Follow-up Yttrium-90 Internal Pair Production PET/CT Imaging in Patients with Primary or Metastatic Liver Tumors as compared with Bremsstrahlung Imaging: A Prospective Case Series

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Background

- Selective internal radiation therapy (SIRT) with Yttrium-90 (Y-90) is an important modality in the treatment of unresectable liver metastases from CRC and NETs, as well as HCC.
- Post-SIRT radiologic assessment is required in order to determine the adequacy of treatment delivery and to detect potential non-target embolization.
- At most institutions, post-therapy localization is achieved with SPECT or SPECT/CT, which are sometimes limited by poor resolution, particularly in SPECT imaging alone.

Scientific Basis of Y-90 PET/CT

- Yttrium-90 (Y-90) is a radioembolic agent, which primarily undergoes beta-decay. The electrons produced in this process interact with surrounding tissues, producing Bremsstrahlung photons detectable by SPECT.
- Y-90 has a minor branch to the 0+ excited state with an energy of 1.7 MeV, producing an internal e+e- pair in 1 of every 32 million decays. This subsequent internal pair production reaction is detectable by PET.

Methods, Results, and Conclusions

- Assessment of Y-90 embolization can be achieved readily with commonly used PET or PET/CT scanners.
- Improvement in imaging resolution post-Y-90 embolization may aid in more accurately determining dose distribution and non-target embolization where SPECT/CT is not readily available.
- Future studies will further explore PET/CT-based dosimetric methodologies, and paired with pre- and post-Y-90 FDG PET or CTA, may potentially prove to have prognostic value.

Patient 1: 25 yo female with metastatic Wilms tumor referred for left hepatic artery radioembolization. She was status-post Y-90 embolization of right lobe 2 months prior.

Patient 2: 62 yo female with HCC of 4B referred for Y-90 embolization of right lobe 2 months prior, and Y-90 treatment from the LHA 1-month prior.

Patient 3: 59 yo male with HCC, left portal vein thrombosis, and previous treatment with chemoembolization referred for RHA Y-90 embolization.

References