ANGRY BOWELS BREAKING HEARTS: A CASE SERIES
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ABSTRACT
Stress cardiomyopathy or Takotsubo cardiomyopathy (TCM) is transient left ventricular apical akinesis in the absence of angiographic evidence of corresponding obstructive coronary artery disease. A classic presentation is of chest pain following intense emotional or physical stress. Reports of stress-inducing triggers include acute respiratory failure, sudden death of a loved one, sympathomimetic drugs, pheochromocytoma crisis, diabetic ketoacidosis, and even earthquakes. We report three cases of intra-abdominal etiologies precipitating Takotsubo cardiomyopathy: two with small bowel obstruction, and one with *Clostridium difficile* colitis.

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Takotsubo cardiomyopathy; stress-induced cardiomyopathy

1. Case 1
An 86-year-old woman with a history of hypertension, osteoarthritis, and right hip arthroplasty two months previously was in her usual state of health until the onset of worsening watery diarrhea two weeks prior to presentation. She had no melena, hematochezia, nausea or vomiting. She was found to have *Clostridium difficile* colitis and was started on metronidazole and cholestyramine six days prior to presentation. She was sent to the hospital on account of non-resolving symptoms. A heart rate of 98 beats per minute (bpm) was noted. Her physical exam was otherwise negative. Except for an elevated creatinine, her laboratory values were unremarkable. An electrocardiogram showed normal sinus rhythm at 110 bpm, with minor nondiagnostic ST/T-wave changes. Oral vancomycin was added to metronidazole to treat *Clostridium difficile* colitis. She was given intravenous fluids for volume resuscitation for pre-renal acute kidney injury, with resolution. She completed a ten-day course of antibiotics as an outpatient.

Less than a week later, she returned to the emergency department with pleuritic chest pain and dyspnea. Work-up revealed pulmonary edema with B-type natriuretic peptide (BNP) of 272 pg/mL (0–100 pg/mL). Cardiac catheterization revealed mild two-vessel coronary artery disease, and a large area of left ventricular apical hypo- to akinesis consistent with stress cardiomyopathy. Similar findings were seen on a transthoracic echocardiogram (TTE). She clinically improved and followed up with cardiology as outpatient with repeat TTE showing resolution in her TCM.

2. Case 2
An 85 year-old woman with a history of hypertension and reflux disease presented with diffuse abdominal pain, nausea, and vomiting. She denied fevers, chills, chest pain, dyspnea, diarrhea, constipation, or palpitation. She also denied recent diet or medication changes, illnesses, and sick contacts. She denied any recent stressful or psychosocial events, and denied having a depressed mood.

Vital signs on admission were notable for a heart rate of 112 bpm and blood pressure of 172/107 mmHg. Physical exam was notable only for diffuse abdominal tenderness. An electrocardiogram showed sinus tachycardia and old left bundle-branch block. Troponin was 0.23 ng/mL (0.00–0.09 ng/mL) and (BNP) was 239 pg/mL (0–100 pg/mL). She had a predominantly neutrophilic leukocytosis of 19.1/uL, lactate of 2.1 mmol/L, and alkaline phosphatase of 304 U/L. A CT scan of the abdomen revealed small bowel obstruction with transition point in the anterior pelvis, near the midline, and associated pneumatosis intestinalis. She was placed on bowel rest, and the mild troponin elevation was deemed to be demand-mediated.

However, the troponin continued to rise to a peak of 8.75 ng/mL (0.00–0.09 ng/mL), and the BNP rose to 3748 pg/mL (0–100 pg/mL). She remained asymptomatic. An echocardiogram revealed severe hypo-apical to akinesis with an ejection fraction of 20%. A coronary angiogram showed normal coronary arteries. Left ventricular filling pressures were elevated. These findings were consistent with Takotsubo cardiomyopathy. This and her small bowel obstruction continued to improve
with conservative management. She was discharged and had follow-up TTE 2 months later, which showed improvement in ejection fraction to 48% with mild diastolic dysfunction and significant improvement in the previously seen severe akinesis.

3. Case 3
An 83-year-old woman with a history of chronic obstructive pulmonary disease and bladder cancer was hospitalized for a small bowel obstruction, with a transition point in the distal ileum. She was managed conservatively and discharged. Two days later she returned, presenting with two days of chest pain and dyspnea. She had no cardiac history. Physical exam was unremarkable. Her troponin was 0.34 ng/mL (0.00–0.09 ng/mL). Her EKG showed normal sinus rhythm with old left bundle branch block. A ventilation perfusion scan was negative. On suspicion of stress cardiomyopathy, a transthoracic echocardiogram was obtained, and it revealed an akinetic apex with EF of 35% consistent with Takotsubo physiology. She underwent an angiogram which revealed normal coronary arteries. Two years prior an echocardiogram had shown normal left ventricular function. She was started on a beta blocker, ACE inhibitor and aspirin. Repeat echocardiogram after discharge showed normal left ventricular size and systolic function with EF of 50–55%.

4. Discussion
Takotsubo cardiomyopathy was initially described in post-menopausal women of East-Asian descent presenting with chest pain or dyspnea following severe emotional or physiologically stressful events [1]. The pathogenesis involves catecholamine release leading to myocardial stunning as well as coronary endothelial dysfunction [2]. This phenomenon may be underestimated. There are reports that more than 2% of all patients presenting with ST-segment elevation myocardial infarctions to have Takotsubo cardiomyopathy as an underlying process [3].

Since Takotsubo cardiomyopathy shares clinical features with acute coronary syndrome, patients often complain of chest pain and dyspnea. Electrocardiographic changes are often non-specific. Key laboratory values include troponin and BNP levels. In the absence of kidney injury, troponins have been reported to be mildly elevated (15 ng/mL or less) [4]. BNP continues to be used as a marker for acute cardiomyopathy, and its elevation is supportive of Takotsubo cardiomyopathy. In all of our patients, cardiac catheterization and angiography were undertaken. A left ventriculogram showing the classic ‘octopus-pot’ pattern of apical akinesis, in the setting of normal or minimally abnormal coronary arteries, is the most valuable diagnostic tool. Transthoracic echocardiography can confirm resolution. While the prognosis is generally good, complications include left ventricular thrombus formation as well as incomplete resolution, and recurrences are described in up to 10% of patients [3].

Bowel ischemia with transmural necrosis is among the serious complications of intestinal obstruction and inflammation, often necessitating emergent surgical intervention. Fortunately, our patients had findings of lesser severity on abdominal imaging, and their symptoms resolved with medical management. Yet even this degree of stress, induced by obstruction and inflammation, was enough to precipitate TCM. On review of the literature, there have only been three prior reported cases of TCM caused by intra-abdominal etiologies [5–7]. Two reported were after development of Clostridium difficile infection. Both cases of TCM resolved upon management of the bacterial infection, with the hypothesis of pathogenesis for TCM being hypovolemia and catecholamine surge. 1 case of necrotic small bowel obstruction has been associated with TCM which developed after exploratory laparotomy which also eventually resolved after management of the SBO. To our knowledge, this is the first case series of intra-abdominal pathologies leading to TCM, with resolution of TCM after management of the intra-abdominal illness.

Our three reported cases are of Caucasian women older than 80 years of age. Our patients did not have extensive medical comorbidities; thus, relatively softer insults may be enough to cause physiological stress in the elderly population. Therefore, more deliberate intravascular resuscitation may be warranted in this population along with bowel rest, and more liberal pain control, to minimize the chances of triggering catecholamine release.

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