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Bandung, 11 - 12 Nov 2016
Holiday Inn Pasteur

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Description of Panoramic Radiograph Failure at RSGM UNPAD

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ABSTRACT

INTRODUCTION:The panoramic radiograph is a single and a large X-ray film that shows the entire face and the bony structure of the teeth. There are few errors in performing panoramic radiographs such as positioning errors and technical errors. **Objective**: The purpose of this research is to identify the failure of panoramic radiograph at RSGM UNPAD.**Materials and methods**The method of this research was a descriptive research with secondary data collected by a cross-sectional technique from February until March 2016. There were 418 total sample of failed panoramic radiograph taken in the Radiology Installation of RSGM UNPAD.**Result**:From the result, the largest proportion of the sample is from criteria 9, contact between tongue and palate, which accounts for (46.41%). This is followed by criteria 3, chin pointing upward (23.44%), criteria 10, open lips (20.81%), criteria 2, head behind of the plane focus (17.46%), criteria 7, head turned to the right (14.35%), criteria 11, incorrect position of the spine (13.39%), and criteria 6, head tilted to the leaf (11.24%). Meanwhile, there are five criteria reported the least number of sample firms, which account for less than 10 percent, namely criteria 1, head forward of the plane focus (9.33%), criteria 4, chin pointing down (8.61%), criteria 8, head turned to the left (8.37%), criteria 5, titled to the right (7.65%), and criteria 12, movement during exposure (6.93%). **Conclusion:**As a conclusion, the error that occurs most often is the patient does not put their tongue on the palate accounts for, while fewest error of the criteria applicable is as much as movement during exposure.

Keyword: Panoramic radiograph, Failure, RSGM UNPAD

INTRODUCTION

A panoramic radiograph is considered useful and practical to complement the clinical examination in the diagnosis of diseases of the teeth, such as endodontic disease, and disease of the bones of the face[1]. One of the complementary exams more often performed

by the dentist has been the radiographic examination, which is important in the auxiliary diagnostic in oral problems.[2]

The main indications of panoramic radiography are the general survey and oral health; provide best subsidies for surgical procedures; initial and progressive evaluation for orthodontic treatment; information on growth and development in children. Moreover, the review about chronological dental eruptions and axes of eruptions of permanent teeth; cystic lesions or neoplastic views; dimensional measurement for implantology; historical documentation of the patients; evaluation of the temporomandibular joint and to detect the existence of foreign bodies are also the indication of panoramic radiography.[3]

In some cases that the image quality is not satisfactory, the value of the radiographic images decreases and they should be repeated. It will also result in increased exposure to radiation, more cost, and waste of time (Kaviani et al., 2008) Such compromised quality is not the result of the existing limitedness of radiographic equipment; rather, they usually result from errors committed by the operators during patient adjustment. Therefore, knowledge about common errors during preparation for panoramic radiographs might be effective in preventing unnecessary exposure of the patients to radiation, wasting their time, imposing extra costs on them, and finally resulting in high-quality images.[4]

In a study by Rushton, the most common technical errors were the patient anteroposterior position, and low radiographic contrast and density.[5] In another study, 35% of the images were free of errors and in 20% of them the patients' head were in a more anterior position than the standard. In 15.5% of the images, the patients had not placed their tongues on the palate.[6] In general, the least frequent error was related to patient movement.[7]

In a study by Al-Fateh, the most common positional error was a superimposition of the palatoglossus air space on the roots of maxillary incisors (81.8%), followed by a half slumped position of the patients (17.2%).[8] In a study by Glass et al., the most common errors in panoramic radiographs of 75 edentulous patients were evaluated; in 67 radiographs (89.3%) there were one or more errors regarding the correct positioning of the patients.[9]

In a study by S.Pandey, all radiographs taken for a 3 months period were 1010. All panoramic radiographs examined for various errors. Data were analyzed for the frequency of some faults, both technical and processing errors, which directly contributed to the failure of the radiographs. Total 1010 radiographs were analyzed for errors. 27.5% (n=278) were showing errors which ranged from technical errors 11.3% (n=14) to positional errors 16.2% (n=164) and 72.5% of radiographs were error free. The most common technical error was density/dark radiographs which were 45% (n=51) and the most common positional error found was tongue not resting against the palate, 20% (n=32).[7] A perfect X-rays cannot be done immediately but takes time to get it.[10]

Concerning the importance of panoramic radiography in the field of dentistry, a study will reveal the failure of panoramic that usually occurred in performing this radiograph for the operator's reference and guidance in order to minimize the errors that usually happened. Based on the information above, the author is interested in conducting a research that

investigates the positioning errors of panoramic radiograph at the Radiology Installation of RSGM UNPAD will be conducted. The aim of this study is to identify the failure of panoramic radiograph at the Radiology Installation of RSGM UNPAD.

The purpose of this research is to determine the common factors that are affecting the failure of panoramic radiograph at the Radiology Installation of RSGM UNPAD.

MATERIALS AND METHODS

The design of this research will be descriptive study. It will be carried out by making overviews of common failures in performing panoramic radiograph at the Radiology Installation of RSGM UNPAD. The population of this would be all the panoramic radiographs at RSGM UNPAD. The samples used in this research will be the failed panoramic radiographs taken in the Radiology Installation of RSGM UNPAD that meet the positioning error criteria. The sample size will be determined by purposive sampling technique. The total sample size calculation would be estimated from 450 samples to 500 samples.

This research would only enroll, the failed panoramic radiographs due to incorrect position that was taken at RSGM UNPAD:- [11]

Head positioned forward the plane of focus
Head positioned behind the plane of focus
Chin pointing upward
Chin pointing down
Patient's head tilted to the right
Patient's head tilted to the left
Patient's turned to the right
Patient's turned to the left
Absence of contact between tongue and palate
Open lips
Incorrect positioning of the patient's spine
Patient movement during exposure

RESULT

Table 1 Distribution of Subject According to Gender

Gender	Total Radiograph	Percentage (%)
Male	185	44.26 %
Female	233	55.74 %

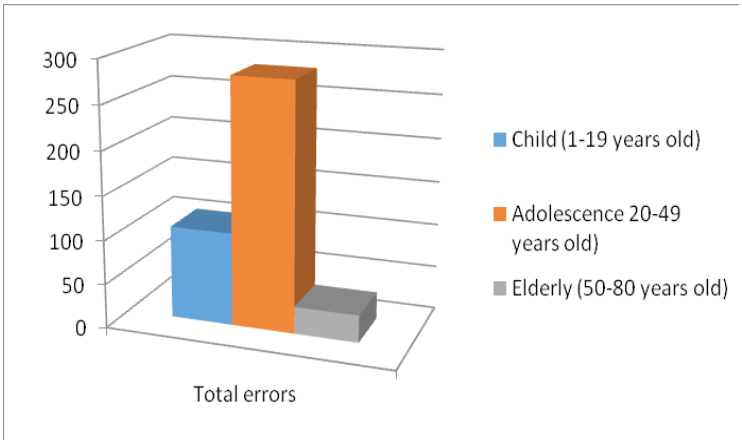

Diagram 1 Distribution of subject according to gender

Table 2 Total Errors Based on the Age Group

Age Group	Total errors	Percentage (%)
1-19 years old	106	25.36 %
20-49 years old	281	67.22 %
50-80 years old	31	7.41 %

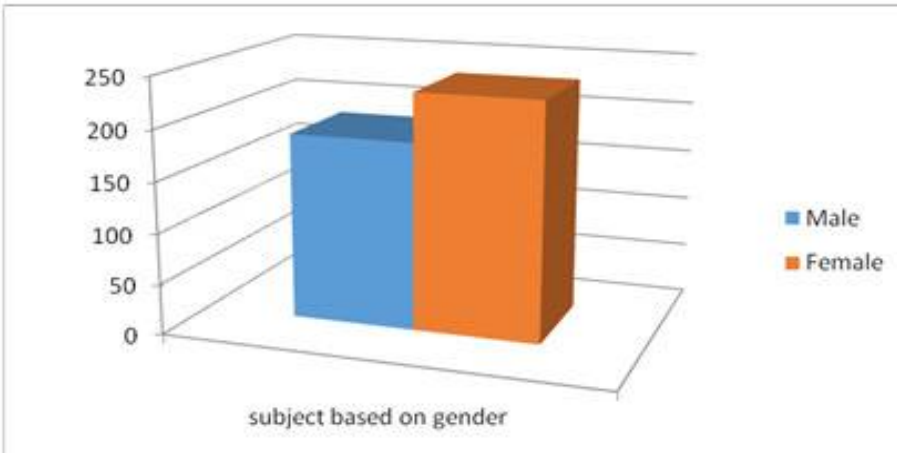

Diagram 2 Total Errors Based on the Age Group

Table 3 The Result of Positioning Errors Observed in RSGM UNPAD

Panoramic Radiograph Failure at RSGM UNPAD		
Criteria	**Total errors**	**Percentage (%)**
Head forward of the plane focus	39	9.33 %
Head behind of the plane focus	73	17.46 %
Chin pointing upward	98	23.44 %
Chin pointing down	36	8.61 %
Head tilted to the right	32	7.65 %
Head tilted to the left	47	11.24 %
Head turned to the right	60	14.35 %
Head turned to the left	35	8.37 %
No contact between tongue and palate	**194**	**46.41 %**
Open lips	87	20.81 %
Incorrect position of spine	56	13.39 %
Movement during exposure	**29**	**6.93 %**

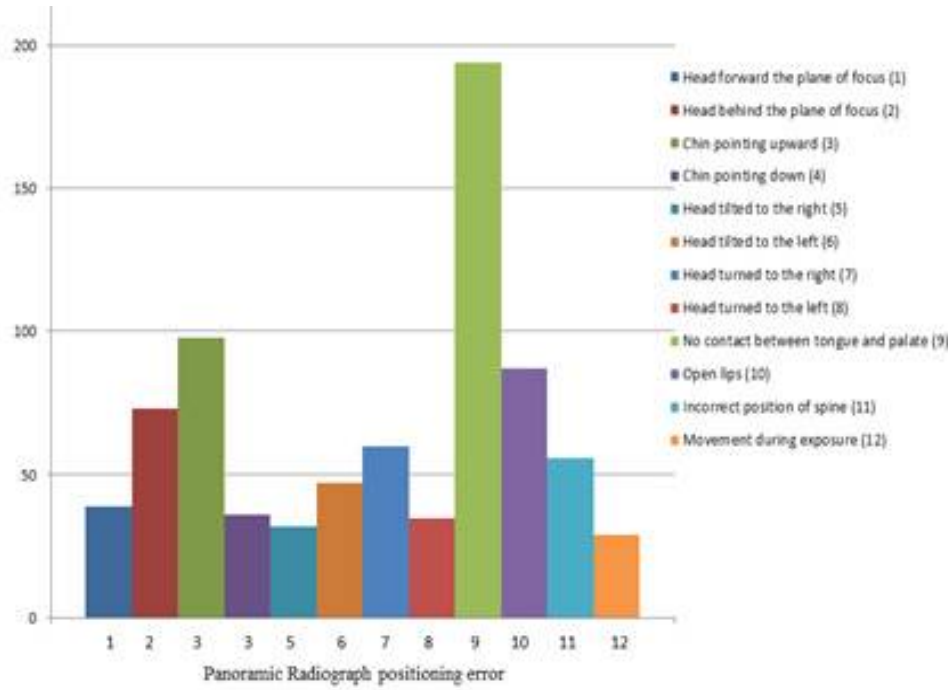

Diagram 4.3 The Result of Positioning Errors Observed in RSGM UNPAD

DISCUSSION

Table 1 and diagram 1 shows the female is the majority subject to the percentage of 55.74% with a total of 233 panoramic radiographs whilemale subject is 44.26% with a total of 185 radiographs. This result is aligning with a previous researcher Benjamin et al (2011) with results, 47.3% males and 52.7% females where the female subject is higher than the male subject.

It can be further seen in Table 2 and Diagram 2, the result of total errors is classified into three stages of age group. Stage one, child from the age of 1 to 19 years old, stage two, adolescence from the age 20 to 49 years old and stage three, elderly from the age 50 to 80 years old. With regards to the classification of total errors into a respective age group, the largest proportion of the total errors is from the adolescence group (20-49 years old), which accounts for 67.22% of the total errors. This is followed by child group (1-19 years old) 25.36% and elderly (50-80 years old) 7.41%. This result is not in any agreement of researchers because many of the studies excluded the child subject from their sample of the study. This is proved by the study done by Dhillon, 2012 and Al-Faleh where they excluded child as their sample of the study. In brief, these results indicate that the majority of the age group that usually makes positioning errors are from the age group of 20 to 49 years old (adolescence).[8,17]

Table 3 and diagram 3 provide the descriptive statistics of the sample across 12 specified criteria of positioning errors that have been employed in this research. With regards to the identified criteria, the largest proportion of the sample is from criteria 9, contact between tongue and palate, which accounts for (46.41%). This is followed by criteria 3, chin pointing upward (23.44%), criteria 10, open lips (20.81%), criteria 2, head behind of the plane focus (17.46%), criteria 7, head turned to the right (14.35%), criteria 11, incorrect position of the spine (13.39%), and criteria 6, head tilted to the left (11.24%). Meanwhile, there are five criteria reported the least number of sample firms, which account for less than 10 percent, namely criteria 1, head forward of the plane focus (9.33%), criteria 4, chin pointing down (8.61%), criteria 8, head turned to the left (8.37%) criteria 5, titled to the right (7.65%), and criteria 12, movement during exposure (6.93%).

The results from the survey report 39 errors (9.33%) is grouped under criteria 1, the patient's head forward of the plane focus. This result is in agreement withresults obtained in the studies done by Shakeel Khan (2015) where the result of patient's head forward the plane of focus error percentage is 20.8% that examined 480 samples which is higher than recent study. They differ in result because a study by Shakeel Khan, 2015 examined all pretreatment digital panoramic radiographs of patients with permanent dentition, presenting to the Orthodontic Department where recent study the sample is taken from a various department. According to Choi (2012), the images in a radiograph will appear shortened and narrowed due to the front teeth located out of focus with a blurred aspect.[12] In addition, the premolars will overlap the column on the ramus of the mandible.

Table 4.3 also indicates that 73 errors which represent 17.46% is grouped under

criteria 2, the patient's head behind of the plane focus. This result is in agreement withresults obtained in the studies done by Dhillon (2012) that the result shows 30.0% of percentage for patient's head positioned behind the plane of focus based on 1,782 samples which is higher than recent study. The explanation to the differ in result compare to recent research is that the period of sample from the study of Dhillon is taken for 38 months while recent study is taken for 2 months. This occurs when the patient's head positioned behind the plane of focus, the dental arches, especially the anterior teeth are located outside of focus with a blurred aspect as seen on the forward head positioned in expanding along a horizontal direction. This is supported by Passler and Vesser 2006; Langland and Langlais, 2002, who stated that the condyles can be designed to the side edges of the image receptor .[13,14]

The other explanation for 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 underestimate the importance of proper positioning in performing the panoramic radiograph. In this study backward positioning (17.46%) was more prevalent than forward positioning (9.33%). This is with agreement by Dhillon et al that reported in their study that backward positioning of the patient (30%) was more prevalent than forward positioning (18.3%)

Meanwhile, there are 98 errors (23.44%) is grouped under criteria 3, chin pointing upward. This result is in agreement withresults obtained in the studies done by Al Faleh (2002) that the result recorded for the percentage of chin pointing upward account for 11.6% that examined 500 samples which is lower than recent study. The result differs as seen that the studies done by Al Faleh is only focused on six positioning errors compared to recent studies that focus on twelve criteria of positioning errors. Under those circumstances, if the chin is elevated, the occlusal plane on the radiograph appears flattened or inverted, and it creates a distorted image of the jaw. Hence, the shadow radiopaque palate bone overlaps the roots of the maxillary teeth. Accordingly, Ezoddini Ardakani (2011) argued the chin of the patient and the occlusal plane must be positioned correctly so that distortions are avoided.[15] In contrast, if the chin pointing down, the teeth are too overlapping region and the symphysis may be out of the jaw radiography. In addition, both mandibular condyles can be projected out of the upper edge of the image .[16] As shown in table 4.3 the results indicate there are 36 errors is grouped under criteria 4, chin pointing down (8.61%). In another research stated that the percentage for chin pointing down is (12.5%) by Shakeel Khan (2015) based on 480 samples which is higher than recent study. The differ in the result is because of the amount of sample conducted by Shakeel Khan et al higher.

Furthermore, the results of the research pointed out that there are only 32 errors (7.65%) is fall down under criteria 5, titled to the right, while 47 errors (11.24%) fall down under criteria 6, titled to the left. In fact, Dhilllon (2012) states that it is very common for the patient to incline or turn the head to the right or left. Therefore, it is possible to observe the radiographic image in an asymmetric structure to the side to which has the slope seemed to have reduced in size compared to the opposite side and occurs marked overlapping in the proximal surfaces.[17] This result is also supported in the research by Dhillon that the percentage of patient's head tilted to left or right is 12.7% that examined 1,782 samples.

The explanation to the differ in result compare to this research is that the amount of sample from the study of Dhillon is taken for 38 months while this study is taken for 2 months with a large sample size.

In addition, criteria 7, head turned to the right and criteria 8, head turned to the left report the total error as 14.35% and 8.37%, respectively. For this reason, the film shows that the teeth on one side of the midline appear to have extended and to overlap the sharp proximal surfaces, whereas, the teeth on the opposite side are shown shortened. As a result, the branch from one side of the mandible appears much larger than the other one, and the condyles differ in size. This result is in agreement with theresult obtained in the studies done by kaviani (2008) reported that the percentage of patient head rotation to left or right occurred accounts for 39.5% based on 250 samples. They differ in a result seen in the study of kaviani higher than recent study because the amount of sample is lower than a recent study that only emphasize in positioning error compared to the previous study by kaviani that conducted darkroom errors, failure to remove metallic accessories, and equipment setup error.

On the other hand, Table 4.5 highlighted that 194 errors are grouped under criteria 9, no contact between tongue and palate meanwhile 87 errors is grouped under criteria 10, open lips. Under that situation, the absence of tongue contact with the palate is identified by the visualization of a radiolucent band designed at the height of the apex of the upper teeth in a panoramic radiograph. Moreover, if the tongue is not on the plate or the lips are open, the air between the parted lips obscures the crown of the upper and lower teeth. The apical region of the maxillary teeth is obscured by the dark air space between the dorsum of the tongue and the hard and soft palates (palatoglossal air spaces). This is supported by Akarslan et al., (2003) who provided that the position of the tongue also has a great influence on the quality of the radiographic image.[18]

The possible explanation for this error may be a lack of communication between the operator and the patient because of different languages. The technician may find difficulty in instructing the patient to swallow and to keep the tongue on the roof of the mouth. Another explanation is that the patient sometimes may misunderstand the instruction, putting only the tip of the tongue on the palate, or the patient does not pay much attention to the instruction given by the operator. Finally, criteria 11, incorrect positioning of spine and 12, patient movement during exposure show a result of 56 errors and 29 errors, respectively. This result is in agreement with the result obtained in the studies done by Al Faleh (2002) research that the incorrect patient's spine occurred accounts for 17.2% that examined 500 samples. With respect to posture of the patient, the incorrect column positioned and movement during radiography can produce a "ghost image" in radiopaque area in the center of radiography, in the region of the incisors, as well as blurred portions in radiography and large site defects in the inferior border of mandible.[17] The explanation for the incorrect spine is there is a natural inherent tendency for patients when holding the handles of the machine to slump. The dental technician needs to make sure before taking the radiograph that, the patient's back and spine are erect with the neck extended.

Based on table 4.3 the result shows the largest percentage is absence contact of the tongue on palate criteria account for 46.41%. This is supported by S. Pandey in 2014 that also result in the highest amount of percentage is 71.6% that examined 1010 of radiographs.[7] The least numbers of percentages based on the research result are patient movement during exposure, which is accounted for 6.93%. This is confirmedby the study of Dhillon in 2012 that examined 1,782 radiographs of panoramic with a percentage of 1.6%.[17]

CONCLUSION

The most frequent type of mistake in panoramic radiograph is patient positioning errors. Based on current research that has been conducted, the most common of positioning error is the patient does not put their tongue on the palate. Meanwhile the least common of positioning error is patient movement during the exposure of panoramic radiograph.

ACKNOWLEDGEMENT

Bismillahirrahmanirrahim. In the name of Allah SWT, the Most Gracious and Most Merciful for His blessings and His will to grant me strength, willpower and determination to complete my thesis as one of the requirements to graduate as Sarjana Kedokteran Gigi at Faculty of Dentistry, Universitas Padjadjaran.I would express my deepest and sincere gratitude to all these individuals who helped me directly and indirectly throughout the process of completing this minor thesis.Dr. Nina Djustiana, drg., M.Kes as the Dean of Faculty of Dentistry, University of Padjadjaran.Drg, Ria N Firman, M.Hkes., Sp.RKG (K), as my first supervisor for her full guidance, valuable time, immense patience, constructive suggestions and advice in the study deserve my warmest gratitude.Drg, Farina Pramanik. MM., Sp.RKG, as my second supervisor for her valuable ideas, inspiring discussions, endless encouragement, guidance and time are much appreciated.Dr. Drg. Avi Laviana, Sp. Ort as my dosenwali for her advice and guidance, endless encouragement, and time are much appreciated.The lecturers and staffs of Radiology, Department of Faculty of Dentistry, Universitas Padjadjaran for their overwhelming cooperation. My beloved parents, Mohd Shuhaimi Bin Yunus and Nik Samihah Binti Maidin. My siblings; Muhammad Nubli, Ahmad Faizal, Nik RozlinElini, Nik Hanis Nujhan, Nik Suriani, Ahmad Syafiq and Muhammad Wafiy for their prayers, endless encouragement, and love in making this thesis possibleAll KPBI staffs and lecturers for their cooperation and assistance in the process to complete this study.My fellow classmates who helped me and guided me in completing this minor thesis Thank you for those who have involved directly and indirectly for their constant support, help and advice. May Allah SWT bless all of them, for all the contribution they have made for this thesis to be completed. I hope this research would be meaningful and can be referred as a guidance for education purpose in the future.

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