LABORATORY DIAGNOSIS OF ACUTE MYOCARDIAL INFARCTION

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CRITERIA FOR DIAGNOSIS OF AMI

- Chest Pain
- Electrocardiogram (ECG)
- Cardiac Markers

Diagnosis Requires at Least Two of These Criteria
Diagnostic Specificity of ECG is about 100%

But Its Diagnostic Sensitivity is 63-82%
FEATURES OF AN IDEAL CARDIAC MARKERS

They Should Be

- Heart Specific
- Highly Sensitive
- Able to Differentiate Reversible from Irreversible Damage
- Allow The Monitoring of Reperfusion Therapy
- Able to Estimate Infarct Size And Prognosis
- Easy to Use And Cost Effective
- Undetectable in Patients without Myocardial Damage
Cardiac Enzymes

1) CRATINE KINASE (CK)
2) LACTATE DEHYDROGENASE (LD)
3) ASPARTATE TRANSAMINASE (AST)

Cardiac proteins

1) MYOGLOBIN
2) TROPONIN

New Research Markers

1) GLYCOGEN PHOSPHORYLASE
2) HEART FATTY ACID BINDING PROTEIN
CREATINE KINASE (CK)

- Total CK
- CK Isoenzymes
- CK Isoformes
TOTAL CK

After Onset of chest Pain

1) It Increases within Few Hours
2) Peaks within 24 h
3) Return to Normal Levels within 48 to 72 h

It Is Not Specific
CK-MB

- After Onset of chest Pain
  1) It Increases within 4 to 6 h
  2) Peaks within 24 h
  3) Return to Normal Levels within 48 to 72 h

- It Is Valuable for Diagnosis of AMI, But It Is Not Limited to Myocardium
CK-MB

Using % CK-MB for Differentiating Myocardial Damage from Skeletal or Neural Damage

\[
\% \text{ CK-MB} = \frac{\text{CK-MB activity}}{\text{Total CK activity}} \times 100
\]

Normally Less Than 1.5%
LACTATE DEHYDROGENASE (LD)

- After Onset of AMI
  1) It Increases within 12 to 18 h
  2) Peaks within 1 to 3 d
  3) Return to Normal Levels within 8 to 14 d

- It Is Not Specific
- LD1 & LD2 Are More Specific
- Using LD Flip Is Specific for Myocardial Damage
- It Is Helpful for Late Diagnosis of AMI
- Determination of LD1 or $\alpha$-HBD Activity May Be of clinical Significance for Estimation of The Size of Infarct
ASPARTATE TRANSAMINASE (AST)

- Was the first marker used for the laboratory diagnosis of AMI.
- It lacks cardiac specificity.
- Presently has no clinical significance in diagnosing AMI.
MYOCARDIAL PROTEINS

- MYOGLOBIN
- TROPONIN
- GLYCOGEN PHOSPHORYLASE
- HEART FATTY ACID BINDING PROTEIN
MYOGLOBIN

- Consist of 5-10% Cytoplasmic Proteins of Striated Muscle (Skeletal & Cardiac)
- Earlier Marker for Myocardial Damage
- Mb Increases Within 1 to 2 h after Onset of AMI
- It Is Not Specific for Cardiac Muscle
- Using CA III to Improve Specificity
- It Is Useful for
  1) Rule Out of AMI
  2) Diagnosis of Reinfarction (Rapid Clearance)
Thin Filament of Muscle Consist of:

- **Actin**
- **Tropomyosin**
- **Troponin Complex**
  1) *Troponin C (TnC)*
  2) *Troponin I (TnI)*
  3) *Troponin T (TnT)*
CARDIAC TROPONIN T (cTnT)

- After Onset of AMI
  1) It Increases within A Few Hours
  2) Peaks within 1 to 2 d
  3) Return to Normal Levels within 5 to 10 d

- It Is Useful for
  1) Diagnosis of AMI after 2 to 3 Days
  2) Differential Diagnosis of Myocardial Damage from Skeletal Muscle Damage
  3) Estimation of Infarct Size
  4) Monitoring after Reperfusion
CARDIAC TROPONIN I (cTnI)

- After Onset of AMI
  1) It Increases within A Few Hours
  2) Peaks within 1 to 2 d
  3) Return to Normal Levels within 5 to 7 d

- It Is Highly Specific for Myocardium
- It Is A Very Sensitive Marker of Cardiac Damage
GLYCOGEN PHOSPHORYLASE ISOENZYME BB (GPBB)

- This Enzyme Is Involved in Carbohydrate Metabolism
- It Is Not specific for Heart
- GPBB Increases between 1 to 4 h After Chest Pain Onset and Returns to Normal Levels within 1 to 2 d.
- It Is Significantly More Sensitive Than CK, CK-MB, Mb and TnT during The First 3 to 4 h after Onset of AMI
HEART FATTY ACID BINDING PROTEIN (H-FABP)

- Fatty Acids Are Major Fuels for Muscles
- H-FABP Is Involved in Cellular Uptake, Transport, and Metabolism of Fatty Acids
- It Is Not Heart Specific
HEART FATTY ACID BINDING PROTEIN (H-FABP)

After Onset of chest Pain

1) It Increases Rapidly within 2 to 4 h
2) Peaks within 5 to 10 h
3) Return to Normal Levels within 24 to 36 h

It Can Be Used

1) To Determine Recurrent Infarctions
2) For Early Confirmation or Exclusion of AMI
CARBONIC ANYDRASE (CA) ISOENZYME III

- It is a soluble protein that catalyses hydration of CO$_2$ to bicarbonate.
- There are seven carbonic anhydrase isoenzymes.
- CA III is not found in cardiac muscle, but presents in skeletal muscle.
- It can be used to differentiate skeletal and cardiac muscle damage.