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Protection of Radiation Dose Colon in Loop Fluoroscopy with Suspicion of Megakolon Disease at Radiology Unit of Bunda Thamrin Hospital Medan

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ABSTRACT

A research had been done about radiation doses on Colon In Loop diagnostic with suspected megakolon disease using fluoroscopic X-ray. The radiation should be on the radiation field directly opposite to assist the patient during Colon In Loop diagnostic. The scattering radiation from fluoroscopic X-ray might affect to the radiation worker or the patient's assistant it used X-rays. The measurement of scattered radiation at distance of 0 cm, 10 cm, 20 cm, 30 cm and 50 cm with the appropriate voltage variation required for the inspection of fluoroscopy colon in loop ie 80 kVp with 8 mAs and 70 kVp with 8 mAs aimed to determined the distance of the radiation worker's secure points. The measurement was done by Thermoluminisence Dose. Radiation dose received and increased at 0 cm for exposure factor at 80 kVp with 8 mAs of radiation dose 64.983 mSv and 92,24% and exposure factor at 70 kVp with 8 mAs radiation dose 41,955 mSv and 92,77%. The received radiation dose was smaller at 50 cm for exposure factor at 80 kVp with 8 mAs radiation dose of 0.100 mSv with a percentage were 0.14%, exposure factor at 70 kVp with 8 mAs radiation dose of 0.013 mSv or 0.03%. The results showed that the radiation dose would be smaller when the distance of radiation source increased. Then, from this researched confirmed that 50 cm was a secure point when did the inspection of fluoroscopy colon in loop.

Keywords: Fluoroscopic X-ray, Thermoluminisence Dose, Colon In Loop, Factor of Exposure and Distance.

I. INTRODUCTION

Megakolone disease including colonic disorders, usually occurs in the sigmoid colon with signs of difficulty removing feces and stomach enlarged [1]. To know someone suffering from megakolon disease diagnosis needs to shoot the objects using fluoroscopic X-rays. It will be done using 500 mA X-ray plane equipped with fluoroscopy. Radiation utilization on Colon In Loop diagnostic with the suspicion of Megakolon disease also has a risk as well as the utilization of the other radioactive substances [2]. Therefore, to reduce the negative effects of radiation need to applied the provisions of radiation safety and radioactive source security [3].

Radiation workers have to be on the radiation field directly opposite the patient to assist the patient to do Colon In Loop diagnostic with the suspicion of megakolon disease [4]. it will cause the patient companion also affected by exposure to radiation [5]. Radiation doses on Colon In Loop diagnostic with suspected megakolon disease using fluoroscopic X-ray.The radiation should be on the radiation field directly opposite to assist the patient during Colon In Loop diagnostic.

II. METHODOLOGY

Research begins with with doing observation using Thosiba fluoroscopy X-ray at Bunda Thamrin

Hospital, Medan. The measurement of Radiation Dose of X-ray Fluoroscopy Plane using Thermoluminisence Dose with variation of distance and exposure factor. Variation distance starting from 0 cm, 10 cm, 20 cm, 30 cm and 50 cm when variation of exposure factor starting from 60 kVp; 70 kVp and 80 kVp. Then, processing analysis data from Thermoluminisence Dose result read by TLD Reader. And finishing data with compare to standard data from another source.

III. RESULT AND DISCUSSION

Measurement Result of Radiation Dose At 80 kVp with 8 mAs with Several Distance

Measurement of radiation dose on Colon In Loop Fluoroscopy diagnostic with suspected megakolon disease was done by exposure factor at 80 kVp and 8 mAs with several distance. This measurement was done by using dosimeter Thermoluminisence Dose counted 21 pieces. The result of this measurement after reading in TLD Reader, can be seen in Table 1.

Table 1 shows the results of measurements with Thermoluminisence Dose dosimeters from four points. From these data it can be seen that radiation exposure received by radiation workers with radiation dose at 0 cm, 10 cm, 20 cm, 30 cm and 50 cm respectively 64,983 mSv, 4,484 mSv, 0,502 mSv, 0,243 mSv and 0,100 mSv . The farther of distance from the radiation source it will be smaller the received dose, and then if the distance getting closer from the source it will the dose received greater.

Measurement of Radiation Dose At 70 kVp and of 8 mAs with Several Distance.

Measurement of radiation dose on Colon In Loop Fluoroscopy with suspected megakolon disease was done by exposure factor at 70 kVp and 8 mAs current strength with variation of distance can be seen in Table 2.

Table 1. Measurement result of radiation dose by exposure factor at 80 kVp and 8 mAs

Space cm	Exposure Factor at 80 kVp and 8 mAs				
	I mSv	II mSv	III mSv	IV mSv	Average mSv
0	65.826	64.727	61.115	68.26	64.983
10	6.305	4.094	2.805	4.73	4.484
20	0.611	0.55	0.472	0.37	0.502
30	0.313	0.164	0.171	0.32	0.243
50	0.101	0.094	0.09	0.11	0.100

Table 2. Measurement result of radiation dose by exposure factor at 70 kvp and 8 mAs

Space (cm)	Exposure Factor at 70 kVp and 8 mAs				
	I (mSv)	II (mSv)	III (mSv)	IV (mSv)	Average (mSv)
0	41.661	40.692	43.888	41.580	41.955
10	3.402	2.099	2.634	2.854	2.747
20	0.367	0.283	0.449	0.375	0.369
30	0.210	0.072	0.135	0.152	0.142
50	0.004	0.025	0.012	0.013	0.013

Table 2 shows that the radiation dose values at 0 cm, 10 cm, 20 cm, 30 cm and 50 cm respectively are 41,955 mSv, 2,747 mSv, 0.369 mSv, 0.142 mSv and 0.013 mSv. The result indicate the some conclusion from measurement of radiation dose at 80 kVp and 8 mAs that The farther of distance from the radiation source it will be smaller the received dose, and then if the distance getting closer from the source it will the dose received greater. The average measurement result of primary radiation directly from the source of radiation (perpendicular source) shows the received dose is greater for the exposure factor at 80 kVp with strong current 8 mAs radiation dose of 64.983 mSv with a percentage of 92, 42%, exposure factor at 70 kVp with a current strength of 8 mAs radiation dose of 41.955 mSv with a percentage of 92, 77%. The average measurement result from radiation scatter from the radiation source shows that the received dose is smaller for exposure factor at 80 kVp and 8 mAs radiation dose equal to 0,100 mSv with percentage equal to 0,14%, exposure factor at 70 kVp with strong current 8 mAs radiation dose of 0.013 mSv with a percentage of 0.003. If the average radiation dose received by the radiation worker is multiplied by 10 times the Colon in Loop check per month from 120 patients per year then the maximum radiation dose received at a distance of 50 cm with a voltage of 80 kVp and of 8 mAs, the dose is 12 mSv /year, while at a voltage of 70 kVp and 8mAs the dose is 1.56 mSv.

If the average radiation dose received by the radiation worker is multiplied by 15 times the Colon in Loop check per month from 180 patients per year then the maximum radiation dose received at a distance of 50 cm with a voltage of 80 kVp and 8 mAs, the dose is 18 mSv / year while at a voltage of 70 kVp and 8 mAs the dose is 2.34 mSv / year. From this results can be concluded radiation dose in radiation workers will safe at a distance in 50 cm.

Protection Radiation in Radiology Unit at Bunda Thamrin Hospital Medan

Radiology Room Bunda Thamrin Hospital Medan be equipped 30 cm wall with whole door of room made of wood coated 2 mmPb. The Fluoroscopy chamber where the study is measured P x L x T = 8.00 mx 6.00 mx 4.00 m and indoor inspection chamber also contain holder / protector for operator (radiation worker) equipped with observation window equal to 2 mmPb of size P x L = 30 cm x 20 cm. At the door of the Fluoroscopy room there is also a warning sign of radiation hazard and above the door there is a notice which when the fluoroscopy diagnostic takes place then automatically the radiation alert light will be on with red colour.

As radiation protection in the radiology room there are also 5 (five) apron leads with a protection value of 0.5 mmPb and gloves as well as gloves and radiation protection glasses. Hence the Radiology unit of Bunda Thamrin Hospital has shaved attention and apply radiation protection very well.

IV. CONCLUSION

The average measurement results of radiation scatter from the radiation source show that the received dose is smaller at distance of 50 cm for exposure factor at 80 kVp voltage with 8 mAs shows radiation dose 0.100 mSv or 0.14%, the exposure factor on a voltage 70 kVp with 8 mAs shows radiation dose 0.013 mSv or 0.03%. At distance 50 cm, radiation workers received a dose of radiation 0.003 mSv and this dose is declared safe with a permitted dose of 20 mSv / year. The safe distance point for radiation workers performing a Colon In loop diagnostic with an X-ray fluroscopy must spacing until 50 cm or more from the radiation source.

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