

**SubID:** 31150802667

**Typ sesji:** OS - Sesja Ustna

**Język prezentacji:** angielski

**Tytuł pracy:** Y-90 PET/CT and SPECT/CT anthropomorphic phantom imaging. Qualitative and quantitative assessment of visibility of cold and hot liver tumours.

**Temat:**

**Autor / Autorzy:** Agata Kubik<sup>1</sup>, Anna Budzyńska<sup>2</sup>, Krzysztof Kacperski<sup>3</sup>, Patrycja Szubstarska<sup>1</sup>, Michał Kuć<sup>4</sup>, Piotr Piasecki<sup>5</sup>, Marcin Konior<sup>4</sup>, Mirosław Dziuk<sup>2</sup>, Edward Iller<sup>6</sup>

<sup>1</sup>Department of Nuclear Medicine, Military Institute of Medicine, Warsaw, Poland

<sup>2</sup>Department of Nuclear Medicine, Military Institute of Medicine, Warsaw, Poland; Affidea Mazovian PET/CT Medical Centre, Warsaw, Poland

<sup>3</sup>Particle Acceleration Physics and Technology Division (TJ1), National Centre for Nuclear Research, Otwock—Świerk, Poland; Department of Nuclear Medicine, Military Institute of Medicine, Warsaw, Poland

<sup>4</sup>Radiological Metrology and Biomedical Physics Division (H2), National Centre for Nuclear Research, Otwock—Świerk, Poland

<sup>5</sup>Department of Interventional Radiology, Military Institute of Medicine, Warsaw, Poland

<sup>6</sup>National Centre for Nuclear Research, Radioisotope Centre POLATOM, Otwock—Świerk, Poland

**Abstrakt:**

**Purpose:** The aim of this study was to assess the feasibility of visualising hot and cold tumours in Y-90 PET/CT and Bremsstrahlung SPECT/CT imaging, as well as to assess the influence of energy window selection on image usefulness. By using an anthropomorphic phantom we aimed to approximate a clinical setting, and by imaging it over 15 days to assess the impact of different activities on foci visibility.

**Materials and Methods:** The data was acquired using an anthropomorphic phantom including liver with two spherical tumours (one cold- with no activity, one hot). Liver and hot tumour were filled with Y-90 chloride. Over the imaging period the activity in the liver ranged from 1431 to 38 MBq and in the hot lesion from 19.4 to 0.5 MBq. Nine imaging sessions were conducted, all including SPECT/CT imaging using 30 sec/ projection, high-energy collimators and three energy window settings (W1: 0-280 keV, W2: 100-200 keV, and W3: 100-200 keV comprised of four narrow emission windows), and PET/CT imaging according to clinical protocol (30 min/bed). Qualitatively, the visibility of the tumours was appraised based on the scores awarded by three independent observers. For the quantitative assessment, contrast-to-noise ratio (CNR) was calculated for both spheres in all images and Rose criterion was applied to determine visibility.

**Results:** We have found good correlation between the qualitative and quantitative assessments of the lesions visibility in most cases. For SPECT/CT imaging the cold tumour proved too small to be discernible (CNR <0.5) regardless of the Y-90 activity in the liver, while hot sphere was visible up to the fifth day of imaging for the best acquisition (energy window W2, CNR>4). Dividing the energy window (W3) yielded the worst qualitative results, which were not fully in agreement with the quantitative assessment. For PET/CT imaging, the cold tumour was only visible with the highest Y-90 activity (CNR>4), whereas the hot one was seen up to the tenth day of imaging (CNR>5).

**Conclusions:** In our study PET/CT provided better images for assessment of hot and cold foci visibility than SPECT/CT, however due to limited number of registered counts it is not

without its limitations. CNR seems to provide a good quantitative measure of lesion's visibility, which is in agreement with qualitative assessment. Dividing the energy window for SPECT/CT acquisition did not improve the data, which suggests that further quality improvements must be obtained through other means, possibly via more advanced scatter correction.