

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 MARKERS

■ 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 α -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

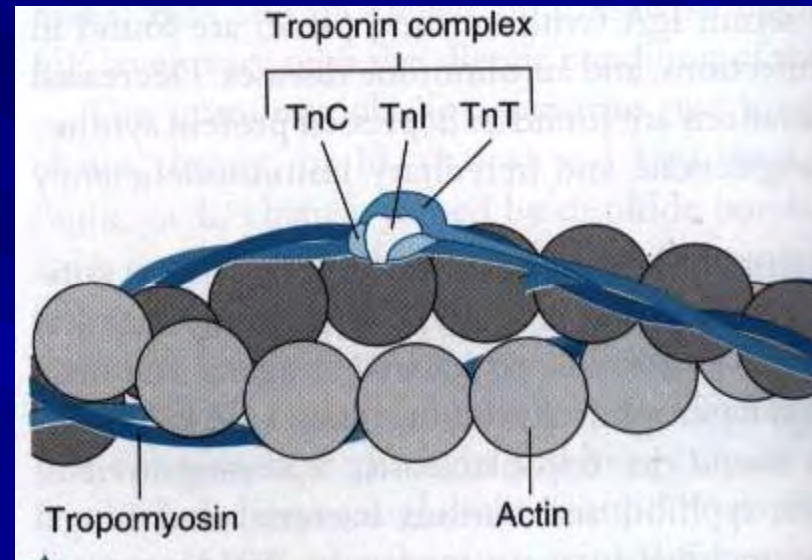
MYOGLOBIN

- 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)*

TROPONIN

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 ANHYDRASE (CA) ISOENZYME III

- **It Is A Soluble Protein That Catalyses Hydration of CO₂ 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**

Current cardiac markers: Relative levels vs. time of onset after AMI

