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## Tumor heterogeneity characterization in a dedicated breast PET scanner: a feasibility study based on patient and phantom data

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Introduction: different quantitative parameters estimated from PET and dedicated breast PET images have been proposed in order to describe heterogeneity in tumors, which could have predictive value in breast cancer. However, existing studies have not reached agreement on the predictive performance, in particular for textural features and other heterogeneity-related parameters. We have carried out a standardized study based on comparisons between patient and phantom data in order to reveal for why existing studies have not reached agreement on the predictive value. Our aim was to compare texture features and heterogeneityrelated parameters derived from phantom and patient studies measured in a dedicated breast PET scanner (MAMMI PET).

Material and Methods: we have carried out multiple acquisitions of a phantom specifically developed for dedicated breast PET scanners, simulating homogeneous spherical tumors of different sizes with different activities. In addition, 52 patients with invasive breast cancer, prior neoadjuvant chemotherapy, underwent dedicated breast PET study (MAMMI PET) in prone position. Low Gray-Level Run Emphasis (LGRE) and Cumulative SUV-volume histograms (CHAUC) were obtained from phantom and patient data.

Results: CHAUC analysis provided similar values from phantom and patient data. This might be explained by the fact that some factors not necessarily related to the tumor heterogeneity could be significantly affecting the measure of CHAUC. Similar findings were found for LGRE analysis, although some tumors provided LGRE values significantly higher than those obtained from phantoms. In these cases, LGRE could be interpreted as a suitable measure of heterogeneity.

Conclusions: our findings showed that comparisons between patient and phantom data are strictly required before considering studies about the predictive value of the existing textural features and heterogeneity-related parameters.

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