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Blunt traumatic coronary artery dissection: A case study

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ABSTRACT

Background: Coronary artery dissection is an extremely rare but lethal complication of blunt chest trauma. Dissection may cause thrombus formation or vasospasm, leading to the clinical presentation of acute myocardial infarction. Diagnosis can be difficult as traumatic chest pain has several etiologies; therefore, an electrocardiogram (ECG) is necessary in all cases of thoracic trauma [1-3].

Case report: Thirty-eight-year old female, with no significant past medical history, presented to a freestanding emergency department with complaints of severe chest pain and right shoulder pain after a blunt trauma water sport accident. Upon selective angiography of left and right coronary artery and left heart catheterization, the patient was found to have an occluded distal left anterior descending artery (LAD). The patient underwent aspiration thrombectomy of the proximal LAD artery and percutaneous transluminal coronary angioplasty (PTCA) of distal LAD artery, which decreased the stenosis from 100% to less than 10%. The patient was discharged home on hospital day three with follow up in one month.

Coronary artery dissection should be considered in blunt thoracic trauma particularly in cases of unexplained chest pain, regardless of the mechanism of injury, age of patient or comorbidities. Patients should be evaluated with an ECG, troponin, and possibly an echocardiogram to rule out this type of injury.

Introduction

Coronary artery dissection is an extremely rare but lethal complication of blunt chest trauma, with an incidence rate reportedly of 0.1% [4]. Despite its low incidence, early recognition is crucial to patient outcomes and should be considered by the physician. Dissection may cause thrombus formation or vasospasm, leading to the clinical presentation of acute myocardial infarction. Diagnosis can be difficult as traumatic chest pain has several etiologies; therefore, an electrocardiogram (ECG) is necessary in all cases of thoracic trauma [1–3]. The left anterior descending artery (LAD) is the most common vessel affected, followed by the right coronary artery (RCA) [5]. Patients may have a delayed presentation, or be asymptomatic, as mild coronary artery injury can occur. Coronary artery dissections have been reported in low energy mechanisms and in patients as young as age 14; thus, mechanism and age should not be used to rule out the possibility of this complication [4,6]. We present a case of a 38-year-old female presenting with an LAD dissection

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after blunt chest trauma.

Case report

A 38-year old female, with no significant past medical history, presented to a freestanding emergency department with complaints of severe chest pain and right shoulder pain. The patient was on an inner tube being pulled by a boat when the patient was tossed into the air and landed forcefully, hitting the face and chest on the water. The patient denied any initial loss of consciousness or gross chest pain. One hour later the patient developed abrupt onset severe right arm and neck pain that radiated to the back. The patient subsequently felt nauseated and then vomited.

Upon evaluation in the emergency department, basic laboratory results were obtained, only notable for a leukocytosis of 15.9 K/uL and a troponin of 0.079 ng/mL. Chest x-ray and right shoulder and humerus x-rays were normal. CT of head and cervical spine revealed no injuries. Initial ECG obtained at the time of arrival was a rate of 72 with ST elevation lateral leads with reciprocal changes. Repeat ECG was obtained 5 min later, showing a rate of 84, with anterolateral acute infarct, and a ST elevation myocardial infarction (STEMI) alert was activated (Fig. 1). Transport was called but additional imaging was obtained during the wait. CT with contrast of chest, abdomen and pelvis was obtained that showed no evidence for aortic dissection or solid organ injury. At that time, the patient was transferred to a level two trauma center for higher level of care for trauma evaluation, cardiothoracic surgery evaluation, and interventional cardiology.

Upon arrival to the trauma center, a CTA chest with cardiac gated windows and CTA head and neck revealed no vascular injury or aortic dissection. A bedside transesophageal echocardiogram was obtained and showed anterior wall hypokinesis but no aortic dissection, as requested by cardiothoracic surgery. The decision was made to proceed with selective coronary angiography to rule out coronary artery disease, coronary occlusion, or coronary artery dissection. Upon selective angiography of left and right coronary artery and left heart catheterization, the patient was found to have an occluded distal LAD, likely due to thrombus embolization in setting of blunt chest trauma (Fig. 2). The patient underwent aspiration thrombectomy of the proximal LAD using an aspiration catheter, as well as percutaneous transluminal coronary angioplasty (PTCA) of distal LAD using 2 × 15 mm balloon, with decrease of stenosis from 100% to less than 10%. Heparin drip and aspirin were initiated following the procedure.

The patient returned to the ICU for further management. MRI of the cervical spine and right brachial plexus were obtained as the patient continued to have weakness to the right upper extremity after cardiac intervention. MRI showed scalene hematoma and concern for brachial plexus neuropraxia, and the motor function slowly improved throughout the remainder of the stay. The coronary injury was medically managed with dual antiplatelet therapy for 3–6 months and a beta-blocker was initiated. A repeat ECG was obtained showing resolution of the ST changes (Fig. 3). The patient tolerated a diet, participated with therapy for the right upper extremity pain, and was discharged home on hospital day three with follow up in one month.

Discussion

Blunt thoracic trauma has a high morbidity and mortality rate. An analysis of 515 patients by Shorr et al. suggested these were as high as 15.5% and 36% respectively [7]. A literature review in 2006 by Christensen et al. revealed that 82% of the patients presenting with acute myocardial infarction after blunt chest trauma were under the age of 45 [5]. Our patient presented approximately one hour

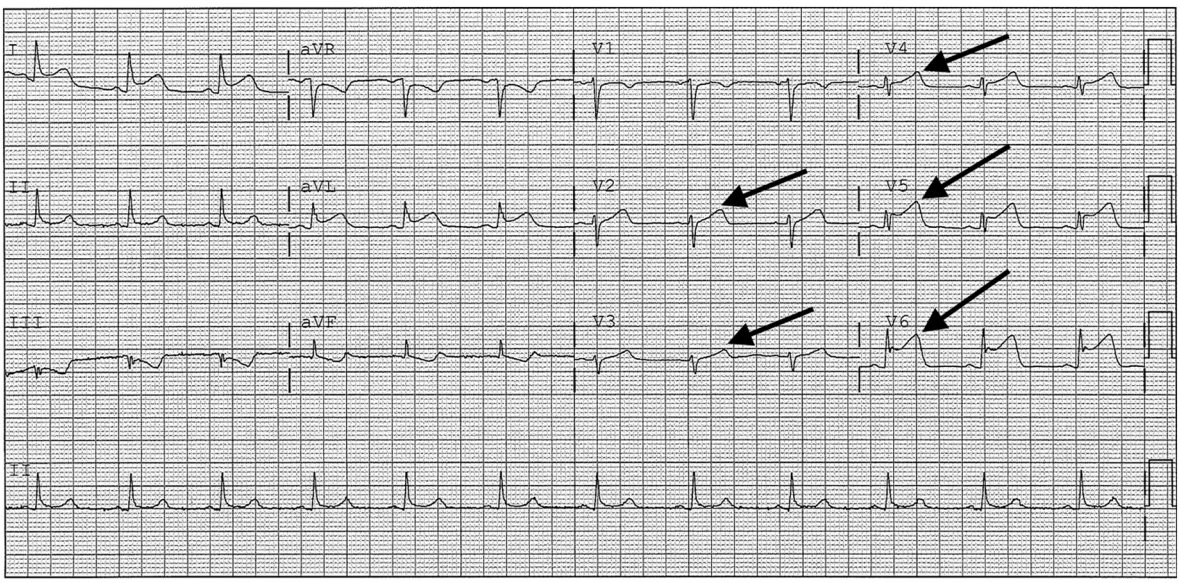

Fig. 1. Initial ECG: ST elevations in anterior leads.

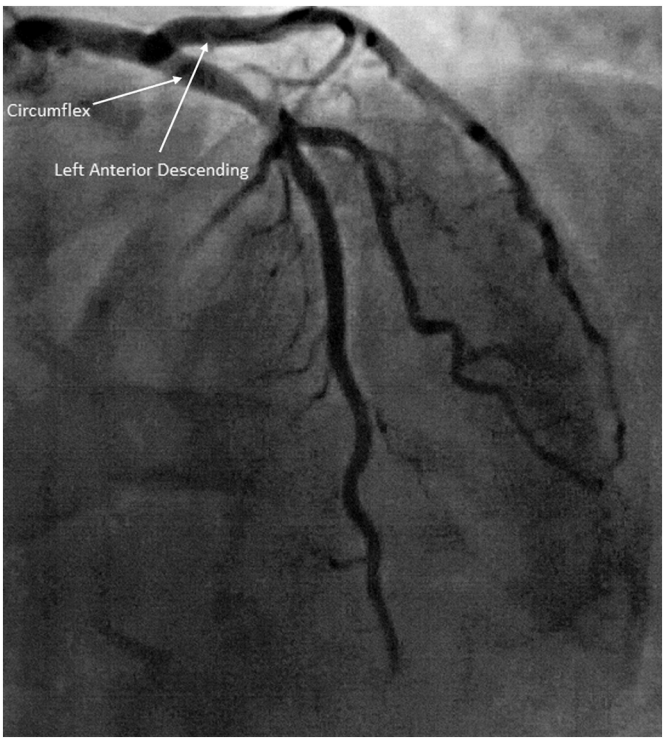

Fig. 2. Coronary catherization.

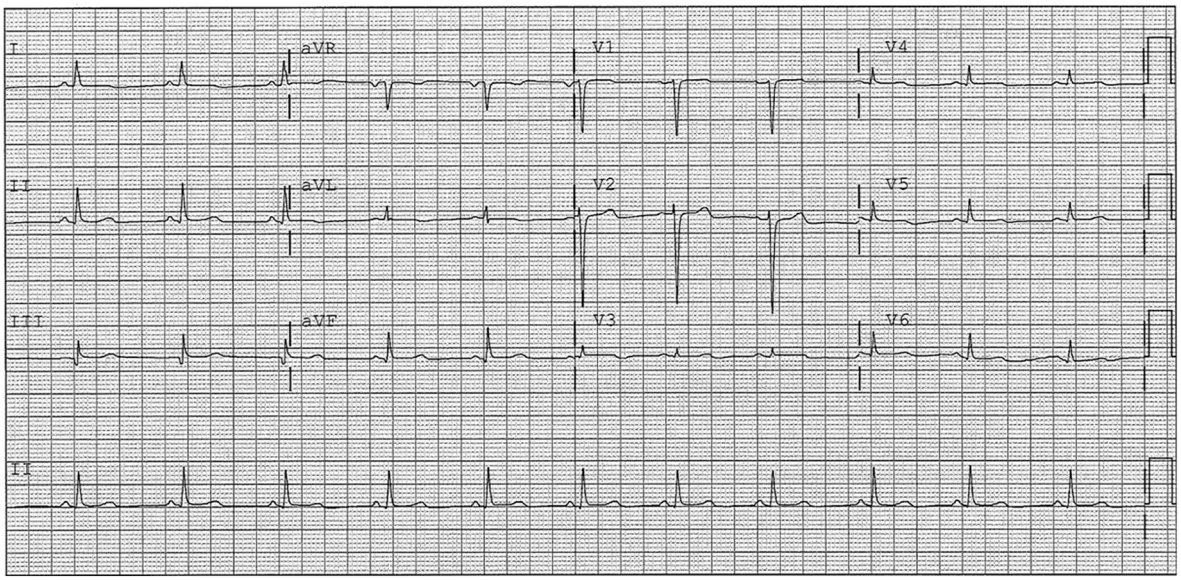

Fig. 3. Repeat EKG status-post coronary catherization: ST elevations have resolved.

after water-sport trauma with acute coronary syndrome (ACS) symptoms. The patient was young and otherwise healthy. Age, lack of comorbidities, and mechanism of trauma should not deter the physician or practitioner from obtaining an early ECG. Cardiac chest pain is often complicated to diagnose in trauma due to distracting injuries and chest wall tenderness. Current Eastern Association for the Surgery of Trauma (EAST) guidelines propose an ECG as well as cardiac markers should be performed on any patient in which one suspects blunt cardiac injury [8]. These guidelines suggest obtaining an ECG in blunt chest trauma is practitioner dependent. This carries the risk of failing to obtain an ECG when practitioner suspicion for cardiac injury is low, particularly in low-energy mechanisms. Reports exist in which patients experiencing chest pain up to twelve hours post-trauma and delayed coronary artery stenosis up to one

year after initial chest trauma [9,10]. It is also believed that the incidence of coronary artery damage in blunt trauma is under reported due to both delayed patient presentations and patients dying on scene in severe trauma [11].

There are currently no guidelines suggesting screening every patient with an ECG regardless of mechanism of chest trauma. Coronary artery dissection can occur in any patient demographic and with any mechanism of blunt thoracic trauma. The typical patient, like the one presented here, will present with substernal chest pressure and ECG changes typical of ACS [2,3,7]. However, the presentation can also be completely asymptomatic making this deadly condition difficult to diagnose [11]. A normal ECG is reassuring and provides a comparison if the patient were to be reevaluated for chest pain. T-wave abnormalities such as hyperacute T-waves as well as ST-segment elevation can suggest coronary artery compromise. In the trauma setting, the next step is often echocardiogram to evaluate structural and nonstructural damage to the heart [8]. Echocardiography can reveal hypokinesis as in our patient, or akinesis which guides management. Diagnosis is made through percutaneous coronary intervention (PCI) which allows visualization of the dissection [10,12,13]. Treatment of coronary artery dissection is patient dependent. Factors such as co-morbidities, hemodynamic stability, and co-injury should influence decision making [14]. The mainstay of treatment for left anterior descending and right coronary artery disease is PCI with stent placement. Anticoagulation must be used with caution in trauma patients due to other injury and the potential for bleeding. If the left main coronary artery is involved, surgical approach via coronary bypass is recommended [12].

Although coronary artery dissection is rare, it should be considered on the differential for blunt thoracic trauma, particularly in the context of unexplained chest pain and when the ECG or troponin levels show ischemia. Further research is warranted on this topic of blunt trauma induced coronary artery dissection to better detect and treat these patients, including long-term outcomes.

Declaration of competing interest

No conflicts of interest to disclose by any of the authors, either financial or personal.

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