**Diffusion-weighted magnetic resonance imaging for subtype-specific prediction of pathologic complete response in neoadjuvant chemotherapy.**

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**Background**

Apparent diffusion coefficient (ADC) presents a biomarker that is sensitive to tumor cellularity.

**Diffusion-weighted magnetic resonance imaging (DW-MRI):** non-invasive, quantitative imaging approach to retrieve ADC maps of tumor regions.

**Objective:** to evaluate predictive performance of percent ADC metrics for pathologic complete response (pCR) in HER2-negative breast cancer undergoing standard neoadjuvant chemotherapy

**Quantitative Analysis of DCE and DWI-MRI**

**N = 79 female patients** with high-risk, stage III/IV breast cancer, undergoing NAC with Paclitaxel (I-SPY 2 control patients of Pambrolizumab and MK2206 arm)

48 patients with HR+HER2-
31 patients with HR-HER2-

Two MR imaging timepoints:
- pre-treatment ($T_0$)
- after three weeks ($T_3$)

Retrospective analysis of
- ADC metrics from DWI-MRI [1,2]
- FTV from dynamic-contrast enhanced (DCE) MRI clinical outcome
  - pCR responders vs. pCR non-responders

For every metric $M$: 

\[
\% \text{change} = 100 \times \left( \frac{M_{TV} - M_{0}}{M_{0}} \right)
\]

**Results:** Predictive power of ADC-based metrics and FTV for pCR

- 16 out of 79 patients (20.3 %) reached pCR (residual cancer burden (RCB) index = 0)
  - 18.6 % pCR among HR+HER2-
  - 22.5 % pCR among HR-HER2-

- pCR patients show higher %change regarding ADC (ADC and FTV)
- %change of 95% percentile ADC yielded the highest AUC
- %change of FTV yielded second highest AUC
- Highest AUCs for %change per subtype-specific analysis:
  - HR+HER2-
  - 95% percentile ADC
  - HR-HER2-
  - MEAN ADC

Conclusions

- Histogram percentile ADC metrics have potential to achieve better predictive performance than mean tumor ADC at early treatment, especially for HR+HER2- cancer subtype
- Additional studies are warranted to increase the cohort size.

**ADVOCATE’S PERSPECTIVE:** Histogram percentile ADC metrics have the potential to achieve better predictive performance than mean tumor ADC at early treatment. Early prediction of responders and non-responders will increase treatment optimization by allowing responders to switch early to their next scheduled therapy while allowing non-responders to switch early to a different trial therapy thereby avoiding side effects from a therapy that is not working for them.


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