Challenging & Unusual Cardiac & Pulmonary Case Studies

Objectives
♥ Discuss clinical presentation for the diseases presented.
♥ Discuss pathophysiological differences between these diseases and the typical cardiac and pulmonary patients.
♥ Formulate a plan of care for the diseases presented.

Speaker Disclosures
♥ AACN Speaker Bureau
♥ Cross Country Education Speaker Bureau
♥ Handouts will be available at www.cherylherrmann.com

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49 y/o male with crushing chest pain is enroute to your facility via ambulance
What is your action?
1. Go to Cath Lab
2. Repeat EKG
3. Draw cardiac enzymes
4. Observe

Time Is Muscle
Door to PCI time = 49 minutes
Ambulance EKG to PCI time = 66 minutes
- Occluded RCA
- RCA post stent

Challenging & Unusual Cardiac & Pulmonary Case Studies

Case Study #1
- 69 y/o female comes to ED with c/o of severe chest discomfort
- PMH: mild HTN and hyperlipidemia
- B/P 173/89, HR 91, RR 21
  SpO₂ 98% on 2 l/np

EKG on admission
- EKG on admission
Rural hospital with no cath lab
- NTG 0.4 mg SL x 3 in 30 minutes
- ASA 81 mg po
- Metoprolol 25 mg po
- Retavase

More history….
- A few hours earlier in the same ED, her husband came in full arrest and was not able to be resuscitated

No relief of symptoms… Repeat EKG
No improvement

Labs on admission
- CK = 156
- CKMB = 10.7 ↑
- Myoglobin = 298 ↑
- Troponin I = 2.91 ↑
- BNP = 35

Cardiac Cath findings
- Normal coronary anatomy – No CAD
- Markedly depressed LV function with ejection fraction = 5 – 10%
- Severe hypokinesis to akinesis of the distal 2/3 anterolateral, apical, and inferior walls.
- The basal segments contract vigorously giving it very Japanese amphora shape suggestive of Takotsubo cardiomyopathy
Management

- Transferred to CVICU
- No IABP due to hemodynamically stable and recent Retavase
- Diagnosis: Broken Heart Syndrome or Takatsubo cardiomyopathy

Discharged the next day so she could attend her husband’s funeral

- Discharge medications
  - Aldactone 25 mg every day
  - Alprazolam 0.5 mg prn
  - Altace 2.5 mg every day
  - ASA 81 mg every day
  - Coreg 6.35 mg every 12 hours
  - Coumadin 5 mg po every day
  - Lasix 20 mg every other day
  - Lipitor 40 mg po at hs

6 weeks later

- EF 60%
- Patient doing well

Broken Heart Syndrome

- A specific syndrome of stress-related reversible cardiomyopathy
- Mimics acute myocardial infarction without obstructive disease

Precipitating factors

Marked psychosocial or physical stress
Transient Left Ventricular Apical Ballooning
Takotsubo Cardiomyopathy

♥ 1st Described in Japanese literature in early 1990
♥ Was first attributed to simultaneous spasm of multiple coronary arteries
♥ Original name given “Takotsubo Cardiomyopathy”

Takotsubo is the narrow-necked bulging container used by Japanese fisherman to trap octopus.
The shape of the takotsubo pot resembles the distorted ballooning ventricle.

Etiology

♥ Unclear etiology
♥ 1 – 2% of patients who have S/S AMI have apical ballooning (Japan & USA)
♥ 6-9 times more common in women
♥ 6% of women with AMI have apical ballooning
♥ Most often in postmenopausal women

Unclear etiology
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Pathophysiology

♥ Marked systolic ballooning of the ventricular apex
♥ Hypercontractility of the base of the heart
♥ Most common in LV ---can occur in RV
♥ Initial reports thought it was due to spasm
♥ Now thought to be related to stunning of the myocardium related to excessive catecholamines

Other possible pathophysiology mechanisms

♥ Since preceded by increased psychosocial or physical stress suggest an association with ↑ SNS activity
♥ Catecholamines have a toxic effect on the myocardium
♥ Catecholamine levels reported to be 7 – 34 times as high as the normal 2 – 3 elevation in classic AMI patients

♥ Rupture of a nonobstructive plaque followed by spontaneous thrombolysis
♥ Microvascular coronary spasm or dysfunction
♥ Transient obstruction to left ventricular outflow
♥ Acute myocarditis
Other findings
- Abnormally long left anterior descending artery that courses along the diaphragmatic surface of the left ventricle
- But not consistent finding

Signs & Symptoms (not consistent)
- Chest pain
- ST segment changes
- Release cardiac biomarkers
- Syncope or near syncope
- Fatigue/malaise
- Palpitations
- Dyspnea
- Hypotension
- Pulmonary edema
- Cardiogenic shock
- Lethal ventricular arrhythmias

12 Lead EKG
- Variable findings
- ST segment elevation or depression usually in the precordial leads (V2 – V5)
- Reciprocal changes in the inferior leads may not occur
- Q waves usually do not develop
  - or Q waves V3 – V6
- Deeply inverted T waves are common in the recovery period
- Markedly prolonged QT interval

Cardiac biomarkers
- Only moderately elevated
- Do not follow the typical rise-fall-pattern seen with AMI

Echocardiogram/Cardiac Cath
- Systolic ballooning of the ventricle, akinetic or dyskinetic left ventricle
- Ejection fraction markedly decreased in the acute phase – as low as 14 – 40%
- No significant coronary artery disease to account for the marked left ventricular dysfunction
Normal LV on Echo

Systole

Diastole

Left ventriculogram in systole (3a) and diastole (3b) to illustrate the ballooning

65-year-old woman was admitted to a local ED due to chest pain in the retrosternal region associated with severe dyspnea. Before the onset of the symptoms, the patient reported a significant stress episode following a serious quarrel with her husband.


Left ventriculogram of the patient during systole showing mid, distal and apical left ventricular ballooning, with vigorous contraction of the basal segment as seen in Takotsubo cardiomyopathy

Nuclear stress testing

Evidence of reversible myocardial injury

Diagnosis

Immediately difficult to differentiate between STEMI caused by thrombosis

Suspect Takotsubo Cardiomyopathy when obstructive CAD is not present to explain the LV dysfunction

Confirmation of diagnosis: typical octopus morphology of LV

Stressor considered supportive evidence

Complete resolution of LV dysfunction weeks after the event
Management

- Prompt recognition of apical ballooning prevents unnecessary administration of fibrinolytics with the ST segment elevation
- Specific guidelines do not exist
- Mostly managed per NSTEMI and STEMI guidelines
- Proceed with STEMI treatment & emergent cardiac cath

Management of Cardiogenic shock

- Vasopressors
- Pacemaker
- Intraaortic balloon pump (IABP)
- Support until LV recovers

Supportive Management

- Arrhythmias → antiarrhythmic drugs
- Diuretics → pulmonary congestion
- B Blockers, vasodilators, ACEI, vasoconstrictors, IABP → left sided HF
- Short term anticoagulant → prevent LV thrombus

Prognosis

- Left ventricular function improves rapidly
- Often within 7 – 30 days
- EKG changes may be slower to resolve
- Generally favorable prognosis
- Mortality of 0 – 8%

Case Study # 2

- 49 y/o white female came to ED because of two episodes of resting palpitations associated with tightness across the midchest and in the throat, SOB and diaphoresis
- Symptoms subsided by the time patient arrived at ED
EKG in ED. Troponin Normal
Sent home to follow up with cardiologist next day

EKG during stress test in cardiologist office. Sent directly to cath Lab

Cardiac Cath: Normal Coronary Arteries
LV apical balloning, EF = 40%

Stressors
♥ Aunt died one month ago
♥ Just told father has terminal illness
♥ Significant other – 3 stents last week

TS: EKG day later
Note: Deep T wave inversion & prolonged QT interval

Case Study # 3
74 y/o female POD #2 rectal prolapse repair & cholecystectomy

PMH
- 2 coronary stents three years ago & iliac stents.
- Quit smoking 4 years ago. Smoked 1 ½ packs x 50 years

Clear lung sounds, uneventful post op course. SpO$_2$ 97% on room air

3/6 POD #2 1450

Patient abruptly has respiratory distress.

Respirations 36 labored

SpO$_2$ drops to 78% on 3 liters

RRT called

RRT assessment

O$_2$ increased to 7 l/min. SpO$_2$ 81%

BP 197/111, HR 139, Resp Rate 36 labored

Lungs crackles throughout

Color dusky

ABGs:
- Ph 7.45
- pCO$_2$ 30
- pO$_2$ 45
- TCO$_2$ 21.8
- O$_2$% 83
- BE -3.1
- Lactic Acid 1.9

What do you suspect?
1. Hypoxia
2. Pulmonary Edema
3. Pulmonary Embolus
4. Acute AMI

O$_2$ increased to 100% nonrebreather. SpO$_2$ increased to 91%

Transferred to ICU at 1505
EKG at 1509

CXR at 1535

Remember: SpO2 was 97% on room air just prior to the acute change

Cath results: Normal LAD & other coronary arteries

- Anterobasal & basal 2/3 of inferior wall contracts normally
- Rest of LV is akinetic & perhaps dyskinetic
- EF = 20%
- Findings are consistent with “broken heart syndrome/Takotsubo cardiomyopathy”
- Physical stressor - surgery

Patient started on Cardizem
Placed on BiPap 12/6
Given Lasix 40 mg IV
Albuterol/Atrovent & Pulmicort nebulization
Supportive management of Cardiogenic shock

12 Lead EKG 48 hours later
10/15/2014

CXR 4 days later

10 days later 3/20

♥ Back on telemetry unit
♥ Patient abruptly goes into respiratory distress and is diaphoretic.
♥ BP 97/45, HR 131, RR 40 SpO₂ 92%
♥ Placed back on BiPAP 14/10

3/20 1600

♥ Started on Cardizem @ 10 mg/hour
♥ ABGs
  – pH 7.53
  – pCO₂ 23
  – pO₂ 60
  – TCO₂ 20
  – O₂% 94
  – BE – 3.3
  – Lactic Acid 4.7 (Abdomen tender)

CXR on 3/20

♥ Transferred back to ICU
♥ Supportive Care of Cardiogenic Shock
♥ Started having Ventricular Tachycardia – defibrillated several times over the next several hours. Then made DNR & expired shortly thereafter.
**Broken Heart Syndrome**

**Summary: Clinical features**

- Onset of s/s often preceded by emotional/physical stressor
- Most common in postmenopausal women
- ST-segment abnormalities that mimic those of AMI
- Mild to moderate increase in levels of cardiac enzyme compared with the increase in AMI
- No significant coronary artery disease to account for the left ventricular dysfunction
- Left ventricular “ballooning” wall motion at the apex with hypercontractility at the base
- Transient and reversible left ventricular changes with favorable prognosis


**Broken Heart Syndrome Takotsubo Cardiomyopathy**

- Avoid Fibrinolytics!

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**Case Study # 4**

42 y/o white male

- Came to ED due to c/o substernal burning pain that radiates up chest to both arms.
- Becomes SOB with chest pain
- Episodes last approx 10 minutes at a time.
- Episodes occur more when lying flat. This occurs several times during the night so he is not able to sleep
- Episodes have been occurring for last 4 months.

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**More History**

- Had a negative stress test & normal GI workup.
- Denies any drug use of cocaine or other medications
- Quit Smoking 4 months ago. No other past medical history
- Father had some cardiac problems when he was in his 50s or 60s --- history unclear.

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**42 y/o white male**

- Pain free on arrival to ED
- Alert, Oriented
- Skin Warm/dry
Feb 24 at 1331
- When laid down for EKG developed chest pain
- BP 122/77, HR 87, RR 20 SpO₂ 99%
- Chest pain 7/10
- Weight: 70 kg

EKG in ED

Chest pain resolved when sat up
- BP 118/56, HR 74, RR 20

At 1339 on 2-24 (6 minutes later), the chest pain was gone. Pt was sitting up at the time.

Troponin < 0.4 ng/ml
- CK = 71
- Total Cholesterol = 161
- Triglycerides = 66
- HDL = 35
- LDL = 113

Called cardiologist
- 1st EKG STEMI that resolved after a few minutes.
- Admit patient to CVICU. Started on ASA, plavix, heparin drip, nitroglycerin drip, and lopressor
- Hold cardiac cath for now as pain free with normal EKG
Cardiac Cath Feb 25
Initial Injection of RCA

Cardiac Cath Feb 25
RCA after administration of
Intracoronary Nitroglycerin

Management

- Diltiazem 180 mg
- Nitroglycerin 0.4 mg Transdermal patch. Apply at bedtime and remove at 10 am.
- Two days later, stated, “I am finally sleeping at night!”
- Discharged with
  - Diltiazem 180 mg daily
  - Nitroglycerin 0.4 mg Transdermal patch at HS

Prinzmetal or Variant Unstable Angina

- Caused by a dynamic obstruction from intense vasoconstriction
- Unstable angina represents a transition from stable angina to an unstable state
- One or more of the coronary arteries are more than 60% obstructed or the symptoms have become more frequent, more severe, or occur at rest

Management

- Modification of risk factors
- Vasodilators to decrease spasms
  - Nitroglycerin
  - Calcium Channel Blockers