Pre-Congress Symposium 6 (Dosimetry/Physics)
Saturday, October 21, 13:00-16:00

Session Title
Monte Carlo Simulation / Image Reconstruction – Part II

Chairs
Cecilia Hindorf (Lund)
Michael Ljungberg (Lund)

Programme

13:00 – 13:15	Dimitris Visvikis (Brest): Short Introduction to the Principles of Monte Carlo Methods
13:15 – 13:45	Stefaan Vandenberghe (Ghent): Monte Carlo Simulation of PET Systems
13:45 – 14:15	David Sarrut (Lyon): Monte Carlo Simulation of SPECT Systems
14:15 - 14:45	**Coffee Break**
14:45 – 15:15	Michael Ljungberg (Lund): Quality Assurance of Nuclear Medicine Procedures Using Monte Carlo Simulated Images of Virtual Patients
15:15 – 15:40	Hugo de Jong (Utrecht): Full Monte Carlo Based Image Reconstruction – Are we there? Part 1
15:40 – 15:50	Michael Ljungberg (Lund): Full Monte Carlo Based Image Reconstruction – Are we there? Part 2
15:50 – 16:00	Concluding Remarks and Panel Discussion

Educational Objectives

1. Learn the basic principles behind the Monte Carlo simulations of photons for imaging including sampling, probability distributions, interaction types and the use of different types of analytical and voxel-based phantoms,
2. To understand the potential of Monte Carlo simulations in evaluating and improving medical imaging for both PET and SPECT/Planar Imaging system by examples of studies where parameters not possible to measure can be accurately calculated for further use in quantitative compensation procedures,

3. To learn how Monte Carlo based clinically realistic patient studies can be tailored and distributed for different users and used for multi-center quality assurance of common Nuclear Medicine imaging procedures,
4. To learn the principles behind full Monte Carlo based iterative reconstruction methods and how this branch has been developed during the years and to understand the pro's and con's that are associated with conventional methods related to it.

Summary

The Monte Carlo method is a well-established method that offers unique possibility to simulate and create data that often are impossible to measure. The MC method has been very successful in quantitative NM Planar/SPECT/PET imaging where the creation of energy-spectrua and projections can be studied in detail to be able to quantify fractions of scatter, penetration, backscatter, false coincidence etc. When connecting accurate camera models to virtual 3D and 4D patient models, represented by high-resolution voxel-images here, projection data and related sinograms can be created that resemble real data to a high degree. The MC method has also a potential to be a very accurate projector in an iterative reconstruction procedure.

Key Words

Monte Carlo Simulation, Planar/SPECT/PET imaging, Iterative Reconstruction