POST-RECONSTRUCTION METHOD TO CORRECT PARTIAL VOLUME EFFECT IN SPECT IMAGING

K N P G ALLANGBA [1,2,3,4,5], A GIULIANO [4], A KOUAME-KOUTOUAN [2], N KOUASSI-ABOUKOUA[2], A TRAINO [4]

[1] *Faculty of Environment, University Jean Lorougnon Guédé, Daloa, Côte d'Ivoire*

[2] *Laboratoire de Biophysique et Medecine Nucléaire, University Félix HOUPHOUET-BOIGNY, Abidjan, Côte d'Ivoire*

[3] *Department of Medical Physics, University of Trieste and International Centre for Theoretical Physics (ICTP), Italy*

[4] *Unit of Medical Physics, Pisa University Hospital "Azienda Ospedaliero-Universitaria Pisana", Via Roma 67, 56126 Pisa, Italy*

[5]: *Correspondant E-mail : pgallangba@gmail.com*

ABSTRACT

The Partial Volume Effect (PVE) is the most important loss-of-quantification factor in nuclear medicine, particularly for assessment in regions of interest smaller than the FWHM of the imaging system's point spread function (PSF). A post-reconstruction algorithm based on the mathematical theory was implemented to correct the PVE.

OBJECTIVE

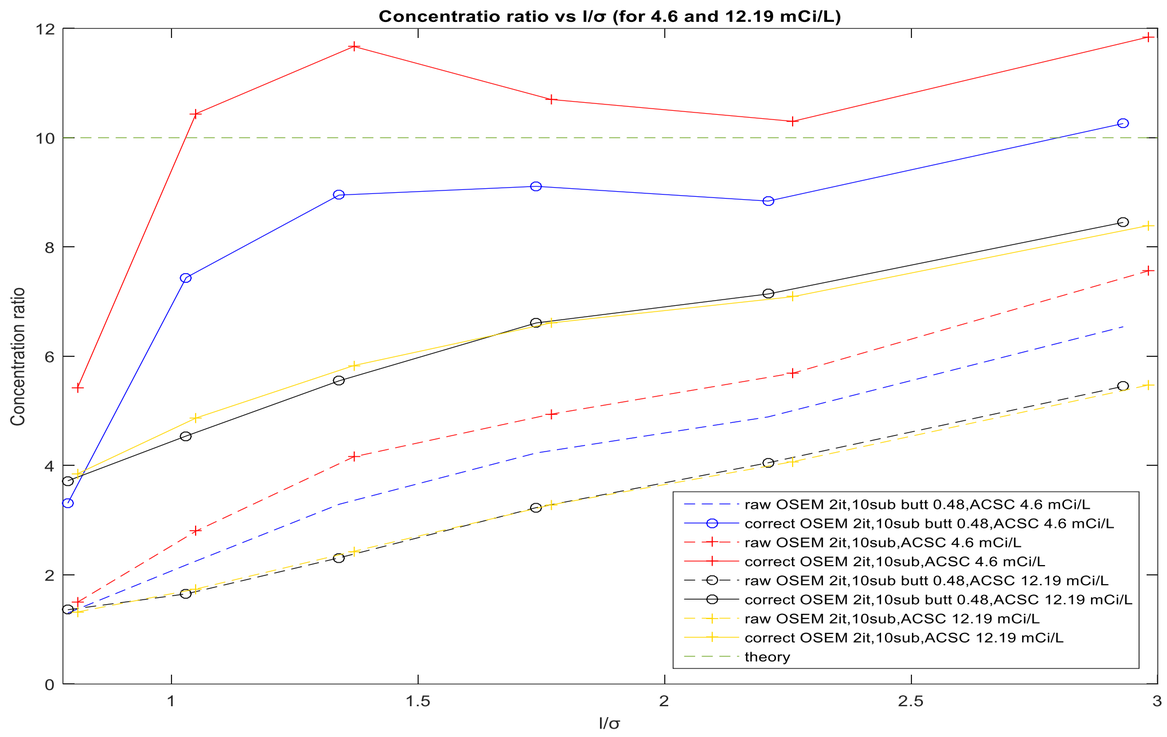
Study focused on the application of a post-reconstruction correction algorithm of PVE at regional level in SPECT imaging.

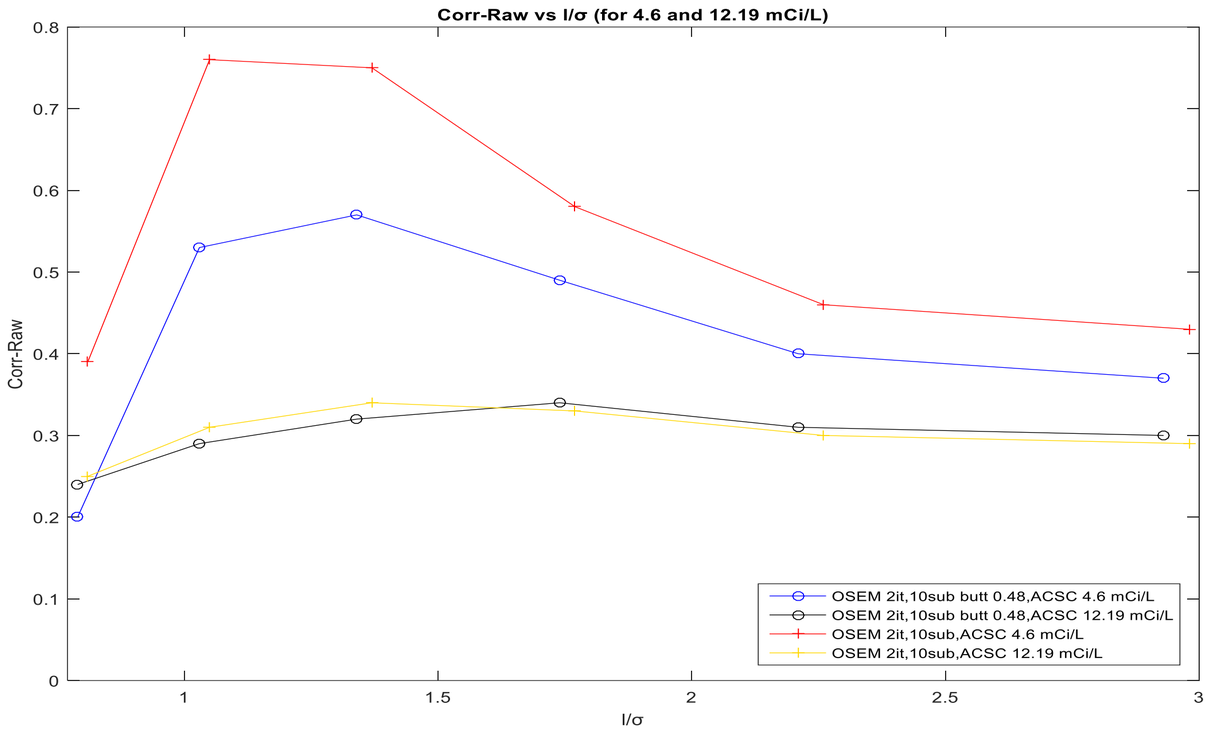
MATERIALS AND METHODS

After a quantitative evaluation of the sigma of the PSF of the SPECT imaging system, several experimental situations have been studied using the standard NEMA IEC Body phantom [1], which contains six spherical inserts that mimic lesions with diameters of 10 mm, 13 mm, 17 mm, 22 mm, 28 mm and 37 mm, filled of ^{99m}Tc. A sphere-to-background activity concentration ratio of 10:1 was adopted. The post-reconstruction algorithm based on the mathematical theory implemented in MATLAB [2], was used to correct the PVE in SPECT images studied.

RESULTS

The experimental measurements were carried out with two activity concentrations of 99mTc: 4.6 mCi/L and 12.19 mCi/L. The PVE correction approach has been employed in this paper to correct PVE on spherical VOIs of different sizes and to evaluate the recovery of quantitative data. Images were reconstructed using Ordered-Subset Expectation Maximization (OSEM,2 iterations,10 subsets) algorithm, applying scatter and attenuation corrections, both with and without the application of Butterworth filter. The rate of the mean difference between the corrected and raw image, when we consider the size of the sphere of 13 mm, 17 mm, and 22 mm, gives a percent improvement rate of PVE correction for images with Butterworth is about 52.66% at 4.6 mCi/L versus 31,7% at 12.19 mCi/L respectively and for images without Butterworth is approximately 69.7% at 4.6 mCi/L versus 32.87% at 12.19 mCi/L respectively.





CONCLUSION

This work shows that the application of the PVE correction method allows the recovery of the loss of dosimetric quantification.

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