Takotsubo Cardiomyopathy: A woman’s broken heart

Amit Gupta, MD FACC
Interventional Cardiologist
CANM
Case 1

- 50 year old female
- No past medical history
- ED presentation after fall from subway stairs
- Exam: Stable vitals, right orbital fracture
- EKG: 1mm ST elevation in II, V1-V4
- CK 3395, MB 34, Troponin 3.47
- EEG and other labs and imaging normal
Case 1

• ECHO: EF 25-30%, severe anteroapical wall motion abnormality
• Diagnosis: ? ACS: STEMI
• Admitted to SICU due to severe facial trauma and no cardiac symptoms
• Plans for cardiac cath once orbital hematoma stabilized
• Treated with ACEI and BB. No antiplatelet meds used

Case 1

- Follow up ECHO at day 3 showed complete resolution of wall motion abnormalities
- EKG showed sinus bradycardia and biphasic T waves in V2-V4
- Cardiac cath was cancelled
- Day 12: Dobutamine stress ECHO showed no wall motion abnormalities at peak stress
- Follow up out patient cardiac CTA: no CAD

Case 2

- 69 year old female with HTN and dyslipidemia
- Restrained front passenger, truck hit a deer on Natchez Trace parkway
- Driver (spouse, aged 77) unrestrained, ejected from the truck
- EMS arrival at scene: She developed severe chest pain, syncope with EKG evidence of anterior ST elevation MI.
- Flown by helicopter from scene to NMMC cath lab
Case 2
Case 3

- 50 year old female with history of migraines, fibromyalgia, depression.
- Lost her daughter in an accident a year ago
- Developed severe chest pain on the anniversary of her daughter’s death
- EKG showed anterolateral T wave abnormalities
- Troponin 0.43
Case 3
Takotsubo Cardiomyopathy

• Cardiomyopathy characterized by transient apical and midventricular LV dysfunction in the absence of significant coronary artery disease that is triggered by emotional or physical stress.
  – In setting of depressed/abnormal function of distal and apical LV segments there is compensatory hyperkinesis of basal walls → “ballooning” of apex during systole.

• Typically recover normal LV function in 1-4 weeks.
Takotsubo Cardiomyopathy

• 1\textsuperscript{st} described in Japan in 1991
• Named after the tako-tsubo, which is an octopus trap
  – Shape of the trap is similar to the appearance of LV apical ballooning noted in patients with this form of cardiomyopathy
• Was later described elsewhere and is being increasingly recognized.
Takotsubo Cardiomyopathy

Aliases

• Takotsubo cardiomyopathy
• Stress-induced cardiomyopathy
• Transient left ventricular apical ballooning syndrome
• Apical ballooning syndrome
• Broken heart syndrome
• Ampulla cardiomyopathy
Takotsubo Cardiomyopathy

- May account for up to 2% of suspected ACS
- In-hospital mortality ranges 0-8%
- Much more common in women (~90%), especially postmenopausal women (>80% of cases)
- Mean age 58-75 years
- Triggers: trauma, death of loved one, other catastrophic news, devastating financial losses, natural disasters, physical illness/ICU, etc.
Proposed Mayo Clinic criteria for Diagnosis

• Transient hypokinesis, akineses, or dyskinesis of the left ventricular mid segments with or without apical involvement; the regional wall motion abnormalities extend beyond a single epicardial vascular distribution; a stressful trigger is often, but not always present.

• Absence of obstructive coronary disease or angiographic evidence of acute plaque rupture.

• New electrocardiographic abnormalities (either ST-segment elevation and/or T-wave inversion) or modest elevation in cardiac troponin.

• Absence of: Pheochromocytoma, HOCM or Myocarditis

(Postulated) Pathogenesis

- **Catecholamine excess**
  - Norepinephrine levels are elevated in ~75% in some studies
  - Plasma catecholamines are significantly higher than in cases of MI
  - May induce microvascular spasm or dysfunction → myocardial stunning or direct myocardial toxicity
  - Limited endomyocardial biopsy data c/w histologic signs of catecholamine toxicity

- **Coronary artery spasm or microvascular spasm**

- **Myocarditis**
Presentation... (similar to acute MI)

- Substernal chest pain
- ECG abnormalities
  - ST elevation (usually anterior precordial leads)- 82%
  - ST depression
  - T wave inversion
  - QT prolongation
  - Abnormal Q waves
- Elevated cardiac biomarkers
- Dyspnea
- Shock
- Syncope
Cardiac cath and ECHO
Acute Complications

- Tachyarrhythmias, bradyarrhythmias
- Pulmonary edema
- Cardiogenic shock
- Transient LV outflow tract obstruction
- Mitral valve dysfunction
- Acute thrombus formation and stroke
- Death
Evaluation

• Because presentation is similar to ACS, proceed to cardiac catheterization

• LV ventriculogram and/or echocardiography can both be used to visualize apical ballooning with akinesis or dyskinesis of apical \(\frac{1}{2}\) to \(\frac{2}{3}\) of the LV.
  – Average LV EF range 20-49%
  – Can have “atypical” ballooning of the middle or basal portions of the LV (much less common)
  – Wall motion abnormalities typically involve the distribution of more than one coronary artery

• Ventriculography and echocardiography also allow evaluation for LV outflow tract obstruction (~16%).

• Cardiac catheterization reveals lack of flow limiting coronary lesions or evidence of plaque rupture.
Left ventriculogram

Echocardiogram

• Hypokinesia or akinesis of mid and apical segments of the LV
  – Motion abnormality involves more than one coronary artery distribution
  – Function at the base is normal

• RV may show similar findings in ~30% of patients (seen in sicker patients)
Cardiac MRI

- Documents degree of wall motion abnormalities
- No delayed hyperenhancement
  - MI and myocarditis show hyperenhancement
Treatment

• Patients will initially be treated as ACS (anticoagulation, ASA, Beta-blocker, ACE)
• Beta-blockers and ACEI are reasonable at discharge
• Consider several weeks of warfarin therapy if LV dysfunction is severe
• CHF can be seen in ~20% of patients at follow up, which responds well to diuretics
Management

• Supportive, conservative therapy
  – Hydrate if EDP low, identify and eliminate stressors (if possible)

• Treat LV dysfunction with standard heart failure regimen- including beta blocker, ACE inhibitor, diuretics (if volume overloaded), aspirin
  – Usually treated for ~6 months

• For pts who are hypotensive with shock, perform echo to evaluate for LVOT obstruction.
  – No LVOT obstruction→ inotropes, IABP if needed
  – +LVOT obstruction→ NO inotropes (can worsen obstruction), use beta blockers (+/- α agonist Phenylephrine), IABP if needed
  – +/- fluid resuscitation (evaluate pulmonary status)
Prognosis

Overall, good prognosis. If patient survives the acute phase, long-term prognosis is excellent.

- 0-8% in-hospital mortality, likely closer to 1-2%
- Recovery of LV function, typically in 1-4 weeks
- Late sudden death (rare) and recurrent disease (<10%) have been reported
The Octopus is resting in its Tako-Tsubo - Do NOT irk it!
The Octopus is unhappy and on a prowl
The Octopus has found its target - the heart

sympathetic nervous system

left ventricle

Takotsubo

Striped Giraffe Press © 2005
Oh! No! -- Big trouble! -- The Octopus IS the CNS
The CNS is stressed and resentfulful

mental or physical stress - anger pain - trauma

left ventricle

Takotsubo

Striped Giraffe Press © 2005
Conclusion

ooohlala!

norepinephrine

left ventricle

catecholamine-induced transient myocardial stunning

Takotsubo

Striped Giraffe Press © 2005
Take Home Points

• Takotsubo cardiomyopathy is a syndrome of transient dysfunction of apical/midventricular LV with compensatory hyperkinesis of basal segment resulting in apical ballooning.
• It is triggered by significant emotional or physical stress.
• It is more common in post-menopausal women.
• Presentation is similar to MI (symptoms, ECG changes, and biomarker elevations). Accounts for ~1-2% of suspected ACS cases.
• No significant coronary artery disease or evidence of plaque rupture can be identified.
• LV function recovers, typically within 4 weeks.