

Quality Control Procedures for microPET/CT and microSPECT/CT

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Introduction

Quality Control (QC) procedures are important to maintain a high quality of acquired image data and should be performed on a regular basis and according to predefined protocols.

Although quality control procedures are well established in the clinic, they are still under development in the pre-clinical setting.

A project has commenced with the aim of providing recommendations for relevant QC tests to perform on microSPECT/CT and microPET/CT systems.

Methods

A questionnaire was sent to the members of the COST action BM0607 by working group 3 (Dosimetry and Radiobiology) to establish the potential needs for pre-clinical imaging platforms within Europe.

The development of QC procedures will entail a description of the evaluation method, tolerance limits, planned actions if the results exceed the tolerated levels and routines for reporting and archiving the results.

Measurements are performed for evaluation of the protocols in parallel to the connected administrative work.

Results

The seven teams that responded on the questionnaire have in total 14 pieces of equipment used for pre-clinical research. Thirty-six percent (36%) of the imaging equipment is a microSPECT, 43% a microPET and 57% include a microCT. Equipment for multimodality imaging (78%) is more frequent than single mode.

Sixty-four percent (64%) of the responding teams performed performance measurements upon arrival of the equipment, 86% of the teams perform QC procedures and 57% perform the QC procedures suggested by the manufacturer, although comments indicate that further input would be most valuable.

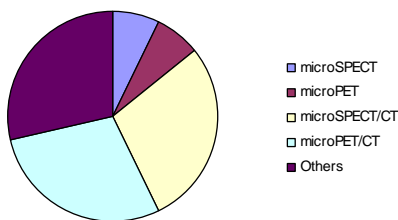


Figure: Equipment utilised for pre-clinical imaging for the responding teams.

Examples of test procedures that are under development:

- Test of the multimodality (alignment the co-registered PET or SPECT-image and the CT image)
- Test of Hounsfield Units for the CT (determine the mean value and the standard deviation of the HU for air and water in a region of interest).
- Test of spatial linearity for the PET, SPECT and CT images
- Test of uniformity for the PET and SPECT images
- Test of sensitivity for the PET and SPECT (activity quantification).

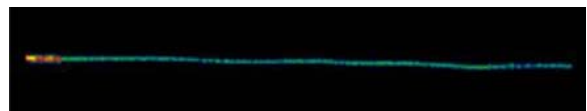


Figure: Test of the spatial linearity of a microSPECT system. The figure shows a coronal image from an acquisition of a capillary tube filled with ¹¹¹In. The non-linearity seen in the image resulted from an instability in the gantry that was corrected.

Conclusions

There is a need to develop Quality Control procedures for pre-clinical imaging.

Routine QC can be performed with relatively simple acquisitions and analysis methods.

Problems can be detected and corrected at an early stage.

