Initial experience with the EANM accreditation procedure of FDG PET/CT devices

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INTRODUCTION

• Many factors affect SUV (Fig1.) quantification of FDG PET/CT studies (overview of factors).

• Multicenter quantitative FDG PET/CT studies are hampered by variability in applied methodology resulting in large inter-institute SUV differences (Fig.2).

• To this end the EANM published the European guideline for PET tumour imaging with FDG (Boellaard et al., EJNMMI 2010).

• EARL accreditation program, endorsed by EANM and EORTC, was started in 2010 to implement this guideline.

OVERVIEW OF FACTORS AFFECTING FDG PET/CT SUV QUANTIFICATION

Technical factors*

- Relative calibration between PET scanner and dose calibrator (10%)
- Residual activity in syringe (5%)
- Incorrect synchronisation of clocks (10%)
- Injection vs calibration time (10%)
- Quality of administration (50%)

Physics related factors*

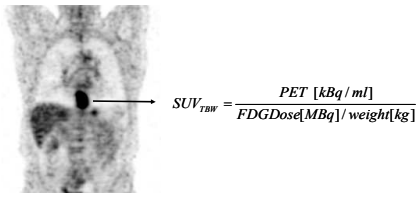
- Scan acquisition parameters (15%)
- Image reconstruction parameters (30%)
- Use of contrast agents (15%)
- Region of interest definition (50%)

Biological factors*

- Uptake period (15%)
- Patient motion and breathing (30%)
- Blood glucose levels (15%)

*Percentages between brackets indicate typical (largest) effect on SUV result

R. Boellaard 2009, J Nucl Med Supplement Issue 50: 11S



$$SUV_{TBW} = \frac{PET\ [kBq/ml]}{FDGDose[MBq]/weight[kg]}$$

Figure 1: Standardised uptake value (SUV)

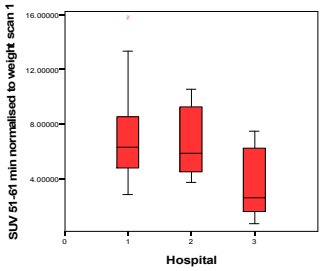


Figure 2: Baseline SUV data from 3 different institutes, showing large variability in SUV results between sites 1 and 2 versus 3: the latter not meeting the guideline standards

EANM FDG PET/CT GUIDELINE ESSENTIALS

The EANM FDG PET/CT guideline for tumour imaging handles various factors influencing SUV by giving strict recommendations for:

- Patient preparation
- FDG dosage as function of weight and scanning time
- PET acquisition
- PET image reconstruction
- Data analysis
- Quality control (QC) procedures

Important aspect is use of **harmonising** performance standards.

EARL (EANM Research Ltd) ACCREDITATION PROGRAM

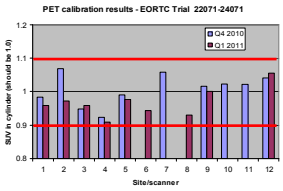
Harmonising performance QC standards: minimises differences in image quality and qantification between sites.

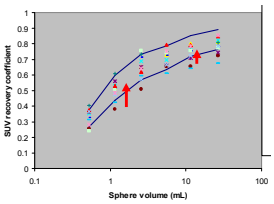
QC aims at

- Verification of PET/CT system calibration using uniform cylinder
- Verification of SUV recovery and image quality using modified NEMA NU 2 phantom.

Pilot accredition program (10.2010-04.2011): 11 Imaging sites, 12 PET/CT systems

RESULTS





Initially 2 PET/CT systems needed recalibration and/or adjustment of reconstruction settings for achieving harmonised performance

CONCLUSIONS

- The EARL FDG PET/CT accreditation program is feasible and was successfully completed.
- Results of this initial pilot encourage to further spread the accreditation initiative across Europe
- At present an additional number of imaging sites are being accredited.