

Curebound Cure Prize Fall 2022

Screening for Ovarian Cancer with Advanced Diffusion MRI in Patients at High Risk for Ovarian Cancer



Rebecca Rakow-Penner, MD, PhD (MCC)
Anders Dale, PhD (MCC)
Michael McHale, MD (MCC)

Scientific Abstract:

The goal of this proposal is to develop a reliable MRI tool for ovarian cancer screening for women at high risk for the disease. A reliable screening tool will potentially delay or eliminate the need for prophylactic oophorectomies in this high-risk population. Specifically, a screening tool will be developed based on the advanced diffusion magnetic resonance imaging properties of healthy and malignant ovarian tissue.

Aim 1: Develop an advanced diffusion-weighted (DW) MRI model based on restriction spectrum imaging MRI specific for ovarian cancer. Characterize the diffusion properties of healthy and malignant ovarian tissue from oversampled multi-shell DW-MRI data. Develop an ovarian specific model based on biophysical properties and empirical data. Imaging and pathology from 50 patients will be collected, 10 with ovarian cancer.

Aim 2: Perform prospective pilot study of novel ovarian RSI diffusion model in patients with high suspicion of ovarian cancer. Post-surgical pathological specimens will be used as a gold standard for comparison to the imaging performed prior to oophorectomy. This will be performed on 25 patients, 5 with ovarian cancer.

Aim 3: Correlate genetic markers associated with ovarian malignancy from post-operative pathology with pre-operative quantitative ovarian MR imaging. Correlation will be assessed between FAK expression and quantitative perfusion MRI in ovarian cancer. Correlation will be assessed between Myc expression and quantitative diffusion MRI/RSI in ovarian cancer. The genetic analysis will be performed on 15 cancer patients and 15 patients with benign or normal ovaries.

Lay Abstract:

Ovarian cancer is the fifth-most deadly cancer among women in the United States with 60% of cases already metastasized at the time of diagnosis. Multiple screening programs have been attempted but none so far have demonstrated mortality benefit. Women at high risk for the disease undergo prophylactic removal of the ovaries at age 35 – 40, due to suboptimal screening and high risk for the disease after 40.

Magnetic resonance imaging (MRI) with advanced diffusion-weighted imaging may improve the sensitivity and specificity of ovarian imaging to enable a beneficial screening technique as well as decrease unnecessary surgeries for benign disease. Diffusion-MRI has the additional advantages of being a radiation-free and contrast media-free exam. The overall objective in this proposal is to develop a robust advanced diffusion-weighted imaging technique that provides a highly sensitive and specific reflection of ovarian cancer tumor burden and can screen non-invasively for

ovarian cancer. This will decrease the need for prophylactic removal of ovaries and provide a novel technique for early detection.

In addition, this proposal will probe the relationship between genetic expression associated with ovarian cancer and imaging biomarkers, providing new information for cancer prediction models non-invasively.