THE DOSIMETER PERSONAL USE IN CONTROLLED AREA

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ABSTRACT

The discovery of X-rays revolutionized medicine because it allowed a patient to be examined internally with no surgery. But also caused damage to health professionals and patients due, its oxidizing action. In the beginning of its discovery, many doctors were exposed and exposed beams to their patients for long periods of time, therefore, they developed diseases caused by radiation and the medical community realized that something was wrong. Then created a radiological protection commission to regulate its use in humans and so limit your exposure. Today we know that many companies still did not fit the standards of radiation protection. So we evaluate the technical professionals in radiology regarding the correct use of personal dosimeter, through a descriptive study with a quantitative approach, we used the information collection technique based on a questionnaire developed for this purpose which was delivered and collected personally. From this survey, we sought to assess the knowledge of the basic guidelines of radiological protection. He concluded that the majority of respondents know the rules of use of the personal dosimeter, but do not use it properly, due mainly to lack of supervision by the company, overwork and neglect.

Keywords: ionizing radiation, radiation protection, dosimeter

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1. INTRODUCTION

The discovery of X-rays revolutionized medicine because it enabled the patients to be examined internally without the need for surgery. But also caused damage to health professionals and patients, due to their ability to ionize atoms and molecules. Therefore, early in the 20th century, there were many reports of people who have become ill due to overexposure, since at that time its harmful effects were not well known and did not exist a standard that is regulated its use. So the scientific community realized that something was wrong.

X-rays are a form of ionizing radiation, and when it hits an atom, it may ionize atoms and produce ions. So the free electrons produced in ionization collide with other atoms and create more ions.

The electrical charge of an ion can cause a chemical reaction within the cells. Among other things, the load can break DNA strands. A cell with a broken strand of DNA can die or develop a DNA mutation. If several cells die, the body may develop various diseases. If the DNA mutate the cell can become cancerous - and this cancer can spread. If the mutation is in a sperm or an egg, can cause genetic effects [1]. Because of all these risks, currently doctors use X-rays to a limited extent, taking into account the principles of protection, reduction and dose monitoring.

We now know that to reduce exposure to X-rays, limiting occupational doses is necessary to increase the distance, shielding and reduce the exposure time. In addition it is extremely necessary the correct use of personal dosimeter for the doses of monitoring tests are done correctly.

Monitoring of doses for occupational exposure is made through the use of an individual dosimeter reading and indirect occupational control says that every professional during your workday and while staying in the controlled area should:

1) use them in the most exposed torso.

2) use them on the lead apron.

3) to further use at the end, in those cases where they may be subjected to high doses.

4) failing that, keep them away from the ionizing radiation sources, with the standard dosimeter [2].

But in many cases are not used properly by professionals [3]. Photographic dosimeters consist of a movie film set in a plastic support that can be trapped in clothing [4]. The photographic method was the first to be used in the detection of radiation [5]

The exposure of the dosimeter to ionizing radiation sensitizes the film, darkening when it is revealed. The amount of darkening of the film is evaluated with a densitometer and is proportional to the radiation dose received. The main purpose of these devices is to monitor

whether the exposures, which workers are subjected, are being kept low, and ensure that dose constraints are not exceeded [3].

Have thermoluminescent dosimeters - TLDs are made up of crystals that accumulate energy when irradiated and re-emit as light when subjected to a thermal heating rate, this property is called thermoluminescence. The light emission of the crystals is represented by a curve that relates the light emitted in depending on the heating temperature and this ratio determines the dose previously focused on the detector.

It is the responsibility of the radiation protection service holders through the doses of measurements made by the individual dosimeter:

1) provide for the investigation of cases of monthly effective doses greater than 1.5 mSv. And the results are to be seated.

2) notify the local health authority monthly results over 3/10 of the annual limit, along with a report of the measures taken.

3) when the monthly values are greater than 100 mSv, holders must provide a special investigation and, with a likely exposure of the user, must submit it to an assessment of cytogenetic dosimetry [2].

In Brazil the values of lower monthly doses of 0.2 mSv are not considered to logging level [2,6]. The log level was defined as the value from which should be performed numerical recording of the measured value of the quantity of interest. Values lower than it is of little importance for radiological protection, being considered as zero [7].

The radiological protection system should strive to keep exposures below recommended thresholds, avoiding, thus, the stochastic effects, since the biological effects produced by radiation are cumulative. Therefore the use of personal dosimeter for monitoring doses and personal protective equipment is essential (PPE) appropriate [8].

For the purposes of application of regulatory standards, it is considered PPE, every device or product, for single use used by the worker, for the protection of susceptible risks threaten the safety and health at work. All PPE, national or imported manufacture, can only be offered for sale or used with the Certificate of Approval of the indication (CA), issued by the national body responsible for safety and health at work of the Ministry of Labor and Employment (MTE) which is responsible for monitoring the quality of the equipment. They should be available free and in good condition in diagnostic radiology services, and healthcare team should be able to use and maintain the equipment properly. [9]

PPE should be used by professionals in the following cases:
1) The professional who is any part of the body exposed to the primary beam, you should use apron with at least 0.5 mm lead equivalent;
2) Professional to protect the scattered radiation should make use of apron with at least 0.25 mm lead equivalent [10].

The secondary or scattered radiation is the main source of irradiation of professionals. Lead aprons 0.5 mm in thickness can trap up to 98% of the secondary radiation and 0.25mm hold up to 96% by protecting the gonads and about 80% of the active bone marrow. The thyroid gland protectors can reduce exposure by up to 10 times. The plumbíferas surgical gloves, which are commercially available, have an attenuation factor against radiation ranging from 5 to 20%, depending on the [11] model. In addition to the equipment listed above, every fluoroscopy equipment must possess curtain or skirt plumbífero, bottom and side, as well as screens or mobile lead screens with a thickness not less than 0.5 mm lead equivalent for operator protection against scattered radiation the patient [2, 8, 11, 12, 13].

The plumbíferas clothes in no time must be folded and when not in use must be kept in horizontal surface or appropriate support, therefore the bend, the lead coating may fracture and violate the radioprotection system [2,8]. Rarely a protection fault of plumbíferas garments can be detected visually and that they must go through fluoroscopy annually to check its integrity. By not using the plumbíferos PPE during examination of vascular catheterization, professional increases the exposure dose by a factor of 10 or more. [11] Measured the effective dose received by the thyroid gland doctors, and concluded that the doses were 10 times to the case of those who worked unleaded protection [14].

In order to try to tailor the use of ionizing radiation to the rules established in this Regulation, in order to keep exposures below recommended limits [2]. Research shows flaws in the internal control procedures of companies [15], and so it is important to evaluate the services under the criteria of radiation protection guidelines [16], to verify the need to maintain a permanent education with professionals who are exposed to [17] ionizing radiation, since the professionals who participate in training and lectures on radiation protection, perform radiological procedures with greater quality, with regard to radiological protection [18].

In a survey done in the directly exposed services and staff to ionizing radiation at the University Hospital Clementino Fraga Filho (HUCFF-UFRJ), it was found that most of these employees were not properly monitored, only three services maintained a dose control workers employed to provide independent service and that there was no control for cases of high doses. It was concluded that it is possible to manage the entire dosimetry of an institution like the HUCFF-UFRJ, only using applications like database, which are available commercially or even free [7]. And the continuing education of professionals and implementation of procedures aimed at reducing doses are actions that result in adequate control of radiation exposure [19].
We can see that is a concern that the standards established in radiological protection guidelines are followed by workers and companies suited to the regulations [8].

Since the observation of the rules reflects a service with greater protection to patients and professionals involved in this activity. So we propose to evaluate the use of personal dosimeter in controlled area in the city of Goiânia, as we believe that any worker behavior change in any area depends on what the depth of his knowledge on the subject [19].

2. OBJECTIVES

1-evaluate the knowledge of individual dosimeter use.
2-evaluate the knowledge of which part of the body must use the personal dosimeter.
3-evaluate the knowledge of the dosimeter use with lead apron.

3. MATERIALS AND METHODS

This is a field of research, descriptive, with a quantitative approach [20]. The aim is to an approximation of reality from the frame of reference of the study subjects themselves, up to the researcher seeking to understand the meaning of human action and not just describe it using the information collection technique based on a questionnaire with closed questions, prepared for this purpose and it was delivered and collected personally. From this survey, we sought to assess the knowledge of the basic guidelines of radiological protection. The universe of this research are the radiology technicians who work in the city of Goiânia. Association Technicians in Radiology has provided us with this number of technical and through a statistical expression determine the sample size.

Were asked three questions regarding the use of personal dosimeter in controlled area, the 79 radiology technicians and the results presented here has a 10% uncertainty. The choice of research participants was random, and these belong to the public or private service regardless of gender or age.

The data collected in the questionnaires were tabulated for analysis and the results are organized into charts in Microsoft Excel 2003 program.

4. RESULTS AND DISCUSSION

The Order 453 says that during their working day and while staying at the professional controlled area must wear personal dosimeter indirect reading. In this study we assessed the knowledge of the dosimeter use by workers in controlled area and the results are shown in chart 1.

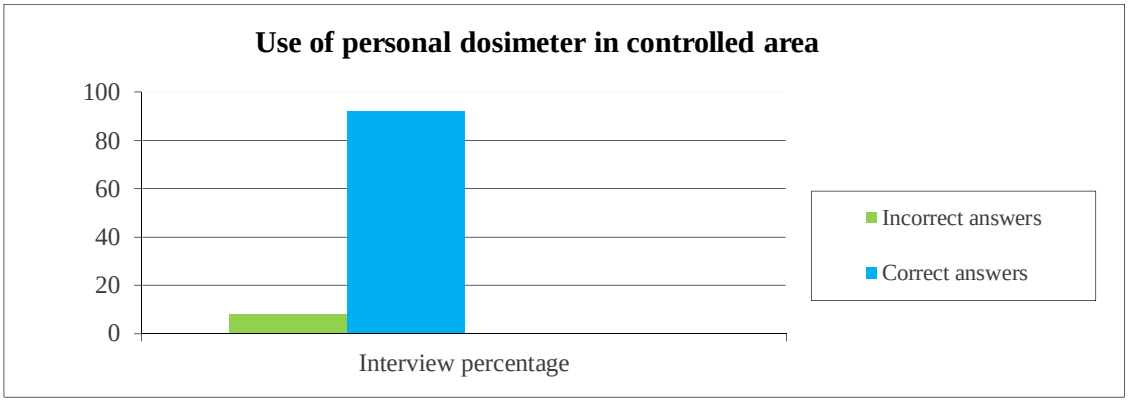

Figure 1 - Evaluation of the use of personal dosimeter in controlled area.

The results presented in Figure 1, shows that 92% of respondents said they know that during your working day is required to wear personal dosimeter. This coincides with the results presented elsewhere [16]. Where most of the technicians reported that always used the personal dosimeter when they were controlled area, however, had no regular access to dosimetric report, and did not know how to interpret it. Registered also an employee using the dosimeter of

another employee who had been dismissed. [16] The continuing education of professionals who are exposed to ionizing radiation is a need to improve the safety of services [17].

According to the ordinance 453 individual dosimeters intended to make individual portions measures should be placed on the lead apron and dose reading the value obtained is multiplied by 1/10 [2]. We also evaluated the knowledge of these professionals regarding the correct positioning of the dosimeter when used along with the lead cloak and the results are in Figure 2:

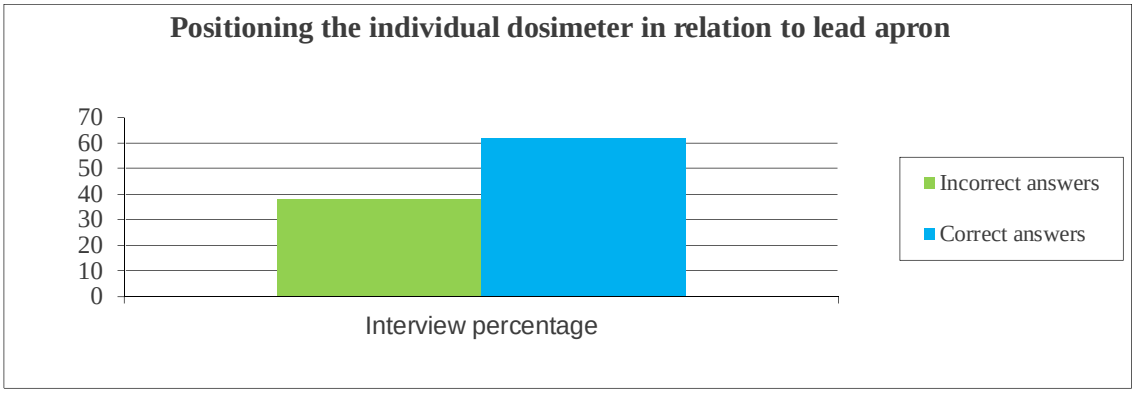

Figure 2 - Positioning the individual dosimeter in relation to lead apron.

Figure 2 shows that 38% did not answer correctly using the dosimeter with the lead apron. Professionals surveyed in two health institutions in Acre use the personal dosimeter under the lead apron. [16] The correct use of the meter is essential to estimate the equivalent dose of the parts that are not protected by shielding at the time of exposure [14]. And as the mean equivalent dose limit for the lens in 5 years of work is 20 mSv / year, not use it on the apron can induce errors in readings, especially for professionals who receive doses equal to or less than 2 mSv since this dose would be multiplied by 1/10 [2] and the measured value would be equal to or less than 0.2 mSv. As the log level in Brazil is less than 0.20 mSv [2,6]. It would not have read doses for the professional. In a period of one year for example a professional in practice received in its crystalline 2 mSv / month would have a zero dose. So we believe it is important that the authorities setting stricter means of controlling the use of the dosimeter and protecting the edges and especially the lens.

We asked the experts in that area of the body the personal dosimeter should be placed. The results are shown below in Figure 3.

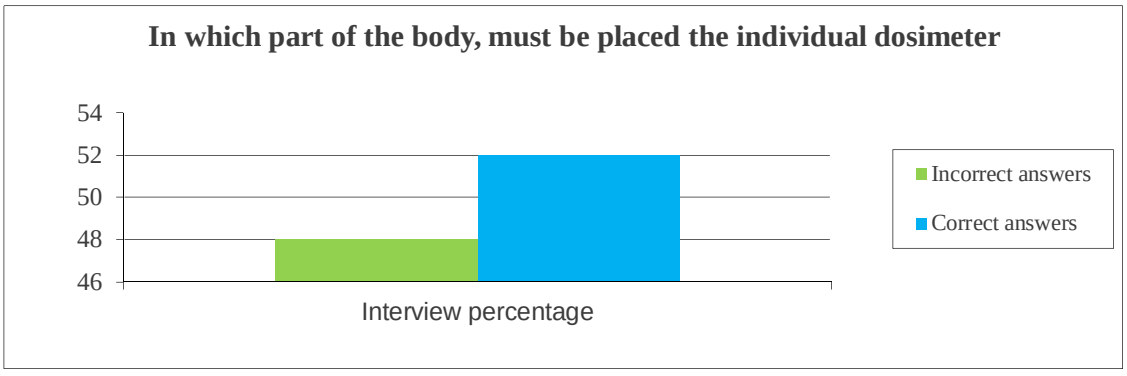

Figure 3 - In which part of the body, must be placed the individual dosimeter.

Only half of the respondents replied that the correct place to put the dosimeter is the most exposed torso. Survey found that most establishments provides individual monitors for occupationally exposed workers to ionizing radiation, however they are not properly educated about their use of standards [8]. What we can see is that the lack of training and supervision by companies seeking to improve the quality of its services and associated with this, there is negligence on the part of professionals, since many know the rules of use of individual dosimeters, but prefer not to use them correctly.

5. CONCLUSIONS

1) Of the respondents 92% of professionals said they knew the rules of use of the dosimeter in controlled area.

2) Almost 38% of respondents did not know how to use dosimeter with apron, which can cause distortions in rates, particularly in the extremities and crystalline.

3) Almost 50% do not use dosimeter in the correct region of the trunk, which shows the lack of internal control in companies and professional negligence.

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