

Quality Analysis Of Thorax Radiography Images In Postero Anterior Projection (PA) With Focus Film Distance (FFD) Variations In The Radiology Installation Of Sundari General Hospital

Yusriwan Tjuanda

Akademi Pendidikan Kesehatan (Apikes) Talitakum Medan, Indonesia

Jl. Sei Batang Hari No.81 A kelurahan Babura Kecamatan Medan Sunggal

Email: brastagisil@yahoo.com

ABSTRACT

Radiology is one of the supporting installations in a hospital that is useful for diagnosing a disease. This requires inspection techniques and image quality, with the aim of knowing the comparison of radiographic image quality on Thorax examination of the PA projection with FFD variations of 120 cm, 160 cm, 180 cm at Sundari General Hospital, using the general radiographic modality of the Toshiba brand. The examination was carried out on 9 adult patients. A radiographic image is obtained with differences in contrast which is analyzed visually, to distinguish which image has higher quality in terms of density, contrast and detail values. It can be concluded that from the Thorax PA radiographic image, the 120 cm FFD is more optimal. And for the examination of PA thoracic patients in theory it is expected to use a 180 cm FFD.

Keywords: *contrast, detail, density, focus film distance, radiographic image quality, thorax.*

INTRODUCTION

Radiology is one of the supporting installations in hospitals that is useful for establishing a diagnosis and therapy of a disease. To make a proper diagnosis, a radiographic technique is needed that is appropriate for the organ being examined (Rasad, 2015). Radiology is a medical science that is used to see parts of the human body using electromagnetic wave radiation or mechanical waves. Radiographic quality is the ability of a radiograph to provide clear information about the object or organ to be examined. Radiographic quality is determined by several components including density, contrast, sharpness and detail. Factors that affect the magnitude of radiographic quality include several components including kV, mAs and one of them is FFD (Rasad, 2015). Focus-to-Film Distance (FFD) is one of the primary factors used in radiographic examinations. FFD is the standard distance between the x-ray emission point in the x-ray tube (focal spot) and the image receptor (Charlton, 2003). FFD settings can affect the quality of the radiograph, such as film density, contrast, x-ray radiation intensity, detail and distortion of the object image so that FFD settings must be done properly. (Andrey, 2017). The effect of changing the FFD distance is enlarged and the OFD distance is reduced, then the magnification of the image obtained is smaller and closer to the original image or vice versa in changing the FFD distance and the OFD distance is reduced in object irradiation, then the

magnification obtained is greater (Felda, et al, 2014). The FFD is enlarged, the OFD remains the same, the image will approach the original size (Anita Nur Mayani & Muflihatun, 2017). Changes in the FFD and OFD distances greatly affect the image results, the further the FFD, the sharper the image. One of the radiographic examinations that affects changes in FFD is the Thorax radiograph examination. The Thorax is a cavity that is limited and surrounded by the Thorax wall which is formed by bones, cartilage, and muscles. In the Thorax cavity there are two rooms, namely the lungs and mediastinum and the respiratory and circulatory systems occur. The organs located in the chest cavity are; Esophagus, lungs, liver, heart, blood vessels and lymphatic vessels (Ombregt, 2013). According to Bushong (2016), good radiographic quality is an image that is able to provide clear information about the object or organ being examined. Radiographic quality is the ability of radiography to provide clear information about the object or organ being examined. Radiographic quality is determined by several components including: density, contrast, sharpness, and detail. In the study of Dewi Nurul Afifah (2015) it was stated that at FFD 120 cm the CTR value still met the provisions for normal heart size, which is ≤ 0.5 . In the study of Maulana Sidiq Nugraha (2020) using FFD 150, the CTR value obtained with FFD variation $<50\%$ so that it was still within normal limits, but magnification in the width of the heart and lungs. According to Sigit Wijongko, et al (2016) in the Thorax examination using FFD 183 cm. Based on the author's experience during field work practice (PKL) at Sundari General Hospital, Medan, the routine Thorax projection examination is PA (Posterior Anterior) projection using a minimum FFD of 100 cm and a maximum of 120 cm. The relationship between CTR (Cardio Thorax Ratio) and the normal size of the heart is to determine whether the patient's heart size is enlarged or not. Based on this background, the researcher is interested in conducting a study entitled "Analysis of the Quality of Thorax Radiography Images with Postero Anterior Projections with Variations in Focus Film Distance at the Sundari General Hospital Installation, Medan".

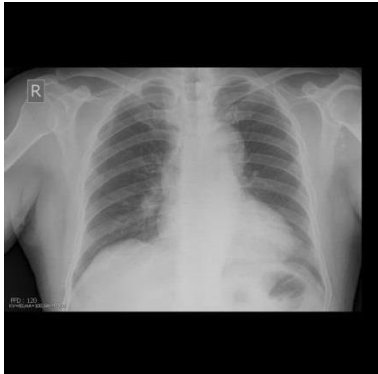
METHOD

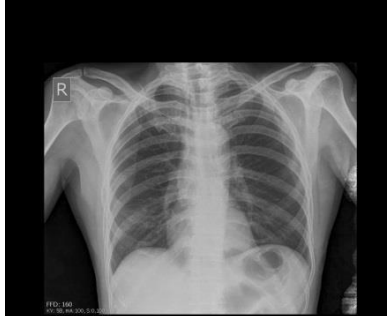
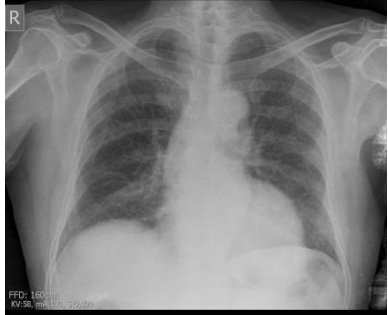
The type of research used in this study is quantitative with an experimental study. The experimental method can be interpreted as a research method used to find the effect of certain treatments on others under controlled conditions to determine the comparison of FFD in Thorax examinations to obtain optimal image quality. Location This research was conducted at Sundari General Hospital, Medan. This research was conducted in May - June 2023 at Sundari General Hospital, Medan.]

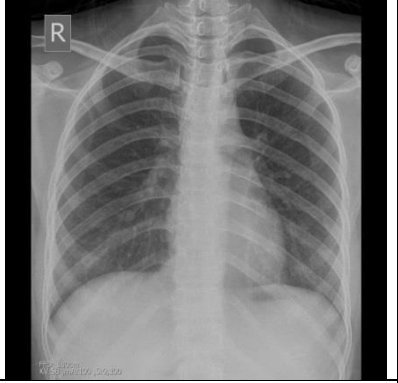
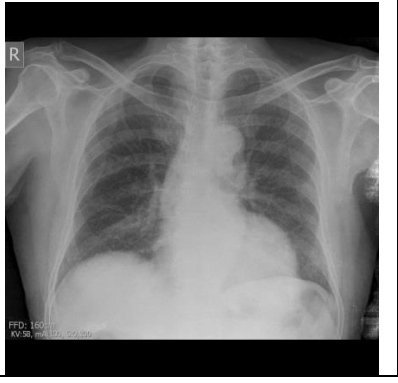
RESULTS AND DISCUSSION

Results

Table 1 Patient Data Totaling 9 and Thorax photos

FFD	Patient	Patient Size				Thorax X-ray
		BB	TB	Body Thickness	Exposure Factor	
120 cm	A	73 kg	167 cm	24 cm	Kv : 60 mA : 100 s : 0,100	
120 cm	B	48 kg	150 cm	19 cm	Kv : 58 mA : 100 s : 0,100	
120 cm	C	69 kg	168 cm	19 cm	Kv : 59 mA : 100 s : 0,100	

160 cm	D	55 kg	172 cm	20 cm	Kv : 59 mA : 100 s : 0,100	
160 cm	E	70 kg	174 cm	23 cm	Kv : 59 mA : 100 s : 0,100	
160 cm	F	50 kg	156 cm	17 cm	Kv : 58 mA : 100 s : 0,100	

180 cm	G	56 kg	164 cm	19 cm	Kv : 58 mA : 100 s : 0,100	
180 cm	H	78 kg	180 cm	21 cm	Kv : 60 mA : 100 s : 0,100	
180 cm	I	73 kg	156 cm	20 cm	Kv : 59 mA : 100 s : 0,100	

Source: Research Results, 2021

According to Carlton (2001), the density range commonly found in radiography is 0.25-2.5 and is referred to as optical density or commonly abbreviated as OD, which is the density that can be seen directly by the human eye.

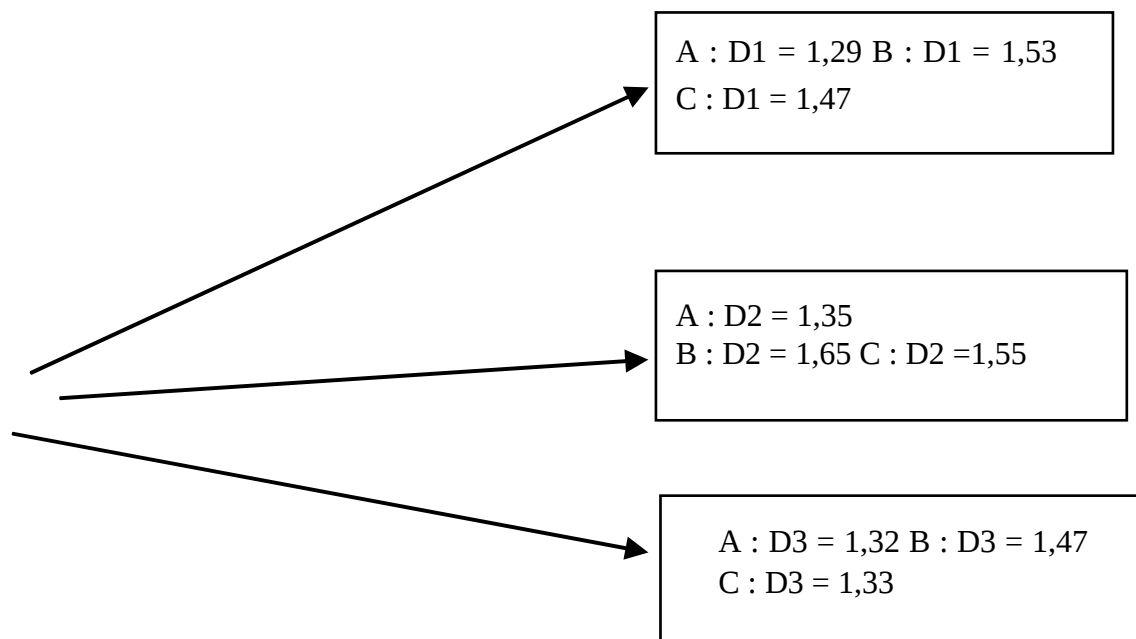
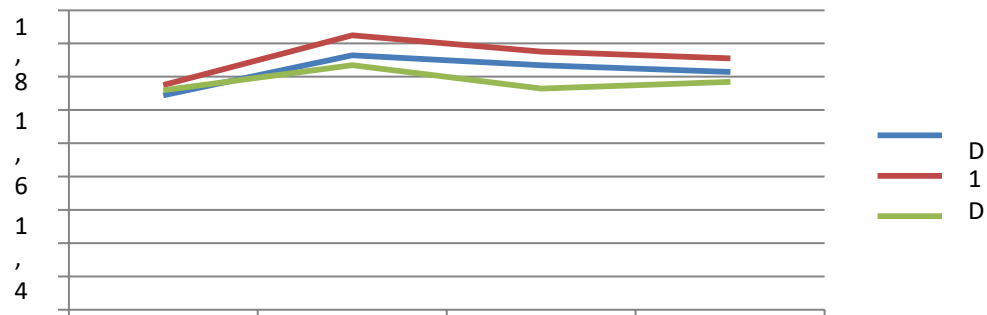


Table 2 FFD Density Measurement 120 cm in the lung category

Patient	D1	D2	D3	D AVERAGE
A	1,29	1,35	1,32	1,32
B	1,53	1,65	1,47	1,55
C	1,47	1,55	1,33	1,45

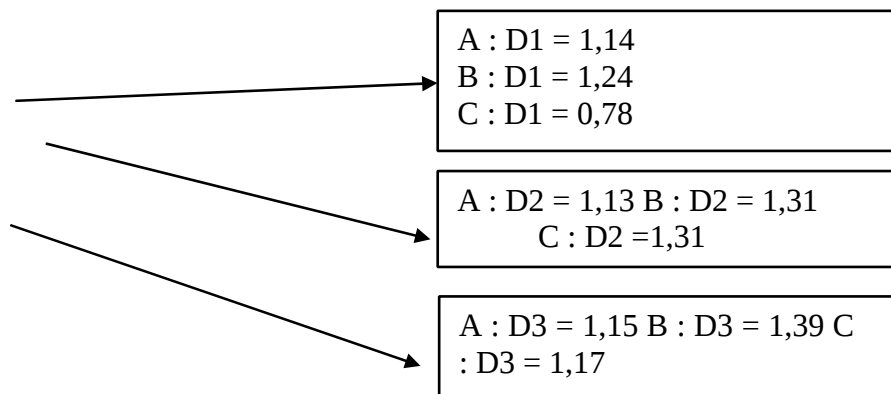
1. For FFD 120 cm, the three patients A, B, C with an average D1 density value in the lungs of 1.43
2. For FFD 120 cm, the three patients A, B, C with an average D2 density value in the lungs of 1.51
3. For FFD 120 cm, the three patients A, B, C with an average D3 density value in the lungs of 1.37

Graph 1 Density of Three Points in the Lungs for Patients A, B, C



Source: Research Results, 2021

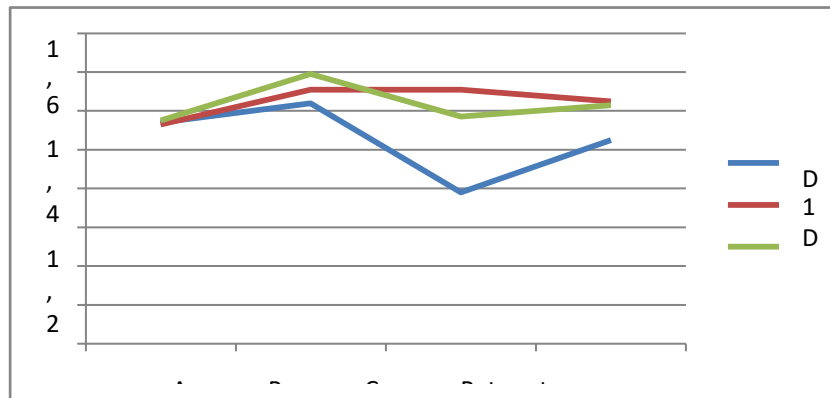
Based on graph 1 above, the highest density in the lung category is D2 with a value of 1.51. The process of measuring the three density points in the costae category in FFD 120 cm for patients A, B, C:



Source: Research Results, 2021

1. For FFD 120 cm, the three patients A, B, C with a density value of D1 in the costae averaged 1.05
2. For FFD 120 cm, the three patients A, B, C with a density value of D2 in the costae averaged 1.25
3. For FFD 120 cm, the three patients A, B, C with a density value of D3 in the costae averaged 1.23 The density of the three points on the costae for patients A, B, C can be seen in graph 4.4:

Graph 2 Density of the Three Points on the Costae for Patients A, B, C



CONCLUSION

The quality of radiographic images at a distance of FFD 120 cm, namely the density in the lungs, costae, aorta, the density value is higher than at a distance of FFD 160 cm and FFD 180 cm. The density in the heart and outside the tissue is higher when using FFD 180 cm. The use of good FFD is used based on the results of the study, namely FFD 120 cm, because it can show clear anatomical detail quality so that it is easily analyzed. The further the FFD, the contrast, detail, sharpness decreases because the radiation penetration power decreases. In this case, the contrast, sharpness and detail on FFD 120cm, 160cm, and 180cm cannot be compared. Because the condition of the patient or object and the thickness of the object are different, affecting the contrast, sharpness, and detail.

REFERENCES

- Rasad, Sjahriar., 2015. Diagnostic Radiology. Jakarta: Balai Penerbit FKUI. Ombregt, L. (2013). Applied Anatomy Of The Thorax And Abdomen.
- Nugraha, Sidiq Maulana., 2018. Analysis of Focus Film Distance Thorax PA Examination Against Accurate Cardiothoracic Ratio Measurement Results.