Hemostasis and Stem Cell Therapy in Myocardial Infarction

Ryan Ranitya

Department of Internal Medicine, Faculty of Medicine Universitas Indonesia - Cipto Mangunkusumo Hospital, Jakarta, Indonesia.

Correspondence mail:
Department of Internal Medicine, Faculty of Medicine Universitas Indonesia - Cipto Mangunkusumo Hospital. Jl. Diponegoro no. 71, Jakarta 10430, Indonesia. email: rranitya@gmail.com.

Cardiovascular disease has been well known as the most frequent cause of death in many countries all over the world.[1] Acute myocardial infarction (AMI) is a sudden clinical coronary event that has high mortality and morbidity rate. The survivals of AMI will have left ventricle (LV) remodelling and decreased cardiac functions in the following years due to necrosis of cardiomyocites after AMI leading to chronic heart failure. However, revascularization therapy such as percutaneous coronary intervention (PCI) and medications cannot regenerate the necrotic cardiomyocites. Stem cell (SC) therapy as novel strategy in management of AMI has been developing so fast recently. Potential beneficial mechanism of SC therapy after AMI includes myocardial preservation, decreased infarct expansion and myocardial regeneration.[2,3] To date, SC therapy in management of AMI seemed feasible and safe in clinical practice.[4]

Number of trials had been conducted to search for promising results and answers to many questions regarding the matter. The TOPCARE-AMI (transplantation of progenitor cells and regeneration enhancement in acute myocardial infarction) with 59 patients showed improvement in ejection fraction and infarct size after 1 year follow-up.[5] The REPAIR-AMI (reinfusion of enriched progenitor cells and infarct remodelling in acute myocardial infarction) trial with larger samples of 204 patients showed improvement in global LVEF at 4 months follow up from 48.3%±9.2% to 53.8%±10.2%.[6] A systematic review of SC therapy in AMI with 13 RCT and 811 enrolled patients indicated LV function improvement in short term follow-up.[7]

Percutaneus coronary intervention (PCI) as revascularization strategy in AMI is well-established. However, there are always possible risks of post-complication such as sub-acute stent thrombosis, restenosis and vascular rupture resulting in complicated recurrent ischemic events. Predisposition of thrombus formation, which is postulated by Virchow, includes abnormalities of blood flow, blood constituent and vessel wall. Even one of those factors will predispose to "hypercoagulable state".[8] Coagulation reaction induced by vascular injury in patients with AMI. Alteration in the kinetic of coagulant reactions suggest that systemic coagulation pathways in AMI is hypereactive or stimulated, resulting in thrombin formation and platelet activation.[9] The clinical fact is that patients with recent AMI have an increased risk of recurrent coronary events. Activated coagulation associated with AMI might help explain the patophysiology of it. Persistent platelet hyperactivity has an important role in post-PCI thrombosis complication. PREPARE study had shown higher ADP-induced platelet aggregation in patients who had recurrent ischemic events after 6 months from AMI.[10] During and after AMI, the mechanism of hemostatic changes remains unclear. Theoretically, hemostatic profiles will determine the "prothrombotic state" and ischemic events occurrence. One of the original article in this edition is a study by Irawan C et al.,[11] investigated the hemostatic paramaeter changes of pre-post intracoronary injection of peripheral blood stem cell (PBCS) in patients

with recent AMI at baseline and 3 months after combined G-CSF and erythropoetin (EPO) based SC therapy.[12] Hemostatic parameters measured were platelet aggregation, blood and plasma viscosity, Prothrombin time (PT), APTT, CRP and fibrinogen. Aim of this study was to observe the parameter changes in hemostasis profile before and after SC therapy in AMI. Baseline examination showed mixed result from below to above normal viscosity laboratory value range. The interesting result is that there was "normalization" of some hemostatic parameter in some patients after 3 months follow-up. More specific and larger studies should be done to explain the mechanism of these hemostatic parameter changes. The CRP and fibrinogen level, which are also known as inflammatory markers, showed decreasing level after 3 months. The relationship between activated coagulation pathway and systemic inflammatory activation in AMI is an important thing to explore in clinical studies.

Studies regarding SC therapy in AMI had various outcomes in term of cardiac parameter improvement. Actually there are many factors that influence the outcomes of SC therapy in AMI. One of them might be the influence of hemostatic status in AMI patients. Studies on hemostatic profile would be needed more to better understanding the mechanism of hemostatic changes in AMI patients treated with SC therapy. In the future, this field of research might attract attention to encourage novel strategy in AMI management with SC therapy.

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