

## Evaluating Response To Neoadjuvant Chemotherapy In Locally Advanced Breast Cancer Using Diffusion Weighted-MRI (DWI) And IVIM Parameters

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**Background and Purpose:** To investigate diffusion weighted MRI(DWI) and changes in random pseudodiffusion ( $D^*$ ) of invasive breast carcinoma in patients undergoing neoadjuvant chemotherapy(NACT). Additionally we aim to evaluate tumour response towards NACT and the baseline MRI imaging phenotypes of tumour mass versus normal breast tissue (using ADC and IVIM parameters).

DWI sequence is a useful adjunct to dynamic contrast enhanced(DCE) to characterize hypercellularity of breast lesions. Malignant lesion demonstrate lower ADC values which reflects the hypercellularity of cancer cells restricting the random diffusion of water molecules. Cells breakdown after chemotherapy will show increase in ADC values as compared to baseline pre-treatment.

**Methods:** A prospective study involving women with invasive breast carcinoma (n=15) age between 29 to 66 years (mean age=46) who are planned for 6 cycles of NACT prior to surgery. DCE MRI were performed at 3 different intervals (Pre-NACT, post first and third cycles of chemotherapy). The radiomics and DWI data of the target lesions were obtained using volumetric and single ROI measurements. The IVIM parameters (from multiple b values) were also calculated and compared.

**Results:** The mean volume of breast mass is 148.6 cm<sup>3</sup>. Mean ADC values for malignant tumour is ( $0.76 \times 10^{-3}$  mm<sup>2</sup>/s) as compared to normal contralateral breast tissue ( $1.90 \times 10^{-3}$  mm<sup>2</sup>/s). Following first cycle of NACT, quantitative findings showed 69% reduction of tumour mean volume to 45.7 cm<sup>3</sup> and 22% increase in mean ADC values ( $0.96 \times 10^{-3}$  mm<sup>2</sup>/s)

**Conclusion:** ADC values showed significant increase as early as first cycle of NACT. IVIM parameters provides noninvasive sensitivity to microperfusion properties of breast tumors without need of contrast agent thus it is useful to patient who is contraindicated to gadolinium. These tools are expected to enhance the role of MRI in monitoring treatment response of cancerous lesions in the breast.