References

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Using the ADVIA Centaur Cardiac Troponin I Assay for Accurate Early Diagnosis of AMI
On the basis of sensitivity and myocardial specificity, cardiac troponin (cTn) is the preferred biomarker for diagnosis of acute myocardial infarction (AMI). Conventional cardiac troponin assays require 4-8 hours (h) for levels to become abnormal, peaking at 12-16 h and declining over the subsequent 5-9 days.1 Moreover, more sensitive cardiac troponin assays allow earlier detection, supporting more rapid triage of chest-pain patients. Use of a sensitive cardiac troponin I assay facilitates experienced detection and assessment of a change—important in the differentiation of an AMI related to myocardial ischemia from other causes of myocardial necrosis.2

3-hour algorithm
**Diagnosis of Acute Myocardial Infarction**

Acute myocardial infarction (AMI) is diagnosed when there is evidence of myocardial necrosis in a clinical setting consistent with acute myocardial ischemia. Necrosis has been defined by a significant rise or fall (serial change) of cardiac troponin, with at least one value above the 99th percentile upper limit of normal (ULN). Diagnosis also requires at least one other well-defined hallmark of AMI (evidence of ischemia, ECG and/or imaging abnormalities).

Cardiac troponin assays should strive for total imprecision of ≤ 10% coefficient of variation (CV) at the 99th percentile ULN of the reference population.

On the basis of imprecision and other performance characteristics, the ADVIA Centaur® TnI-Ultra™ assay is a contemporary-sensitive assay which is guideline acceptable.

Clinical introduction of the sensitive cardiac troponin assays significantly increases the number of chest pain patients presenting with values exceeding the 99th percentile ULN as a result of causes other than AMI (see table).

In the appropriate clinical setting, serial testing can differentiate between increased troponin levels due to AMI and increased levels due to non-ischemic causes. Rising or falling patterns indicate AMI, whereas, unchanged levels are found in chronic diseases.

However, changes in cardiac troponin concentrations are also observed in patients with atrial fibrillation non-coronary artery disease patients; and, for other acute cardiac situations such as tachyarythmias, myocarditis, hypertensive crisis, and Takotsubo cardiomyopathy.

It is important to remember that interpretation of cardiac troponin values must always accompany clinical assessment, including evidence of ischemia by clinical symptoms, ECG, and imaging.

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**Example algorithm for the diagnosis of AMI and risk stratification of patients with suspected NSTE-ACS using sensitive (s) and high-sensitivity (hs) assays.**

1. First measurement at admission, 0 h
2. Second (hs)-cTnI measurement—3 h later
   - Chest pain < 6 h
     - No serial change
     - Pain free: GRACE score < 140
     - Differential diagnoses excluded
   - Chest pain > 6 h
     - + No serial change
     - Pain free: GRACE score < 140
     - Differential diagnoses excluded
   - (hs)-cTnI > ULN
     - Highly abnormal
     - + Clinical presentation
   - (hs)-cTnI ≤ ULN
     - Highly abnormal
     - + Clinical presentation

**Example significant serial change**

3 h = > 16 ng/L (16 pg/mL, 0.016 µg/L)

The significant serial change must be determined for each assay, and may be determined independently by each institution.

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**Elevations of Cardiac Troponin Values Due to Myocardial Injury**

- **Injury Related to Primary Myocardial Ischemia**
  - Plaque rupture
  - Intraluminal coronary artery thrombus formation
- **Injury Related to Supply/Demand Imbalance of Myocardial Ischemia**
  - Tachy-/bradyarrhythmias
  - Aortic dissection or severe aortic valve disease
  - Hypertrophic cardiomyopathy
  - Coronary spasm
  - Coronary embolism or vasculitis
  - Coronary endothelial dysfunction
  - Injury not related to myocardial ischemia
- **Multifactorial or Indeterminate Myocardial Injury**
  - Congestive heart failure: acute and chronic
  - Stress cardiomyopathy
  - Severe pulmonary embolism or pulmonary hypertension
  - Sepsis and critical illness
  - Renal failure
  - Acute neurological disease, including stroke, or subarachnoid hemorrhage
  - Infiltrative diseases (amyloidosis, hemochromatosis, sarcoidosis, and scleroderma)
  - Stressful exercise

Abbreviations: LVH: left ventricular hypertrophy; CAD: coronary artery disease; GRACE score: Global Registry of Acute Coronary Events Risk Score; NSTE-ACS: non-ST-elevation acute coronary syndrome; NSTEMI: non-ST-elevation myocardial infarction; ECG: electrocardiograph.