CHEST PAIN & HYPOTENSION AFTER ELECTRIC CARDIOVERSION

HANA AKSELROD, PGY-3 || MAINE MEDICAL CENTER || BAR HARBOR, SEPT 2015
PATIENT CASE

- **ID:** 71 F presenting to the hospital for elective electrical cardioversion of AFib with RVR
- **HPI:** Presented to the hospital with AFib-RVR symptomatic for hypotension and dyspnea. Recent course notable for worsening AFib refractory to multiple meds and s/p one DCCV attempt with temporary conversion to sinus rhythm.
- **PMH/PSH:**
  - ESRD due to PKD, s/p deceased donor renal transplants in 1996 (failed due to thrombosis) and 1998; baseline Cr ~1.3.
  - Atrial flutter s/p ablation 2009, sick sinus syndrome s/p PPM, and treatment-refractory Afib with RVR.
  - Iliocecal adenocarcinoma s/p resection, ileostomy; recently treated for C.difficile colitis.
- **Medications:** Diltiazem, metoprolol, propafenone, warfarin, cyclosporine, prednisone, omeprazole, pravastatin
- **Allergies:** Flecainide (vision changes), opioids (itching), fentanyl (hypotension)
- **Family Hx:** Adult Polycystic Kidney Disease (father, sister, son, daughter), stroke (father)
- **Social Hx:** Retired, former smoker, supportive family
PATIENT CASE

- Difficult sedation due to prior hypotension to fentanyl; admitted and observed overnight.
- Presented to cardioversion in the morning with HR 160-180s and SBP 80s. TEE showed normal EF (consistent w/prior full TTE done 1 week prior) and no clot in the LA.
- DCCV performed with 200 J. After one shock converted to NSR, improving to SBP >100.
Pre-cardioversion ECG
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- DCCV performed with 200 J. After one shock converted to NSR, improving to SBP >100.
- Two hours post procedure, the patient developed substernal chest pain radiating to the back and arms.
- ECG showed sinus tachycardia with anterior & inferior Q waves.
- Echo showed extensive wall motion abnormalities and LVEF 25%.
- Labs:
  - INR 2.4
  - Troponin T: 0.06
After onset of chest pain
STAT TEE AFTER ONSET OF CHEST PAIN

- LVEF 20-25%
- Extensive hypokinesis of LV wall
COMPARISON: LAST TEE (T - 1 WEEK)

- LVEF 60-65%
- Moderate MR
- LV hypertrophy
- No wall motion abnormalities
NEW-ONSET ACUTE LV DYSFUNCTION AFTER DCCV

- Differential diagnosis
NEW-ONSET ACUTE LV DYSFUNCTION AFTER DCCV

- NSTEMI was suspected and she was taken emergently to the cath lab, where no occlusive CAD was seen, however the coronary vasculature appeared diffusely constricted/spasming.
- Left ventriculography showed LVEF 10% with apical hypokinesis.
- Right heart pressures were moderately elevated and cardiac output was < 2.
- Nitroglycerin was infused, with subsequent relaxation of the coronaries but no immediate improvement in cardiac output.
- An intraaortic balloon pump was placed, dobutamine and norepinephrine infusions were started, and she was transferred to the cardiac ICU on heparin.
- Troponins were trended over the next 12 hours: 0.06 → 0.89 → 0.69
CATH LAB FINDINGS

Diffuse coronary vasospasm
CATH LAB FINDINGS

Post nitroglycerin infusion
CATH LAB FINDINGS

Right side circulation
PATIENT CASE: HOSPITAL COURSE

Management:
- Managed initially with IABP and pressor support (dobutamine, norepinephrine, dopamine, milrinone)
  - Choice of pressors limited by tachycardia contributing to low cardiac output
  - Reverted to AFib-RVR on Day 3; managed with amiodarone, DCCV x 3
  - IABP weaned on Day 4, continued on milrinone
  - AV node ablation on Day 7
  - Empiric antibiotics: vancomycin, piperacillin-tazobactam, metronidazole; negative cultures
- Course complicated by AKI, urinary retention, UTI, DVT, and thrombocytopenia with negative HIT panel.
- Transplant team involved in admission, CVVH performed on Day 6-8 to help relieve volume overload.

Outcome:
- Complete resolution of heart failure on Day 10. Pressors weaned, TTE showed LVEF 55%.
- Kidney function recovered (Cr returning to baseline)
- Patient survived this admission. However in the following year she had multiple hospital admissions for non-cardiac problems (ileostomy reversal, infections) and eventually succumbed to kidney failure in 2015 (faced with the need for dialysis again and chose palliative care).
TTE DAY 4

- LVEF 25%
- Persistent apical ballooning
• LVEF ≥ 55%
• LV hypertrophy
TTE DAY 30+

- LVEF $\geq 55$
- LV hypertrophy
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TAKOTSUBO CARDIOMYOPATHY
EPIDEMIOLOGY, PATHOPHYSIOLOGY, AND MANAGEMENT
Incidence: consensus opinion, ~2% of patients presenting with MI to hospital, and up to 10% in select groups of post-menopausal women.

Large hospital in California: of 1,297 post-menopausal women presenting with ACS-like syndrome and positive troponins, 5.9% met criteria for Takotsubo Cardiomyopathy (TCM).

In the National Inpatient Sample study (2008-2009), 24701 patients with TCM were compared to controls with MI and Ortho presentations:
- More likely to be female, Caucasian, and wealthier
- Less likely to have “traditional” cardiovascular risk factors
- More likely to have h/o CVA, mood disorders, drug abuse, malignancy, chronic liver disease, or sepsis
- No difference in age vs. controls
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CLINICAL FEATURES

- **Diagnosis:**
  - NSTE-MI-like presentation ("typical" anginal chest pain, nonspecific ECG)
  - Elevated troponins (nearly always)
  - "Clean" coronary angiography
  - Reduced EF:
    - Characteristic echographic appearance
    - Average LVEF at diagnosis: 37% in RI TCM registry

- **Initial description:**
  - First described in Japan in 1991 [Dotey et al.]
  - Formally recognized by AHA in 2006
  - PubMed: 8 citations 2003; 246 in 2013
  - Japan patient characteristics: over 90% female, average age 74
**PRECIPITATING FACTORS**

- Physical (less common) or emotional stress
- Underlying psychological factors?
- Role for chronic stress?
- Case reports:
  - Drug overdose
  - Pulmonary illness attack
  - Pheochromocytoma
  - Cardioversion

### Table 2

<table>
<thead>
<tr>
<th>Emotional</th>
<th>26 (37%)</th>
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<tbody>
<tr>
<td>Bad news about family member</td>
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<tr>
<td>Domestic argument</td>
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<tr>
<td>Domestic/financial stressor</td>
<td>3</td>
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<td>Wallet stolen</td>
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<td>Bad driving directions</td>
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<td>New diagnosis of personal disease</td>
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<td>Heated town meeting</td>
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<td>Upcoming operation</td>
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<tr>
<td>Unemployed adult son living at home</td>
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<tr>
<td>Stressful business meeting</td>
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<tr>
<td>Sending parent to nursing home</td>
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<td>Directing a symphony</td>
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<td>New job anxiety</td>
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<td>Lost job</td>
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<table>
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<tr>
<th>Physical</th>
<th>21 (30%)</th>
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<tbody>
<tr>
<td>Severe physical illness</td>
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<tr>
<td>Chronic obstructive pulmonary disease exacerbation</td>
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<tr>
<td>Fall</td>
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<td>Tooth extraction</td>
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<td>Minor motor vehicle accident</td>
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<td>Compression fracture</td>
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<td>Postsurgical</td>
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<tr>
<td>Drug overdose</td>
<td>1</td>
</tr>
<tr>
<td>Postsurgical pain</td>
<td>1</td>
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<tr>
<td>Multiple bee stings</td>
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<tr>
<td>Allergic reaction</td>
<td>1</td>
</tr>
<tr>
<td>Colonoscopy preparation</td>
<td>1</td>
</tr>
<tr>
<td>No identifiable stressor</td>
<td>23 (33%)</td>
</tr>
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</table>
A 76-year-old woman presenting in acute heart failure with nonspecific ECG changes and non-occlusive findings on coronary angiography, 10 hours after elective DCCV for AFib [Heart Lung Circ 2008]

A 67-year-old woman who developed acute cardiogenic shock and findings characteristic for TCM immediately after undergoing DCCV for AFib [Tex Heart Inst J 2014]

The patients made their recovery after supportive measures; duration of treatment consistent with TCM.
- Contraction patterns similar to pheochromocytoma-related cardiomyopathy
- Catecholamine overload mechanism:
  - Initial phase: activation of $\beta$-adrenergic receptors
  - Subsequent: a negatively-inotropic pathway
MANAGEMENT AND PROGNOSIS

- Supportive management
- Predictors of mortality [AJC 2014]:
  - Meta-analysis of 382 studies (2,120 patients, 11 countries). Mean age was 68 years, 87% female.
  - The in-hospital mortality rate among patients with TCM was 4.5%. Of these, 38% were directly 2/2 TCM.
  - Male gender was associated with higher mortality rate (OR 2.6, p=0.0008)
  - Patients who died tended to be older (72±7 vs 65±7 years).
OTHER COMPLICATIONS OF DCCV

- Thromboembolic events
- Transient hypotension associated with sedation (fentanyl)
- Induction of arrhythmias (bradycardia, AV block, asystole, VT/VF)
- Electric burns to skin / soft tissues
- Injuries to health care workers
- No direct myotoxicity from electricity in studies
SUMMARY POINTS

- Considering Takotsubo cardiomyopathy in relation to iatrogenic events
- Risks and benefits of direct-current cardioversion
- Medical complexity, stress, and risk of adverse events
- Challenges in communication and expectations
REFERENCES


THANK YOU

- Dr. John Love
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- Dr. Stephen Hayes
- Christopher Barnaby
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