Validation of navigated beta-probe imaging with PET/CT-generated activity surfaces

New approach in radio-guided resection for FDG-positive tumors

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Background

• Lately $\beta$-probes have been proposed for intra-operative localization of residual cancer cells after resection, given their high accuracy and sensitivity$^1$.

• The combination of them with spatial localization systems offers new possibilities for intra-operative nuclear imaging and radio-guided surgery$^2$.

2  Wendler et al. 2006, Kishenkov et al. 2007, Wendler et al. 2007
Background

\(x_1, y_1, z_1, c_1\)
\(x_2, y_2, z_2, c_2\)
\(x_3, y_3, z_3, c_3\)
...
\(x_n, y_n, z_n, c_n\)
Background

Adapted from Wendler et al. 2006
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Objectives

• Find ways to validate introduced technology.
• Generation of beta-emission surfaces from a preoperative PET/CT.
Materials

ART2 Cameras & DTrack, ART GmbH

β-probe & NodeSeeker, Intra-Medical Imaging LLC

Biograph Sensation 16 PET/CT, Siemens

Ad hoc phantom
Methods

Phantom preparation

PET/CT scan
- Surface extraction
- Diffusion calculation
  - Navigated β-probe scan
- Surface reconstruction
  - Activity map generation
  - Rigid registration
  - Comparison
Methods

PET/CT volume

Diffusion calculation

CT surface

Emission surface
Results

PET/CT generated emission surface

Navigated $\beta$-probe emission surface
Conclusions

• PET/CT-generated surfaces present a promising visualization for surgical planning.
• The generated PET/CT emission surfaces correlate well with the ones acquired using the β-probe.
• This good correlation allows us to confirm this approach as a valid step toward radio-guided tumor resection and intra-operative nuclear imaging.