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PSMA PET/CT and mpMRI discrepancies in prostate cancer detection with whole-mount histopathology gold standard.

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Background: Multiparametric MRI (mpMRI) and PSMA-PET are complementary imaging modalities used in the pre-surgical evaluation of patients with prostate cancer (PCa). The aim of this study was to evaluate the imaging and pathology parameters associated with PSMA-PET and mpMRI disagreement with each other and with gold standard histopathology. **Methods:** Patients undergoing radical prostatectomy (RP) with pre-surgical PSMA-PET and mpMRI were screened for inclusion in this retrospective analysis. Patients had the imaging scans done <3 months from each other, and whole mount histopathology (WMHP) slides available. Two nuclear medicine physicians and 2 radiologists independently contoured PCa lesions on PSMA-PET and mpMRI, respectively. A consensus read was done with a third reader for each modality, and a majority rule was applied (2:1). Quantitative measures were extracted on a lesion-basis (SUVmean, SUVmax, tumor volume). A PET/MRI fusion was obtained, and agreement/disagreement was assessed visually, based on the overlapping lesion contours. WMHP slides were used to establish the disagreement of imaging-identified lesions with the gold standard pathology. Independent samples t-test and one-way ANOVA were used to assess group differences. Univariable and multivariable logistic regression models were used to assess the association of clinical, pathological, and imaging variables with PSMA-PET and mpMRI agreement/disagreement with each other and with pathology. **Results:** The cohort included 114 patients, and 175 pathology lesions were identified (ISUP 3, n=22; ISUP>3, n=153). mpMRI and PSMA PET identified 138 and 170 lesions, respectively. Sensitivity for ISUP>3 lesions was 79% and 87% for mpMRI and PSMA-PET, respectively. 115/153 (76%) ISUP> 3 lesions were correctly identified, and 14/153 (9%) were missed by both imaging modalities, respectively. 5/153 (3%) were correctly identified by mpMRI and missed by PSMA-PET, 17/153 (11%) were correctly identified by PSMA-PET and missed by mpMRI. Lesion's ISUP grade group and size on pathology were significantly lower in mpMRI- compared to mpMRI+ and in PET- compared to PET+ lesions. SUVmax and SUVmean were significantly higher in PET+/MRI+ than PET+/MRI- lesions. Lesion's ISUP grade group and size were significantly correlated to PSMA-PET and mpMRI agreement, whereas PSMA-PET metrics were not. Logistic regression model showed that lesions with lower ISUP, smaller size, and lack of aggressive prostate cancer features on pathology (cribriform pattern and intraductal carcinoma) have higher likelihood of being missed by PET and mpMRI and of PET/MRI disagreement. **Conclusions:** Higher SUVmax, SUVmean, and tumor volume on PSMA-PET were associated with a TP finding on PSMA-PET, higher ISUP grade group and size on pathology were associated with a TP finding on both PSMA-PET and mpMRI, and with agreement between PSMA-PET and mpMRI. Research Sponsor: None.