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SM Emergency Medicine and Critical Care

Case Report

Pick up the Probe and Drop the Stethoscope: Emergency Focused Bedside Ultrasound in Aortic Dissection

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Article Information

Received date: Sep 17, 2017
Accepted date: Sep 28, 2017
Published date: Oct 05, 2017

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Keywords Aortic dissection; Bedside ultrasound

Abstract

Aortic dissection haunts every emergency physician as it is a life-threatening and time critical condition where patients may not present with the typical stabbing chest pain that radiates to the back. Discussed here are three cases of aortic dissection that manifested in three different presenting symptoms and how focused bedside ultrasound played a pivotal role in the management.

Introduction

Aortic dissection is a life threatening condition that every emergency physician would not want to miss for any patient who presents with an acute chest pain to the Emergency Department (ED). Asouhidou and Asteri [1] reported that up to 30% of patients with acute aortic dissection were initially given a different diagnosis [1]. Although an acute onset of central tearing chest pain that radiates to the back is the classical description, it is not always seen in all patients with aortic dissection. Presented here are three cases of aortic dissection with three different presentations of the condition, and how focused bedside ultrasound as a quick screening tool in the emergency department help in the management. This information will help practicing physicians to understand the importance of focused bedside ultrasound assessment and how its liberal use in the acute setting helps in the management of the patients.

Case One

An 86-year-old Chinese lady presented to the ED two hours after the onset of constant central chest pain that radiated to the back. This was associated with diaphoresis and nausea. Clinically she was initially hypotensive at 67/48 mmHg, but the blood pressure responded with fluid resuscitation to 108/68 mmHg. Cardiovascular examination revealed normal heart sounds with no murmur, no radial-radial pulse or radial-femoral pulse delay. ECG showed a sinus rhythm with T wave inversions in leads V_2 to V_5. Her chest x-ray showed a widened mediastinum with a left-sided pleural effusion (Figure 1). Bedside focused ultrasound assessment was performed via the RUSH protocol for evaluation of her hypotension. Upon the fourth view in the extended-FAST evaluation for free fluid, the subxiphoid view revealed pericardial effusion with fibrinous clot, large aortic root dissection with moderate aortic regurgitation.

She underwent an emergent CT aortogram which confirmed a Stanford type A aortic dissection with haemopericardium, with the dissection originated distal to the aortic root and extended to the aortic arch.

Case Two

A 71-year-old Caucasian gentleman was brought to the ED by the ambulance as a standby case for hypotension. He was witnessed to have dropped onto the ground with jerking movements while shopping. He was a known hypertensive. On arrival at the ED, his blood pressure was 79/53 mmHg. His heart sounds were normal on auscultation. Bedside ultrasound was performed via the RUSH protocol to evaluate for the possible cause of the hypotension. Upon the fifth view for evaluation of the abdominal aorta (i.e. after the initial four views to evaluate for intra-abdominal fluid and pericardial effusion), a dilated proximal abdominal aorta at 3.71 cm diameter was seen, with a suspected flap seen within the lumen (Figure 2). This led to an emergent CT aortogram that showed a Stanford type A aortic dissection that involved the aortic root, aortic arch, innominate artery and left subclavian artery.

Case Three

A 26-year-old Indian gentleman was referred by the General Practitioner (GP) to the ED for an acute behavioral change. He was previously well with no known medical condition. He presented

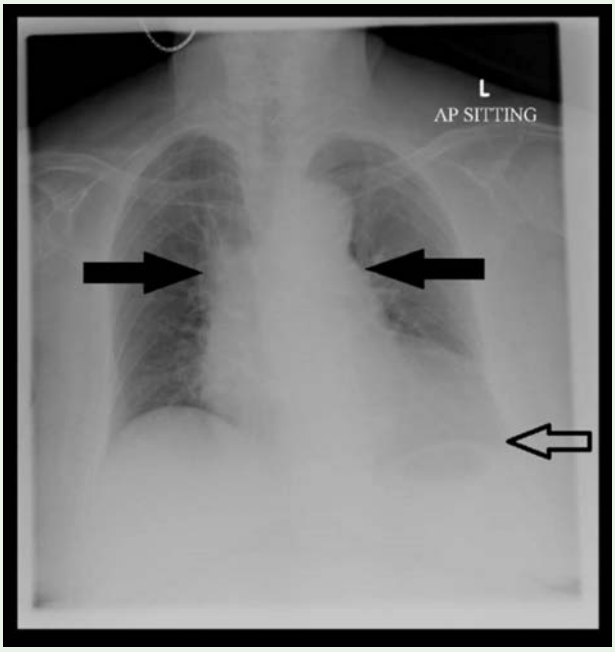

Figure 1: Chest x-ray showed a widened mediastinum (as indicated by the black arrows) with a left-sided pleural effusion (as indicated by the black-outline arrow).

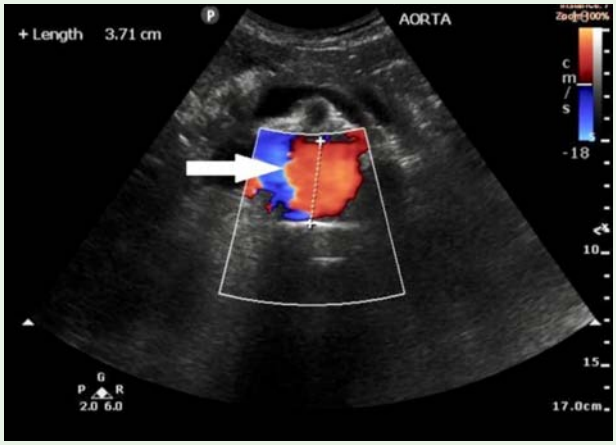

Figure 2: Ultrasound of the proximal abdominal aorta showing a dilated proximal abdominal aorta at 3.71 cm diameter, with a suspected flap (as indicated by the white arrow) seen within the lumen.

with two days of fever and sore-throat, of which he consulted his GP but was unable to recall his visit to the clinic subsequently. He was afebrile and his haemodynamics were stable. Physical examination revealed an oriented patient, with no neurological deficits or signs of meningism elicited. He had no clinical features to suggest Marfan syndrome or any underlying connective disorders. Cardiovascular examination did not reveal any heart murmur.

A 12-lead Electrocardiogram (ECG) showed tall R waves in the precordial leads with anterolateral ST-segment depression and T wave inversion in V_5 and V_6 (Figure 3). Laboratory investigation revealed an elevated troponin T level at 0.17 µg/L (normal: <0.01 µg/L) and NT-proBNP at 1769 pg/ml. Bedside 2D-echocardiography was performed in view of the abnormal ECG findings and showed aortic dissection with free aortic regurgitation, a hypertrophied left ventricle and a small pericardial effusion. A CT aortogram showed a Stanford Type A aortic dissection involving the aortic root, ascending and arch of the aorta.

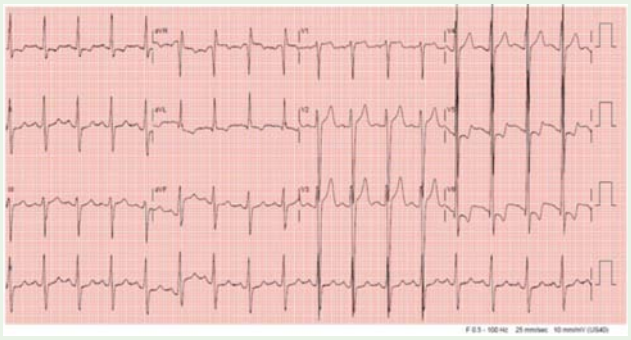

Figure 3: 12-lead ECG showing tall R waves in the precordial leads with anterolateral ST-segment depressions and T wave inversions in V_5 and V_6.

Discussion

Aortic dissection is a rare condition with reported incidence of 5 to 30 cases in every 1 million population [2]. However the immediate mortality rate is high and this makes early diagnosis and treatment critical for survival. If the condition is not diagnosed and treated promptly, 40 – 50% of patients with proximal aorta dissection will die within 48 hours [3]. Though a high index of suspicion is always advised for patients who present with an acute constant central chest pain, aortic dissection usually presents in a myriad of clinical presentations. A typical case would be a hypertensive male patient in his 60s who presents with an abrupt onset of chest pain [4]. However the above three cases clearly illustrate the varied presentation for aortic dissection, of which only one case presented in the typical presentation; the other two cases presented with seizure-like syncope, and acute behavioural change with ECG abnormalities. Presence of a diastolic murmur which is indicative of an aortic regurgitation would suggest an acute aortic dissection but this is seen only in 40 – 50% of patients with proximal dissection [5]. None of the three cases discussed had a heart murmur on presentation.

The European Society of Cardiology mentioned in their task force report on aortic dissection in 2001 that CT is the modality used frequently in patients with suspected aortic dissection and has high sensitivity and specificity, at higher than 90% and 85% respectively [6]. However for patients with non-typical presentation, clinical suspicion for aortic dissection would be not be high and it would not be practical nor ethical to subject such patients to CT imaging in view of the concern with unnecessary radiation as well as hefty healthcare cost. Pape et al. [7], in their study on long-term trends in acute aortic dissection, observed a significant increase in the usage of CT chest as the first choice imaging modality for the diagnosis of acute aortic dissection [7]. The disadvantages of a direct CT scan for suspected aortic dissection are many, and these include high cost, high dose of radiation exposure and its associated risks, possible misinterpretation leading to costly management [8], and contrast allergic reactions [9]. Even among those cases of suspected aortic dissection with

subsequent CT imaging; Robert et al. [10] reported a low positivity rate of 18.0% for acute aortic aortic dissection or other acute aortic disorder [10]. Hence in the absence of the typical symptoms, a focused bedside ultrasound evaluation is very useful especially for the evaluation of unexplained hypotension using the RUSH protocol [11] or for cases with abnormal ECGs.

Focused bedside ultrasound has its advantages of being easily available in the emergency department, low cost, high repeatability depending on the patient's clinical course (e.g. a sudden drop in blood pressure, worsening chest pain, or new ECG changes), and more importantly it poses no risk of radiation exposure. It can decrease medical errors, provide more efficient real-time diagnosis, and supplement or replace more advanced imaging in appropriate situations [12]. Ultrasound skill acquisition has also been shown to be easy and can be achieved in a relatively short training period [13,14]. Aortic flap was detected on bedside ultrasound for all the three cases and pericardial effusion was detected in two. These led to emergent CT aortogram to confirm the diagnosis.

The sensitivity and specificity of bedside ultrasound performed via the trans-thoracic approach for detection of aortic dissection vary, as these will depend on the anatomic location of the dissection; the sensitivity and specificity were reported to range from 35 – 80% and 39 – 96% respectively [15]. Braverman (2010) concluded that trans-thoracic echocardiogram is not the first modality of choice for diagnosing dissection [16]. However with all the advantages of focused bedside ultrasound as discussed earlier, it is definitely a good screening tool for aortic dissection or other aortic conditions especially for cases with non-typical presentations, before subjecting the patients directly to CT scan. Focused bedside ultrasound assessment provides real-time imaging and studies can be performed and re-directed to include other structures and areas as deem necessary clinically; CT imaging would not have such an advantage as more studies would mean a higher radiation exposure and higher cost incurred.

Limitations

Although all three cases had the diagnosis of aortic dissection made on the initial focused bedside ultrasound assessment, all the studies were performed by emergency physicians who were credentialed and had strong interest in point-of-care bedside ultrasonography. As this is an observational case-series study, it would thus be hard to conclude whether an averagely-skilled emergency physician with no special interest in bedside ultrasound would be able to pick up the aortic dissection if they were in the same three situations. Hence further prospective study will be necessary to evaluate the sensitivity and specificity of focused bedside ultrasound in the diagnosis of aortic dissection in the emergency department.

Conclusion

Prompt and targeted use of focused bedside ultrasound in the ED plays an important role in the management of aortic dissection where patients may present in a myriad of clinical presentations, from the typical central ripping chest pain, to less typical symptoms such as syncope, hypotension or ECG abnormalities. It is good as an initial screening tool for possible acute aortic condition before subjecting the patients to CT imaging.

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