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.
• 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.