Purpose: The aim of this study was to determine whether PET/MRI could predict response to neoadjuvant chemotherapy (NAC) in advanced breast cancer using various parameters.

Materials and methods: We recruited 56 female Pts (median, 48 y; 26-69 y) with locally advanced breast cancer (1.5-13.5 cm). All patients underwent 3 cycles of NAC. Before the 1st NAC (#1), after the 1st NAC (#2), all patients underwent parallel PET/MRI: whole body FDG PET/CT, breast MRI. MRI functional parameters were selected from the transaxial image of highest SUVmax. Each tumor was analyzed by 11 functional parameters: volume transfer constant at #1, #2 (Ktrans1, Ktrans2), outflow rate constant at #1, #2 (kep1, kep2), extracellular extravascular volume fraction at #1, #2 (Ve1, Ve2), initial area under the concentration-time curve at #1, #2 (iAUC1, iAUC2), maxSUV at #1, #2 (SUV1, SUV2), ratio of maxSUV at #2 to baseline (SUVratio). Treatment response was evaluated according to Sataloff scale after surgery. Each parameter was compared between responders and nonresponders using Mann-Whitney test and evaluate the diagnostic power using ROC curve analysis.

Results: After surgery, 7 (12.5%) patients showed pCR and 49 (87.5%) patients did not. Only Ve tended to increase after NAC, but other parameters were likely to decrease. Ktrans1, kep1, iAUC1, iAUC2, SUV2 of pCR were significantly lower than those of non-pCR (P = .0044; P = .0055; P = .0047; P = .0074; P = .028, respectively). Regarding area under ROC curve, Ktrans1, iAUC1, kep1, iAUC2, SUV2 (0.835, 0.833, 0.827, 0.815, 0.76, respectively) showed higher value than others. The best Ktrans1, iAUC1 cutoff for differentiating between pCR and non-pCR were 0.167, 4.113 respectively, which yielded a sensitivity of 100%, 85.7% and a specificity of 65.3%, 85.4% respectively.

Conclusions: Functional parameters (Ktrans1, iAUC1) from PET/MRI can predict treatment response before first cycle of neoadjuvant chemotherapy in breast cancer by selection of PET image.