Troponin Elevation Not Associated With Acute MI

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Cardiac Symposium
September 18, 2015

Case Presentation

• 66 year old previously healthy man
• 3 day history of SOB on minimal exertion
• No chest pain, recent surgeries, calf pain
• 3 syncope spells morning of transfer
  • The last spell resulted in brief CPR with P=30, minimal respirations

Labs at local hospital

<table>
<thead>
<tr>
<th>Test</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Troponin I</td>
<td>0.12 (ULN 0.06)</td>
</tr>
<tr>
<td>D Dimer</td>
<td>3189</td>
</tr>
<tr>
<td>BNP</td>
<td>194</td>
</tr>
<tr>
<td>Cr</td>
<td>1.5</td>
</tr>
<tr>
<td>Hb</td>
<td>14.7</td>
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</tbody>
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Admit at Heart Hospital

Vitals
• BP 115/83  P 102
• O2 Sat 94% on 2L O2
• R= 18
• Appeared SOB

Labs

<table>
<thead>
<tr>
<th>Lab</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Troponin T</td>
<td>0.10</td>
</tr>
<tr>
<td>CPK</td>
<td>89</td>
</tr>
<tr>
<td>MB</td>
<td>5.4</td>
</tr>
<tr>
<td>Cr</td>
<td>1.2</td>
</tr>
</tbody>
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EKG

- Anterior T inversions V1-3
- Borderline R axis
- Q lead III

EKG reminded me of similar EKG from my fellowship. 24 year old man with a massive PE...

Dilemma at 2 pm

• History and D Dimer suggests PE
• Troponin elevation, EKG T inversions and CPR suggest MI
• Cardiac cath vs. CT scan chest
Results

Echo Findings:
- EF 60-65% normal LV wall motion
- RV markedly enlarged at 5 cm, markedly reduced function
- RV pressure 67 mmHg

Venous Doppler:
- Acute DVT, left popliteal vein

CT Scan:
- Extensive bilateral PE, including a saddle thrombus at the bifurcation

Timeline of Events

Dr. Bacharach consulted to Cath Lab
9/3/13  Pulmonary angiogram-lytic catheter for directed thrombolysis
  -TPA 2mg/hr, PA pressure 83/22, m=47
9/4/13  Repeat Pulmonary angiogram
  -marked improvement RPA, some residual in LPA, breathing much improved
9/5/13  Main pulmonary arteries free of clot,
  -small clots sub segmental bronchus’s IVC filter inserted
9/6/13  Dismissed on Xaralto
  -Breathing back to near normal
  -Repeat echo: RV size back to normal 2.7 cm with normal function
10/2/13  Abdominal and pelvis CT negative for malignancy
4/18/14  Echo: RV normal size/function
  -RV pressure= 37mmHg
  -Venous Doppler: DVT present
  Xaralto indefinitely
EKG in PE

1. Most common (70%) sinus tachycardia and nonspecific ST-T changes
2. S1 Q3 T3 < 10% of cases
   - S1: acute cor pulmonale R axis
   - Q3
   - T3: acute RV strain
3. Other Arrhythmia: at fib, bradycardia, new RBBB-poorer prognosis

Troponin Elevation in PE

1. 32-50% in mod to severe PE
2. Etiology
   a. Injured RV cells from Acute RV dilation of RV from increased PA pressures
   b. Reduced coronary perfusion
   c. Hypoxia from perfusion-ventilation mismatch
   d. Combination of above
3. Guide to management
   Elevated Troponin plus RV dilation
   Tenfold increase of adverse effects
   Justification for Thrombolysis
Troponin
• 3 complexes: Troponin C, I, T
• Located in actin filament of striated muscle
  - both skeletal and cardiac
• Cardiac isoform Troponin I only found in cardiac muscle.
  - Troponin T also in minor degree in skeletal muscle
  - rare skeletal muscle disease patient with elevation of Troponin T.
  - Troponin T & I sensitivities similar.
• Troponin T & I more specific for MI than CPK and MB.
  - Diagnosis of micro myocardial damage.

Troponin
• Appears in blood 2-4 hours after MI (>80% in 2-3 hours)
• Persists up to 10-21 days
• Detected by inexpensive immunoassay
• Troponin T & I elevation is defined as above the 99th percentile of healthy reference population.
  - Therefore, 1% false positive tests by definition.

Troponin elevation not associated with an MI
A. Pulmonary Embolism as before
B. Renal Disease, ESRD
  1. Elevated in 19-52% in dialysis patients
  2. Small fragments of Troponin are normally released in small quantities and cleared by normal kidneys. Reduced clearance by diseased kidney may allow levels high enough to be detected by immunoassays.
  3. Increases due to concomitant diseases
  4. Acute MI diagnosis by rise (>=2%) from usual baseline Troponin value. Usual Troponin rise but prolonged fall.
  5. Troponin T has greater frequency of elevation in renal disease than does Troponin I.

Troponin Elevations with Coronary Intervention
1. 24-40% after successful PCA in stable and unstable CAD
   Reasons:
   a. Side branch occlusions
   b. Coronary dissections
   c. Transient ischemia from temporary device occlusion
   d. Micro emboli

2. Open Heart Surgery: Troponins almost always elevated in small amounts for average of 5 days even without CABS Myocardial cell damage from:
   a. Incomplete cardio protection
   b. Reperfusion injury
   c. Direct surgical trauma

Troponin elevation not associated with an MI
C. Septic Shock
  1. Troponin elevated in 36-85% of cases, majority without associated CAD
  2. Etiology
    a. Increased demand: fever, Tachycardia
    b. Decreased supply: respiratory failure with hypoxia, hypotension, anemia
    c. Direct myocardial injury from bacterial endotoxins and other inflammatory factors

D. Acute and Chronic CHF
  1. Acute CHF
    a. 50-55% elevated Troponins in admitted patients with acute CHF
    b. Etiology
      i. Increased wall tension from volume/pressure overload
      ii. sub endocardial ischemia from increased wall strain
  2. Chronic Stable CHF
Troponin elevation not associated with an MI

E. Atrial Fibrillation-Tachycardia
1. Elevated in 9.2% of atrial fib cases in ARISTOTLE trial comparing apixaban and warfarin. The patients with elevated Troponin had increased risk of stroke. Even with rate control, Troponin may be slightly elevated.
2. Tachycardia reduces diastolic filling period (the time for coronary perfusion), increases cardiac filling pressures, and increases myocardial O2 demand.

F. Acute Pericarditis/Myocarditis
1. Acute Pericarditis - 32-49% Troponin elevation
2. Myocarditis - 34%

G. Ablation, Cardioversion, Defib shocks
1. Ablation - more than 90% Troponin elevation
2. Cardioversion - little or no increase of Troponin I, none Troponin T
3. Repeated defibrillator shocks for VT/VF commonly results in Troponin elevations but may also have acute coronary ischemia as etiology of VT/VF

H. LVH, Hypertrophic Cardiomyopathy, AS
Etiology: Increased muscle mass, remodeled microcirculation

I. Acute Stroke - intracranial hemorrhage
1. 27% have increased Troponin
2. Likely due to imbalance of autonomic nervous system with increased sympathetic activity and catecholamine effect.

J. Myocardial Contusion
K. Heterophile Antibody - Causes false positive Troponin values by binding to the conjugating antibodies of the Troponin assay.
1. From exposure to animal proteins - vets, farmers, pet owners
2. Mouse monoclonal antibodies - imaging and cancer therapy
3. Patients with elevated Rheumatoid factor (11.5% false positive Troponin)
4. Pathologist Bruce Prouse reported two cases at McKennan with positive troponin from a heterophile antibody.

L. Ultra endurance exercise - Transient <24 hours
M. Amyloidosis - Compression of myocytes
N. Cardio toxic chemotherapy
O. Post cardiac transplantation - all first three months, later elevations suggest rejection

P. Burns >25% of body

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Conclusion

• Check for causes other than myocardial ischemia in patients with borderline or very mildly elevated Troponin values.