

Cardiac markers

Diagnosis of MI

The most serious type of ischemic injury is acute myocardial infarction (AMI). Transient and fully reversible myocardial ischemia is called angina pectoris . Clinical manifestations:

- Pain in the chest
- Changes on ECG
- Changes in biochemical markers

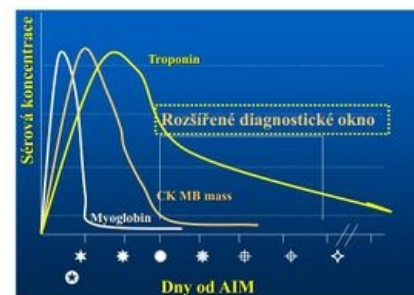
Classical tests in the diagnosis of MI

Test enzyme	Standard	The beginning of the rise	Maximum	Standardization	Multiplier at maximum
Aspartate aminotransferase (AST)	< 0,67 μ kat/l	4-8 h	16-48 h	3-6 days	Up to 25
Creatine kinase (CK)	men < 3,2 μ kat/l women < 2,4 μ kat/l	3-6 h	16-36 h	3-5 days	Up to 25
CK-MB isoenzyme	< 0,4 μ kat/l, < 6 % of total CK activity				
Lactate dehydrogenase(LD)	< 8 μ kat/l	6-12 h	24-60 h	7-15 days	Up to 8
LD isoenzymes					

New tests in the diagnosis of MI

Myoglobin

- cytoplasmic protein, source of O₂ in the anaerobic phase of contraction
- in the blood 0.5-2 h after MI (sensitivity 4-5 h)
- small molecule (Mr = 17,100), rapidly lost from the blood through the glomeruli
- standard
 - M < 92 μ g/l
 - F < 76 μ g/l



CK-MB mass isoenzyme (antigen determination)

- concentration is given in mass units (μ g/l) !!
- degraded molecules also react to the antigen (higher sensitivity)
- standard: < 5 μ g/l

Myoglobin, CK MB mass and Troponin, their serum levels during myocardial ischemia

Test enzyme	The beginning of the rise	Maximum	Standardization	Multiplier at maximum
Myoglobin	0,5-2 h	6-12 h	0,5-1 d	Up to 20
Troponin T	3,5-10 h	12-18 h (3-4 d)	7-20 d	Up to 300

Recommended procedure for biochemical examination in suspected AMI

First recruitment on admission - STATIM

- Basic parameters for broader differential diagnosis: Na, K, Cl, urea, creatinine, Ca, uric acid, cholesterol, TAG, total bilirubin, ALT, AST, ALP, GMT, LD, CRP
- Cardiac markers:
 - CK, CK-MB
 - Myoglobin – difficulties lasting 2-12 hours, normal renal function
 - Troponin T:
 - a) within 8 hours to exclude AMI
 - b) after 12 hours to diagnose microinfarcts

Further recruitment

- 2. Recruitment in 6 ± 2 hours (CK, CK-MB, troponin T, Myoglobin)
- 3. Recruitment in 12 ± 2 hours (CK, CK-MB if the diagnosis or extent of involvement is not clear)
- 4. Recruitment in 24 ± 2 hours - exceptionally

Interpretation of results

Myoglobin

- $< 30 \mu\text{g/l}$
 - normal in healthy, excludes AMI between 6 and 10 hour
- $30\text{--}70 \mu\text{g/l}$
 - if the concentration rises to less than $40 \mu\text{g/l}$ within 1 h, MI can be ruled out
- $> 70 \mu\text{g/l}$
 - excluding skeletal muscle damage, MI

Troponin T

- $< 0.05 \mu\text{g/l}$ - MI can be excluded, repeat in 10-12 h
- $0.05\text{--}0.1 \mu\text{g/l}$ - it is recommended to repeat testing in 1 hour
- $0.1\text{--}3 \mu\text{g/l}$ - myocardial damage
- $> 3 \mu\text{g/l}$ - massive myocardial damage

Troponin I

- $< 0.1 \mu\text{g/l}$ - MI can be excluded
- $0.6\text{--}1.5 \mu\text{g/l}$ - according to the WHO this is evidence of MI

Confirmation of myocardial reperfusion

Analyze	Myocardial reperfusion		
	Successful		Unsuccessful
	$C_1\text{--}C_0$ ($\mu\text{g/l}$)	$T_{\max}\text{--}T_0$ (h)	$T_{\max}\text{--}T_0$ (h)
Myoglobin	> 150	< 3	> 12
CK MBmass	> 10	$< 8\text{--}12$	> 12
Troponin T	$> 0,2$	< 14	> 14
Troponin I	> 100	< 14	> 14

Natriuretic peptides

- Hormones synthesized in atrial and ventricular cardiomyocytes
- Maintain electrolyte and volume homeostasis
- ANP, BNP - produced by cardiomyocytes
- CNP - produced by vascular endothelial cells and renal epithelium

Links

Related articles

- Cardiac markers in AMI

Resource

- MRAZOVA, K. *Kardiomarkery* [online]. [cit. 2012-03-15]. <<https://el.lf1.cuni.cz/p67526721/>>.

