ASSESSMENT OF SCATTERED RADIATION IN COMPUTED TOMOGRAPHY FACILITIES WITH MULTI-SLICE CT MACHINES

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INTRODUCTION

• Computed tomography (CT) is one of the fastest and most efficient medical imaging techniques.
• CT scans generate high-quality cross-sectional images (often called slices) of the different parts of the body with the use of specialized x-ray equipment and multiple beam projections.
• Radiation protection survey and evaluation (RPSE) • conducted to ensure protection from unwanted radiation exposures • designed to assess whether the radiation safety procedures of medical imaging facilities adhere to the recommendations and guidelines of the National Council on Radiation Protection and Measurements (NCRP) and/or the International Commission on Radiological Protection (ICRP).

MOTIVATION

• CT produces relatively high levels of scattered radiation that can potentially be harmful if not properly monitored and controlled.
• The present study investigates the radiation levels produced in CT facilities with multi-slice CT machines, and assesses whether radiological personnel and members of the public are adequately shielded against unnecessary radiation exposure.

RESULTS

• All CT facilities have comparable accumulated dose measurements.
• At 0° and 180°, scattered radiation is attenuated by the gantry.
• The higher-sliced CT (Facility B and D) produced higher levels of scattered radiation in a very short amount of scan time as compared to lower-sliced CT (Facility A and C).
• With the exception at 0° and 180°, the measured doses for each angle were observed to be decreasing at increasing distances from the isocenter.
• The decrease in radiation levels were not inversely proportional with the square of the distance from the source.
• The measurements at 0° and 180° were found to be minimal increase with the distance from the isocenter, this is attributed to the sensitivity and uncertainty (approx. 30%) of the radiation survey detector used.

 Adequacy of the Shielding Barriers

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• Relatively higher levels of radiation were measured at the main door of the CT machine room of each facility, and at the control room door for Facility D, as compared to other areas. This is due to the gaps at the door of the facilities were scattered radiation are able to pass through.
• The average weekly radiation levels measured are significantly below the P/T ratio.

CONCLUSIONS

• There are high scattered radiation levels inside a multi-slice CT machine room during CT procedures.
• Scattered radiation around the CT machine decreases with increasing distance from the isocenter.
• Relatively low levels of scattered radiation was measured inside the control room, with averaged weekly doses significantly below the limits recommended by the ICRP and the NCRP.
• The main door of the CT machine rooms, lead glass, and control room doors are adequate shielding barriers.
• The radiation principle, ALARA (“As Low As Reasonably Achievable”), should always be observed. Hence, it is imperative to always make an effort to maintain and control exposures to ionizing radiation.

REFERENCES


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