

Lesion detectability of a gamma camera based coincidence system with FDG in patients with malignant tumors: A comparison with dedicated positron emission tomography

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Objective: The aim of this study was to investigate the lesion detectability of a gamma camera based coincidence detector system (c-PET system) in comparison to the dedicated PET system (d-PET system), and thereby clarify the feasibility of the clinical application of this system and also describe any factors influencing the lesion detectability of the c-PET system. **Methods:** We examined 74 patients including 19 with malignant lymphoma, 16 with lung cancer, 9 with primary malignant bone tumor, 7 with esophageal cancer, 6 with malignant melanoma, 3 with hepatocellular carcinoma, 3 with primary unknown cancer, 2 with breast cancer, 2 with colon cancer, and 7 with others. d-PET images were obtained using ECAT EXACT HR⁺ at 60 min, followed by c-PET imaging using ECAM at 120 min after the injection of 185 MBq of FDG. Each image was reconstructed without any attenuation correction. In the image interpretation, the whole body was classified into 16 regions (5 superficial regions and 11 deep regions). The FDG accumulation of the lesions was evaluated by visual grading based on the consensus of three nuclear medicine physicians, and the findings were classified into three grades; (++) , (+) , and (–). The lesions were also classified into 3 groups according to their size: large group (≥ 2 cm), middle group ($1 \leq < 2$ cm) and small group (< 1 cm). **Results:** In 627 regions, the abnormal FDG uptake was detected in 109 regions by the d-PET system. Out of 109 regions, the c-PET system could detect the lesions in 91 regions and was false positive in 1 region. Therefore, the sensitivity, specificity, and accuracy of the c-PET system were 83.5%, 99.8% and 97.0%, respectively. Lesion detectability of the small group (54.5%) was significantly lower than that of the large group (97.9%) ($p < 0.001$) and that of the middle group (93.1%) ($p < 0.001$); however, the difference in lesion detectability between the large and middle groups was not significant. Neither the degree of FDG accumulation nor the location of the lesion markedly influenced the lesion detectability of the c-PET system. However, when we focused on the large and middle size lesions, the detectability of deep lesions tended to be lower than that of superficial lesions. **Conclusion:** In conclusion, the lesion detectability of the c-PET system was inferior to that of the d-PET system, especially in the case of small lesions. Further examination is required to assess the clinical usefulness of the c-PET system.

Key words: FDG, coincidence PET, dedicated PET