Identification of Novel Biomarkers for Acute Myocardial Infarction Using Immunohistochemistry and Qpcr Analysis of Circulating Endothelial Cells

Inas Abd Almajed Rasheed, Ph.D* Anas Ahmed Saleh, F.I.C.S.M, C.A.M.B**

ABSTRACT

Background: Acute myocardial infarction (AMI) remains a leading cause of morbidity and mortality worldwide. Circulating endothelial cells (CECs) have emerged as potential biomarkers for vascular injury and endothelial dysfunction associated with AMI. However, further investigation is needed to fully understand their role in both diagnosis and prognosis.

Objectives: This study aimed to assess the presence and activation of CECs in AMI patients compared to healthy controls. Specifically, it sought to identify and quantify endothelial cell markers and analyze gene expression profiles of potential novel biomarkers present in CECs.

Methods: This prospective cross-sectional study involved 25 AMI patients and 25 healthy controls. CECs were analyzed using immunohistochemistry, flow cytometry, and quantitative PCR (qPCR) for von Willebrand Factor (VWF) gene expression. CD31 and CD146-positive cells were quantified by immunohistochemistry. Flow cytometry was used to evaluate the percentage and absolute count of CECs, along with the mean fluorescence intensity of CD31 and CD146. VWF gene expression was measured by qPCR.

Results: AMI patients exhibited significantly elevated CEC counts per million mononuclear cells, along with higher percentages of CECs relative to total nucleated cells, compared to the control group. Flow cytometry results indicated that AMI patients had significantly higher percentages of CECs compared to total viable PBMCs, as well as a greater absolute number of CECs per milliliter of blood. The fluorescence intensity of CD31 and CD146 was notably higher in AMI patients. VWF gene expression was also significantly increased in AMI patients when compared to controls.

Conclusion: This study demonstrates that CEC levels and activation are substantially elevated in AMI patients, establishing their potential as biomarkers for both diagnosis and prognosis. The comprehensive analysis of CECs using multiple techniques provides a strong foundation for further investigation into their clinical utility in the management of AMI.

Key words: Circulating endothelial cells - Acute myocardial infarction - Biomarkers - Endothelial dysfunction - Vascular injury - Flow cytometry

Bahrain Med Bull 2025; 47 (2): 2876 - 2884

* Department of Pathology
University of Tikrit, College of Medicine.
E-mail: dr.enas11@tu.edu.iq

** Department of surgery, University of Tikrit, College of Medicine
Iraq.