Predicting Treatment Response in Triple Negative Breast Cancer Through Quantitative Image Analysis in Perfusion MRI

Triple Negative Breast Cancer (TNBC) is an aggressive form of breast cancer with limited treatment options, chemotherapy being one of the most effective. Currently, dynamic contrast-enhanced magnetic resonance imaging (DCE-MRI) causes radiologists to diagnose more residual tumors than actually in existence, thus risking further health detriment and wasting hospital resources by sending patients into unnecessary surgery. This work seeks to model if a patient will achieve pathological complete response (pCR) based on image features of pharmacokinetic maps derived from the non-invasive DCE-MRI scans taken before and after chemotherapy. Gray level co-occurence matrix (GLCM), one of the features used, indicates both the micro texture and general dimensions of the lesion. The other features used, Riesz, examined the texture on a larger scale. These two features were combined in different models, incorporating scans both before and after chemotherapy. The most efficient model, comprised of non-texture and Riesz features, accurately predicts pCR for more than four of every five patients, improving on previous research by 15%. However, further research may uncover the issues that might occur when the model is used in a clinical environment. These results can be improved upon by expanding image analysis to three dimensions.