Takotsubo Cardiomyopathy (TTC)

Background
1. Definition
   o Acute onset reversible left ventricular apical ballooning (during systole), with chest pain, ECG changes and no, or minimal, elevation of cardiac enzymes in absence of significant CAD
   o Also known as:
     ▪ Broken heart syndrome, transient LV apical ballooning, stress induced cardiomyopathy
   o 1st described in Japan in 1991
   o Takes its name from unusual shape, resembling Japanese octopus jar, the left ventricle assumes during systole in affected patients

Pathophysiology
1. Pathology of disease
   o Hallmark is hypokinesis of the apex of left ventricle (LV)
     ▪ As the base of LV contracts, the apparently stunned apex balloons outward, forming characteristic shape
   o Exact etiology not well understood
   o Catecholamines play major role in development of TTC
     ▪ Patients present in times of acute stress, when sympathetic outflow is frequently increased
   o Catecholamines have been shown to induce myocardial damage both clinically (pheochromocytoma) and experimentally
   o In patients with stress cardiomyopathy
     ▪ Plasma catecholamine levels
       • 2-3 times higher than in MI
       • Up to 34 times higher than in healthy pts
     ▪ Catecholamine-induced myocardial stunning is a proposed mechanism of TTC
   o Unique anatomic features (greater response to adrenergic stimulation, limited coronary circulation) of the left apex may explain its vulnerability to TTC
     ▪ Main consequence of significant TTC is heart failure

Diagnostics
1. Impossible to distinguish between TTC and myocardial infarction on the basis of Hx and PE alone
   o Studies typically used to evaluate chest pain (ECG, cardiac enzymes) may confound Dx rather than clarify it
2. History
   o Chest pain, often at rest
   o Dyspnea
   o Syncope
   o Recent emotional trauma (typical feature)
     ▪ Unexpected death of a loved one
• Domestic abuse
• Arguments
• Financial losses
• Accidents
• Court appearances
• Any high stress event
  o Physical stressors
    • Varied physical stressors
    • Exhausting physical activity
    • Asthma attacks
    • Exacerbation of other systemic disorders
    • Medical procedures (endoscopy, colonoscopy)

3. Physical exam
  o Findings nonexistent or subtle
  o Significant findings, if present, usually due to left heart failure
  o Blood pressure: normal - shock
  o Systolic cardiac murmurs occasionally noted
    • Ejection murmur heard over aorta or base
    • Mitral regurgitation
  o Pulmonary crackles 2° to pulmonary edema

4. Diagnostic testing
  o ECG abnormal in most cases
  o ECG of limited value
    • Lack of reciprocal ECG changes and Q waves
    • Q waves have been noted but are transient
    • Corrected QT interval tends to be significantly longer in patients with TTC
  o Cardiac enzymes
    • Limited value
    • May not rise at all, may rise and fall in pattern similar to MI
    • Peak levels at presentation, with faster normalization than is seen in infarction
    • BNP markedly elevated during acute phase
  o Echocardiography
    • Large area of apical hypokinesis
  o Cardiac catheterization
    • Cath findings do not correspond to presenting symptoms
    • No treatable coronary lesions
  o Ventriculography
    • Classic finding of apical ballooning accompanied by hyperkinetic activity at the base of ventricle

5. Criteria (Mayo Clinic):
  o Transient akinesis or dyskinesis of left ventricular apical and midventricular segments
    • Regional wall motion abnormalities must extend beyond single epicardial vascular distribution
Exclusion of obstructive coronary disease or angiographic evidence of acute plaque rupture
- New ECG abnormalities
- Exclusion of recent head trauma, intracranial hemorrhage, hypertrophic cardiomyopathy, myocarditis, obstructive epicardial coronary artery disease, pheochromocytoma

**Differential Diagnoses**

1. **Acute coronary syndrome**
   - Associated with ST elevation on ECG

2. **Aortic dissection**
   - Widening of mediastinum on CXR
   - Ripping, tearing pain felt in intrascapular region

3. **Pulmonary embolism**
   - Seen on CT

4. **Tension pneumothorax**
   - Decreased breath sounds
   - Shifting of trachea
   - Seen on CXR

5. **Pericarditis**
   - Pericardial friction rub
   - Beck's Triad:
     - Jugular venous distention
     - Muffled heart sounds
     - Hypotension
   - Electric alternans on ECG

6. **Hypertrophic obstructive cardiomyopathy**
   - ECG will show LV hypertrophy
   - Echo may be diagnostic

**Therapeutics**

1. **Supportive treatment**
   - Beta blockers for dynamic intraventricular obstruction
     - Metoprolol 25 mg PO qD
   - Calcium channel blockers for coronary vasospasm
     - Diltiazem 120 mg PO BID
   - Beta blockers, ACE inhibitors and diuretics for heart failure
     - Furosemide 20 mg PO qD
     - Lisinopril 20 mg PO qD
   - Short-term anticoagulation until left ventricular function recovers
     - Often used prophylactically

2. **Thrombolytic agents not indicated**

**Prognosis**

1. Despite dramatic presentation, prognosis of TTC is positive
2. Mortality of 1-3%
3. Most patients regain full functional capacity within 2-4 weeks
4. Recurrence rate has not yet been identified

References

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