Susan G. Komen

Research Grants – Fiscal Year 2015

This research grant was approved for FY2015 Research Programs funding. This grant will be funded upon the execution of grant agreements between Komen and the grantee institutions.

Uncovering mechanisms responsible for shoulder morbidity following radiotherapy

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Lead Organization: Northwestern University

Grant Mechanism: PDF Clinical **Grant ID:** PDF15329262

Public Abstract:

As advances in treatment seek to end breast cancer, a new focus is needed on the functional abilities of those who benefit from these treatments to ensure that breast cancer survivors can maintain a high quality of life. The inclusion of radiotherapy in breast cancer treatment has successfully improved survival rates of patients diagnosed with early-stage breast cancer. Yet these same patients can experience shoulder disease in the months and years after radiotherapy, including pain, weakness, and restricted movement. These limitations affect a patient's daily living, including their ability to lift and carry objects or maintain employment. There is a poor understanding of why shoulder disease develops following radiotherapy, which has prevented the development of a standard of rehabilitative care for survivors. Therefore, the objective of this proposal is to understand how different radiotherapy treatments impact the prevalence of shoulder disease in breast cancer patients. We suspect that the build-up of scar tissue in the skin, fat, and muscle tissues exposed to radiation can predispose some breast cancer patients to shoulder disease. Since multiple muscles control the shoulder, scar tissue from radiation in one or more muscles may alter a patient's ability to use their affected shoulder. Identifying these affected muscles is key to optimize radiotherapy protocols for future patients. In order to isolate the mechanisms of shoulder disease in breast cancer patients, we will introduce new clinical methods that can robustly assess shoulder stiffness, which is a quantitative measure of the shoulder's functional capacity to move and generate force. These shoulder stiffness measurements will be directly compared to ultrasound images of the muscles exposed to radiation, which can help identify if radiation-induced

scar tissue precedes shoulder disease following radiotherapy. Our specific aims are 1) to determine the longitudinal effect of radiotherapy on shoulder stiffness and 2) to quantify the physiological causes contributing to shoulder stiffness. We will investigate these specific aims in 20 women undergoing radiotherapy of the breast and 20 women undergoing radiotherapy of the breast and draining lymphatics. The inclusion of different treatment plans will allow us to determine if increasing the area exposed to radiation produces worse shoulder outcomes. Patients in both aims will be examined at four time points during their first year of recovery. The proposed research will assist in the prevention, screening, and rehabilitation of women undergoing radiotherapy, including using the clinical tools developed here to adjust radiotherapy treatments to maximize disease free survival and shoulder function. I will gain key training in radiation oncology to clinically translate these findings in my own independent laboratory.