Takotsubo Cardiomyopathy
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David Stultz, MD, FACC

Handout available at http://www.drstultz.com
Pronunciation is key...
Woman out walking the dog returns to find her home on fire

Firefighters are trying to determine the cause of a house fire discovered by its owner as she returned from walking her dog. She found her home burning about noon.

No one was injured, but Little Guy, a 5-year-old terrier mix, got loose and remained unaccounted for by late afternoon, officials said.

Fire Capt. said the damage was concentrated in the living room and two bedrooms of the single-family ranch.

A neighbor said she dismissed the sound of sirens but then she saw the flames. “It’s a horrible thing, because you lose everything,” she said. “I’m just glad she’s all right, and I really hope her dog is OK, too.”

He ran back into the house, said of his mother’s dog. “Everything depends on him. If he’s OK, she’ll be OK.”

Dayton Daily News
Case 1
House fires are hard on the heart

- 76 year old female
- No prior history
- Presented to ER 8 hours after fire
  - Looking for dog, possible smoke inhalation for 20 minutes
- Acute shortness of breath and chest discomfort
  - Lasted about 1 hour
- Fluctuating BP/hypotensive in the ER
Past Medical History

- No significant past medical history.
- History of orthopedic procedures to femur and wrist
- No medications
- Lives alone with her dog
- Smokes about ½ pack cigarettes a day
- Very infrequent alcohol use, none recent
Physical Exam

- **Initial Vitals**
  - HR 88
  - BP 97/68
  - O₂ saturation 98% on 2 Liters NC
  - resps 22/min
- **GENERAL:** A&O x 3, no acute distress
- Neck: No JVD, no bruits
- Heart: regular, occasional PVC, no murmur
- Lungs: decreased in bases
- Extremities: no edema, distal pulses intact and equal
- Neuro: No focal deficits
Laboratory Data

- Creatinine, Sodium, Potassium normal
- WBC 11.4, Hgb 14.1, platelets 205,000
- Troponin I 1.22 -> 4.03
- CK-MB 12.1 -> 14.5

- Initial ABG (32% FiO₂)
  - CO level 2.4% (normal range 0-2%)

- Followup ABG (32% FiO₂)
  - CO 1.6%
  - pO₂ 91mmHg, pCO₂ 37mmHg
8 hours after the fire
Later that night
Cath

Systole

Diastole
Hospital Course

- After catheterization, developed atrial fibrillation with rapid ventricular response
- Systolic blood pressures in the 80’s
- Attempted cardioversion, unsuccessful
- Treated with IV amiodarone
Missing pet found, fine after fire

... police today confirmed that a 5-year-old Terrier mix breed dog unaccounted for during a house fire ..., is safe and back home with his owner.

"I'm very pleased to say that he was found yesterday... He turned up out running around in the neighborhood."

Little Guy went missing after his owner... returned home from taking him for a walk and found her home ... ablaze.
Discharge Medications

- **Aspirin** 81 mg daily
- **Coumadin**
- **Lipitor** 80 mg daily
- **Lisinopril** 5 mg daily
- **Metoprolol** 12.5 mg po b.i.d.
- **Aldactone** 25 mg daily
- **Amiodarone** 200 mg po b.i.d.
- **Lasix** 40 mg po daily
- **Protonix** 40 mg daily
- **Albuterol** 90 mcg INH q.2h. prn
- **Spiriva** 18 mcg INH daily
- **Advair** 250/50 INH b.i.d.
4 months later
Followup Echo

Systole

Diastole

Echo

Penetration /V

56dB S1/-2/2/7
Gain = 0dB Δ=4

Store in progress
HR= 92bpm

Echo

Penetration /V

56dB S1/-2/2/7
Gain = 0dB Δ=4

Store in progress
HR= 118bpm

Echo

Penetration /V

56dB S1/-2/2/7
Gain = 0dB Δ=4

Store in progress
HR= 65bpm

Echo

Penetration /V

56dB S1/-2/2/7
Gain = 0dB Δ=4

Store in progress
HR= 120bpm
Takotsubo
Japanese Octopus Pot

- Also known as
  - Apical ballooning syndrome
  - Broken heart syndrome
  - Stress induced cardiomyopathy

http://www.takotsubo.com/
http://www.lifestylewellnesscoach.com/wellness/the-broken-heart-tako-tsubo/
Etiology and presentation

- 1st identified in 1991 in Japan
- Significant increase in attention in 2002
- Precipitated by a stressful event
  - Psychological or physical
- Presentation consistent with acute myocardial infarction
  - Chest pain
  - Shortness of breath
  - EKG changes including ST Elevation
  - Abnormal cardiac enzymes
  - Can have unstable hemodynamics

Features of Takotsubo Cardiomyopathy

- Significant left ventricular wall motion abnormality
  - Normal or hyperdynamic basal segments
  - Hypokinetic, akinetic, or dyskinetic apical segments
- No obstructive coronary atherosclerosis at cardiac catheterization
Differential diagnosis of “Acute MI with normal coronaries”

- Myocardial Oxygen Demand-Supply Disproportion
  - Aortic stenosis
  - Prolonged hypotension
  - Takotsubo cardiomyopathy
  - Carbon monoxide poisoning
  - Incomplete differentiation of the aortic valve
  - Aortic insufficiency
  - Thyrotoxicosis
Differential diagnosis of “Acute MI with normal coronaries”

- Miscellaneous
  - Cocaine abuse
  - Myocarditis
  - Myocardial contusion
  - Myocardial infarction with normal coronary arteries
  - Complication of cardiac catheterization
Differential diagnosis of “Acute MI with normal coronaries”

- Arteritis
  - Luetic
  - Granulomatous (Takayasu disease)
  - Polyarteritis nodosa
  - Mucocutaneous lymph node (Kawasaki) syndrome
  - Disseminated lupus erythematosus
  - Rheumatoid spondylitis
  - Ankylosing spondylitis

Braunwald, 8th ed.
Differential diagnosis of “Acute MI with normal coronaries”

- Trauma to coronary arteries
  - Laceration
  - Thrombosis
  - Iatrogenic
  - Radiation (radiation therapy for neoplasia)
Differential diagnosis of “Acute MI with normal coronaries”

- Coronary mural thickening with metabolic disease or intimal proliferative disease
  - Mucopolysaccharidoses (Hurler disease)
  - Homocystinuria
  - Fabry disease
  - Amyloidosis
  - Juvenile intimal sclerosis (idiopathic arterial calcification of infancy)
- Intimal hyperplasia associated with contraceptive steroids or with the postpartum period
- Pseudoxanthoma elasticum
- Coronary fibrosis caused by radiation therapy
Differential diagnosis of “Acute MI with normal coronaries”

- Luminal narrowing by other mechanisms
  - Spasm of coronary arteries (Prinzmetal angina with normal coronary arteries)
  - Spasm after nitroglycerin withdrawal
  - Dissection of the aorta
  - Dissection of the coronary artery

Braunwald, 8th ed.
Differential diagnosis of “Acute MI with normal coronaries”

- Emboli to Coronary Arteries
  - Infective endocarditis
  - Nonbacterial thrombotic endocarditis
  - Prolapse of mitral valve
  - Mural thrombus from left atrium, left ventricle, or pulmonary veins
  - Prosthetic valve emboli
  - Cardiac myxoma
  - Associated with cardiopulmonary bypass surgery and coronary arteriography
  - Paradoxical emboli
  - Papillary fibroelastoma of the aortic valve (“fixed embolus”)
  - Thrombi from intracardiac catheters or guidewires
Differential diagnosis of “Acute MI with normal coronaries”

- Congenital Coronary Artery Anomalies
  - Anomalous origin of left coronary from pulmonary artery
  - Left coronary artery from anterior sinus of Valsalva
  - Coronary arteriovenous and arteriocameral fistulas
  - Coronary artery aneurysms
Differential diagnosis of “Acute MI with normal coronaries”

- Hematological (in situ Thrombosis)
  - Polycythemia vera
  - Thrombocytosis
  - Disseminated intravascular coagulation
  - Hypercoagulability, thrombosis, thrombocytopenic purpura

Braunwald, 8th ed.
Case 2
Don’t argue with the nurse

- 75-year-old Female who was accompanying her husband at his ophthalmologist appointment.
- She suddenly became upset, short of breath, and she had an argument with the nurse.
- Developed chest pain and diaphoresis.
Past History

- Past Medical History
  - Poor historian
  - Dementia
  - No other significant history noted

- Medications – None

- Family History – Positive for CAD
Physical Exam

- Vitals – HR 70, BP 140/70
- General – A&O x 3, initially no distress
- Lungs: Clear to auscultation
- Heart: Regular with S4 gallop.
- Neurologic: Symmetric facial expressions. No focal deficits.
Baseline EKG – 3 months prior
Presenting EKG 1
Chest pain subsided
Presenting EKG 2
(Chest pain recurrence in ED)
Inferior/Anterolateral ST changes with ongoing chest pain

- Taken to cardiac cath lab urgently
Labs

- Troponin I peak 0.57ng/mL (0-0.49 normal)
EKG day 2
EKG day 3
Discharge Medications

- **Aspirin** 81 mg daily
- **Toprol-XL** 25 mg daily
- **Lisinopril** 10 mg daily
- **Lipitor** 40 mg daily
- **Plavix** 75 mg daily
- **Protonix** 40 mg daily
- **Aricept** daily
6 month followup

- Overall doing well
- Still some intermittent episodes of chest pain well controlled with sublingual nitroglycerin as needed
EKG 6 months later
Follow-up Echo

Systole

Diastole
Profile of the typical patient

136 patients from 2001-2008, Minneapolis

- Mean age 68 ± 13 years
- 96% female
- 89% could identify a stressor within 12 hours of presentation
  - 47% emotional (personal or family life crisis)
  - 42% physical (medical illness or diagnostic test)
- Physical stressors more common in men

Acute Complications

- 3/136 died in acute phase
  - Cardiogenic shock
  - Anoxic brain injury
  - Traumatic intracerebral hemorrhage
- 5/136 had apical thrombus
  - 2 had embolic events
- 13/136 developed LV outflow tract obstruction due to systolic motion of anterior mitral leaflet

Ejection fraction

- Average EF at admission 32% ± 11%
- 126/136 had eventual return of EF ≥50%
  - 94 had normal EF by 1st followup (51 ± 52 days)
  - 26 more had normal EF by 76 ± 137 days

5% had recurrence of Takotsubo Cardiomyopathy within 4.4 years of initial event

Case 3
Pain and back surgery can stress the heart

- 74 year old female
- 2 days post-op laminectomy for back pain
  - Extensive pain pre-op and post op
  - Very anxious about hospitalization
- Acute respiratory distress
Past Medical History

- Hypertension
- Hyperlipidemia
- Coronary artery disease
  - MI with 2 LAD stents 11 years ago
- Peripheral vascular disease
  - PTA/stents 12 years ago
  - Aortofemoral bypass 11 years ago
- Smokes < ½ pack cigarettes a day
Outpatient medications

- **Aspirin** 81 mg daily
- **Atenolol** 25 mg daily
- **Simvastatin** 40 mg daily
- **Lisinopril** 20 mg daily
- **Hydrochlorothiazide** 25 mg daily
- Alprazolam 0.5 mg daily
- Fosamax 70 mg daily
- Levothyroxine 25 mcg daily
- Omeprazole 20 mg daily
- Premarin 1.25 mg daily
- Zoloft 50 mg daily
- Ultracet 325 mg prn
Physical Exam

- Pule 94, BP 92/66
- Respirations 26, O₂ saturation 98% on nonrebreather face mask
- General: Mild respiratory distress
- Neck: Supple, No JVD noted
- Lungs: Clear
- Heart: Regular, no murmurs
- Extremities: No edema, no cyanosis
Labs

- Hgb 11.7, WBW 12.3, Platelets 271,000
- Creatinine 1.1, Na 133, K+ 4.2, glucose 144
- CK-MB 5.1 -> 9.4
- Troponin I 0.03 -> 0.79
- CT Chest (PE protocol) negative for PE
Prior EKG
Current EKG
Hospital Course

- Supportive therapy
- Changed to metoprolol succinate (Toprol XL)
- Continued lisinopril, Aspirin, simvastatin
3 months later

EKG
Followup Echo

Systole

Diastole
Role of Catecholamines

- Can cause
  - Acute myocarditis
  - Cardiomyopathy
  - Tachycardia
  - Arrhythmias

- Mechanisms
  - Direct toxic effect on myocardium
    - Calcium overload
    - Free radical production
    - Increased sarcolemmal permeability
  - Damage secondary to increased myocardial oxygen demands
    - Or decreased supply due to vasoconstriction

Braunwald, 8th ed.
Variants of Takotsubo Cardiomyopathy

- Reverse Takotsubo
  - Basal and midventricular hypokinesisis with preserved apical wall motion

- Midventricular Takotsubo
  - Midventricular akinesisis with normal wall motion of basal and apical segments

Braunwald, 8th ed.

Treatment of Takotsubo Cardiomyopathy

- No specific therapy
- General treatment for heart failure and NSTEMI
  - Beta blockers, Ace inhibitors
  - Aspirin, statin
  - Lasix as needed
  - ? Digoxin, nitrates
- Specific treatment for complications
  - Anticoagulation for emboli, atrial fibrillation
  - Hemodynamic support as needed
Conclusion

- Takotsubo cardiomyopathy mimics acute myocardial infarction
- Precipitated by emotional or physical stress
- Characteristic left ventricular wall motion abnormalities
- Supportive therapy
  - Can have acute complications
- Often left ventricular function recovers
References