, in groups of 3 to 4 people and in the rotations within 10 days. Teaching of students about preparing periapical radiograph of different parts of jaw is conducted in one-credit practical course and on the Phantom. However, at the beginning of each rotation, the principles of providing periapical radiographs were re-trained. Differences in various anatomic parts of jaw regard to proper access and good vision, movement of facial muscles specially tongue and lack of cooperation of some patients, were problems that students were faced with. In this study the samples were consisting of reviewing all radiographs which were taken by students using the Bisector technique in the radiology department during a semester. In this study, the check list method was used for collecting the information, in which the information was marked at first by senior dental students and at last by oral and maxillofacial radiologists during verifying the photographs taken by students. This check list included a variety of errors related to radiographic technique and processing in radiographs developed by students of the previous semesters. It was corresponded to the most common errors listed in different studies, as well. Radiographs without good enough quality in terms of resolution and with distortion (deformities) were not delivered to the patient and radiography was repeated. The processing

of all the radiographs were performed by an automatic processor. Finally, spss version 21 was used to analyze the information.

**RESULTS**

Among 2292 radiographs taken by students in the Radiology Department of Dental School Zahedan, a number of 296 (12.9 %) had errors, 281 radiographs were with technical errors (94.9 %) and 15 radiographs had errors resulted from processing (5.1 %). The results indicated a higher frequency of technical errors in the study group Among the 281 radiographs with technical errors, the most frequent errors were Elongation with frequency of 55 (19.6 %), incorrect placement of films with frequency of 53 (18.9 %) and Cone cut by repeating in 41 cases were the next most common errors (14.6 %). According to the information in Table 1 As well as in 15 errors resulted from processing in 296 radiographic films, 281 cases (94.4 %) had technical errors, and 15 (5.1 %) had processing errors.

According to the information in Table 2 the most common technical errors caused by students were Elongation (elongation of image), the incorrect placement of the film, Cone cut and cut off the apex of the X-ray respectively.

Table 3 shows that the most common processing errors are paper sticking to the films during film processing. The maximum errors are paper sticking to the films with frequency of 8 (53.3 %).

**Table 1: Results of radiographic errors**

Radiographic error	Frequency	Percentage
Technical error	281	94.9 %
Processing error	15	5.1 %
Total	296	100 %

**Table 2: Distribution of technical errors frequencies**

Technical error	Frequency	Percentage	Cumulative Percent
Elongation	55	19.6	19.6
Foreshortening	20	7.1	26.7
Incorrect Horizontal Angle	37	13.2	39.9
Incorrect Videos Placement	53	18.9	58.7
Cone cut	53	18.9	58.7
Cut of the Apex in Radiography	41	14.6	73.7
Dark Radiography	39	13.9	82.2
Light Radiography	5	1.8	89.0
Unexposed Film	3	1.1	90.0
Motion Blur	12	4.3	94.3
Re-radiation to Films	7	2.5	98.6
Placement of Back and Front of Film	4	1.4	100.0

**Table 3: Distribution of processing errors frequencies**

Processing Errors	Frequency	Percentage	Cumulative Percent
Light Exposure of Film in darkroom	4	26.7 %	26.7
Scratch of Film in Processing	3	20 %	46.7
Paper Hang to Film	8	53.3 %	100.0
Total	15	100.0	

## DISCUSSION

One of the most important safety principles used in preparing of radiographies is utilizing the methods for reducing X-rays exposure to the patients[1&8]. The errors and their reputation in radiography lead to increase the x-ray exposure to the patient. Repeated radiographs also result to the waste of time and additional costs[2&3]. Exposure risk of the ionizing radiation used for medical and dental purposes, has always been a controversial subject. It is now accepted that to minimize this risk, all exposures must be minimized (ALARA). Today, different scientific and technological advancements in intraoral radiography are provided to reduce the dose, including the use of the fast films (F and E speed) and rectangular collimation (Rectangular collimation) in which the reduction of received dose is 50% and 60% respectively[9]. The technical errors made by the practitioner, would require repeated radiographs as a result they would increase the patient's exposure. Factors that affect the quality of intraoral radiographs are including patient preparation, receptor placement and adjusting the central beam in vertical and horizontal angles[10]. In this work, the frequency of errors in periapical radiology has been evaluated in Radiology Department of Zahedan. The 2292 X-ray radiographs were taken by students a number of 296 (12.9%) films were separated due to errors, 281 films were (94.9 %) with technical errors and 15 films (5.1 %) had processing errors. In a study conducted by Patel, among 24150 X-rays produced by students, 2238 film were unacceptable due to one or more technical errors (9.2%)[11].

In addition to in the study of Rushton, the x-ray radiographs were investigated regard to technical and processing errors, in which 49% radiographs were unacceptable, 49% had slight deficient and only 2% were excellent, after training and changing the procedure 39% of radiographs were unacceptable, 56% were acceptable and 5% were excellent[3]. This study is different from two recent studies, such that there is training intervention. Based on the results it was shown that training of students reduces errors significantly. As well as in a study conducted by Kazzi for determining the quality of films after root canal therapy, it was revealed that 16.7 % of films produced by parallel method and 48.9 % films produced by bisector techniques had unacceptable quality[12]. In a study of Ezzeddini, a number of 3361 radiographs prepared by

dental students were examined, 1217 of them had errors (36.2 %). About 36.5 % of errors were processing errors and 63.5 % were technical errors. These students were trained and were tested again to obtain skills in the preparation and interpretation of the X-ray radiographs. Out of 3500 X-ray radiographs taken after training about 350 had errors (10%), in which 35.5 % were processing errors and 64.5% were technical errors[1]. Haghnegahdar in his study investigated 3188 periapical radiographs which have been taken through bisector method in which a number of 113 radiographs were technically unacceptable (3.5 %)[13]. Other purpose of this study is to evaluate the frequency of different types of technical errors, the most frequent technical errors in this work were Elongation with frequency of 55 (19.6 %), improper placement with the frequency of 53 (18.9 %), Cone cut with 41 frequent (14.6 %), cut off the apex in 39 cases (9/13%), which these results are consistent with the results of Ezzoddini's study. The most frequent errors in the mentioned study, were Elongation, incorrect placement of the film, Cone cut and cut off the apex of the X-ray radiographs respectively[1]. Furthermore in the study of Zhang the main technical errors, were Elongation together with Shortening Con (38.84 %), wrong horizontal angle (37.16 %), improper placement of films (14.16 %) and Cone cut (5.59 %)[14]. In the study of Patel, wrong placement of the films (64.9 %), Elongation and Shortening with together (11.57 %), Cone cut (11.17 %) and wrong horizontal angle (4.6 %), were the greatest technical errors respectively[11]. In the study, conducted by Kazzi, the most frequent errors were Cone cut, wrong placement of films, Elongation and Shortening[12]. In the study of Haghnegahdar the most common technical errors were wrong placement of films (35.4 %), Cone cut (18.2%), wrong horizontal angle (16.6 %), Elongation and Shortening (14.4 %), respectively[13]. Another aim of this study was to obtain the frequency of processing errors. In this work the highest processing errors, were sticking of paper to the films (8 out of 15), light exposure of film in the darkroom (4 out of 15) and scratching of films during processing (3 out of 15 patients), however, in the study of Ezzeddini the most common processing errors were yellow-brown color, smog in the film, white and black spots and scratches[1].

## CONCLUSIONS

The results indicate that about 12.9% errors were existing in the x-rays radiographs taken by students. The most common technical errors in this study were technical (94.9 %), including Elongation, Cone cut, incorrect placement of films and cut of the apex in the X-ray films. Existing of errors in the X-rays films decreases the quality of the X-ray radiographs, and results in reduced ability of dentist in the treatment of patients. The results indicate that about 12.9 % errors occur in the x-ray films taken by students. According to the interval between the clinical training and theoretical training of radiology department, it is essential that the required training about radiography errors and the way of their fixing are provided to the students at the beginning of the practical course in order to increase the dentists' skills in preparing high quality radiographs, to strengthen the medical diagnosis of dentist and to reduce the risks of contacting of staff and patients with ionizing radiation.

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