PET monitoring of liver directed selective internal radionuclide therapy for metastatic gastro-oesophageal cancer

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DESCRIPTION

A 74-year-old man with metastatic gastro-oesophageal adenocarcinoma involving coeliac lymph nodes and liver was treated with fluorouracil and oxaliplatin (FOLFOX) chemotherapy. Despite initial good response, Oxaliplatin was omitted after development of significant peripheral neuropathy. His subsequent imaging showed progression of disease, predominantly in the liver. Selective internal radionuclide therapy (SIRT–Yttrium-90 (⁹⁰Y) resin microsphere radioembolisation) was chosen by the multidisciplinary team as the modality to target his dominant left hepatic lobar disease.

⁹⁰Y is a β -particle emitter suitable for radionuclide therapy, which, until recently, was not thought to be able to provide images directly from the decay of the radionuclide.¹ Pretreatment (¹⁸F) fludeoxyglucose positron emission tomography (FDG PET)/CT demonstrated increased glucose metabolism in the rim of the large left lobe lesion. After informed consent, 810 MBq (⁹⁰Y)-microspheres were injected into the left hepatic artery, using selective

catheterisation. Approximately 18 hours post-radioembolisation a ⁹⁰Y PET/CT scan confirmed good deposition of the radiolabelled microspheres around the lesion from which the dose of radiation could be derived. Follow-up (¹⁸F)-FDG PET/CT scan taken 11 weeks after the intervention demonstrated a very good response with markedly reduced metabolic activity (figure 1). There was no progression of the left lobe lesion for 15 months.

The high sensitivity PET/CT scanner used allows acquisition of (¹⁸F)-FDG and the technically challenging ⁹⁰Y images. ⁹⁰Y images are more difficult to capture due to very low radiation flux available for imaging from ⁹⁰Y decay (32 ppm); this has been demonstrated previously.² Liver directed SIRT is an emerging new treatment modality for patients with metastatic gastrointestinal cancers, which was recently shown to delay disease progression in the liver.³ Here we have shown that multitracer PET allows accurate dosimetry and therapeutic monitoring in a single imaging platform, and should be considered in future investigations of this treatment.

Figure 1 The figure demonstrating coronal, sagittal and transverse/axial sections in the three columns from left to right, respectively. The top row showing the pretreatment FDG-positron emission tomography (PET) scan at baseline. The middle rows showing the immediate PET/CT scan after insertion of ⁹⁰Y SIR-spheres. The bottom row demonstrating the follow-up FDG-PET scan at 11 weeks postprocedure, with markedly reduced metabolic activity around the left lobar lesion. FDG, fludeoxyglucose (¹⁸F); ⁹⁰Y SIR-Spheres, Yttrium-90 selective internal radionuclide-spheres; SIRT, selective internal radionuclide therapy.

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Learning points

- ▶ High sensitivity positron emission tomography/CT scanners can acquire standard (^{18}F)-fludeoxyglucose and Yttrium-90 (^{90}Y) images to accurately record dose delivery and treatment response following selective internal radionuclide therapy.
- ▶ Durable response was achieved with (^{90}Y)-microsphere radionuclide therapy in liver metastasis arising from gastro-oesophageal adenocarcinoma—a therapeutic option for isolated liver metastasis in patients who are otherwise unsuitable for aggressive surgical intervention.

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manuscript reviews and final preparations. SC provided overall supervision of the manuscript design and final approval.

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Competing interests None declared.

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