

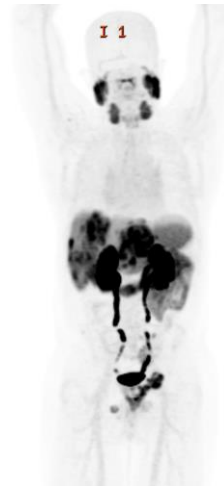
# Optimization of Lu-177 PSMA Post-Therapy Imaging Time

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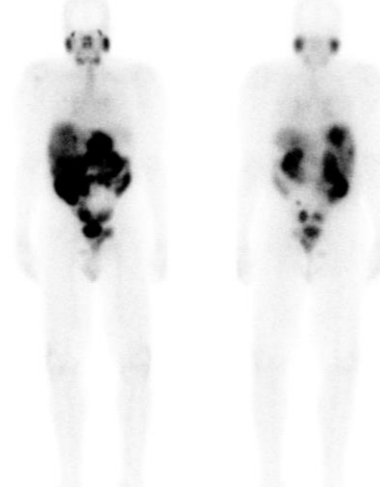
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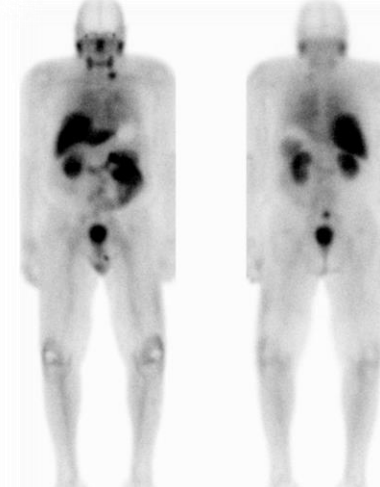
Case 1. Pre-therapy PET planar MIP demonstrates PSMA-avid lesions involving the prostate, pelvic floor musculature, left pelvic nodes, liver, and skeleton



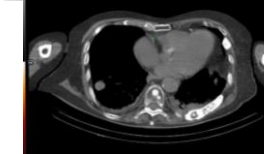
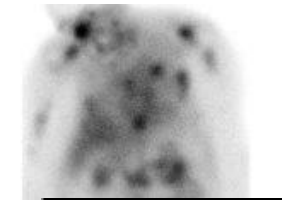
Case 1. 24h whole body planar Images show similar distribution of lesions as PET. Images taken at this time have relatively less background activity



Case 2. Pre-therapy PET planar MIP demonstrates PSMA-avid lesions in the left supraclavicular region, retroperitoneum, and pelvis



Case 2. 4h whole body planar images demonstrate similar distribution of lesions as PET. These images have relatively more background soft tissue activity



Case 3. Whole body planar images (top row) show multiple lesions but their exact location in the thorax is difficult to determine. SPECT CT (bottom two rows) demonstrate activity in skeletal lesions, pulmonary nodules, and pleural effusions



## Purpose

Lutetium-177 PSMA is a theranostic agent with therapeutic effects from beta minus decay and diagnostic capabilities with gamma rays. In clinical practice, its imaging properties are underutilized with no standardized timing for imaging (except for dosimetry). In fact, many centers perform no imaging. At MD Anderson, scan times vary from one hour to 72 hours post-injection. This project compares scans performed at 4 and 24 hours to determine if there is a difference in image quality to guide treatment and incorporate the results into our clinic.

## Methods

Our sample size included 88 Lu-177 PSMA therapy patients from November 2022-September 2023. Our inclusion criteria required that these patients have PET within two months prior to treatment with a full dose (200 mCi) of Pluvicto. Whole body planar and targeted SPECT-CT images were obtained for each patient. Six nuclear medicine attending physicians assessed a blinded selection of 10 patients.

## Results

Physicians accurately identified the timing of post-treatment scans 71% of the time (93% correct with 4-hour and 50% correct with 24-hour). When rating image quality, the distributions in the two groups differed significantly (Mann-Whitney U = 287.5, P < 0.05 two-tailed) with a significant higher score given to 24-hour post-treatment scans.

Physicians believed they could identify the same lesions on post therapy imaging as pre-treatment PET 62% of the time (43% with 4-hour imaging and 80% with 24-hour imaging) and stated that SPECT added value 65% of the time (utility in localizing lesions and identifying smaller lesions).

## Conclusions

As theranostics continue to grow in nuclear radiology, thoughtful use of imaging is important to guide clinical decision making. Post-therapy imaging has proven useful in our practice to identify patients who do not respond well to therapy (as seen in growing or new lesions), demonstrate treatment response, as well as detect incidental conditions such as hydronephrosis that affect treatment.

This study found that physicians prefer the quality of 24-hour images but often have difficulty differentiating them from 4-hour post-therapy scans. As our practice grows, further studies will help elucidate the best method for post-treatment imaging.