



Florida
CHAPTER



Radiation toxicity | Michael Fradley, MD

CANCER BACKGROUND

Radiation is a common component of the treatment of various cancers. In fact, it is estimated that radiation will be utilized in the management of more than 50% of patients with cancer and has led to dramatic improvements in the mortality of numerous malignancies including Hodgkin's Lymphoma, head and neck cancer and breast cancers. With patients living longer and in many cases surviving their disease, there is increasing recognition of radiation-treatment related cardiotoxicity which may not become apparent for several years after the completion of therapy.

ADVERSE EFFECTS

Multiple different short-term and long-term cardiotoxicities have been identified with radiation exposure. The incidence of cardiotoxicity varies based on location and dose of radiation. Multiple different short- and long-term cardiotoxicities have been identified including acute myocarditis, accelerated coronary disease, valvular heart disease and baroreflex dysfunction. Accelerated coronary disease is a major concern with chest and mediastinal radiation. The 25-year cumulative CAD incidence for patients receiving mediastinal radiation is 12.6% for patients with a mean heart dose of ≥ 25 gray. Similarly, among women with left breast cancer the rate of major

adverse cardiac events increases linearly by 7.4% per gray of radiation to the heart. Valvular heart disease is also a significant concern in long term survivors of chest radiation with the aortic and mitral valves most commonly affected given their anterior location in the heart. Regurgitant lesions are more common than stenotic disease. Finally, radiation to the head and neck can lead to autonomic dysfunction related to baroreceptor damage as well as accelerated carotid artery disease.

RECOMMENDATIONS

Although rates of cardiotoxicity are improving with newer technologies and techniques, reduction in cardiac radiation exposure remains the main objective for improving radiotherapy-related CV morbidity and mortality. In recent years, this has been accomplished with the use of 3-dimensional CT planning systems and the widespread use of intensity modulated radiation therapy (IMRT). In addition, cardiovascular risk factor modification and surveillance strategies are essential. Both the National Comprehensive Cancer Network (NCCN) and the American Society of Echocardiography recommend screening echocardiograms as well as stress testing 5-10 years after completion of chest radiation, and carotid ultrasounds at a similar interval post neck radiation.

DATA TO SUPPORT

- Armanious M et al. Cardiovascular Effects of Radiation Therapy. *Curr Probl Cancer*. 2018; 42(4): 433-442.
- Darby SC et al. Risk of ischemic heart disease in women after radiotherapy for breast cancer. *N Engl J Med*. 2013;368:987-998.
- van Nimwegen et al. Radiation Dose-Response Relationship for Risk of Coronary Heart Disease in Survivors of Hodgkin Lymphoma. *J Clin Oncol*. 2016 Jan 20;34(3):235-43.

INDICATIONS

Radiation therapy is a common component of the treatment strategy for various cancers: breast, Hodgkin's and non-Hodgkin's lymphoma, lung, head and neck, prostate

ONCOLOGY COMMENTS

In addition to cardiotoxicities other common side effects of radiation therapy include: skin dryness, blistering and fatigue. Other side effects are site specific ranging from hair loss and mouth sores, to nausea, diarrhea, rectal and bladder bleeding.

