Abstract

Dosimetric study and risk analysis for CT scans on lung cancer patients in follow-up

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The increasing use of ionizing radiation in clinical practice, in particular computed tomography (CT), has led to a dramatic increase in the radiation dose to the general population in the last three decades, with the consequent risks that this exposure entails. Even more, therefore, there is an increasing attention to risks for patients undergoing CT scans, especially in the case of young people, more sensitive to radiation damage.

A particular category is that of cancer patients: they repeat "whole-body" CT (brain-thorax-abdomen) scans more often, justified by the need to identify and stage the tumor, promptly verify any recurrence (follow-up) or to evaluate the response to antineoplastic treatments (re-staging). If these multiple exposures do not represent a substantial risk in the case of advanced malignancy with poor prognosis, the optimized use of ionizing radiation to reduce risks could instead be crucial in cancer patients with longer life expectancy.

Although the general effort to limit the exposure, however, there is a lot of evidence that state a wide variability in terms of complexity related to the differences in the equipment and their use. Technical parameters such as the correct use of the voltage of the X-ray tube, the height of the bed, the correct delimitation of the anatomical area to be included in the scan and, more generally, the knowledge of radiation protection standards have proven to be fundamental to reduce unwarranted overexposure in patients undergoing CT examinations.

To optimize exposure, it is essential to have presumably homogeneous data (such as the same survey in the same individual for the same indication) to evaluate other variables that can be corrected if these could cause significant deviations from the ALARA principle (e.g. use of different protocols based on different technicians or doctors, different equipment, etc.).

The aim of this study is to evaluate the exposure of a relatively homogeneous population of lung cancer patients in follow-up, with potentially more favorable prognosis. A retrospective observational analysis is performed using DoseWatch, a web-based dose monitoring software provided by General Electric company and owned by the San Luigi Gonzaga Hospital (Orbassano), which allows to collect

data from the Picture archiving and communication system (PACS). In particular, this study is part of the Project "Dosimetric analysis on patients exposed to ionizing radiation for diagnosis and treatment of advanced lung cancer", approved by the Ethics Committee of San Luigi Gonzaga Hospital. The patient's dosimetric history regarding the CT scans, as well as personal information, were obtained through the dose monitoring system, whose acceptance test is part of this thesis. The results provide indications for optimization and quantify the risk related to CT exposure (estimated with PCXMC) that can also be translated to other populations of neoplastic (but also non-neoplastic) patients.