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Novel Biomarkers for the Early Detection of Myocardial Infarction

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Early myocardial infarction (MI) detection is critical for timely management and improved patient outcomes. MI results from an imbalance in myocardial oxygen supply and demand, leading to cardiac tissue necrosis. While traditional biomarkers such as Troponin and Creatine Kinase-MB (CK-MB) are widely used for MI diagnosis, their sensitivity is limited, particularly during the critical first three hours after symptom onset.[1] This limitation underscores the need for novel biomarkers capable of providing earlier and more accurate diagnostic insights.

Emerging biomarkers like miRNA-208, miRNA-499, and Copeptin, when combined with troponin, have demonstrated improved early diagnostic sensitivity within the first 1–3 hours of symptom onset compared to troponin alone. Circulating Growth Differentiation Factor 15 (GDF-15), known for its role in inflammatory conditions, also shows significant prognostic value in cardiovascular diseases, including MI. Retrospective analyses reveal that additional markers such as soluble suppression of tumorigenicity 2 (sST2), GDF-15, soluble urokinase plasminogen activator receptor (suPAR), and heart-type fatty acid-binding protein (H-FABP) are elevated in acute MI patients, while fetuin A levels are notably reduced.[2] These findings suggest their utility in diagnosing and assessing the severity of MI.

RNAs have emerged as promising candidates in MI diagnostics. For instance, N1LR and SNHG1 exhibit negative and positive correlations, respectively, with traditional biomarkers, offering insights into disease progression. Similarly, long noncoding RNAs such as TTTY15 and HULC have been shown to outperform conventional markers, with correlation and regression analyses indicating their significant role in MI pathophysiology. Nourin-based miRNAs have also demonstrated a strong association with stress test outcomes in diagnosing myocardial ischemia, further reinforcing their diagnostic value.

Soluble lectin-like oxidized low-density lipoprotein receptor-1 (sLOX-1) has also been identified as a promising biomarker, with elevated circulating levels and the sLOX-1/oxidized LDL ratio aiding in MI diagnosis.[3] These innovative biomarkers not only complement traditional diagnostic approaches but also hold potential for reflecting disease progression and guiding personalized treatment strategies.

The integration of these novel biomarkers into clinical practice could address the limitations of conventional methods, enabling earlier detection and more effective management of MI. Continued research into their validation and standardization is essential to ensure their reliability and utility in diverse patient populations. By advancing the diagnostic toolkit for MI, these biomarkers pave the way for improved patient care and outcomes in the future. Integration into emergency department

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algorithms could significantly reduce diagnostic uncertainty in early-presenting patients.

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