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## Cardiotoxicity associated with radiotherapy in breast cancer: A question-based review with current literatures

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### *Abstract*

Radiotherapy is an indispensable unit of multidisciplinary treatment of breast cancer. Although the application of modern techniques has led to a significantly reduction in radiation-induced heart disease, it is still recognized as the leading causes of morbidity and mortality among breast cancer survivors. With the growing number of long-term survivors, it is important to understand the cardiovascular risks associated with radiotherapy. Questions exist regarding the existence or not of a safe radiation threshold dose that the heart (or its substructures) can receive and strategies to minimize risk of radiation. This paper aims to review the current understanding of radiation-induced cardiotoxicity and try to give answers to those unsettled issues based on current literatures.

### *Keywords*

Radiotherapy, Breast Cancer, Cardiotoxicity, Cardiac Events, Mean Heart Dose

### *Introduction*

Breast cancer (BC) is one of the most common cancer in women worldwide (with 5- year overall survival rate of 90%), and for many of them, radiotherapy (RT) has been used<sup>1</sup>. An early landmark meta-analysis by Cuzick J et al, comparing outcomes in patients with BC randomized to receive surgery with or without RT, clearly demonstrated the overall survival (OS) beyond 10 years was significantly worse in patients received RT<sup>2, 3</sup>. According to a meta- analysis of Early Breast Cancer Trialists' Collaborative Group (EBCTCG) published in 2005, the cardiac specific mortality was increased by 27% in patients treated with surgery plus RT in contrast to patients with surgery alone<sup>4</sup>. The increase in cardiovascular (CV) deaths reported in early studies is mainly due to the high irradiated volumes and high doses to the heart,

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