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Cardio-Oncology: Between a Rock and a Hard Place

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Abstract

Heart disease and cancer are currently the two leading causes of death in the Western World, creating an intriguing scenario when these two diseases intersect. It is increasingly being recognized that cancer therapeutics have unintended cardiovascular toxicity. Cardio-oncology is a novel, interdisciplinary area of growing interest, based on a comprehensive approach for the management of cancer patients with cardiac diseases.

Keywords: Cardio-oncology; Cardiotoxicity; Chemotherapy; Biomarkers

Abbreviations: BNP: Brain Natriuretic Peptide; HTN: Hypertension; LVD: Left Ventricular Dysfunction; VEGF: Vascular Endothelial Growth Factor; HF: Heart Failure; ROS: Reactive Oxygen Species

Background

Heart disease and cancer are currently the two leading causes of death in the Western World, creating an intriguing scenario when these two diseases intersect. Cancer-related survival improvement is likely due to advancements in early recognition and novel treatment modalities; however it has been associated with an unexpected increase in premature cardiovascular events, including coronary artery disease, hypertension, arrhythmias, stroke, and the development of congestive heart failure [1].

Types of Cardiotoxicity

With respect to ventricular dysfunction, two categories have been previously proposed and conventionally accepted thus far. Type I cardiotoxicity, seen classically with anthracyclines, is thought to be irreversible, dose-related, and caused by free radical formation, oxidant stress, and myofibrillar disarray. Type II cardiotoxicity, seen traditionally with the use of trastuzumab, has been described as reversible and not dose-related, with no accompanied ultrastructural abnormalities. However, it should be noted that the distinction between the two types of cardiotoxicity may be more complicated than once perceived [2]. Radiation therapy induces a spectrum of cardiotoxicities that differ considerably from chemotherapy-related cardiotoxic effects and affect all layers of the heart [3].

Cancer Therapies with Potential Cardiotoxicity

A variety of chemotherapeutic agents are linked with cardiovascular injury after treatment for cancer. The agents most commonly associated with injury include anthracyclines (Doxorubicin, Daunorubicin, Idarubicin), alkylating agents (Cyclophosphamide), tyrosine kinase inhibitors (Sunitinib, Imatinib, Sorafenib, Lapatinib), monoclonal antibodies (Trastuzumab, Bevacizumab), antimetabolites (5-Fluorouracil), microtubule-targeting agents (Paclitaxel, Docetaxel), and proteosome inhibitors (Bortezomib) [4]. The cardiotoxic effects and the mechanism of toxicity are summarized in Table 1.

Diagnosing Cancer Therapy-Induced Cardiotoxity

The cornerstone of cancer therapy-induced cardiotoxity diagnosis is the myocardial biopsy, since it is still considered as the most accurate and specific method in detecting the ultrastructural alteration of cardiomyocytes [4]. Nevertheless its invasiveness limited its use in clinical practice. Imaging methods emerged in the last decades as the landmark in monitoring cardiotoxicity in cancer patients. Left ventricular ejection fraction (LVEF) is widely considered the most important parameter for the diagnosis of cardiotoxicity. Several criteria for the diagnosis of cardiotoxicity are established by the Cardiac Review and Evaluation Committee Criteria for Diagnosis of Cardiotoxicity [5]. Despite the usefulness of LVEF as an index of overall cardiac function performance, it should be noted that this represents a late phenomenon in the physiopathology of the chemotherapy-induced cardiotoxicity. Therefore, other imaging methods that evaluate cardiac function independently of cardiac volumes

alterations, aiming to detect the earliest manifestation of cardiotoxicity have been in use in recent clinical practice.

Table 1: Cardiotoxic effects of Cancer Therapy

Cancer Therapy	Cardiotoxic Effects	Mechanism of Cardiotoxicity
Anthracycline	LVD, HF	Impairment of protein synthesis, ROS formation, inhibition of DNA repair
Alkylating agents	Pericarditis, LVD, HF	ROS production
Tyrosine kinase inhibitors	HTN, LVD, HF, Ischemia, QT prolongation	Impairment of cell signal transduction, cell cycle regulation, metabolism and transcription
Monoclonal antibodies	LVD, HF, HTN, LVD, HF	Inhibition or ErbB2 pathway and VEGF
Antimetabolites	Arrhythmia, Ischemia	Coronary vasospasm
Microtubule-targeting agents	Arrhythmia, LVD, HF	Impairment of microtubule function and cell division
Proteasome inhibitors	LVD, HF	Interference with cell cycle degradation proteins
Radiation	Accelerated atherosclerosis, pericarditis, HF, valvular dysfunction	Microvascular injury, macrovascular injury, valve endothelial injury and dysfunction

These include two-dimensional echocardiography, real-time three-dimensional echocardiography, speckle tracking imaging, contrast echocardiography, nuclear medicine imaging, and cardiac magnetic resonance (CMR) [6].

Especially CMR has been proven useful, among others, for the detection of the pathological myocardial substrate, responsible for life-threatening ventricular arrhythmias [7]. Finally, there is optimism that the use of specific cardiac biomarkers (Troponin-cTn), hemodynamic markers (Natriuretic peptides) and oxidative stress/inflammation indices (High-sensitivity C reactive protein-hsCRP, Glycogen phosphorylase BB, Myeloperoxidase-MPO, Total antioxidant status-TAOS, Circulating microRNAs) can help identify patients undergoing treatment who are at high risk for cardiotoxicity [8].

Prevention of Cancer Therapy-Induced Cardiotoxicity

Once evidence of cardiac toxicity is suspected through the use of biomarker, imaging, or clinical exam monitoring it becomes imperative to guide intervention to prevent further damage from occurring. Modulation of chemotherapy with dose and cycle reductions is one possible way of ameliorating cardiac toxicity but often comes at the expense of diminished antitumor effect. Another strategy aims to treat the current cardiac damage and/or prevent further injury through the administration of a variety of preventive agents, such as Dexrazoxane, Angiotensinogen converting enzyme inhibitors (ACE-I), Beta blockers, and Liposomal based doxorubicin [8]. Finally, special attention should be paid to the prevention of cancer-related thromboembolic events, with the use of classical and direct oral anticoagulants [9,10].

Conclusion

Cardio-oncology is a novel, interdisciplinary area of growing interest, based on a comprehensive approach for the management of cancer patients with cardiac diseases. Because of the increasing number of long-term cancer survivors, the ageing of the population, as well as the increased incidence and prevalence of oncologic and cardiovascular diseases, the number of patients presenting with oncologic and cardiologic co-morbidities are increasing, thus emphasizing the necessity for a comprehensive and evidence-based management of patients in whom the two co-morbidities exist.

References

1. Herrmann J, Lerman A, Sandhu NP, Villarraga HR, Mulvagh SL, et al. (2014) Evaluation and management of patients with heart disease and cancer: cardio-oncology. Mayo Clin Proc 89: 1287-1306.
2. Hamo CE, Bloom MW (2015) Getting to the heart of the matter: An overview of cardiac toxicity related to cancer therapy. Clin Med Insights Cardiol 2: 47-51.
3. Jaworski C, Mariani JA, Wheeler G, Kaye DM (2013) Cardiac complications of thoracic irradiation. J Am Coll Cardiol 61: 2319-2328.
4. Cardinale D, Colombo A, Lamantia G, Colombo N, Civelli M, et al. (2008) Cardio-oncology: a new medical issue. Ecancer medical science 2: 126.
5. Seidman A, Hudis C, Pierri MK, Shak S, Paton V, et al. (2002) Cardiac dysfunction in the trastuzumab clinical trials experience. J Clin Oncol 20: 1215-1221.
6. Pizzino F, Vizzari G, Qamar R, Bomzer C, Carerj S, et al. (2015) Multimodality Imaging in Cardiooncology. J Oncol
7. Mavrogeni S, Petrou E, Kolovou G, Theodorakis G, Iliodromitis E (2013) Prediction of ventricular arrhythmias using cardiovascular magnetic resonance. Eur Heart J Cardiovasc Imaging 14: 518-525.

8. Christenson ES, James T, Agrawal V, Park BH. (2015) Use of biomarkers for the assessment of chemotherapy-induced cardiac toxicity. Clin Biochem 48: 223-235.

9. Katsianis A, Petrou E, Kostopoulou A, Theodorakis G (2014) Safety and efficacy of novel oral anticoagulants: a comparison to vitamin K antagonists. Cardiovasc Hematol Agents Med Chem 12: 9-13.

10. Karali V, Panayiotidis P (2014) Novel oral anticoagulants in the management of polycythemia vera and essential thrombocythemia. Cardiovasc Hematol Agents Med Chem 12: 26-28.