

Determination of airkerma values in the group of most frequent radiographic examinations as a basis on patient doses estimation

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Introduction:

The number of medical procedures using X-rays is continuously increasing. As a result, also the dose from medical exposures makes up the largest component of the radiation dose to the population. Together with this increase also the importance of radiation dosimetry requirements for diagnostic medical exposures has raised, and more attention is given to the keeping the dose as low as reasonably practicable without affecting the image quality and the medical benefit of the examination.

The key principles of radiation protection: justification and optimization are valid also in diagnostic radiology, but there are no mandatory dose limits. Instead of the limits the so called diagnostic reference levels (DRL) are introduced and they present the guidance on doses that are acceptable for the specified radiodiagnostic examination. Information about the patient dose data accumulated in different hospitals for the selected most frequent procedures, contributes to the optimization process and allows to compare the obtained results with DRL values. Finally an important contribution of our study is that the dose information obtained for conventional radiography examinations at 5 radiodiagnostic departments in Slovak republic can be disseminated among the radiographers and clinicians of other departments, so that they may result from unnecessary examinations and can take this into account for reduction and optimization of performed diagnostic procedures.

Current status:

Status of radiation protection in relation to medical exposure significantly affected the Directive of the European Commission č.97/43/EURATOM "The protection of individuals against the risk of ionizing radiation in relation to medical exposure." The differences in the actual size of the radiation levels recorded by individual countries may be large, depending on the size of the natural background level of medical care as well as the level of radiation protection in the country. [1] Currently, it is necessary to introduce into clinical practice in a series of measures, which ultimately result in reducing the size of patient radiation exposure while maintaining a sufficiently high value of the notice of the examination procedure. One of the preconditions for the implementation of the principles of radiation protection in medical applications is to follow the indication criteria for imaging in radiology. These criteria should be developed at regional level for each country taking into account their possible implementation. To serve this purpose, diagnostic reference levels. DRL for medical exposure shall apply to standard adult patient weighing 70 kg in the definition of a standard examination procedure must not be exceeded and may be regarded as indicators of compliance with the criteria for investigation. The DRL has repeatedly crossed the radiodiagnostic examinations, the operator shall verify such an incident and take corrective action.

Methodology:

An important task of radiation protection, monitoring of external exposure, interpretation of the measured values on quantities characterizing the risk and severity of exposure, and finally their evaluation as to the application of measures to eliminate exposure, restrict or regulate. Our work is focused on determining the size of the irradiation in selected group of patients, currently the most frequent radiographic examinations. The survey was conducted in 5 hospitals in Slovakia, using different types of radiographic equipment. For each of the types of simple radiographic examinations, the measurement of absorbed dose of ionizing radiation in air [2] was determined the Entrance Surface Air Kerma (ESAK). In the first phase of the study we conducted a survey which was focused on return radiographic images. Main results of this part was determine of the frequency currently most frequent radiographic examinations with regard to imaging quality and quantification patient doses. Based on this survey and subsequent analysis of the data, we derive information on the number and frequency of different types of radiography examinations. Subsequently, we conducted a survey which was focused on size of the irradiation in the group of patients undergoing these examinations. [5] The final processing of received results allowed us to develop a methodology for estimating the size of the exposure of patients to a particular workplace. Estimation is performed with the regression line is found in the functional dependency graph of the input variable surface kerma (ESAK) and the values of tube voltages used for radiographic examinations.

Results:

We determined the size of the exposure of patients on 15 radiodiagnostic departments. In this study we are presenting results on five selected facilities. The analyzes carried out in our work, we compared the size of the irradiation of patients with specific examination of legislation adopted by the guide of diagnostic reference levels (DRL). We have developed a tabulated summary providing information on the size of the exposure of patients undergoing these examinations.

Conclusion:

In this work we studied patients undergoing medical exposure in the group currently most frequent radiographic examinations. Size of the radiation survey was performed of patients in the investigation of the situation and setting out how the principles of optimization into the daily practice of radiodiagnostic departments. We found that all of the measured values, were lower than the value of diagnostic reference level given in Recommendation IAEA in Vienna. [4] At workplaces, Health Center ŽILPO in Zilina, Health Center in Kysucké Nové Mesto, Health Center in Senica, Health Center in Pezinok and Hospital in Trstena are based on the analysis of measurement results suggested method for estimating the size of the exposure of patients undergoing the most frequent radiographic examinations. The principle of this method is estimation of the size of irradiation of the functional dependency graph Entrance Surface Air Kerma values (ESAK) from the power of X-ray. Currently, testing of this method in clinical practice. The results presented are beneficial not only for the offices to which they were established and the impact of radiation dose for the size dependence of the irradiation parameters radiodiagnostic examinations. They also make a contribution to the unification process of further research into hitherto not radiodiagnostic work, been performed to analyze their optimizational conventional radiographic examinations.

References:

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