การวัดปริมาณรังสีโดย Al2O3:C สำหรับการประเมิน
ปัจจัยที่อาจส่งผลต่อบริเวณผิวหนังที่ได้รับจากผู้ป่วยมะเร็งตับที่ได้รับเคมีบำบัดทางหลอดเลือดแดง

Al2O3:C optically stimulated luminescence dosimetry for evaluation of potential factors contributing to entrance skin doses received by liver cancer patients undergoing Transarterial Chemoembolization

ช่วงเวลาดำเนินการ ปี พ.ศ. 2566

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รายละเอียดสรุป

Transarterial Chemoembolization (TACE) has been accepted as an effective technique that can be practically used for liver cancer treatment due to its outstanding benefits for patients with large, infiltrative, and multifocal tumors that cannot be surgically removed. However, this invasive image-guided technique may potentially result in higher radiation doses than general diagnostic radiology. Radiation-induced skin injury caused by excessive exposure to X-rays during fluoroscopically guided procedures has been previously reported. Therefore, dose assessment during TACE examination is relevant to minimize radiological hazards and reduce patient distress.

The study aims to 1) quantify the magnitude of radiation doses received in TACE treatments, 2) evaluate potential factors contributing to an increase of the entrance skin dose, and 3) demonstrate an improved image-guided procedure for reducing radiation doses while maintaining high X-ray image quality. The study was carried out employing an anthropomorphic phantom to determine radiation dose using a standard commercial optically stimulated luminescence dosimeter (OSLD). Experimental data was collected from 370 patients under three specific image-guided techniques. They include 1) abdomen frontal 3 fps procedure where a pathway of blood flow was created using an image acquisition rate of three frames per second (fps), 2) navigation where a blood vessel roadmap was created with subtraction of bones and organs, and 3) fluoroscopy where X-ray beams were continuously delivered to a target for creating real-time images with no interference removed. Analysis of variance was used to demonstrate the difference of the mean entrance skin doses (ESDs) among the three imaging techniques. A multiple regression model was also used to investigate potential factors contributing to the increased ESDs.

The study confirms that the ESDs received by TACE patients using these three imaging techniques are not significantly different. Moreover, the statistical-based model shows that the five main factors obtained from the exposure parameters and patient dosimetric data contribute

to the patient ESDs. They include 1) the dose area product (DAP), 2) fluoroscopy time, 3) X-ray tube voltage, 4) X-ray tube current, and 5) total diagnostic images. All information is reported based on the machine DICOM-RDSR (Digital Imaging and Communication in Medicine – Radiation Dose Structured Report) data after completed examinations. Finally, the ANOVA test confirms that this simplified model can be used to estimate the radiation doses received by TACE patients, accounting for a 95% confidence interval.