Teaching Session 1
Translational Molecular Imaging and Therapy + Physics Committee / EANM Research Ltd (EARL)
Friday, October 23, 09:00-10:30

Session Title
Quantification and Standardisation in Clinical and Preclinical Molecular Imaging

Chairperson
Anne L. Strömvall (Umeå, Sweden)

Programme

09:00 - 09:29 Julia Mannheim (Tübingen, Germany): Molecular Imaging With Small Animal Architectures - Challenges and Chances

09:29 - 09:58 Iva Hristova (Vratsa, Bulgaria / EARL): EARL and the Road to PET/CT Imaging Harmonisation

09:58 - 10:27 Mathieu Hatt (Brest, France): Standardization and Harmonisation for Radiomics Analysis

Educational Objectives

1. Understand the underlying principles of preclinical imaging quantification and the challenges aggregated with scanner design
2. Gain insight on possible strategies to extract accurate metrics from small animal imaging data
3. Frame the development of the EARL program, its objectives and scientific foundations
4. Analyze the importance of reproducibility of results and standardization of methodology in a multi-center point of view
5. Pinpoint strengths and caveats of molecular imaging quantification harmonizing initiatives
6. Contextualize the radiomics concept on the clinical and preclinical settings

Summary

As a non-invasive imaging techniques, nuclear medicine procedures have come to be a fundamental key piece on the drug development, and on gaining a unique insight on the pathophysiology of a number of diseases. On the preclinical context imaging is but one step on the chain of drug development. When the description of complex biochemical processes dictating the tracer's uptake and specific binding to target cells is incomplete or being tested, it is desirable that imaging performs accurately and reproducibly, so as to retrieve reliable data from imaging. However, preclinical imaging is a small niche in nuclear medicine and there are not many resources or guidelines providing researchers with valuable tools to take maximal advantage of their custom-made imaging devices' quantification capabilities.
In 2010, the European Association of Nuclear Medicine (EANM) initiated a programme for the accreditation of PET/CT scanners using [18F]fluorodeoxyglucose (FDG) in order to support compliance with requirements regarding quality control and quality assurance of PET/CT systems. The programme,

run within the scope of EANM Research Limited (EARL) activities, was based on the FDG-PET and PET / CT: EANM procedure guidelines for tumour PET imaging: version 1.0, published in the European Journal of Nuclear Medicine and Molecular Imaging (EJNMMI) in the same year. This widely accepted guideline aims to provide a minimum standard for the acquisition and interpretation of PET and PET/CT scans obtained with FDG. The standardisation achieved by the accreditation programme relates to imaging procedures and methodology, including patient preparation, scan acquisition and image processing and analysis, which is of the utmost importance for quality assurance in daily clinical practice as well as in multicentre trials. The EANM/EARL accreditation programme represents a successful model for the implementation of a system to improve quality in clinical trials and clinical practice.

This session will lead the audience through the challenges of preclinical imaging, focusing on multimodality quantification techniques, on an effort to provide researchers with insight and techniques to ensure accurate and reproducible data extraction from their preclinical imaging procedures. Moving to the clinical imaging the objectives will be to provide an overview of current solutions and future developments in terms of multimodality PET/CT harmonisation. Finally, the session will include an introduction to the potential usage of radiomics for clinical and preclinical research touching on the value of imaging biomarkers in understanding and modelling patient specific physiological processes and outcomes.

Key Words

Clinical and Preclinical Imaging, multi-center imaging performance, quantification, multi-modality, radiomics