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CONTOUR MAPS OF NORMALISED SCATTERED RADIATION DOSES AT DIFFERENT EYE HEIGHTS POSITIONS IN AN ANGIOGRAPHY ROOM BASEDON MULTIPLE LINEAR REGRESSION MODEL

Ahmad Radzi, H.[1*], Sohaimi, N.[1], Md Ralib, A.R.[2,3]

[1]Department of Diagnostic Imaging and Radiotherapy, Kulliyyah of Allied Health Science, International Islamic University Malaysia.
[2]Department of Radiology, Kulliyyah of Medicine, International Islamic University Malaysia.
[3]Department of Radiology, Sultan Ahmad Shah Medical Centre@IIUM.

**Corresponding author: Halimatussa'diah Ahmad Radzi, International Islamic University Malaysia (IIUM), Jalan Gombak, 53100 Kuala Lumpur, MALAYSIA. Email: halimah@iium.edu.my.*

ABSTRACT

Background: The phantom study produced contour maps to educate angiography staff on the distributions of scattered radiation to their eyes.

Methodology: The scattered radiation came from an upper-body PBY-31 phantom (Kyoto Kagaku) exposed to percutaneous transhepatic biliary drainage technical factors. A total of 48 nanoDots™ (Landauer Inc.) were placed on the paper tubes, corresponding to six positions and eight heights (from 135 cm to 170 cm, with 5 cm increments) of the angiography staff's eyes from the scattered source. The studied projection and positions were posteroanterior (PA), 25° right anterior oblique (RAO), and 25° left anterior oblique (LAO). The measured doses (mGy) were normalised to the respective dose area product for each exposure ($mGym^2$). The normalised doses ($mGy/mGym^2$) were then transformed to their common logarithmic (log_{10}) form and analysed using a multiple linear regression model. After the analysis, the back transformation was performed, and the contour maps of the results were produced.

Results: Linear relationships were observed between log_{10} normalised scattered radiation doses with eye heights and positions for all projections [F (6,137) = 56.96, p< .001 (PA), F (6,137) = 299.94, p< .001 (25° RAO), F (6,137) = 333.953, p< .001 (25° LAO)]. An increase of 5 cm heights reduced normalised doses by 15.9%, 16.8%, and 6.7% in PA, 25° RAO, and 25° LAO, respectively. In PA projection, 155 cm and above eye heights received lower scattered radiation doses for all positions. Meanwhile, in 25° RAO, the flat panel detector (FD) shielded the position right next to the irradiated area. However, this position received higher scattered radiation doses in 25° LAO.

Conclusion: The contour maps differed for each projection, and the distribution of scattered radiation in an angiography room was affected by the shielding of the FD.

Keywords: Angiography, radiation dosimetry, radiation protection, eye, occupational radiation exposure