

Cardiovascular MR Imaging in Cardio-oncology



Ashenafi M. Tamene, MD^a, Carolina Masri, MD^b,
Suma H. Konety, MD, MS^{a,*}

KEYWORDS

- Cardio-oncology • Cardiotoxicity • Radiation-induced heart disease
- Cardiovascular magnetic resonance imaging

KEY POINTS

- Patients with cancer are at risk for developing short-term and long-term adverse cardiovascular outcomes, due to both direct and indirect off-target effects of cancer treatment.
- Cardiac magnetic resonance (CMR) imaging provides accurate assessment of left ventricular ejection fraction and should be used for monitoring cardiac function of patients both during and after cancer therapy.
- CMR imaging can additionally evaluate for myocardial, valvular, pericardial abnormalities; assess vascular compliance and provide tissue characterization of cardiac masses.

INTRODUCTION

Based on currently available estimates, there are 13.7 million patients with a history of cancer in the United States who are either cancer free or undergoing treatment, and about 1.7 million new cases are expected to be diagnosed in 2014.¹ Owing to significant progress made in diagnostic and treatment capabilities over the past few decades, a sizable proportion of these individuals have an increased chance of long-term survival.¹ Like diabetes or hypertension, cancer may now be considered as a chronic manageable disease and as such it requires not only early detection, periodic surveillance, and appropriate therapy but also control of comorbid conditions.² Cardio-oncology has emerged as a unique interface between the two fields, because cardiovascular events are increasingly being recognized as major sources of morbidity and

mortality in cancer survivors, because of either direct cardiac toxicity of chemotherapeutic agents² or the presence of underlying concomitant cardiovascular comorbidities.^{3,4}

Cancer can affect the cardiovascular system in multiple ways ranging from direct invasion of cardiac structures from primary or metastatic tumors of the heart to short-term or long-term cardiotoxic effects of treatment modalities, such as chemotherapy and radiation. The traditional focus of cardiac imaging has been on monitoring baseline and posttreatment left ventricular ejection fraction (LVEF), mostly through the use of echocardiography or multiple gated acquisition nuclear scans.⁵ Cardiac magnetic resonance (CMR) imaging, by virtue of its accurate depiction of cardiac morphology and function, is rapidly being adopted as an imaging modality that can provide a comprehensive assessment in cardio-oncology (Fig. 1).⁶

Disclosure: The authors have nothing to disclose.

^a Division of Cardiology, University of Minnesota Medical Center, 420 Delaware Street Southeast MMC 508, Minneapolis, MN 55455, USA; ^b Division of Cardiology, University of Washington Medical Center, 1959 NE Pacific St, Seattle, WA 98195, USA

* Corresponding author.

E-mail address: shkonety@umn.edu

Magn Reson Imaging Clin N Am 23 (2015) 105–116

<http://dx.doi.org/10.1016/j.mric.2014.09.007>

1064-9689/15/\$ – see front matter © 2015 Elsevier Inc. All rights reserved.

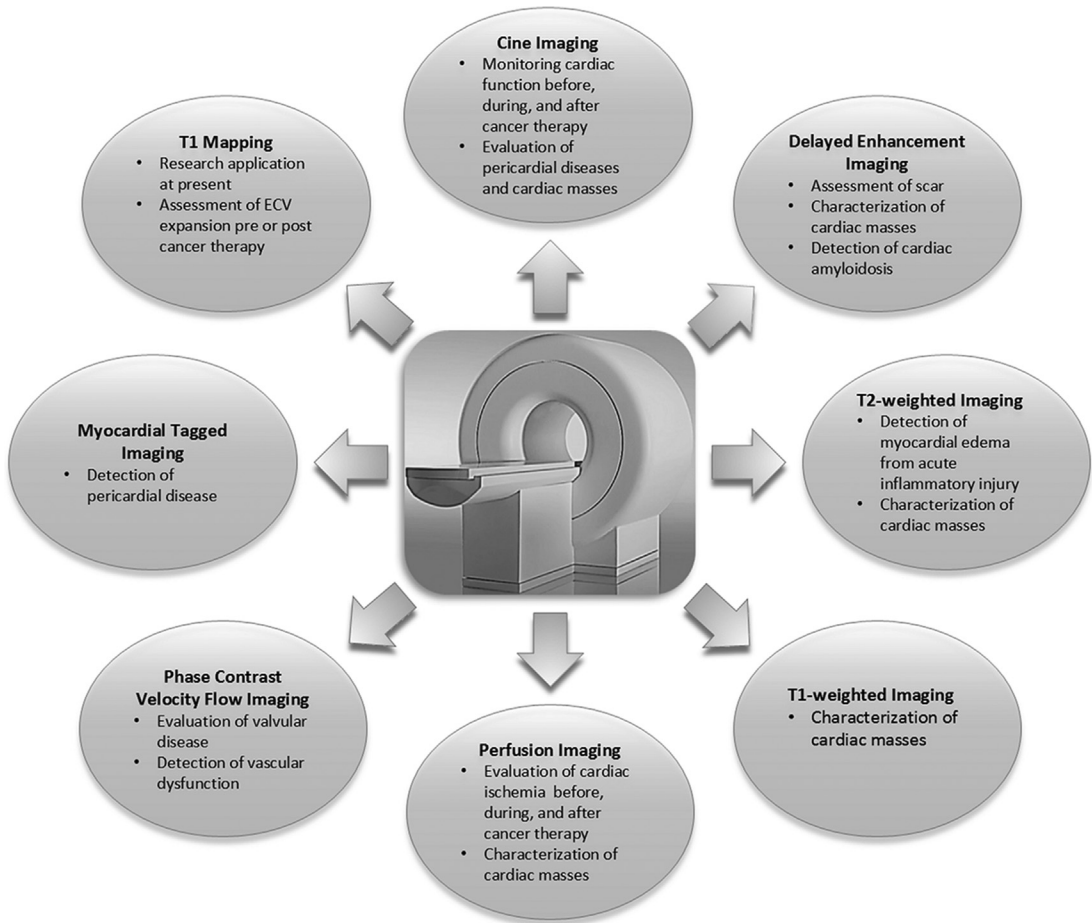


Fig. 1. The various applications of cardiovascular MR imaging in cardio-oncology. ECV, extracellular volume.

This article discusses the role of CMR imaging in the following 4 broad categories:

1. Cardiotoxicity of chemotherapeutic agents
2. Radiation-induced heart disease (RIHD)
3. Cardiac tumors
4. Other conditions pertinent to cardio-oncology

CARDIAC MAGNETIC RESONANCE IN THE DETECTION OF CARDIOTOXICITY FROM CHEMOTHERAPEUTIC AGENTS

Brief Overview of Cardiotoxicity

The occurrence of cardiotoxicity in the setting of chemotherapy can be variable and depends on the type of agent used, the overall cumulative dose administered, patient-related factors including age and comorbidities, as well as the use of adjunct therapies such as radiation.^{5,7} Of the different classes of chemotherapeutic drugs that are implicated in causing cardiotoxicity, anthracyclines and tyrosine kinase inhibitor toxicities

are well described.⁷ In the case of anthracyclines, the incidence rates of acute, early-onset, and late-onset chronic progressive forms of cardiotoxicity are less than 1%, 1.6% to 2.1%, and 1.6% to 5% respectively.^{7,8} Incidence rates of cardiomyopathy and congestive heart failure greater than 36% have also been reported in patients receiving anthracycline doses of more than 600 mg per meter square of body surface area.⁹ In a clinical trial of women receiving trastuzumab, a monoclonal antibody-based tyrosine kinase inhibitor, for HER2-positive breast cancer, symptomatic congestive heart failure and asymptomatic 10% or more reduction in LVEF occurred in 1.7% and 7% of patients respectively.¹⁰ The incidence of trastuzumab-induced cardiotoxicity is even higher in real-life settings than is observed in clinical trials.^{11,12}

The pathophysiologic mechanisms underlying chemotherapy-induced cardiotoxicity are complex and incompletely understood. Anthracyclines are thought to promote formation of free radicals,

Download English Version:

<https://daneshyari.com/en/article/4242696>

Download Persian Version:

<https://daneshyari.com/article/4242696>

[Daneshyari.com](https://daneshyari.com)