Strategies to increase cardioprotection through cardioprotective chemokines in chemotherapy-induced cardiotoxicity

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ABSTRACT

Background: Cardiotoxicity is one of the most important side effects of chemotherapy and its management save myocardium from injury and its consequences.

Aim: In this review we discuss cardioprotective chemokines and cardioprotective mechanisms and pathways that induce cardioprotection through cardioprotective chemokines.

Method: We searched English literature articles in Google scholar and PubMed from “1990 to 2018” through using the terms “Cardioprotection; Cardioprotective Chemokine; Chemotherapy Induced Cardiotoxicity; Cardiomyocytes; Cytokine”.

Discussion: The routine cardioprotective strategies during chemotherapy such as angiotensin-converting enzyme inhibitors and β-blockers have cardioprotective effects. Cardioprotective mechanisms and strategies can offer the oncologist several methods to protect the cardiac system through using efficient cardioprotective agents. Chemokines such as SDF-1α, IL-6, IL-8, IL-12 and G-CSF are cardioprotective chemokines. Accelerating the cardioprotection through inducing cardioprotective chemokines production can be useful in chemotherapy.

Conclusion: Stimulating the production of cardioprotective chemokines through the pathways which induce the production of cardioprotective chemokines can work strongly beside the β-blockers and ACE inhibitors. The ambiguous point in cardioprotective pathways is that JAK2/STAT3 pathway which is linked to IL-6 production pathway, which induce intracellular adhesion molecule-1 in the area of the ischemia in myocardium and this process is not benefit in cardioprotection however IL-6 induce cardiomyocytes regeneration so it enhance our dull vision about IL-6. Finally there are several choices which can increase cardioprotection during the chemotherapy and if we overcome the boundaries in confirming the efficiency of cardioprotective chemokines and the activation of them through using several mechanisms we will break through the difficulties over chemotherapy-induced cardiotoxicity.

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1. Introduction

Cancer treatment may affect bone marrow niche [1] and cardiomyocytes. Cardiotoxicity is one of the most important side effects of chemotherapy in cancer patients that increase the mortality and decrease the quality of their life [2]. Chemotherapy-induced cardiotoxicity may occur at the same period, same time or years after the chemotherapy. Cardiotoxicity occurs as a result of reversible cardiac dysfunction or cardiac cell injury [3], so the management of cardiotoxicity is essential for cancer patients [3]. Patients with cancer and cancer survivors increase the risk of adverse cardiovascular outcomes such as Left ventricular (LV) dysfunction, heart failure (HF) and acute coronary syndromes which often occur as a result of the cardiovascular toxicity of chemotherapy agents and their synergism with cardiovascular risk factors and pre-existing cardiac complications [4]. Cardioprotective strategies help to save myocardium from injury and decrease the infarction and its consequences [5]. Chemokines are a family of approximately 50 proteins which target G protein-coupled receptors (GPCRs) to enable cell migration [6]. Chemokines are potent cardioprotective agents, the chemokine stromal cell-derived factor-1α (SDF-1α) is a candidate chemokine which its monomeric form has cardioprotective potential [7]. Several processes such as reactive oxygen species (ROS), calcium overload and chemokines such as: Chemokine (C—C motif) ligand 5 (Regulated upon Activation, Normal T cell Expressed, and Secreted (CCL5/RANTES) contribute to cardiomyocytes death and deleting them protects the cardiomyocytes in cardiotoxicity situation [8]. In other hand inhibiting the chemokine C—C motif (CXC) chemokine-induced neutrophil recruitment and ROS can quench the size of infarction during myocardial ischemia [9]. Several chemokines such as interleukin-2 (IL-2), IL-6, tumor necrosis factor-alpha (TNF-α), transforming growth factor-beta (TGF-β) can be good biomarkers in