Masterproef industriële ingenieurswetenschappen 2015-2016

Quantitative capabilities of 2 state-of-the-art SPECT/CT imaging systems

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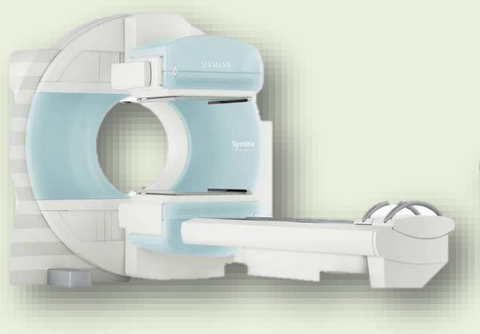
Introduction

SPECT/CT imaging systems with 3D Ordered Subset Expectation Maximization (OS-EM) algorithms allow quantification of radioactivity in absolute units (e.g. kBq/ml). These developments could make in vivo dosimetry with SPECT/CT imaging possible.
This process is compromised by attenuation, scatter and partial volume artefacts.

The **Goal** of this study is to compare 2 state-of-the-art SPECT/CT systems for quantitative accuracy for clinical ^{99m}Tc.



Siemens Symbia T16

Discovery NM/CT 670

Materials and methods

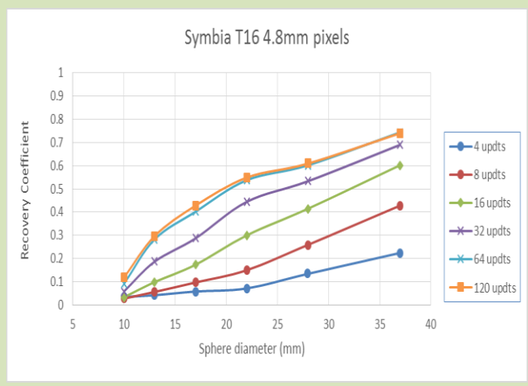
The **first** step is to cross calibrate the systems with a large uniform cylinder phantom in order to calculate the **System Volume Sensitivity (Svol)** which converts image counts to Activity units (kBq/ml).

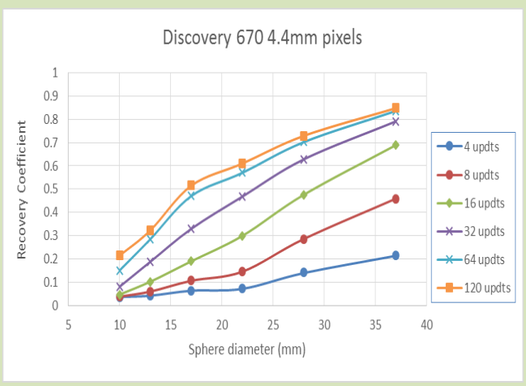
The **second** step is to calculate **Emission Recovery Values** with the NEMA IEC body phantom.

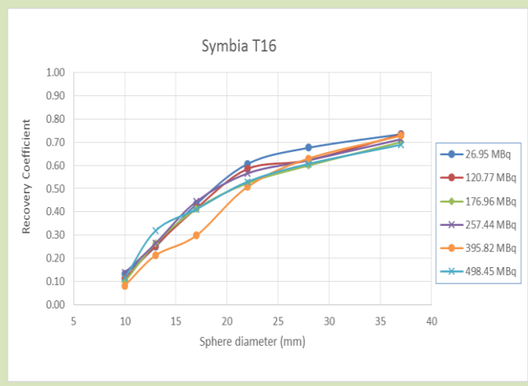
Results

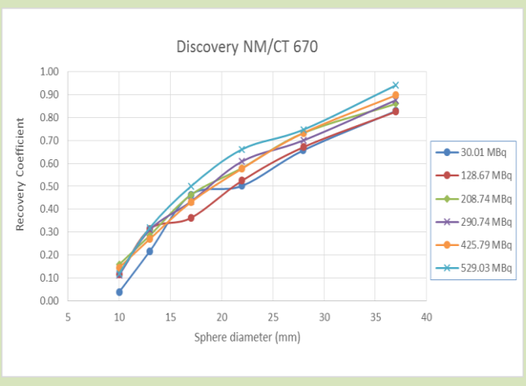
- Symbia T16 Svol: 11.59 ± 0.47 cpm/kBq
- Discovery 670 Svol: 6.11 ± 0.26 cpm/kBq
- Error is about 4%

Contrast recovery









Conclusion

Quantification in a large phantom is accurate within 4% and even possible at very low activities (**diagnostic range**).
A correction strategy for **Partial Volume Effects** is necessary.
The influence of physical and reconstruction artefacts remain a challenge for quantitative SPECT.

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