

KNOWLEDGE OF RADIOGRAPHERS ABOUT RADIATION PROTECTION PROCEDURES

Abdur Rehman Khan, Syed Afaq Hussain Shah

Department of Radiology,
Postgraduate Medical Institute, Lady Reading Hospital, Peshawar

ABSTRACT

Objective: To assess the knowledge of radiographers radiation protection in diagnostic radiology.

Material and Methods: Questions were asked from radiographers of three tertiary care hospitals of Peshawar in November 2005. All radiographers were interviewed by the author according to pre-prepared questionnaire. Questions pertained to principles of radiation protection, permissible occupational dosage, permissible dose for general population, use of foot switch in fluoroscopy, advantage of collimation and effect of increasing Kilo Voltage Peak (KVp) on patient dose. Sampling was convenience sampling.

Results: Correct response was 8.8% on question on principles of radiation protection, 0% for question on permissible occupational dosage and dose for general population, 17.7% for query on use of foot switch in fluoroscopy, 77.7% on enquiry on advantage of collimation and 31% correct answers to effect of increasing Kilo Voltage Peak (KVp) on patient dose.

Conclusion: Knowledge of radiographers regarding radiation protection procedures and principles was poor.

Key words: Radiation protection, Diagnostic radiology.

INTRODUCTION

Medical workers are exposed to low doses at low dose rate to large parts of the body. Dose limits for radiation workers and general population have been set.

There is small but definite risk of radiation in diagnostic radiology¹. Radiation protection standards are based on best available knowledge, cautions and perception. Dose limit for occupational exposure have decreased as knowledge has increased about radiation effect from 6Sv, (60rem) per year for 1900 to 50mSv (5rem) per year in 1958.¹

Radiographer is on key person involved in radiation exposure. Knowledge of radiographer regarding optimal techniques, radiation dose, radiation protection measures is important for reducing radiation exposure to himself and general population. In our part of the world, knowledge of radiographers regarding radiation protection is poor. In this study knowledge of radiographers regarding radiation protection was assessed.

MATERIAL AND METHODS:

We compiled a questionnaire regarding

most important radiation protection procedures. Participants were interviewed by the author. Response of participants was recorded. Answers were compared to key made from text-books of radiological physics^{2,3} and regulations of radiation protection⁴. We selected a convenience sample of 45 radiographers from three hospitals to take part in the study and interviewed each radiographer on one to one basis by the author.

Following questions regarding radiation protection were asked.

1. What are cardinal principles of radiation protection?
2. What is maximum permissible occupational dose?
3. What is maximum permissible dose for general population?
4. What is usefulness of foot switch in fluoroscopy?
5. What is advantage of collimation?
6. What is effect of increasing Kilo Voltage Peak (KVp) on patient dose?

RESULTS

Correct response was 8.8% for question number 1, 0% for questions number 2 and 3, 17.7% for question number 4, 77.7% for question number 5 and 31% for question number 6.

The answer sought in question number one was regarding cardinal radiation protection, which well known and documented almost in all basic physics books of diagnostic radiology. Only four radiographers correctly answered all the three parameters that is putting shield between radiation source and exposed person, increasing distance between source and exposed person and reducing time of exposure. 40 radiographers indicated only importance of shielding. One did not know the answer.

Dose limits are specified for radiographers and general population by International Commission for Radiation Protection and adopted by individual countries. Maximum permissible dose, is 20mSv per year for whole body, 150mSv for lens of eye and 500mSv for extremity. Maximum permissible dose for general population is 1mSv for whole body, 15mSv for lens of eye and 50mSv for extremity. No radiographer knew maximum permissible dose for himself or general population.

Foot switch of fluoroscopy machine is dead man type. Exposure starts when pressure is exerted upon it and exposure is stopped when pressure is relieved. Intermittent exposure by help of foot switch reduces patient dose. This fact was known only to 17.7% radiographers.

Collimation of X-ray beam to area of interest not only improves the quality of image but also reduces the patient and operative dose.²¹ 77.7% radiographers knew this fact. 22.2% were of opinion that this is just to localize the area of interest. 82.3% were of opinion that foot switch is just for convenience of operation of machine.

Increasing KVp produces high energy radiation, which is more penetrating, while applying low KVp technique, more low energy X-rays are produced which can not penetrate through body of the patient to make image. This low energy X-rays are absorbed in the body of patient thus increasing patient's dose. Increasing KVp of technique reduces patient's dose.²³ This fact was correctly answered by 31% of radiographers. While 69% radiographers gave the opposite answer.

DISCUSSION

To our knowledge no such study has been conducted in Pakistan. No paper on such topic could be found in local and international literature. Though there are studies on radiation doses to the

radiographers and radiologists in various fluoroscopic procedures, no study on radiographer's knowledge and competency regarding radiation protection measures could be found.

Most radiographers had little knowledge of radiation protection principles and procedures. This lack of knowledge is harmful to themselves and general population. Genetic risk in human is difficult to assess which occur in descendants of exposed individuals. Somatic effect like leukemia and solid tumor has a latent period of few years to 40 years.² As these effects are not immediately produced, the radiographer become over-confident regarding over exposure to the radiation.

Recent epidemiological study showed that by adopting proper radiation protection measures and cautions there is no increase risk of cancer in medical radiation worker exposed to current levels of radiation doses.³ Though in developed countries the radiation protection measures are strictly observed still deficiency in providing education and training of safety measures is reported. In a study conducted in Japan, 35% quasi public organization and 45% of private organization did not provide education and training in safety measures.⁶

To conclude, knowledge of radiographers regarding radiation protection procedures and principles was poor. There is no regular arrangement for training and educating the radiographers in radiation protection in our country. It is recommended that regular training and education of radiographers in radiation protection may be arranged with collaboration of Pakistan Nuclear Regulatory Authority.

REFERENCES

1. Edward M. Development of Radiation Protection Standards. *Radiographics*. 1991; 2: 699-712.
2. Bushong SC, Health Physics, Radiation Protection. In *Radiological Science for Technologists*, 8th ed. St. Louis Mosby, 2004: 450-546.
3. Farr RF, Allisy-Roberts PJ, Radiation hazards and protection. In *Physics for Medical Imaging* 1999: 148-81.
4. The Ionizing Radiations Regulations 1999; Statutory Instrument 1999 NO. 3232 [Online] 1999 [cited 2006 Jun 10]. Available from: URL:<http://www.opsi.gov.uk/si/si1999/199993232.htm>.
5. Yoshinaga S, Maba Chi K, Sirgardoso Aj, Drody M M, Ron E. Cancer risk among

- radiologists and radiological technologists:
Review of epidemiological studies. Radiology
2004; 233, 313-21.
6. Hisateru OHBA, Ogasawara K, Adurano T.
Survey and analysis of radiation safety
management system at medical institutions-
initial report: Radiation protection supervisor,
radiation safety organization and Education
and Training, Jpn Radiol Technol 2005; 61;
1542-50.

Address for Correspondence:

Abdur Rehman Khan
Department of Radiology,
PGMI, Lady Reading Hospital,
Peshawar.