Journal of
Obesity & Weight Loss Therapy

Short Communication Open Access

Emerging Biomarkers for Early Detection of Myocardial Infarction

Sophie Divines*

Faculty of Medicine and Dentistry, University of Alberta, Edmonton, Alberta, Canada

Introduction

Myocardial infarction (MI), commonly known as a heart attack, is a leading cause of death and disability worldwide. Timely detection and prompt intervention are critical in reducing the mortality and morbidity associated with this life-threatening condition. While traditional diagnostic tools, such as electrocardiograms (ECG) and cardiac enzyme measurements, have been pivotal in diagnosing MI, there is an increasing need for more sensitive and specific biomarkers to detect myocardial injury earlier and more accurately. Emerging biomarkers are promising tools that could improve early detection, facilitate risk stratification, and guide therapeutic decision-making. This article explores the latest advances in biomarkers for myocardial infarction and their potential to transform clinical practice [1].

Description

Traditional biomarkers in myocardial infarction

Currently, the most widely used biomarkers for diagnosing myocardial infarction are cardiac troponins specifically troponin I and troponin T. These proteins are released into the bloodstream when heart muscle cells are damaged. Elevated troponin levels are highly specific to myocardial injury and are considered the gold standard in MI diagnosis. However, troponins may not always provide immediate results, and their levels may rise only hours after the onset of symptoms, making early detection challenging [2]. Other traditional markers include creatine kinase-MB (CK-MB) and myoglobin, which are also released when heart muscle is injured. While useful, these markers are less specific than troponins and can be elevated due to skeletal muscle damage, limiting their diagnostic value. Additionally, these biomarkers are more useful for detecting more severe cases of MI and may not be as effective for detecting milder or early-stage events.

Emerging biomarkers for early detection of myocardial infarction

Recent advances in biomarker research have focused on identifying novel molecules that could detect myocardial injury more rapidly and with greater specificity. Several emerging biomarkers show promise for improving the early diagnosis of MI.

High-sensitivity cardiac troponin (hs-cTn): While cardiac troponins remain the cornerstone of MI diagnosis, hs-cTn tests have emerged as a more sensitive tool for detecting low levels of troponin in the bloodstream. These tests can identify minor myocardial injury earlier than traditional tests, allowing for more rapid detection of MI in patients presenting with chest pain. hs-cTn can detect smaller amounts of cardiac injury and is useful for diagnosing both STEMI and NSTEMI (non-ST-elevation myocardial infarction) in emergency settings [3].

Growth differentiation factor 15 (GDF-15): GDF-15 is a stress-responsive protein that is released from various tissues, including the heart, during episodes of myocardial injury [4]. It has been shown to be elevated in patients with acute coronary syndrome (ACS), even in the early stages of the disease, before troponin levels rise. Studies have suggested that measuring GDF-15 levels could improve risk stratification and help identify patients at higher risk of adverse outcomes, such as heart failure or recurrent MI.

Heart-type fatty acid-binding protein (H-FABP): H-FABP is a small protein found in the heart muscle that plays a crucial role in the transport of fatty acids. Elevated levels of H-FABP have been observed shortly after myocardial injury, making it a potential early biomarker for MI. H-FABP can be detected in the blood within hours of the onset of chest pain, potentially providing a faster means of diagnosing MI than troponins. It has been shown to be particularly useful in the early diagnosis of NSTEMI [5].

Myeloperoxidase (MPO): MPO is an enzyme produced by white blood cells that plays a role in the inflammatory process. Elevated MPO levels have been associated with increased risk of cardiovascular events, including MI. MPO has been identified as a potential biomarker for detecting early signs of acute coronary syndrome (ACS), particularly in patients who do not yet show elevated troponin levels [6]. Furthermore, MPO levels have been linked to the severity of coronary artery disease, offering insight into disease progression.

Circulating microRNAs: MicroRNAs (miRNAs) are small non-coding RNAs that regulate gene expression and are involved in various biological processes, including cardiovascular function. Certain miRNAs, such as miR-1**,** miR-133**,** and miR-208, have been found to be differentially expressed in response to myocardial injury. These miRNAs are stable in the bloodstream and can be detected with high sensitivity. Emerging studies suggest that miRNA profiles could provide a non-invasive means of detecting MI earlier, as well as help predict patient outcomes.

Soluble CD40 Ligand (sCD40L): The CD40-CD40L signaling pathway plays a critical role in inflammation and thrombosis, both of which are central to the pathogenesis of MI. Elevated levels of **sCD40L**, a soluble form of the CD40 ligand, have been linked to increased platelet activation and a heightened risk of atherosclerotic events [7]. Measuring sCD40L levels could provide valuable insights into the risk of acute coronary events, including MI, and help identify patients who are at high risk of developing complications after MI.

Endothelial cell-specific molecule-1 (ESM-1): ESM-1 is a protein

***Corresponding author:** Sophie Divines, Faculty of Medicine and Dentistry, University of Alberta, Edmonton, Alberta, Canada, E-mail: sophie_d@gmail.com

Received: 03-Dec-2024, Manuscript No: jowt-25-157826, **Editor assigned:** 05-Dec-2024, Pre QC No: jowt-25-157826(PQ), **Reviewed:** 19-Dec-2024, QC No: jowt-25-157826, **Revised:** 23-Dec-2024, Manuscript No: jowt-25-157826(R) **Published:** 30-Dec-2024, DOI: 10.4172/2165-7904.1000752

Citation: Sophie D (2024) Emerging Biomarkers for Early Detection of Myocardial Infarction. J Obes Weight Loss Ther 14: 752.

expressed on the surface of endothelial cells, which line the blood vessels. Elevated ESM-1 levels have been associated with endothelial dysfunction, a key factor in the development of atherosclerosis and MI. ESM-1 has shown promise as a potential biomarker for early detection of coronary artery disease and MI, particularly in patients who do not exhibit typical symptoms or elevated troponin levels [8].

Conclusion

The early detection of myocardial infarction is critical for improving patient outcomes and reducing the burden of cardiovascular disease. While traditional biomarkers such as cardiac troponins remain essential for diagnosing MI, emerging biomarkers are paving the way for more sensitive, specific, and timely detection. High-sensitivity cardiac troponins, along with other novel markers such as GDF-15, H-FABP, and circulating microRNAs, offer great potential for identifying myocardial injury in its earliest stages. By incorporating these biomarkers into clinical practice, healthcare providers can more effectively diagnose MI, stratify risk, and tailor therapeutic interventions to improve survival rates and reduce complications. Ongoing research will continue to refine and validate these biomarkers, ultimately leading to more precise and personalized care for individuals at risk of myocardial infarction.

Acknowledgement

None

Conflict of Interest

None

References

1. Jensen MD, Ryan DH, Apovian CM, Ard JD, Comuzzie AG, et al. (2014) 2013 AHA/ACC/TOS guideline for the management of overweight and obesity in adults: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines and The Obesity Society. J Am Coll Cardiol 63: 2985-3023.
2. Dombrowski SU, Knittle K, Avenell A, Araújo-Soares V, Sniehotta FF (2014) Long term maintenance of weight loss with non-surgical interventions in obese adults: systematic review and meta-analyses of randomised controlled trials. BMJ 348: g2646.
3. Teixeira PJ, Going SB, Houtkooper LB, Cussler EC, Metcalfe LL, et al. (2004) Exercise motivation, eating, and body image variables as predictors of weight control. Med Sci Sports Exerc 38: 179-188.
4. Gudzune KA, Doshi RS, Mehta AK, Chaudhry ZW, Jacobs DK, et al. (2015) Efficacy of commercial weight-loss programs: an updated systematic review. Ann Intern Med 162: 501-512.
5. Greaves CJ, Sheppard KE, Abraham C, Hardeman W, Roden M, et al. (2011) Systematic review of reviews of intervention components associated with increased effectiveness in dietary and physical activity interventions. BMC Public Health, 11: 119.
6. Yanovski SZ, Yanovski JA (2014) Long-term drug treatment for obesity: a systematic and clinical review. JAMA 311: 74-86.
7. Avena NM, Rada P, Hoebel BG (2008) Evidence for sugar addiction: behavioral and neurochemical effects of intermittent, excessive sugar intake. Neurosci Biobehav Rev 32: 20-39.
8. Roberts CK, Barnard RJ (2005) Effects of exercise and diet on chronic disease. J Appl Physiol 98: 3-30.