**Modern Radiation Therapy and Cardiac Outcomes in Breast Cancer**

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**Purpose/Objective(s):** Modern radiation therapy techniques have reduced the risk of cardiac events in left-sided breast cancer patients. The impact of these methods has not been recently evaluated in a comprehensive manner on a population-based level. This study evaluated the impact of current radiation therapy practices on specific cardiac events and procedures in a large cohort of women with nonmetastatic breast cancer.

**Materials/Methods:** From 2000-2009, 29,102 patients diagnosed were identified from the Surveillance, Epidemiology, and End Results (SEER)- Medicare database. Medicare claims were used to identify radiation therapy and cardiac outcomes including myocardial infarction, coronary artery disease, congestive heart failure, electrical abnormalities, pericarditis, valvular disease, and cardiomyopathy. Associated procedures (percutaneous coronary interventions [PCI], coronary artery bypass graft surgery, pacemaker or implantable cardiac defibrillator placement, aortic or mitral valve replacement, cardiac ablation) were also identified to better capture the full impact of radiation on the heart. Competing risk analyses, to account for the competing risk of death, and Cox proportional hazards models were used to assess the impact of radiation on these outcomes and survival, respectively.

**Results:** Left-sided breast cancer patients had significantly greater risk of PCI after radiation therapy with an adjusted subdistribution hazard ratio (SDHR) of 1.21 (95% confidence interval [CI]: 1.06 - 1.40) relative to patients with right-sided disease. The increased risk of PCI was limited to women with preexisting cardiac disease. Of the 920 patients who underwent PCI, left-sided breast cancer patients had a significantly increased rate of death, primarily due to cardiac causes, with an adjusted hazard ratio of 1.34 (95% CI: 1.05 - 1.70) for all-cause mortality and SDHR of 2.02 (95% CI: 1.24 3.29) for cardiac mortality. No other cardiac outcome or procedure showed a significant relationship with tumor laterality. There was no difference in all-cause mortality between left- and right-sided breast cancer patients for the whole study cohort.

**Conclusion:** Women with prior heart disease and left-sided breast cancer treated with radiation therapy had increased rates of PCI compared to those with right-sided breast cancer. Those with left-sided tumors who underwent PCI had an increased risk of death, though this observation did not translate into a survival difference for the population as a whole. Although further research is needed to clarify the impact of radiation dose, overall, this study will help physicians better stratify patients and consider more aggressive heart avoidance techniques.