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Cancer Therapy: Protecting the Heart

Nishant Verma*

Department of Environmental Toxicology, Indian Institute of Life Sciences, New Delhi, India

***Corresponding Author:** Nishant Verma, Department of Environmental Toxicology, Indian Institute of Life Sciences, New Delhi, India, E-mail: nverma@iilsindia.org

Received: 01-Nov-2025, Manuscript No. tyoa-25-174625; **Editor assigned:** 03-Nov-2025, PreQC No. tyoa-25-174625(PQ); **Reviewed:** 17-Nov-2025, QC No. tyoa-25-174625; **Revised:** 24-Nov-2025, Manuscript No. tyoa-25-174625(R); **Published:** 01-Dec-2025, **DOI**: 10.4172/2476-2067.1000340

Citation: Verma N (2025) Cancer Therapy: Protecting the Heart . Toxicol Open Access 11: 340.

Abstract

Cardiac toxicity from cancer therapies is a growing concern. Several treatments, including \textit{Immune Checkpoint Inhibitors} (ICIs), anthracyclines, and trastuzumab, can cause significant cardiac issues. Early detection, monitoring, and multidisciplinary cardio-oncology programs are essential. Cardiac biomarkers and Artificial Intelligence (AI) hold promise for improving patient outcomes by predicting and managing these toxicities.

Keywords

Cardiotoxicity; Cancer therapy; Immune checkpoint inhibitors; Anthracyclines; Trastuzumab; Tyrosine kinase inhibitors; Radiation therapy; Cardiac biomarkers; Cardio-oncology; Artificial Intelligence

Introduction

Cancer therapies, while essential for treatment, often bring about cardiac toxicities, requiring careful attention and management. Immune checkpoint inhibitors (ICIs) can induce myocarditis, arrhythmias, and heart failure, emphasizing the need for early detection and management to improve patient outcomes [1].

Anthracycline-induced cardiotoxicity remains a significant concern, necessitating strategies for prevention and management, including cardioprotective agents and cardiac monitoring [2].

Trastuzumab, targeting HER2, is linked to cardiotoxicity, notably heart failure, requiring thorough monitoring and management [3].

Tyrosine kinase inhibitors (TKIs) can cause cardiovascular side effects like hypertension and heart failure, demanding careful management [4].

Radiation therapy to the chest can lead to long-term cardiac complications, highlighting the importance of prevention and early detection [5].

Cardiac toxicity from cancer therapies can manifest as heart failure, arrhythmias, or ischemic heart disease, necessitating practical guidance for monitoring and managing cardiac complications [6].

The increasing use of cardiotoxic cancer therapies underscores the need for multidisciplinary cardio-oncology programs to prevent, detect, and manage cardiac complications [7].

Chemotherapy-induced cardiotoxicity requires early detection and intervention to minimize long-term cardiac damage [8].

Cardiac biomarkers, such as troponin and BNP, are crucial for detecting early cardiac damage and guiding treatment decisions [9].

Artificial Intelligence (AI) and machine learning (ML) are emerging in cardio-oncology for predicting and managing cardiac toxicity, offering potential for improved patient outcomes [10].

Description

The landscape of cancer treatment is complex, often requiring a careful balance between therapeutic benefits and potential cardiac side effects. Several cancer therapies can induce cardiac toxicity, presenting challenges for oncologists and cardiologists alike. One prominent concern is the use of Immune Checkpoint Inhibitors (ICIs), which, while revolutionizing cancer treatment, can lead to cardiac complications such as myocarditis, arrhythmias, and heart failure [1]. Early identification and management are critical in mitigating these risks and improving patient outcomes. Therefore, a comprehensive understanding of the mechanisms, diagnostic approaches, and treatment strategies for ICI-related cardiac adverse events is essential.

Anthracyclines, a class of chemotherapy drugs, have long been associated with cardiotoxicity, posing a significant challenge in cancer therapy [2]. Strategies for preventing and managing this cardiotoxicity, including the use of cardioprotective agents and diligent cardiac monitoring, are crucial. Another targeted therapy, trastuzumab, which targets HER2, can also lead to cardiotoxicity, particularly heart failure [3]. Understanding the mechanisms underlying trastuzumab-related cardiac dysfunction, along with identifying risk factors and implementing appropriate monitoring strategies, is paramount in managing this adverse effect.

Tyrosine Kinase Inhibitors (TKIs) represent another class of cancer therapies that can induce a range of cardiovascular side effects, including hypertension, QT prolongation, and heart failure [4]. Management of these TKI-related cardiac toxicities requires a thorough understanding of their incidence and underlying mechanisms. Furthermore, radiation therapy to the chest can result in long-term cardiac complications such as coronary artery disease, valvular heart disease, and pericardial disease [5]. Preventing and detecting these complications early are essential components of comprehensive cancer care.

Ultimately, effective management of cardiac toxicity from cancer therapies requires a multifaceted approach. This includes careful monitoring of patients, identification of risk factors, and prompt management of cardiac complications [6]. Multidisciplinary cardio-oncology programs play a vital role in preventing, detecting, and managing cardiac complications in cancer patients, emphasizing the need for collaboration between oncologists and cardiologists [7]. The increasing reliance on cardiotoxic cancer therapies underscores the importance of early detection and intervention to minimize long-term cardiac damage [8]. The use of cardiac biomarkers such as troponin and BNP can aid in early detection and guide treatment decisions [9]. The integration of Artificial Intelligence (AI) and machine learning (ML) into cardio-oncology holds promise for predicting and managing cardiac toxicity, potentially leading to improved patient outcomes [10].

Conclusion

Cardiac toxicity is a significant concern in cancer therapy due to the cardiotoxic effects of various treatments. Immune Checkpoint Inhibitors (ICIs) can cause myocarditis, arrhythmias, and heart failure, emphasizing the need for early detection and management. Anthracyclines are associated with cardiotoxicity, requiring strategies for prevention and monitoring. Trastuzumab, targeting HER2, can lead to heart failure, necessitating careful management. Tyrosine Kinase Inhibitors (TKIs) can induce cardiovascular side effects like hypertension and heart failure. Radiation therapy to the chest can result in long-term cardiac complications. Effective management involves monitoring patients, identifying risk factors, and managing cardiac complications through multidisciplinary cardio-oncology programs. Cardiac biomarkers like troponin and BNP are crucial for early detection. Artificial Intelligence (AI) and machine learning (ML) offer potential for predicting and managing cardiac toxicity, improving patient outcomes.

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