

Application of Material Filter for Scatter Correction in Planar Imaging of Thyroid with Tc-99m: Phantom Study

Inayatullah Shah Sayed^{1,}, Ahmad Zakaria², Nazifah Abdullah³, Norhanna Sohaimi¹ & Mohamad Shahrir Abdul Rahim⁴*

¹Department of Diagnostic Imaging and Radiotherapy, Kulliyah of Allied Health Sciences, International Islamic University Malaysia

²School of Health Sciences, Universiti Sains Malaysia

³Faculty of Health Science, Universiti Sultan Zainal Abidin (UniSZA), Gong Badak Campus

⁴Breast Centre, Jalan Hospital, Kulliyah of Medicine, International Islamic University Malaysia

ABSTRACT

Objectives/Research Problem: Detection of scattered gamma photons in nuclear medicine image data limits the quality of resultant image. In thyroid scintigraphy, the scattered gamma photons cause the distortion of shape of cold and hot nodules as well as degrade the overall image quality. Thus, the work presented here aims to improve the image quality by removing some scattered gamma photons with a material filter before reaching the detector of gamma camera.

Materials and Method: A flat sheet of Zinc (Zn) material 0.198mm thick, 44 x 55 cm² sized was used as a filter. For data acquisition Philip ADAC Forte with two heads and fixed with low energy high resolution (LEHR) collimators was used. A Picker's thyroid phantom (without neck) was filled with clean water and 10mCi of Tc-99m was injected. Planar images were acquired with material filter attached on the outer surface of the collimator and without the material filter. In a 256 x 256 sized matrix, 400k counts / image were collected. Images were analyzed using ImageJ software.

Results and Discussion: Material filtered image showed the improvement in perceived image quality of cold and hot regions. Overall a significant reduction at $p < 0.05$ in the image noise with material filter was recorded. However, equivocal results of measured contrast of cold and hot regions (12mm diameter) were recorded with material filter. On the other hand, insignificant improvement in the contrast of 8.7mm diameter cold region with material filter was achieved.

Conclusion: The technique may have application in thyroid patient examinations. However, in order to confirm the results, further investigations are required by imaging various types of thyroid phantoms.

KEYWORDS: Material Filter, Scatter Correction, Image Quality Enhancement, Cold and Hot Thyroid Nodules

*CORRESPONDENCE: inayatullah@iiu.edu.my