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INTRODUCTION

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Cardio-Oncology for the 21st Century: Introduction

Based on the latest statistics the prognosis for patients with malignancy has dramatically improved. The overall 5 year survival rate for those who were diagnosed with a cancer between 2002 and 2008 was approximately 65%¹, and as of 2008, 12 million Americans were cancer survivors.² However, this extended longevity now exposes these patients to the risk of other health issues related to their primary cancer or to the treatment that ensured their survival. Specifically, patients who have not succumbed prematurely to their oncologic disease may develop cardiovascular disease that is either a result of the long-term effects of their traditional cardiovascular risk factors or that is due to the direct cardiovascular toxicity of the cancer itself or from the administered therapy. In fact, Patnaik and colleagues reviewed the Surveillance, Epidemiology, and End Results (SEER)-Medicare linked database and found that breast cancer survivors were as likely to die from cardiovascular disease as from recurrent breast cancer.³ Additionally, Mertens and colleagues found that cardiovascular events are the leading cause of nonmalignant deaths in survivors of childhood cancers.⁴

Because of the ongoing need for recurrent cancer monitoring, the treating oncologist may be the de facto primary care physician for many oncologic patients. Also, the treating oncologist is the most knowledgeable physician with regard to the possible toxicities related to a patient's cancer and any administered therapy. Therefore, in addition to monitoring these patients for recurrent oncologic disease, it is the treating oncologist's responsibility to be cognizant of other long-term health complications to which these patients are susceptible. This special edition of *Seminars in Oncology* reviews the cardiovascular issues that can arise during the ongoing care of oncologic patients.

Cardiovascular disease assessment begins with a careful history that includes questions about the presence of symptoms that may not be part of the usual review of systems associated with cancer patients. A change in exercise tolerance either due to chest/neck/shoulder discomfort or dyspnea, complaints of near-syncope or syncope, feelings of rapid or irregular palpitations, or an awareness of peripheral edema or pulmonary congestion may be indicators of cardiac decompensation. Additionally, in order to complete the cardiovascular history, the presence of known risk factors—hypertension, hyperlipidemia, diabetes, physical inactivity, significant family history, and tobacco/alcohol usage—should be assessed.

During a cancer patient's physical examination, the oncologist needs to include a careful evaluation of the cardiovascular system, including the measurement of

accurate vital signs (blood pressure should be obtained with the arm held at heart level while the patient is sitting on a chair, feet on the floor, after 5 minutes of relaxation⁵), assessment of the jugular venous pressure, auscultation for the presence of arterial bruits as well as for cardiac murmurs, gallops, and rubs, and observation for signs of hypervolemia (e.g., pulmonary congestion, edema, ascites, hepatic congestion).

Based on this history and physical examination, a cancer patient may require further cardiac tests such as electrocardiograms, echocardiograms, nuclear imaging scans, and biomarker measurements. Depending upon the level of the patient's risk and the complexity of the issues involved, co-evaluation with a cardiologist familiar with these cardio-oncologic issues may be appropriate. Davis and Witteles review strategies for cardiac testing in cancer patients at high risk of cardiac complications. In order to assess and treat the long-term risk of developing cardiac disease in cancer survivors, Carver et al propose a comprehensive diagnostic and therapeutic strategy.

Although cardiovascular toxicity including left ventricular systolic dysfunction, heart failure, hypertension, coronary ischemia, pericardial disease, and arrhythmias may develop from all of the classes of cancer therapy, a variety of cancers themselves may adversely affect the cardiovascular system as well. Bonita and Pradhan review the possible toxicities of the chemotherapeutic agents, while Ryberg discusses the cardiac concerns related to treatment with the biologic agents. The

cardiotoxic effects of radiation therapy are discussed by Martinou and Gaya.

Regarding cancer-induced cardiac toxicity, Lenihan et al review the evaluation and management of infiltrative cardiomyopathies and pericardial disease.

Rather than only identifying patients who may have developed overt cardiac toxicity from their cancer-related disease, the ultimate goal for both the oncologist and the cardiologist is to prevent the development of these complications. Cardinale et al review the literature with regard to promising strategies in this area and share the available data regarding treatment options.

In addition to the insults that occur to the cardiovascular system as a result of a patient's cancer or their cancer treatment, a patient's oncologic status may also be affected by their preexisting cardiovascular disease. Many cancer patients will already be maintained on the kind of complex cardiovascular drug regimen that has led to improved survival among cardiac patients. Chen and Parameswaran review how these cardiac agents will affect a cancer patient's clinical status and therapeutic treatment options.

Given the interplay between oncologic and cardiac disease states, Jones et al explore the risk factors common to both of these conditions and demonstrate the data that support a preventive treatment strategy, including exercise, that might be effective in decreasing the incidence of both cancer and cardiac disease.

In an era when more effective detection and treatment of both oncologic and cardiovascular disease states are available, it is incumbent upon treating physicians to be aware of the complicating issues that may negatively impact the prognosis of these patients. More outcomes data is needed to guide specific care recommendations, but in the meantime, close consultation between oncologists and cardiologists is required for the optimal management of patients who have, or who are at risk for developing, *cardio-oncologic disease*.

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