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Case Report

Takotsubo cardiomyopathy following blunt trauma: Early recognition and diagnosis

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ABSTRACT

Background: Takotsubo Cardiomyopathy (TTC) is characterized by reversible left ventricular apical ballooning in the absence of angiographically significant coronary artery disease. While TTC is usually preceded by an emotionally stressful event, physical trauma has been documented as a precipitating incident as well.

Case summary: An 82-year-old female with no past medical history, presented to the emergency department following a motor vehicle collision. Trauma workup was significant for an ulnar fracture, elevated cardiac enzymes, and ST-segment changes. Bedside echocardiogram revealed apical ballooning. She underwent cardiac catheterization, which failed to demonstrate significant coronary artery disease. The patient developed cardiogenic shock and required temporary vasopressor support after failing a trial of intra-aortic balloon pump.

Conclusion: Takotsubo Cardiomyopathy is a rare complication of trauma, which presents with signs and symptoms similar to acute coronary syndrome (ACS) but without evidence of obstructive coronary artery disease. Following trauma, signs of ACS in elderly women should raise provider's suspicion for TTC and prompting bedside echocardiography, which can assist with early diagnosis.

Introduction

Takotsubo Cardiomyopathy (TTC), also known as stress-induced cardiomyopathy or Broken Heart Syndrome was first described in 1990. It is characterized by reversible left ventricular (LV) apical ballooning in the absence of angiographically significant coronary artery disease [1,3]. While the exact pathophysiology underlying stress cardiomyopathy is not known, there are well known characteristics documented throughout the literature. These characteristics include ST-segment and T–wave changes, increased cardiac enzymes, akinesis of the apical and distal anterior wall combined with hyperkinesis of the basal wall, and transient need for hemodynamic support. Onset following a stressful event, as is resolution of apical wall akinesis within days to weeks [1,4]. Physical trauma has also been documented as a precipitating event to TTC [5]. Researchers found that 0.001 % of the patients who developed TTC following a physical trauma were most commonly elderly females after a blunt traumatic injury [5]. We present a case of an elderly female who suffered TTC after a motor vehicle collision.

Abbreviations: TTC, Takotsubo Cardiomyopathy; LV, Left ventricle; IABP, Intra-aortic balloon pump; PAC, Pulmonary artery catheter; LVOT VTI, Left ventricular outflow tract velocity time integral.

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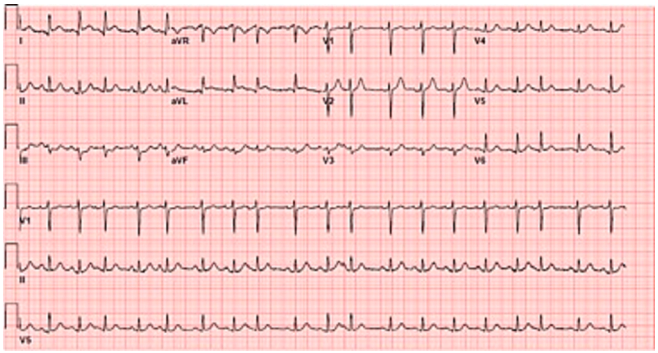

Fig. 1. Admission EKG showing ST segment elevations in lateral leads (I and aVL) and T-wave inversions in III aVF.

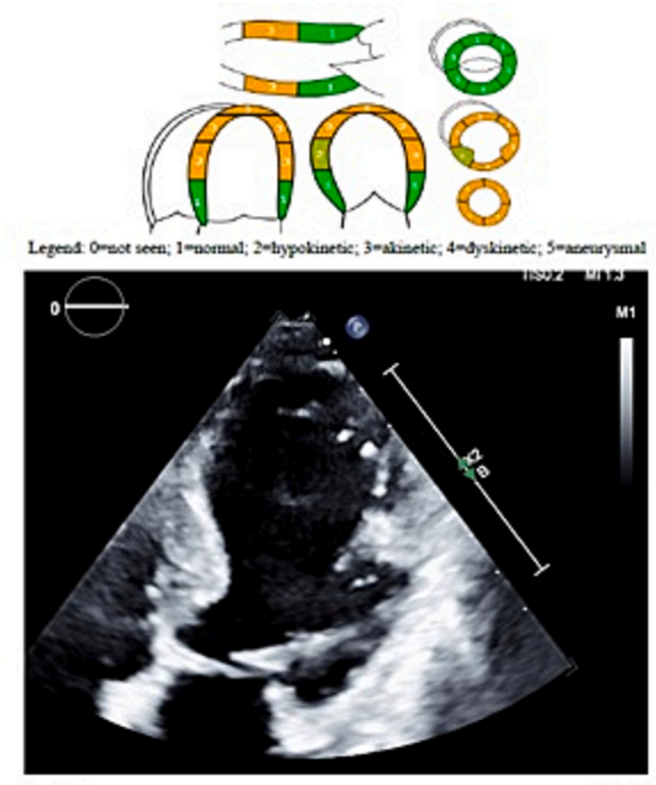

Fig. 2. A) Schematic of admission echocardiogram demonstrating apical ballooning and basal hyperkinesis. B) Snapshot of admission echocardiogram demonstrating apical ballooning.

Case presentation

An 82-year-old female with no past medical history, presented to the emergency department following a motor vehicle collision. She was reportedly the restrained driver of motor vehicle traveling at approximately 30 mph with air bag deployment on impact. On presentation, the patient was awake with a GCS of 15. The remainder of the primary survey was significant for tachycardia and the secondary survey was notable for sternal tenderness and right wrist pain.

The patient underwent a comprehensive trauma work-up that included the following: X-rays of the chest, pelvis, followed by CT brain, CT cervical spine, CT angiogram chest, abdomen, and pelvis, and a right upper extremity X-ray. Trauma labs were obtained, including a CBC, BMP, PT/INR, APTT, blood alcohol level, urine toxicology and analysis. Because of the presentation of the patient, we also obtained a 12 lead EKG and troponin levels. The only positive finding on imaging was a right ulnar fracture. However, the EKG revealed ST segment elevations in lateral leads (I and aVL) and T-wave inversions in III and aVF (Fig. 1). Labs were significant for high sensitivity troponin elevated at 172 ng/L. A bedside echocardiogram revealed apical ballooning and basal hyperkinesis, with LVEF

Fig. 3. Snapshot of left ventriculogram demonstrating apical ballooning.

estimated at 20–24 % (Fig. 2). A cardiac angiography showed severely reduced cardiac function with apical ballooning (Fig. 3).

The patient then developed acute hypoxic respiratory failure requiring noninvasive positive pressure ventilation 6 h after presentation. A point of care ultrasound revealed diffuse pulmonary edema and further reduction in LVEF to 10 %. A pulmonary artery catheter (PAC) and arterial line were placed. The patient underwent left heart catheterization, which was negative for coronary artery disease. Placement of an intra-aortic balloon pump (IABP) was performed, but this was unsuccessful due to worsening hemodynamics upon inflation of the balloon. High-sensitivity troponin peaked on hospital day one at 8000 ng/L.

The patient was admitted to the ICU where she was initially supported with phenylephrine, but then transitioned to norepinephrine and dobutamine based on hemodynamic values obtained from the PAC. Each dose adjustment was made with the assistance of echocardiographic assessment via pulse wave doppler interrogation of the left ventricular outflow tract velocity time integral (LVOT VTI) to carefully monitor for obstructive physiology. She also underwent diuresis with continuous furosemide infusion. During this time, the patient developed a thrombus in her left ventricle, necessitating anticoagulation with a heparin drip. After repeat echocardiogram demonstrated resolution of the thrombus, the heparin dip was discontinued. Over the course of several days, the patient had some recovery of her cardiac function and her LVEF at the time of discharge was 23 %. She was discharged on hospital day ten with Metoprolol, Torsemide, and Spironolactone for her new-onset heart failure.

Discussion

This is a rare case Takotsubo Cardiomyopathy following blunt cardiac injury in an 82-year-old female. The patient presented with classic signs and symptoms of ACS, however bedside echocardiogram revealed apical ballooning characteristic of TTC. The differential diagnosis for post-traumatic chest pain is wide, so it is important that all possibilities are considered. Nevertheless, misdiagnosis of TTC may lead to postponement of necessary interventions, particularly in the case of trauma patients [3].

The differential diagnosis for patients presenting with chest pain after a blunt trauma includes: rib fracture, sternal fracture, aortic dissection, acute coronary syndrome, pulmonary contusion, pneumothorax, hemothorax, atrial or ventricular rupture, and blunt cardiac injury. Thorough history and physical examination provides insight into location, nature, and reproducibility of the pain. In hemodynamically stable patients, initial workup should include an EKG, chest X-ray, chest CT with IV contrast, and cardiac enzymes [6]. CT can diagnose many of these injuries, however in the case of ST changes on EKG, with or without aberrant cardiac enzymes, a bedside echocardiogram should be performed [6,7]. The presence of apical ballooning should raise suspicion for Takotsubo Cardiomyopathy and consideration should be made for coronary angiography or cardiac computed tomography angiography [7]. Following diagnosis of TTC, management is supportive with an emphasis on the treatment of complications [8]. One complication of TTC is cardiogenic shock which is frequently treated with intra-aortic balloon pump (IABP) [4]. However, in the subgroup of patients with TTC who have left ventricular outflow tact obstruction, IABP should be used with caution, as it may lead to hemodynamic instability as was observed in our patient [4,9]. Agents that have inotropic properties can also induce obstructive physiology. It is important to monitor hemodynamic consequences of these agents by utilizing bedside echocardiography.

Below we propose an algorithm to consider for diagnosis of TTC in a patient that suffered a traumatic injury, who presents with

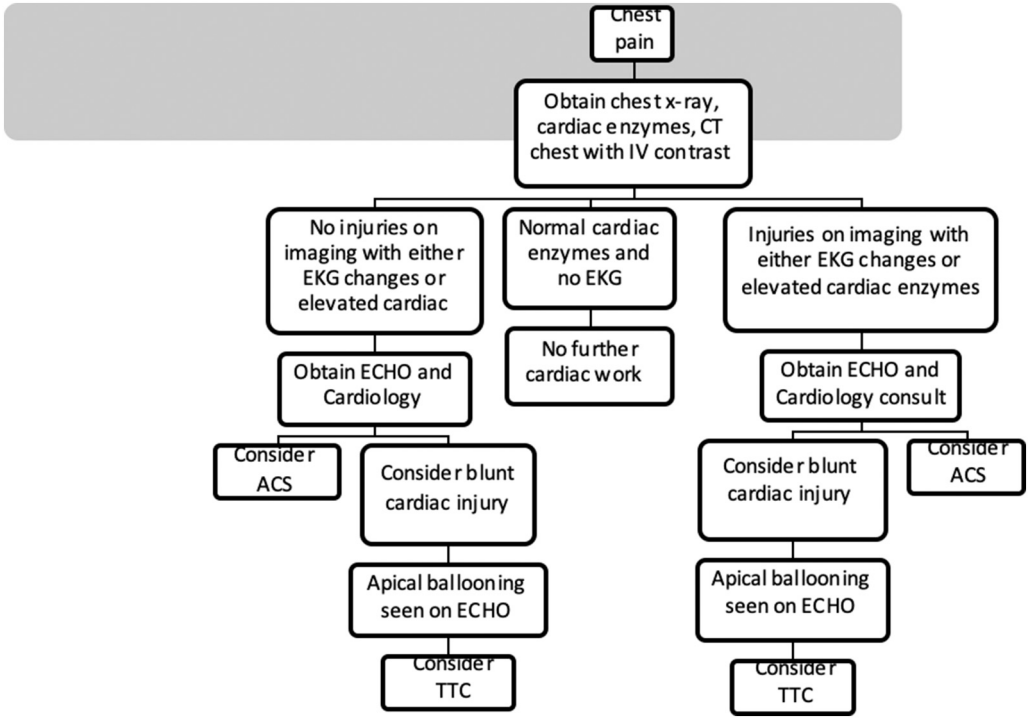

Fig. 4. Diagnosing post-traumatic Takotsubo cardiomyopathy.

chest pain (Fig. 4).

Conclusion

Takotsubo Cardiomyopathy is a rare complication of trauma, which presents with signs and symptoms similar to acute coronary syndrome in the absence of evidence of obstructive coronary artery disease. Following trauma, signs of ACS in patients, and in particular elderly women, should raise suspicion for TTC and prompt immediate formal bedside echocardiography, which can assist with early diagnosis. Once diagnosed, patients should be admitted to the ICU as the management of TTC is supportive with cardiac function recovering over days to weeks.

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None.

Ethical approval

This is an editorial. The NYU Langone Long Island Research Ethics Committee has confirmed that no ethical approval is required.

Declaration of competing interest

All of the above authors declare that they have no conflict of interest.

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