

What is the most appropriate scan timing for intraoperative detection of malignancy using ^{18}F -FDG-sensitive gamma probe? Preliminary phantom and preoperative patient study

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Purpose: To evaluate the appropriate post-injection timing for hand-held-gamma-ray-detecting probe (GDP) scanning for the intraoperative detection of malignancy after preoperative F-18 FDG (FDG) injection. **Methods:** Patient study with superficially located cancer was performed on three patients before operation by dual-phase whole-body PET at 2 and 6–7 hr post-injection of FDG (370 MBq), and by probe scanning from the skin at several points at 1, 3, 5, and 7 hr after FDG injection. TNRa (tumor-adjacent-normal ratio) and TNRc (tumor-contralateral-normal ratio) were calculated. Phantom study was also performed to determine basic GDP function. **Results:** The patient study revealed that tumors showed constant TNRa (0.9–1.3) and TNRc (1.1–3.0) by GDP count rate, and that there was no tendency of an increase in TNRa with time. The standard deviations of GDP count rate were lower at 1–3 hr post-injection compared with those of delayed scans. While delayed PET showed an increase or no change in the tumor FDG uptake, the decrease of normal tissue FDG uptake was not adequate to create higher TNRs. The phantom study revealed that LN model showed TNRa of 1.7 or greater by GDP count rate (cps) when background contained no FDG, but that they showed TNRa of 1.3 or less when the background contained 4% of the LN FDG activity per ml. **Conclusion:** The present study suggests that higher FDG count rate of tumors at 1–3 hr post-injection would be more suitable for the gamma-probe detection compared with lower count rate at 6–7 hr delayed scans with wide standard deviations.

Key words: gamma-detecting probe, F-18 fluorodeoxyglucose, tumor-to-normal ratio, positron emission tomography, post-injection time