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Review article

Rationale for Cardio-Oncology Units

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ABSTRACT

With the rapidly rising number of patients surviving cancer, often in the setting of new or pre-existing cardiovascular disease and risk factors, a need has arisen for a specialty within the realm of cardiovascular care that can evaluate and manage these patients along with our colleagues in oncology and hematology. By the same token, all health care providers involved in the care of cancer patients with heart disease must be fully aware of the impact of adverse cardiovascular effects on the survival of these patients. Collaboration is required to mitigate the effect of cardiovascular toxicity associated with these necessary life-saving cancer therapies. The cardio-oncologist plays a pivotal role in bridging the 2 specialties, by creating a comprehensive plan to address the comorbidities as well as to provide guidance on the optimal choice of therapy. In this 3-part review, we will outline: *a)* the significant impact of cancer therapies on the cardiovascular health of patients with cancer and cancer survivors, *b)* the advantage of a multidisciplinary team in addressing these cardiovascular complications, and *c)* the delivery of clinical care to patients with cancer and heart disease.

Fundamentos de las unidades de cardio-oncología

Palabras clave:
Unidades de cardio-oncología
Cardiotoxicidad
Paciente con cáncer
Superviviente al cáncer

RESUMEN

Con el número cada vez mayor de supervivientes al cáncer, a menudo con enfermedades cardiovasculares o factores de riesgo preexistentes o nuevos, ha surgido la necesidad de una nueva especialidad en el ámbito de la atención cardiovascular que pueda evaluar y tratar a estos pacientes, conjuntamente con nuestros colegas de hematología y oncología. De la misma manera, todos los proveedores de atención médica que participan en el cuidado de pacientes con cáncer y enfermedad cardiaca deben ser plenamente conscientes del impacto adverso de la enfermedad cardiovascular en la supervivencia de estos pacientes. La colaboración es necesaria para mitigar el efecto de la toxicidad cardiovascular asociada con estas terapias anticancerosas que salvan vidas. Los cardio-oncólogos tienen un papel fundamental en la unión entre las dos especialidades creando un plan integral para abordar las comorbilidades y proporcionando orientación para la elección del tratamiento óptimo. En esta revisión de 3 partes se describen: *a)* el impacto significativo de las terapias anticancerosas en la salud cardiovascular de los pacientes con cáncer y los supervivientes a este; *b)* la ventaja de un equipo multidisciplinario para abordar estas complicaciones cardiovasculares, y *c)* la prestación de atención clínica a los pacientes con cáncer y enfermedad cardiaca.

Abbreviations

CTRCD: cancer therapeutics-related cardiac dysfunction
CV: cardiovascular
CVD: cardiovascular disease
HF: heart failure
LV: left ventricular
VEGF: vascular endothelial growth factor

INTRODUCTION

Cancer and cardiovascular diseases (CVDs) may coexist in a patient due to a common occurrence of risk factors and aging,[1] and there is also a growing evidence of a higher prevalence of CVDs in patients diagnosed with cancer.[2] In addition, cancer therapies can have a myriad of effects on the cardiovascular (CV) system, depending on the type of therapy. Furthermore, a patient with cancer and pre-existing CVDs who undergoes cancer therapy is at increased risk for the development of cardiotoxicity.[3] Cardiovascular complications have been reported to profoundly impact quality of life and survival of patients with cancer,[4,5] implying that their recognition and early management must become an important element in the overall care for cancer patients.[6–8]

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A new discipline termed "cardio-oncology" has thus evolved to address the CV needs of cancer patients and optimize their care in a multidisciplinary approach. This new field is committed to optimally manage CV adverse effects of cancer therapy as well as to assist in the overall care of cancer patients from the initial assessment to survivorship.[6]

The present review outlines the significant impact of cancer therapies on the CV health of patients with cancer and cancer survivors as well as the advantage of a comprehensive cardio-oncology service in addressing CV toxicity and delivering clinical care to patients with cancer and heart disease.

DEFINING THE RISK

There has been a remarkable improvement in the care of patients with cancer over the past 2 decades. A combination of early cancer diagnosis, use of novel targeted therapies, radiation therapy, and more radical surgical techniques has decreased cancer-related mortality.[9,10] There is an estimated 14.5 million long-term adult and pediatric cancer survivors in the United States, and this number is expected to reach 19 million by the year 2024.[9,11,12] However, effective cancer therapies can result in short- and long-term CV complications that can compromise their clinical benefits by impacting quality of life and survival,[5,6,9,10] as shown in Figure 1.[5] Indeed, the risk of CV death in some tumor groups may exceed that of tumor recurrence for many forms of cancer.[13,14]

The entire CV system can be affected by cancer therapies, although cardiotoxicity is mostly defined based on changes in left ventricular (LV) ejection fraction.[10,15] The spectrum of adverse CV effects of cancer therapies includes LV dysfunction and heart failure (HF), acute coronary syndromes, hypertension, rhythm disturbances, thromboembolic events, valvular disease, and pericardial disease (Figure 2).[16]

Left ventricular dysfunction and HF are the most frequent manifestations. The incidence of LV dysfunction and HF ranges from 5% to 25% in patients treated with anthracyclines[17,18]; from 2% to 33% with vascular endothelial growth factor (VEGF) inhibitor therapy,[16,19] and in patients treated with HER2 (human epidermal growth factor receptor 2)-targeted therapies around 2.5% for HF and 11.2% for LV dysfunction.[20] Anthracycline-induced cardiomyopathy is often irreversible if not identified early, as the prompt

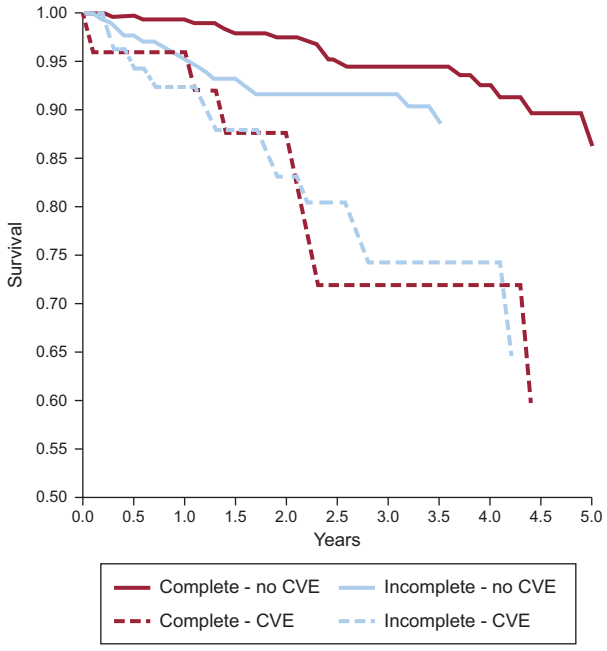

Figure 1. Cardiovascular events (CVE) in patients receiving complete or incomplete trastuzumab treatment demonstrating that patients with CVE have worse survival regardless of trastuzumab completion status. Reproduced from Wang et al.[5] with permission.

initiation of standard HF therapy is one of the critical factors for its recovery.[16,17,21] It can lead to progressive end-stage HF with a prognosis that is worse than that for ischemic or dilated cardiomyopathies and even possibly worse than for cancer recurrence.[6,22,23]

Systemic hypertension (new-onset or worsening) has also emerged as a frequent adverse effect associated with VEGF-inhibitors. The incidence of hypertension ranges from 19.1% to 44.4%, with the lowest incidence seen in patients treated with sorafenib and the highest incidence observed with regorafenib.[24] High-grade (grade 3 or 4) hypertension secondary to axitinib therapy was reported to be associated with significant morbidity, and might result in the need for a dose reduction or discontinuation of this medication.[25]

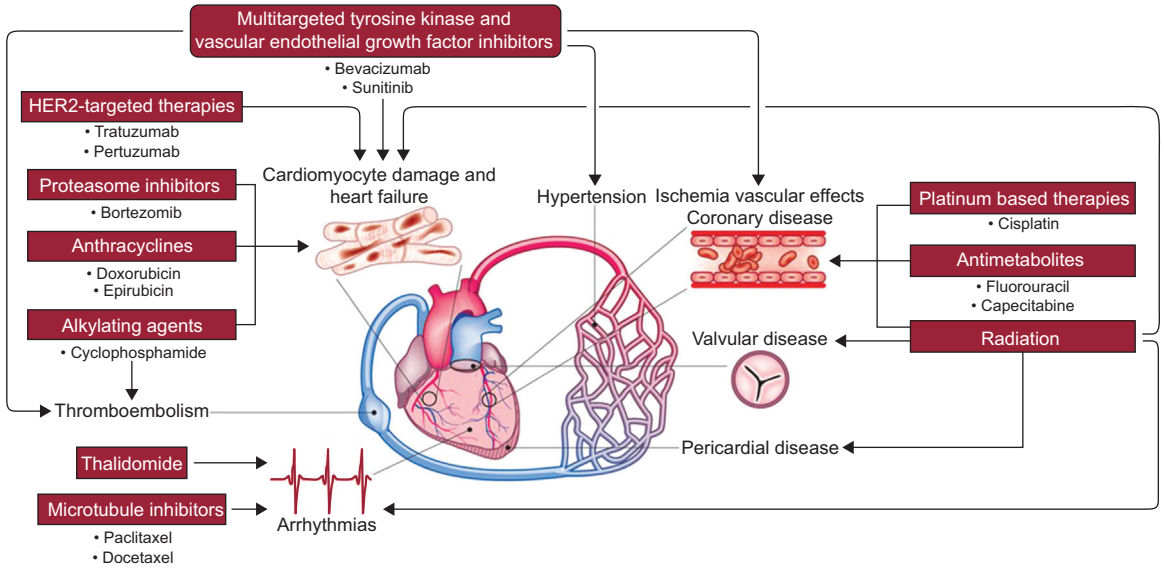

Figure 2. An overview of the cardiovascular adverse effects of chemotherapy and radiation. HER2, human epidermal growth factor receptor 2. Reproduced from Lenneman et al.[16] with permission.

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