Mini Review
Volume 08:01, 2024

Journal of Coronary Heart Diseases

ISSN: 2684-6020 Open Access

Cardiac Biomarkers in the Early Detection of Heart Disease: Current Trends and Future Directions

Giulia Coppens*

Department of Cardiology, University of São Paulo, Butantã, São Paulo, Brazil

Abstract

Heart disease remains a leading cause of mortality worldwide, emphasizing the critical need for early detection and intervention strategies. Cardiac biomarkers have revolutionized the diagnosis and management of heart diseases, offering sensitive and specific tools for risk stratification, diagnosis, and prognosis. This review highlights current trends and future directions in the utilization of cardiac biomarkers for the early detection of heart disease. We discuss established biomarkers such as troponins, natriuretic peptides, and C-reactive protein, as well as emerging biomarkers and novel techniques that hold promise for enhancing diagnostic accuracy and prognostication. Moreover, we explore the integration of multimarker strategies and innovative technologies, such as point-of-care testing and omics approaches, into clinical practice to improve patient outcomes and reduce the burden of heart disease.

Keywords: Cardiac biomarkers • Natriuretic peptides • Heart disease

Introduction

Heart disease encompasses a range of conditions affecting the heart and blood vessels, including coronary artery disease, heart failure, arrhythmias, and congenital heart defects. Despite advancements in treatment and prevention strategies, heart disease remains a leading cause of morbidity and mortality globally, underscoring the importance of early detection for effective management and improved outcomes. Cardiac biomarkers play a crucial role in the early diagnosis, risk stratification, and monitoring of heart disease, enabling timely intervention and personalized care.

Troponins are widely regarded as the gold standard biomarkers for the diagnosis of acute myocardial infarction. High-sensitivity troponin assays have significantly improved the detection of myocardial injury, allowing for early diagnosis and risk stratification. Emerging evidence suggests the utility of high-sensitivity troponins in predicting adverse cardiovascular events and guiding treatment decisions beyond AMI, including in stable coronary artery disease and heart failure. Elevated baseline CRP levels predict future cardiovascular events, including myocardial infarction, stroke, and cardiovascular mortality, independently of traditional risk factors. High-sensitivity CRP assays enable more precise quantification of CRP levels within the lower range, enhancing its predictive value.

B-type natriuretic peptide and N-terminal pro-BNP are established biomarkers for the diagnosis and prognosis of heart failure. Elevated levels correlate with increased risk of adverse outcomes and can aid in the early identification of cardiac dysfunction. Recent studies have explored the role of natriuretic peptides in various cardiovascular conditions, including acute coronary syndromes, valvular heart disease, and atrial fibrillation, highlighting their potential as versatile markers of cardiac stress and dysfunction [1-3].

***Address for Correspondence:** Giulia Coppens, Department of Cardiology, University of São Paulo, Butantã, São Paulo, Brazil, E-mail: GiuliaCoppens21@gmail.com*

Received: 01 February, 2024; Manuscript No. jchd-24-134377; **Editor Assigned:** 02 February, 2024; PreQC No. P-134377; **Reviewed:** 16 February, 2024; QC No. Q-134377; **Revised:** 22 February, 2024, Manuscript No. R-134377; **Published:** 29 February, 2024, DOI: 10.37421/2684-6020.2024.8.204

Literature Review

CRP is a marker of systemic inflammation and has been associated with an increased risk of cardiovascular events. High-sensitivity CRP assays enable the identification of patients at heightened risk for atherosclerosis and adverse cardiovascular outcomes. Beyond its role as a risk marker, CRP may also serve as a therapeutic target, with anti-inflammatory strategies showing promise in reducing cardiovascular risk. CRP adds incremental prognostic value to traditional risk assessment tools, such as the Framingham Risk Score, improving risk stratification in primary prevention settings. Individuals with elevated CRP levels but low or moderate cardiovascular risk based on traditional factors may benefit from intensified preventive measures.

CRP is a pentameric protein predominantly synthesized by hepatocytes in response to pro-inflammatory cytokines, particularly interleukin-6. Its structure consists of five identical subunits arranged in a cyclic pentamer. CRP binds to damaged cells, pathogens, and apoptotic debris, facilitating their clearance by macrophages and complement activation, thereby amplifying the inflammatory response. CRP levels are elevated in individuals with atherosclerosis, reflecting ongoing vascular inflammation. Studies have demonstrated a correlation between elevated CRP levels and the presence, extent, and progression of coronary artery disease.

Discussion

Lowering CRP levels may reduce cardiovascular risk. Statins, in addition to their lipid-lowering effects, exert anti-inflammatory properties and have been shown to decrease CRP levels. However, the benefit of specifically targeting CRP with anti-inflammatory therapies in cardiovascular disease remains an area of ongoing investigation. CRP is a nonspecific marker of inflammation and can be elevated in various conditions, including infections, autoimmune diseases, and obesity. Discriminating between inflammatory and non-inflammatory causes of elevated CRP levels is essential for accurate interpretation. CRP levels can fluctuate over time in response to acute and chronic inflammatory stimuli. Serial measurements may provide a more accurate assessment of cardiovascular risk compared to a single measurement.

Combining CRP with other biomarkers, such as lipid markers, troponins, and imaging modalities, may improve risk prediction and identify individuals at the highest risk of cardiovascular events. Advances in omics technologies may enable the identification of subgroups of patients who are most likely to benefit from anti-inflammatory therapies targeting CRP or other inflammatory

pathways, facilitating personalized treatment strategies. Novel biomarkers, such as galectin-3, growth differentiation factor-15, and soluble ST2, are under investigation for their potential roles in cardiovascular risk assessment, prognosis, and therapeutic targeting. Integration of these biomarkers into multimarker panels may enhance risk prediction algorithms and improve patient stratification [4,5].

POCT devices offer rapid and convenient measurement of cardiac biomarkers, enabling timely decision-making in various clinical settings, including emergency departments, ambulatory care, and remote locations. Miniaturized POCT platforms and smartphone-based applications hold promise for expanding access to cardiovascular diagnostics and monitoring, particularly in resource-limited settings. In acute cardiovascular events such as myocardial infarction, rapid diagnosis and initiation of appropriate treatment are crucial for improving outcomes [6]. POCT enables immediate assessment of cardiac biomarkers, facilitating early diagnosis and timely intervention.

POCT is particularly valuable in resource-limited settings where access to centralized laboratory facilities may be limited. By bringing diagnostic testing closer to the patient, POCT ensures timely and efficient care delivery, especially in rural or remote areas. POCT streamlines patient care pathways by reducing turnaround times for test results. This allows clinicians to make informed decisions promptly, leading to improved patient flow and satisfaction. Genomics, proteomics, metabolomics, and transcriptomics provide valuable insights into the molecular mechanisms underlying heart disease and offer potential biomarkers for early detection and personalized treatment. Integration of omics data with clinical information may facilitate the development of precision medicine approaches tailored to individual patient profiles.

Conclusion

Cardiac biomarkers continue to evolve as indispensable tools in the early detection and management of heart disease. While established markers like troponins, natriuretic peptides, and CRP remain central to clinical practice, ongoing research efforts focus on identifying novel biomarkers and advancing diagnostic technologies to further improve risk stratification and patient outcomes. The integration of multimarker strategies, point-of-care testing, and omics approaches holds promise for enhancing the accuracy and efficiency of cardiovascular diagnostics, ultimately contributing to the prevention and treatment of heart disease on a global scale.

Acknowledgement

None.

Conflict of Interest

Authors declare no conflict of interest.

References

1. Kim, Michael H., Stephen S. Johnston, Bong-Chul Chu and Mehul R. Dalal, et al. "Estimation of total incremental health care costs in patients with atrial fibrillation in the United States." *Circ Cardiovasc Qual Outcomes* 4 (2011): 313-320.
2. Wright, Alison K., Milton Fabian Suarez-Ortegon and Stephanie H. Read. "Risk factor control and cardiovascular event risk in people with type 2 diabetes in primary and secondary prevention settings." *Circulation* 142 (2020): 1925-1936.
3. Damask, Amy, P. Gabriel Steg, Gregory G. Schwartz and Michael Szarek, et al. "Patients with high genome-wide polygenic risk scores for coronary artery disease may receive greater clinical benefit from alirocumab treatment in the odyssey outcomes trial." *Circulation* 141 (2020): 624-636.
4. Heald, Adrian H., Mike Stedman, Mark Davies and Mark Livingston, et al. "Estimating life years lost to diabetes: Outcomes from analysis of National Diabetes Audit and Office of National Statistics data." *Cardiovasc Endocrinol Metab* 9 (2020): 183.
5. Johansson, Mats, Anna Ehnvall, Peter Friberg and Anna Myredal. "Arterial baroreflex dysfunction in major depressive disorder." *J Clin Auton Res* 20 (2010): 235-240.
6. Postorino, Stefano, Paolo Buja, Giuseppe Grassi and Paolo Millosevich, et al. "Mitral valve repair complicated by iatrogenic coronary artery lesion treated with percutaneous coronary intervention." *J Cardiovasc Med* 12 (2011): 180-181.

How to cite this article: Coppens, Giulia. "Cardiac Biomarkers in the Early Detection of Heart Disease: Current Trends and Future Directions." *J Coron Heart Dis* 8 (2024): 204.