Case Report

False Positive Imaging in Presumed Aortic Dissection Resulting in Unnecessary Morbidity

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Abstract

As a medical emergency, acute aortic syndrome, comprised of aortic dissection with false lumen, intramural hematoma, and aortic ulcers, is responsible for high rates of morbidity and mortality. Diagnosing these entities is typically performed with computed tomography (CT) angiography or transesophageal echocardiogram (TEE). Though we commonly rely on these imaging modalities to guide our decision making process, we must keep in mind the possibility of false positive interpretations. We describe a case of a hemodynamically unstable 42-year-old female with a clinical presentation of acute aortic syndrome (AAS). Diagnosis was seemingly confirmed with CT-scan and verified with TEE as an intramural hematoma with large false lumen and an intimal flap. During open surgical exploration of her aorta, there was no aortic dissection, hematoma, or aneurysm present. Newer techniques, such as electrocardiogram (ECG) synchronized CT scanning, may lead to decreased false positive interpretations.

ABBREVIATIONS

AAS: Acute Aortic Syndrome; TEE: Tran Esophageal Echocardiogram; CT: Computed Tomography; MRI: Magnetic Resonance Imaging; CVTS: Cardiovascular Thoracic Surgery; ECG: Electrocardiogram; ICD: Implantable Cardioverter Defibrillator; IV: Intravenous; ED: Emergency Department

INTRODUCTION

Though relatively uncommon, acute aortic syndrome is a medical emergency responsible for high rates of morbidity and mortality. Typical presenting signs and symptoms include severe chest pain with acute hemodynamic compromise. Diagnosis is based upon non-invasive imaging modalities: computed tomography (CT) or transesophageal echocardiogram (TEE). Magnetic resonance imaging (MRI) is seldom used in the emergency situation [1]. Characteristic CT findings of these syndromes are intimal flap with two aortic chambers, intramural hematoma, or a pouch-like protrusion seen with aortic ulcers. False interpretation of these imaging modalities may lead to unnecessary surgical exploration. Implementing a technique such as electrocardiogram (ECG) synchronized CT scanning may lead to decreased false positive interpretation.

CASE PRESENTATION

A 42-year-old African American female with a past medical history of hypertension, end-stage renal disease (ESRD) on peritoneal dialysis, and non-ischemic cardiomyopathy with an implantable cardioverter defibrillator (ICD) presented to the emergency department (ED) complaining of substernal chest pain. The chest pain was located on the left side and described as "someone...sitting on my chest". Upon evaluation, patient was also found to have acute encephalopathy and weakness upon ambulating. Presenting ECG demonstrating sinus rhythm, first degree AV block, left anterior fascicular block, abnormal T-waves in the lateral leads, all features seen on prior ECGs (Figure 1). A CT chest, abdomen, and pelvis with intravenous (IV) contrast were performed for concern of aortic dissection. Prior to the availability of the radiology report the patient became hypotensive and pulse less. Cardiopulmonary resuscitation was initiated and after twenty minutes the return of spontaneous circulation was achieved, although, patient remains hypotensive. The comprehensive metabolic panel returned at this time demonstrating a potassium level of 7.5 mEq/L, and subsequently 8.8 mEq/L on the i-STAT handheld blood analyzer. She was started on multiple vasoconstrictors and her hyperkalemia was treated. The CT report returned which described an indeterminate dense fluid attenuation adjacent to the ascending thoracic aorta, suspicious for intramural hematoma, a dissection variant, with no visualized dissection flap and no extravasations of contrast (Figure 2), as read by radiologist with 11+ years of experience.
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post-residency experience). Further imaging was recommended. Cardiovascular thoracic surgery (CVTS) was consulted and reviewed the images, which they described as a type A aortic dissection. CVTS determined that given the extent of the patient’s comorbidities and poor prognosis surgical intervention would likely be futile, and recommendations were made for medical management. She was subsequently transferred to the intensive care unit for further management. The patient’s clinical status improved and she was weaned off of vasoconstrictor support. Three days after resuscitation in the ED patient self-extubated. In light of her improving clinical status, CVTS recommended TEE to further evaluate the dissection seen on CT. On hospital day seven, TEE was performed. A dissection was noted which appeared to originate at the sinus of valsalva, with a large false lumen (Figure 3), as interpreted by cardiologists with 24+ cumulative years of post-fellowship experience). Also noted was periaortic echo free space with color flow suggesting the extension of the dissection to the valve level. At this time, CVTS planned for surgical exploration and intervention of the aortic dissection seen on imaging. Prior to surgery, the patient underwent coronary angiography, which demonstrated normal coronary arteries. The patient subsequently underwent exploration of the ascending aorta with femoral perfusion bypass. However, per CVTS there was no aortic dissection, hematoma, or aneurysm present on surgical exploration (Figure 4,5). The patient had become significantly deconditioned and was transferred to inpatient rehabilitation. The patient had recurring chest pain secondary to sternotomy, however, performed well in rehab and was able to successfully transition home.

**DISCUSSION**

Acute aortic syndrome includes aortic dissection with false lumen, intramural hematoma (IMH), and aortic ulcers [2]. This case demonstrated two of these variants; IMH seen on CT scan, and aortic dissection with false lumen seen on TEE. The potential downfalls of these imaging modalities (CT scan and TEE) are quite apparent in this patient’s case which resulted in unnecessary surgical intervention. CT scanning remains the first line imaging modality used in most emergency departments, as it is readily available and can be performed quickly. The sensitivity of CT exceeds 95% with specificity ranging from 87-100% [2]. The use of contrast administration with CT scan may exclude patients with renal dysfunction. Magnetic resonance imaging (MRI) has a higher sensitivity and specificity of 95-100%, though is limited in emergency situations secondary to scheduling and time required to complete the exam [1]. TEE has a sensitivity of 99% with a specificity of 89% [3]. When evaluating a patient with a TEE, the downsides include the need for esophageal intubation and sedation. In the right setting, a TEE can be performed quickly and interpreted in less than ten minutes if the appropriate personnel are readily available [2]. Known reasons for false positive findings on imaging studies include anatomic structures, such as the left innominate vein, left pulmonary vein, and superior pericardial recess [1,3]. The left innominate vein may present more inferior than normal resembling an intimal flap [3]. The left pulmonary vein may push against the descending aorta causing the appearance of a false lumen [1,3]. The superior pericardial recess, which is a continuation of the pericardium over the ascending aorta, may mimic a dissection or IMH [1,3]. Streak artifact and motion artifact may also cause false positive findings due to high contrast interference depending on where the contrast is present in the vasculature during image acquisition [3]. Lastly, motion artifact of the aorta can blur images making them difficult to interpret, especially during cardiac systole [3]. In our case, the superior pericardial recess and motion artifact may have been the cause of false interpretation (Figure 2).

Electrocardiogram-gated CT scanning is an imaging modality which synchronizes radiographic image acquisition to the diastolic phase of the cardiac cycle [4]. This reduces transmitted cardiac pulsations (which can frequently degrade thoracic CT studies) [5] leading to improved visualization of the ascending aorta, aortic arch, and proximal descending aorta. This way of synchronization during thoracic CT scan is recommended [1,4] and has also been described for evaluating patients for pulmonary emboli [5-8]. Utilization of ECG-gated thoracic CT imaging in our patient may have provided more accurate information, reducing
unnecessary sternotomy, and decreasing morbidity. Recognition of the potential downfalls of radiographic imaging techniques, and careful evaluation of images, may be the key to preventing the increase in morbidity and mortality in these patients.

For this case, as an acute aortic syndrome was definitively ruled out after direct visualization of the aorta, the most likely cause of her cardiopulmonary arrest was hyperkalemia induced arrhythmia secondary to her ESRD.

REFERENCES


Cite this article