



**Susan G. Komen
Research Grants – Fiscal Year 2014**

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MRI Guided preoperative partial breast irradiation in early stage breast cancer

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Lead Organization: Ohio State University

Grant Mechanism: KS

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Public Abstract:

The goal of breast conserving therapy (BCT) for early stage breast cancer is to maximize cancer control in the breast and preserve breast appearance and sensation. Nearly 30 years of clinical trials has proven that the addition of radiation therapy (RT) following lumpectomy leads to equivalent local cancer control and survival in comparison to breast removal or mastectomy. Accelerated partial breast irradiation (PBI) is a recent development in radiation that has sought to maintain the goals of BCT while reducing the radiation exposure to normal tissue and minimizing the treatment burden for patients. Instead of treating the entire breast daily for > 5-6 weeks, PBI irradiates the breast tissue immediately around the lumpectomy cavity that is the most likely place of cancer recurrence in just 5-10 treatments typically over a period of several days. The current standard practice of delivering breast RT (including PBI) postoperatively has had two major drawbacks: (1) inaccurate targeting, and (2) unknown radiation response. The target volume for PBI has been, so far, the post lumpectomy cavity. This post surgery cavity may not necessarily direct the radiation toward the highest risk area of the breast around the tumor. Furthermore, the postoperative RT delivers radiation in the setting of disrupted blood and lymphatic supply that may theoretically be suboptimal in term of radiosensitivity and that eliminates the opportunity to observe radiation-induced tumor response. MRI has the capability of imaging gross tumor and can be used to guide RT more precisely than guiding surgery. The purpose of this proposal is to develop enabling technology and clinically test MRI-guided preoperative partial breast irradiation, a novel approach, for early stage breast cancer patients. The technology for deformable image registration between breast MRI and CT to improve treatment delivery accuracy will be developed. A prospective clinical trial to test the safety and feasibility of delivering MRI-based preoperative PBI using the newly developed technology will be carried out. We hypothesize that the use of MRI for target definition and CT for treatment delivery for pre-lumpectomy PBI (1) will be feasible, (2) will provide improved accuracy in target definition and treatment delivery, thus, improved treatment outcome, and (3) will allow a means for evaluating the radio-responsiveness of breast cancer. A better understanding of radiation response of breast cancer combined with improved targeting and treatment delivery will encourage novel RT regimens that can achieve greater therapeutic gain and socially-economically better care for breast cancer patients.