

AbstractID: 5614 Title: Monte Carlo simulations of GSF family voxel phantoms for quantification of renal planar scintigraphy

Purpose: To analyze quantitatively the influence of different renal uptakes of ^{99m}Tc -DMSA on the absolute index of renal function (IRF), using Monte Carlo simulated images of voxel phantoms family.

Method and Materials: Four anthropomorphic phantoms of GSF family (Baby, Helga, Donna and Children) were simulated with SimSET code. The phantoms have different dimensions in the region of interest (e.g. renal depth, distance between kidneys, renal volume, body volume). Planar acquisitions were modeled using a parallel LEHR collimator. The phantoms were positioned 10 cm from the collimator. A 20% energy window was used to acquire ^{99m}Tc projection onto 128 X 128 matrices. The energy resolution was modeled with a 10% Gaussian function. For each phantom, five normal and abnormal uptakes were assigned, from 50%-50% (normal) to 10%-90% (severe). The IRF was calculated using the software DMSAQuant, based on the Raynaud method. The results were compared with true activity in each kidney, known by Monte Carlo simulations.

Results: The results of the IRF have shown differences between the calculated indexes and the true index. The higher deviations (75%) are associated with lower relative uptakes (10%). For relative uptakes higher than 40%, the difference between the calculated indexes and the true index remains constant between 5% and 10%.

Conclusion: Our results showed that Raynaud method do not provide accurate values of the absolute IRF when lower relative uptakes are present due to renal diseases. The results have shown that the values of the absolute index of the diseased kidney are influenced by the contralateral kidney. This could be justified because the method only corrects renal depth and age. We suggest that more studies will need to be done to clarify the factors influencing the renal quantification and to model a new correction factor.

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