

Ultra fast gradient echo (GRE), balanced gradient echo (bGRE) and ultra fast spin echo (SE) PET/MRI vs. PET/CT in abdominopelvic oncological lesions – initial clinical results

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TARGET AUDIENCE

Radiologists interested in multimodality imaging and oncology with focus on PET MRI hybrid systems.

PURPOSE

To compare directly the diagnostic accuracy of PET/CT and PET/MRI with three different MR sequences in abdomino-pelvic cancer lesions.

METHODS

Forty-three patients with various oncological diseases were referred prospectively for non-contrast enhanced clinical 2-deoxy-2-¹⁸F-fluoro-D-glucose (¹⁸F-FDG)PET/CT. Non-contrast enhanced PET/MRI was performed and analysed within a 3 T PET/CT-MRI system by using ultra fast gradient echo T1w (LAVA), balanced gradient echo T2w (FIESTA) and fast spin echo T2w (SSFSE). Diagnostic accuracy was defined through detectability, anatomic localization, size and conspicuity of cancer lesions. Wilcoxon signed rank test was used to test for statistically significant differences between PET/CT and PET/MRI.

RESULTS

Seventy-four PET-positive abdomino-pelvic lesions were evaluated. No statistically significant difference was found for lesion detectability in PET/MRI and anatomic localization compared to PET/CT. Lesion size was measured larger for MR imaging. Lesion conspicuity was higher on all PET/MRI sequences than on PET/CT, and higher on LAVA compared to on SSFSE and FIESTA. PET/MR imaging was superior compared to PET/CT imaging for lymph nodes, GIT and liver lesions ($P < 0.05$). For PET/MR sequence selection LAVA and SSFSE were overall superior to FIESTA for lesion conspicuity.

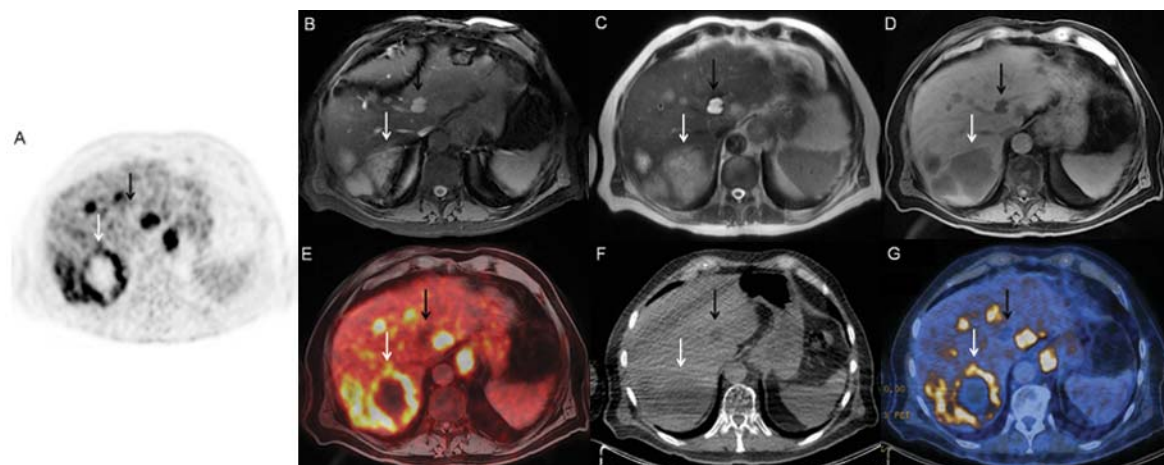


Figure 1: Comparison of PET/CT and PET/MR imaging in a patient with diffuse liver metastases of stomach cancer. Axial PET image shows metabolically active liver lesions (white arrow) in ¹⁸F-FDG-PET (A). The corresponding MR images with FIESTA (B) and SSFSE (C) sequence showing an inhomogeneous hyperintense signal in the center of the liver lesion indicating a necrotic zone. LAVA sequence (D) shows a homogeneous hypointense center of the lesion with a sharp demarcation against normal liver tissue (white arrow). Faint demarcation of these lesions on CT (F) (white arrows). PET/MRI (LAVA) (E) and PET/CT (G) showing elevated ¹⁸F-FDG uptake at the border (white arrow) of the lesions indicating viable tumor in the periphery. Note the non-avid liver lesion (black arrow, A-G) close to the middle hepatic vein in segment IVa (cyst).

DISCUSSION

We compared PET/CT with PET/MRI within a PET/CT-MRI procedure for diagnosis and comparability of PET positive abdomino-pelvic cancer lesions. Additionally, within PET/MRI we evaluated three clinical routine MR-sequences concerning detectability, size and conspicuity of lesions within different anatomic locations. The results of our study indicate that PET/MR imaging in abdomino-pelvic cancer lesions partly outperforms PET/CT if distinct MR sequences are selected. Furthermore, we identified LAVA and SSFSE as basic clinical routine sequences to be sufficient for an accurate diagnosis of PET positive malignant abdomino-pelvic lesions compared to PET/CT. Thus, it is probably safe to replace PET/CT with such a “basic” PET/MRI with just two sequences if necessary and required for the evaluation of abdomino-pelvic lesions.

CONCLUSION

PET/MRI outperformed PET/CT concerning conspicuity of abdomino-pelvic cancer lesions. LAVA and SSFSE were superior to FIESTA for lesion conspicuity.