When does a D-dimer test help make the diagnosis of aortic dissection?

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Abstract: We present a case of an 84-year-old woman who presented with vague abdominal discomfort and syncope secondary to a type A acute aortic dissection. In pursuit of the diagnosis, multiple tests were ordered after the history and physical exam were complete. When the D-dimer levels were reported to be high, a bedside transthoracic ultrasound was performed which showed dilated aortic root and pericardial tamponade, leading us to order a computerized tomography to confirm the diagnosis of acute aortic dissection. A diagnostic testing algorithm being used in our institution using D-dimer, ultrasound, and other tests are provided in patients presenting with possible acute aortic dissection. In this case, bedside ultrasound helped us to rapidly make the diagnosis of acute aortic dissection and arrange for further inpatient care.

Keywords: aortic dissection, D-dimer, bedside ultrasonography, emergency department

Introduction

D-dimer tests are ordered from the emergency department to answer diagnostic questions in a variety of clinical scenarios. D-dimer tests have been increasingly used, even in patients with a low pre-test probability of disease [1]. The number of elderly patients suspected acute aortic dissection (AAD) has increased in the recent years [1]. Ultrasonography for clinical decision-making and guidance during procedures is being increasingly used at the bedside in emergency departments (EDs) [2]. For elderly patients with possible AAD, we formulated (after the patient in the present case report) an algorithm using clinical gestalt, bedside ultrasound and D-dimer levels to help our clinicians guide their further diagnostic testing and treatment of these patients (Fig. 1).

Case report

An 84-year-old woman presented with vague epigastric discomfort associated with 12 hours of generalized weakness and dizziness. She reported no alleviating or aggravating factors regarding her epigastric discomfort, and she denied fever, referral of the pain, nausea, vomiting, constipation, diarrhea, focal neurologic symptoms, change in speech or vision, melena, hematochezia, or headache. She also reported no chest pain, palpitations, cough, dyspnea. She had a history of hypertension.

On admission to the ED, the patient appeared slightly anxious. Her body mass index was 20 kg/m², heart rate was 82/min, respiratory rate was 14/min, axillary temperature was 36.8 °C, and her initial blood pressures were 87/56 and 82/60 mmHg at the right and left upper extremities, respectively. She had no jugular venous distention. Orthostatic changes were not present and SaO₂ was 92% on room air. Heart sounds were distant with a regular rhythm, there were no murmurs or any additional heart sounds. Her abdomen was soft, mildly tender in the epigastric region, and without guarding or rebound on examination. The rest of physical examination was normal, including peripheral pulses. Her ECG showed a normal sinus rhythm, with normal voltage and without dysrhythmia or ischemic signs. The ECG calibration settings were 25 mm/sec and 10 mm/mv.

An upright PA chest radiograph showed borderline widening of the mediastinum. A bedside transthoracic ultrasound was performed by the emergency medicine specialist, using Mindray M7 ultrasound device equipped with a phased array probe (Mindray Bio-
medical Co., Shenzen, China), which revealed a circumferential pericardial effusion: 2.2 cm anteriorly and 1.8 cm posteriorly. The aortic root was 4.7 cm in diameter on parasternal long axis examination (Fig. 2). She had a hemoglobin level of 12.3 g/dl, normal electrolytes and creatinine, GFR was 43 ml/min, and a serum D-dimer of 2221 ng/ml.

The findings at transthoracic ultrasonography along with the increased D-dimer in this patient with vague epigastric discomfort led us to pursue AAD as a possible diagnosis. Computerized tomography (CT) of the chest and abdomen with contrast was performed, which revealed DeBakey type 1 dissection commencing from the aortic valve and extending to the superior mesenteric artery, along with a moderate pericardial effusion. The diagnostic work-up took 65 minutes from door to final diagnosis with contrast-enhanced CT. Cardiovascular surgery consultation was obtained and the patient was admitted to the intensive care unit for medical therapy. The patient died ten hours after admission.

Discussion

The peak incidence of aortic dissection occurs in the sixth and seventh decades [3]. Classically, acute aortic dissection presents with a sudden onset of severe chest, back, or abdominal pain characterized as ripping or tearing in nature. This pattern of pain is the presenting symptom in over 90% of cases, with fewer than 10% presenting only with atypical symptoms [4]. Historically, aortic dissection without pain was thought to be rare, but more recent information suggests that the classic findings are often absent [5]. In the study by von Kodolitsch et al. [6], the following clinical variables are most often associated with thoracic AAD; mediastinal widening, aortic widening, or both on chest radiography; pulse differentials, blood pressure differentials, or both; aortic pain of acute onset, a tearing or ripping character, or both. The incidence of dissection was low (7%) in the absence of all three variables, intermediate with isolated findings of aortic pain or mediastinal widening (31% and 39%, respectively), and high with isolated pulse or blood pressure differentials or any combination of the three variables (83%). The authors concluded that assessment of three clinical variables permitted identification of 96% of cases of thoracic AAD and rapid
stratification of a patient into a low, intermediate, or high risk group [6]. According to this system of stratification, having only mediastinal widening as a finding, our patient was in the intermediate risk group for AAD. In one recent series of 977 patients, 6.4% had painless AAD patients [7]. The classic tearing chest/back pain of AAD was not reported by our patient. Emergency physicians should remember that an acute aortic dissection may present without pain.

To accurately diagnose AAD, physicians typically order a thoracic and abdominal CT with contrast. Serum creatinine may underestimate true kidney function. The GFR/creatinine clearance is a more accurate measure of kidney function [8]. Clinicians need to consider alternative diagnostic studies to confirm a diagnosis of AAD in patients with impaired renal function and in those with other risk factors for contrast-induced nephropathy.

Clinical examination is insufficient to exclude AAD and no biomarker is available for routine clinical use [4]. Routine measurement of D-dimer in suspected AAD patients has been recommended as part of the pre-operative work-up by the Task Force of the European Society of Cardiology [9]. Current guidelines recommend performing invasive (and often not available) tests such as transesophageal echocardiography, computerized tomography, or even angiography in cases of suspected aortic dissection [9].

Aortic dissection is suggested on bedside ultrasound by findings of an aortic root diameter >4 cm and the presence of pericardial effusion [10].

D-dimer measurement to exclude AAD represents an advance in the diagnostic workup of patients with suspected AAD. Two meta-analyses and a prospective cohort study report D-dimer to be a highly sensitive biomarker and exclusion of AAD based on low D-dimer levels is reported to be 100% sensitive [1]. However, diagnostic cut-off values used to rule-out AAD to be quite heterogeneous [2]. Other causes of D-dimer elevation are arterial or venous thromboembolic disease, pulmonary embolism, nephrotic syndrome, intracardiac thrombus, liver disease, preeclampsia, eclampsia, inflammation, malignancy, trauma, pregnancy, vasocclusive episode of sickle cell disease and recent surgery.

Conclusions

As illustrated in this case, an organized approach to patients with clinically suspected AAD is useful in making rapid diagnosis. By using an algorithm such as the one described in this manuscript, the definitive diagnosis of AAD, especially in low- and moderate-risk elderly patients may be achieved in a shorter time frame. The algorithm presented in this paper needs to be proven by a larger prospective randomized trial.

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Conflict of interest: None.

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