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Evaluation of scatter radiation dose to eye lens and thyroid gland from digital mammography

ช่วงเวลาดำเนินการ ปี พ.ศ. 2564

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Background: Digital mammography is a well-established screening examination for breast cancer due to its high sensitivity and specificity. However, digital mammography uses X-ray which is an ionizing radiation that can cause injury to all types of cells. In the patient positioning for mammography, the radiosensitive organs such as eye lens and thyroid gland are close to the radiation beam. Therefore, it is necessary to measure the scattered radiation dose to monitor and control the exposure within the standard limit.

Objective: To study the scatter radiation dose of eye lens and thyroid gland and absorbed doses of breasts in patients undergoing digital mammography at Vajira Hospital, Bangkok, Thailand.

Materials and methods: Optically stimulated luminescent (OSL) dosimeters were taped to the patient's skin over the right and left lateral canthal angles, right and left thyroid lobes of 60 women (age range, 40–70 years) to measure the scattered radiation dose at each location in two routine mammographic projections; the cranial–caudal and the mediolateral oblique projections. The accumulated OSL dosimeters from patients were analyzed on a dosimeter reader. Breast compression thickness, compression force, average entrance skin dose, and glandular dose displayed on the mammography unit were recorded for each projection.

Results: The average scatter radiation dose to the skin overlying the right and left lateral canthal angles were 0.082 and 0.076 mGy, the right and left thyroid lobes were 0.929 and 0.883 mGy respectively. We found that the average scatter radiation doses were not exceed the radiation protection standards. On average, patients receive a glandular dose (AGD) of about 2.64 mGy. AGD was not exceed the dose limit recommended by the ACR where AGD of an ACR accreditation phantom shall not exceed 3 mGy. The average absorbed dose of breasts in digital mammography at Vajira Hospital was within the standard level. Meanwhile, the mean entrance skin dose was 9.96 mGy closer to the limit set by the IAEA, which was specified not to exceed 10 mGy for breasts of thickness between 4 and 6 cm.

Conclusion: The scatter radiation dose and absorbed doses determined through our study were within the standard level. Maximum visibility, especially for the signs of pathology, was achieved

by imaging protocols that optimize the procedure and balance the quality requirements with the radiation dose to the patient. Monitoring of radiation dose in mammography reduces the risk of ionizing radiation and promotes the quality of public health services.