Date: 13th January-2026

LABORATORY AND INSTRUMENTAL INVESTIGATIONS IN MYOCARDIAL INFARCTION

A.Kholmatov

Central Asian Medical University

Clinical residiency

Abstract Myocardial infarction (MI) is a life-threatening cardiovascular condition resulting from prolonged myocardial ischemia and necrosis. Rapid and accurate diagnosis is essential to reduce mortality and improve clinical outcomes. Laboratory and instrumental investigations play a central role in confirming the diagnosis, assessing the extent of myocardial damage, and guiding therapeutic decisions. This article reviews the most important laboratory biomarkers and instrumental diagnostic methods used in the evaluation of myocardial infarction.

Introduction

Myocardial infarction is one of the leading causes of morbidity and mortality worldwide. It occurs due to an imbalance between myocardial oxygen supply and demand, most commonly caused by acute coronary artery occlusion. Clinical symptoms alone are insufficient for definitive diagnosis; therefore, laboratory and instrumental examinations are crucial for early detection, risk stratification, and monitoring of disease progression.

Laboratory Investigations

1. Cardiac Biomarkers

Cardiac biomarkers are essential for diagnosing MI and determining the extent of myocardial injury.

Cardiac Troponins (cTnI and cTnT): Troponins are the most sensitive and specific biomarkers of myocardial necrosis. Their levels begin to rise within 3–6 hours after myocardial injury, peak at 12–24 hours, and may remain elevated for up to 10–14 days.[1,2]

Creatine Kinase-MB (CK-MB): CK-MB increases within 4–6 hours after infarction and returns to normal within 48–72 hours. It is useful for detecting reinfarction.

Myoglobin: Myoglobin is an early marker that rises within 1–2 hours after MI but lacks specificity due to its presence in skeletal muscle.[3]

2. Additional Laboratory Tests

Complete Blood Count (CBC): May reveal leukocytosis in the acute phase.

Lipid Profile: Assesses cardiovascular risk factors.

C-reactive Protein (CRP): Reflects the inflammatory response and predicts prognosis.

Blood Glucose and Electrolytes: Important for metabolic assessment and management.[4]

Instrumental Investigations

1. Electrocardiography (ECG)

Electrocardiography is the first-line instrumental method in suspected MI. Typical findings include:

ST-segment elevation or depression

T-wave inversion

Pathological Q waves

ECG helps differentiate ST-elevation MI (STEMI) from non-ST-elevation MI (NSTEMI).[5]

2. Echocardiography

Echocardiography provides real-time assessment of cardiac structure and function. It can detect:

Regional wall motion abnormalities

Left ventricular systolic dysfunction

Mechanical complications such as papillary muscle rupture or ventricular septal defect[6]

3. Coronary Angiography

Coronary angiography is the gold standard for identifying coronary artery occlusion. It allows visualization of coronary anatomy and enables interventional procedures such as percutaneous coronary intervention (PCI).

4. Cardiac Magnetic Resonance Imaging (MRI)

Cardiac MRI is highly sensitive for detecting myocardial necrosis, edema, and scar tissue. It is particularly useful for assessing infarct size and myocardial viability.

5. Computed Tomography (CT)

Cardiac CT angiography may be used in selected patients to evaluate coronary arteries and exclude alternative diagnoses.

Clinical Importance of Combined Diagnostics

The integration of laboratory biomarkers with instrumental imaging techniques ensures accurate diagnosis, timely treatment, and improved prognosis. Serial measurements and repeated imaging are often required to monitor disease progression and therapeutic response.[4,5,6]

Conclusion

Laboratory and instrumental investigations are fundamental in the diagnosis and management of myocardial infarction. Cardiac biomarkers, particularly troponins, combined with ECG and imaging modalities such as echocardiography and coronary angiography, provide comprehensive diagnostic information. Advances in diagnostic technologies continue to improve early detection and patient outcomes in myocardial infarction.

REFERENCES:

1. Thygesen K, et al. Fourth Universal Definition of Myocardial Infarction. *European Heart Journal.* 2018;40(3):237–269.

2. Braunwald E. *Heart Disease: A Textbook of Cardiovascular Medicine.* 11th Edition. Elsevier, 2019.

3. Amsterdam EA, et al. 2014 AHA/ACC Guidelines for the Management of Patients with Non–ST-Elevation Acute Coronary Syndromes. *Circulation.* 2014;130:e344–e426.

4. Makhamatov U. Anemia Disease and Rational Nutrition in it. – 2023.

5. Maxamatov U., To'lkinov I., Xabibullayeva M. Eating Habits in Hematological Diseases. – 2023.

6. Maxamatov U. S. Treatment of Triggeral Helmintosis in Children and Adolescents Using Folk Medicine. – 2023.