

RSNA 2022 Quality Improvement Report Presentation

The Importance of Imaging and Safety for Yttrium90-Microsphere Therapy

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Introduction:

- Yttrium90-Microsphere Therapy (i.e. Y90) for qualifying hepatic pathologies are increasing in frequency.
- To ensure patient safety and quality of care, proper imaging of target lesions both pre- and post-treatment is essential.
- This allows for correct tumor localization, microcatheter placement, treatment planning, and validation of therapeutic dose delivered.
- Proper imaging can even allow additional resources and treatment strategies in patients who cannot receive treatment.

Introduction Continued:

- The goal of this team was to demonstrate the necessity of pre- and post-therapy imaging techniques.
- Advanced hybridized imaging and collaboration between Angiography, Nuclear Medicine, and Radiation Safety were used to aid in planning of dose delivery, dose calculation, and post-therapeutic imaging.

Methods:

Pre-Treatment Imaging:

- Pre-treatment planning at our facility is performed using liver cross sectional imaging (CT/MRI) followed by intraarterial delivery of 5mCi Tc99m-MAA to the lesion(s) of interest. Hybrid SPECT/CT exam is performed utilizing diagnostic Tc99m-MAA dose (140 keV Gamma).
- Pre-treatment area volume calculation is then determined using the pre-procedure CT/MRI.
- Pre-treatment Nuclear Medicine images are used to assess the lung-shunt fraction and any other extrahepatic shunting.

Post-Treatment Imaging:

- Therapeutic Dose of Beta-emitting Y90-Microspheres infused via IR-Guided Intraarterial injection.
- After treatment with Y90, patients are imaged using PET/CT to verify site of dose delivery.
- Imaging is achieved utilizing the naturally occurring ~1% Positron decay component of Y90.

Methods Continued:

- Our facility decided to track cases after the vendor informed our team that some outside facilities were discontinuing the use of pre-therapeutic imaging.
- These facilities would skip the Tc-99m-MAA SPECT/CT for treatment localization and treat the patient using an assumed lung shunt fraction.
- We felt it prudent to track cases to determine the validity of discontinuing the use of pre-therapeutic nuclear medicine imaging and post-therapeutic PET imaging.

Methods Continued:

- We followed patients where the additional nuclear medicine imaging showed elevated lung-shunting and/or nontarget extrahepatic activity to assess whether the patient's treatment plan was modified.
- Modifications included reduction in dose delivered, splitting the dose angiographically between different arteries (Case 1).
- Changes in treatment plan if patients were precluded from Y90 therapy due to unacceptably high levels of lung shunting (Case 2 & 3).

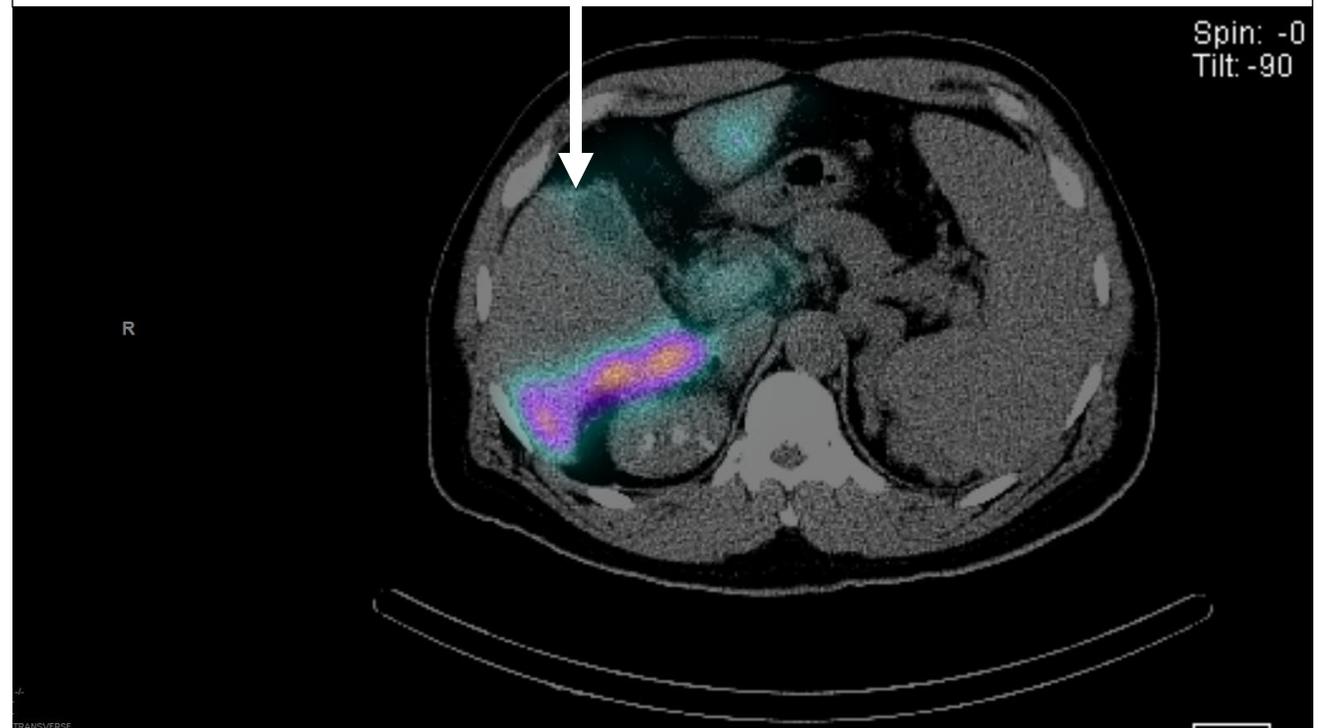
Case 1: Modified/Split Dose.

No Cystic Artery in Angio, visualized gallbladder on SPECT/CT resulted in modified interventional approach and split dose:

Angiography: No visualized Cystic Artery



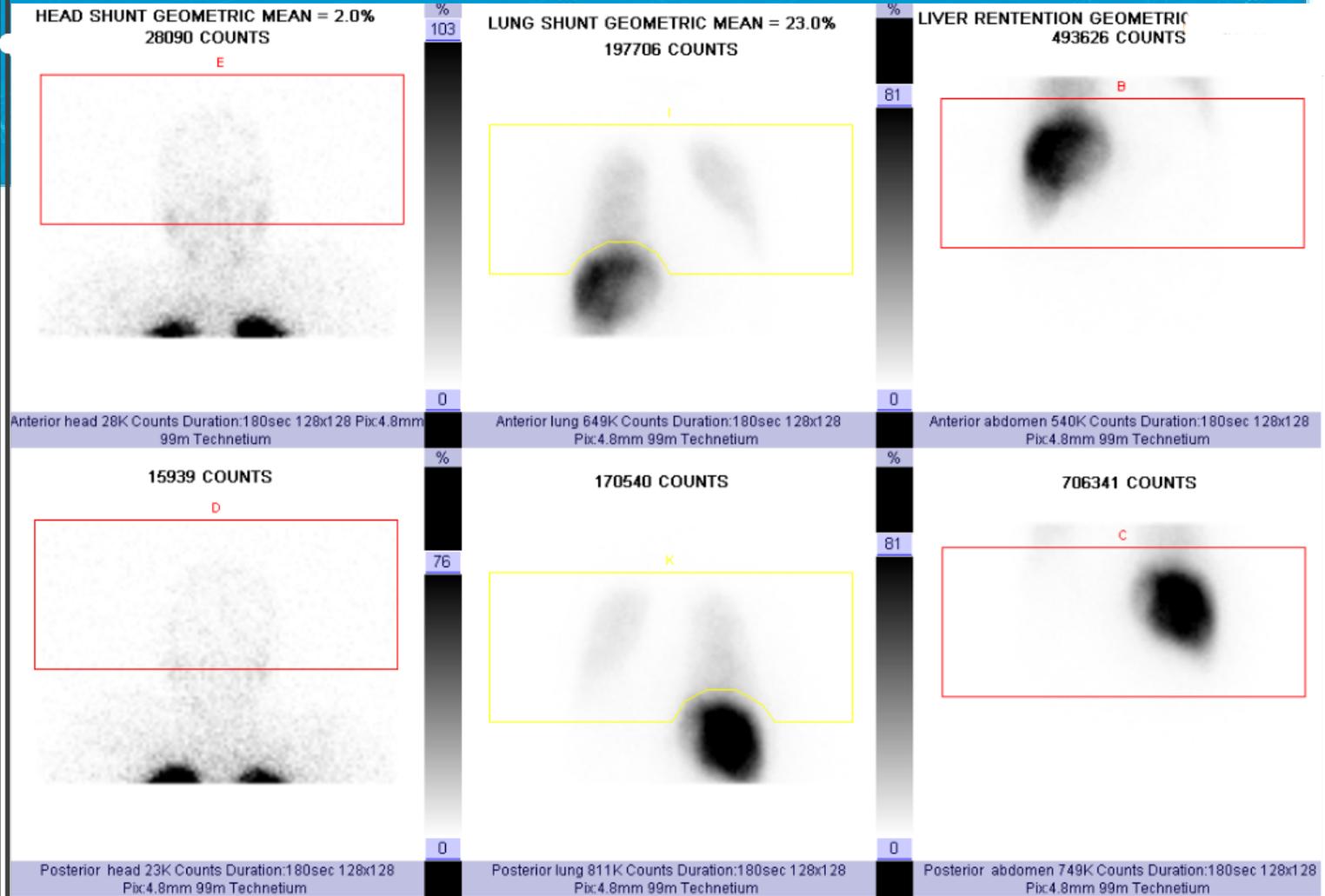
Nuclear Medicine SPECT/CT – Gallbladder Enhancement



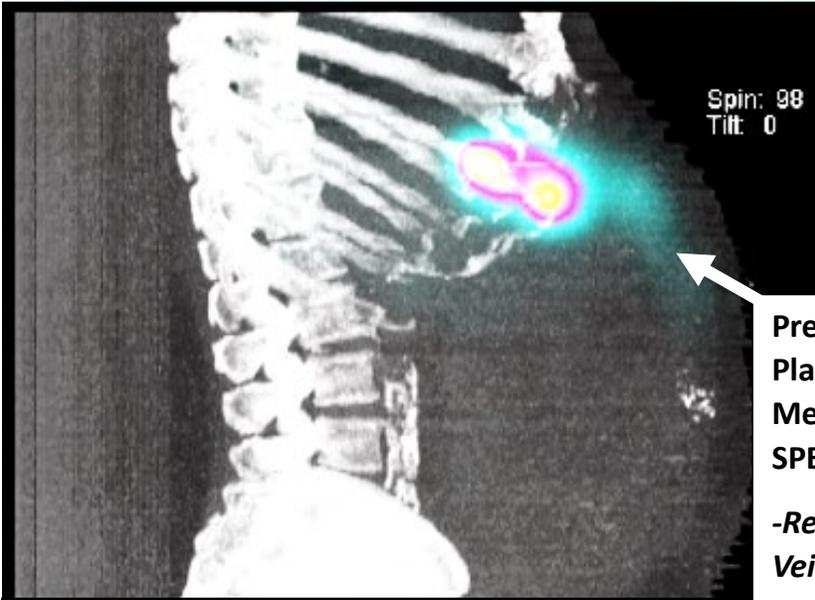
Case 2:

Pre Treatment Imaging
- Elevated Lung-Shunt:
23.0%

*Contraindicated for
Y90-Microsphere
Therapy.*

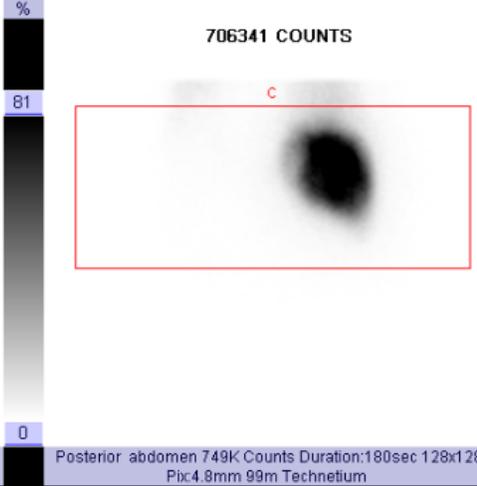
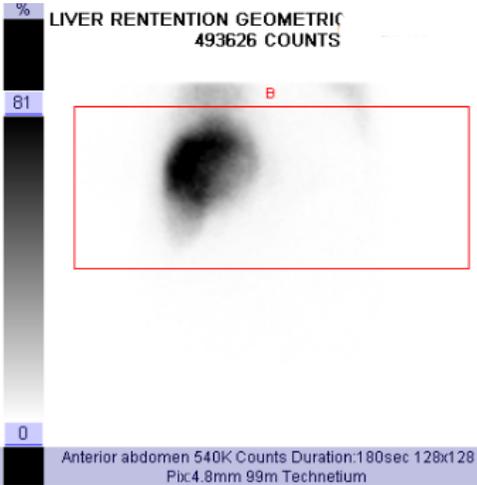
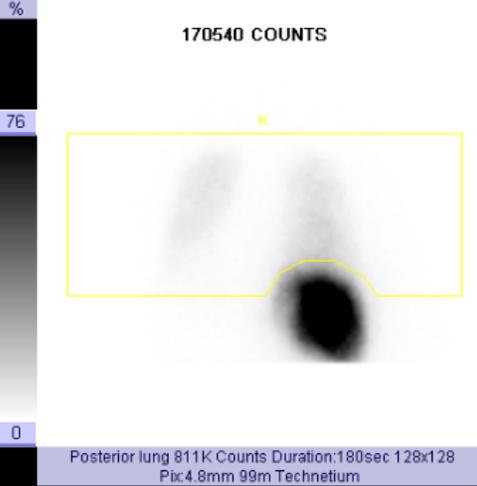
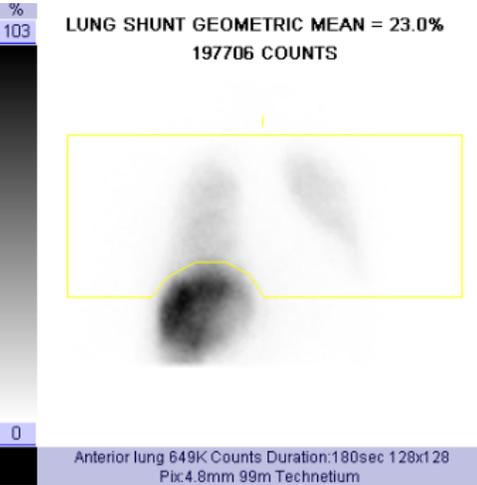
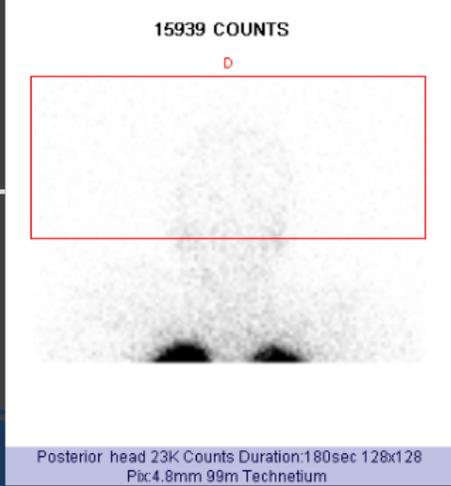
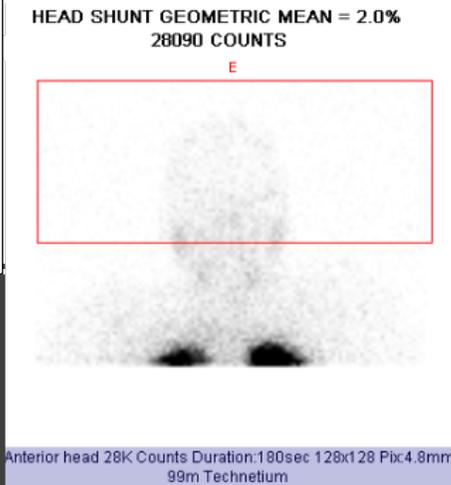
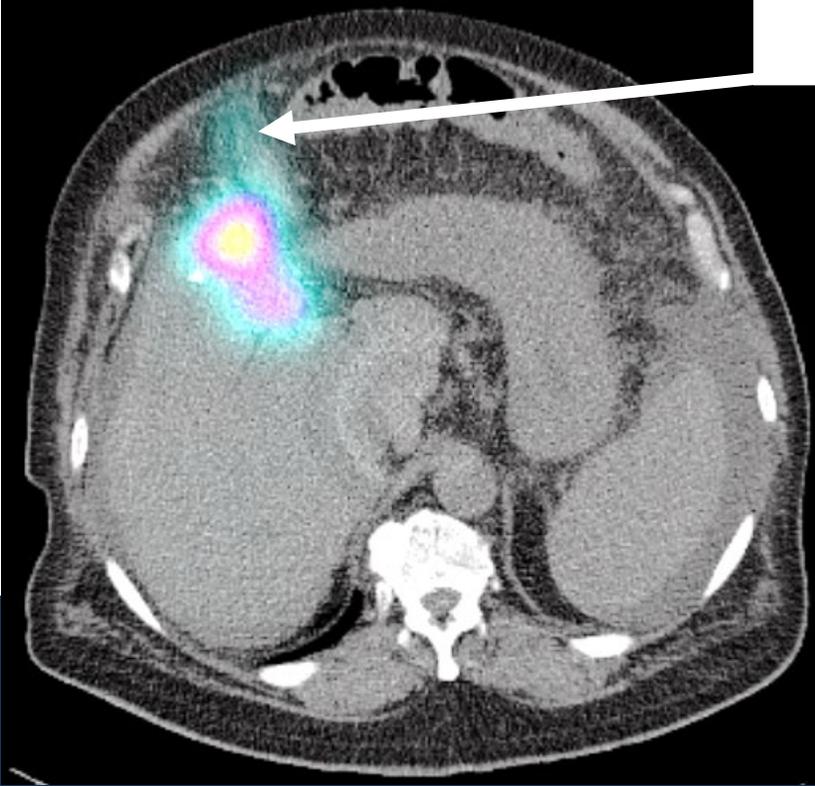


Case 3: Elevated Lung-Shunt: 37.3% and nontarget extrahepatic activity - Contraindicated for Y90 Therapy.



Pre-Treatment
Planning Nuclear
Medicine Tc99m-MAA
SPECT/CT :

-Recanalized Umbilical
Vein



Results & Discussion:

- **Results:** Case evaluation confirmed utilizing advanced imaging techniques (preplanning angiography, Geometric lung-shunt evaluation, SPECT/CT, and PET/CT) lead to improved image quality, interventional approach, and patient safety.
- This is achieved via reduced dose, splitting the dose between different lobar arteries, and validation that dose was delivered without significant exposure to non-target organs.
- **Discussion:** Our facility utilized advanced imaging techniques. It should be noted that all facilities performing Y90s may not have access to a hybridized SPECT/CT, PET/CT, etc.