Purpose:

Several treatment response metrics, such as RECIST and PERCIST, have been established for assessing individual solid tumors. However, metastatic prostate cancer poses a unique challenge to these metrics because bone lesions are often numerous and non-measureable. This study investigated the impact of using different imaging measures for treatment response assessment in patients with metastatic prostate cancer.

Methods:

Six patients with metastatic prostate cancer were treated with molecular targeted therapy and received whole body $[^{18}\text{F}]$NaF PET/CT scans pre-, mid-, and post-treatment. Lesions were segmented using a threshold of 20% the maximum SUV in bone and then manually adjusted with physician guidance. For each patient, SUV$_{\text{max}}$, SUV$_{\text{mean}}$, SUV$_{\text{peak}}$, SUV$_{\text{total}}$, number of lesions, and total volume of bone lesions were determined. For each measure, treatment response was calculated as the percent change relative to pre-treatment. The range of the different responses was calculated for each patient at each response time point. The population average of the patient ranges was calculated.

Results:

The patient responses varied greatly for different imaging measures. The population-averaged range for all response measures was 50%. In general, SUV$_{\text{max}}$, SUV$_{\text{mean}}$, and SUV$_{\text{peak}}$ responses were negative, indicating good response to treatment, but the number of lesions, volume, and SUV$_{\text{total}}$ responses were positive, indicating disease progression. When the measures were separated into these two groups, the population-averaged range was only 25% among the number of lesions, volume, and SUV$_{\text{total}}$ responses and 10% among the SUV$_{\text{max}}$, SUV$_{\text{mean}}$, and SUV$_{\text{peak}}$ responses.

Conclusions:

Several treatment response metrics, such as RECIST and PERCIST, have been established for assessing individual solid tumors. However, metastatic prostate cancer poses a unique challenge to these metrics because bone lesions are often numerous and non-measureable. This study investigated the impact of using different imaging measures for treatment response assessment in patients with metastatic prostate cancer.