

The usefulness of point-of-care ultrasound in the atypical presentation of aortic dissection: a case series and brief review of literature

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ABSTRACT

Acute aortic dissection represents a surgical emergency that, in most cases, may present an atypical and non-specific clinic, making the diagnosis difficult and late. Computed tomography angiography represents the gold standard for diagnosis, but different ultrasound techniques can provide valuable additional information related to diagnosis and optimize therapy and prognostic assessment. In this case series, we describe different atypical patterns of aortic dissection associated with non-diagnostic D-Dimer levels. These atypical conditions escape recognized diagnostic algorithms for diagnosing aortic dissection, although the incidence of such events is far from negligible. A clinical approach in the emergency setting that provides for systematic and standardized use of bedside ultrasound could help reduce the incidence of errors and diagnostic delay, addressing the gold standard instrumental diagnostics for the reference pathology.

Introduction

Acute aortic dissection represents a surgical emergency that can be easily suspected and quickly diagnosed in the case of a typical presentation.¹ In particular, lacerating and acute chest pain, anteriorly, migrating, with posterior irradiation, associated with asymmetry of the peripheral arterial wrists, represent rather suggestive findings. However, in most cases, the presentation of this severe condition is very subtle, and the symptoms are rather unspecific so as to make the diagnosis difficult and sometimes late.^{2,3} In confirmation of this, a high incidence of missed or incorrect diagnoses has been reported in the literature, which hangs over the correct and timely management of acute aortic syndromes.^{4,5} Current imaging techniques, of which computed tomography angiography (CTA) represents the gold standard, can recognize or exclude

alterations of the aortic wall with great efficacy; however, the patient needs an adequate selection.⁶

In the ADvISED Prospective Multicenter Study, a multicenter prospective observational study involving 6 hospitals in 4 countries from 2014 to 2016, the Authors assessed the diagnostic accuracy obtained by adding the D-Dimer dosage to the aortic dissection detection (ADD) risk score (ADD -RS), suggesting a low failure rate for both the ADD-RS = 0 / DD – and ADD-RS ≤1 / DD – strategies.^{7,8}

Different ultrasound techniques, with particular reference to transthoracic echocardiography and vascular ultrasound, and transesophageal echocardiography, intravascular ultrasound, and contrast-enhanced ultrasonography can provide valuable additional information related to diagnosis and optimize therapy and prognostic evaluation.⁹ In the emergency department setting, the bedside ultrasound assessment can provide a rapid clinical and diagnostic framework, particularly in the critically ill patient.

Aim

In this case series, we describe different atypical patterns of aortic dissection associated with non-diagnostic D-Dimer levels and the role of bedside thoracic/abdominal ultrasound in suggesting this suspicion and addressing the diagnosis (Table 1).

Case Reports

The first patient, A, was an 81-year-old man who entered the emergency room for the onset of palpitations for about 4 days. Apparently they were not associated with angina or dyspnea and did not show any hemodynamic deterioration at the presentation.

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Regarding his clinical history, the patient reported essential hypertension in adequate pharmacological control with lacidipine. No other significant morbid conditions were found. Upon examination in the emergency room, the patient was alert and cooperative. We found a sinus tachycardia with an average rate of 130 bpm on the electrocardiogram and no signs of myocardial ischemia. Arterial pressure and arterial saturation in ambient air were within normal values. Hematic tests showed only a slight increase in highly sensitive troponin and values at the upper limits of the norm for pro-BNP; blood gas analysis showed a normocapnic respiratory failure, requiring low flow oxygen therapy, and a mild hyperlactacidemia.

Chest radiography showed a mild bilateral pleural effusion with increased representation of the interstitium. Despite the administration of oxygen therapy and intravenous diuretic therapy, the heart rate remained high, and hyperlactacidemia did not decrease. We performed a bedside thoracic ultrasound evaluation with finding some B lines at the bases, bilaterally, a slight pleural effusion, and, above all, a not hemodynamically significant pericardial effusion, without kinetic disturbances of cardiac walls. We extended evaluation to the abdominal aorta, discovering a diffuse atherosclerotic involvement and non-specific hemodynamic alterations on pulse wave velocity assessment. After the specialist cardiological evaluation, for the suspicion of an ascending aorta alteration, including the valve, the patient was subjected to CT angiography of the thoracic aorta. The instrumental examination showed a type A dissection involving the

aortic valve, with an indication for cardiac surgery correction. No involvement of carotid and subclavian arteries was found. D-Dimer values were slightly altered on blood tests, but not significantly if corrected for the patient's age.

The second patient, B, was a young 40-years-old man, with no significant pathologies in history who entered the DEA for pain in the right hypochondrium, suspected of biliary colic and persistence of high blood pressure, resistant to therapy with calcium antagonists. We found an isolated elevation of creatine phosphokinase at the blood tests, with a slight D-Dimer level elevation. There was no hyperlactacidemia or troponin alteration. Electrocardiogram was normal, with heart rate at the upper limits. At the bedside ultrasound evaluation of the abdominal aorta, we found demodulation of the hemodynamic flow, altering the vascular wall. Subsequent CT angiography of the aorta revealed a type B dissection (type III b DeBakey classification) involving the distal aorta and the right external iliac.

The third patient, C, was a young man with sudden isolated left flank pain associated with urinary retention. At the clinical evaluation, we found pain on percussion of the left side; arterial pulses were symmetrical and normal. We found marked neutrophilic leukocytosis in the blood tests, the elevation of the C reactive protein, and creatine phosphokinase; elevated lactacidemia was found on blood gas analysis. The patient underwent bedside ultrasound with suspicion of left renal colic; however, the ultrasound evaluation ruled out a dilation of the renal pelvis,

Table 1. Clinical characteristics and ultrasound findings of patients.

	Patient A	Patient B	Patient C
Age, y.o.	74	40	36
Sex	Male	Male	Male
Initial symptoms	Palpitations	Right hypochondrium pain	Left flank pain
SBP, mmHg	120	160	150
DBP, mmHg	80	100	90
Frequency rate, bpm	130, sinus tachycardia	100, sinus tachycardia	90, sinus tachycardia
D-Dimer, mcg/IF EU	750	470	510
CPK, U/L	260	180	630
Lactate levels	1.7	0.7	2.9
TT US	Pericardial effusion, basal B lines, mild pleural effusion	No relevant findings	No relevant findings
TA US	Atheromatous abdominal aorta, aspecific hemodynamic alterations on pulse wave	Demodulation of the hemodynamic flow, associated with alteration of the vascular wall on the pre-renal aorta	No flow detectable on the left renal artery, asymmetrical flow on iliac arteries
Type of lesion	Stanford A, DeBakey II	Stanford B, DeBakey IIIb	Stanford B, DeBakey IIIa

SBP, systolic blood pressure; DBP, diastolic blood pressure; bpm, beat per minute; TT US, trans-thoracic ultrasound; TA US, trans-abdominal ultrasound.

showing a hyperechogenicity of the renal cortex with almost no arterial flow detectable in the left renal artery. Moreover, the hemodynamic arterial profile was asymmetric at the level of the external iliac arteries, with a reduced systolic peak on the left side, affected by the suspected dissection.

The patient underwent CT angiography with dissection of the abdominal aorta in the pre-renal tract, the complete exclusion of the left renal artery, and ongoing renal infarction.

Discussion

Aortic dissection represents a severe pathology whose treatment and prognosis depend both on the type of vascular lesion, and on the precocity of the diagnosis.¹⁰ In particular, mortality rate secondary to thoracic aortic dissection is high, and above all, time-dependent, increasing from 1% to 1.4% for each hour of treatment delay, and in any case up to 68% in the first 48 hours.^{11,12}

The most frequent clinical presentation consists of chest pain - pulses.^{12,13} However, dissection can occur anywhere in the aorta, making clinical manifestation potentially unpredictable. Indeed, cases of atypical presentation are frequently described and associated with variable outcomes¹⁴ (Table 2). Acute painless aortic dissection has been described in 5% of patients and may occur in approximately 5% of patients; in about 8% of cases, it was reported as painless and associated with syncope. Acute paraplegia has been reported rarely in 4.2% of 1805 patients with aortic dissection.¹⁵⁻¹⁸ Numerous other clinical reports describe a myriad of clinical presentations, potentially making the physician's job in diagnosing the disorder very difficult.¹⁹ The importance of the rapid and certain diagnosis of aortic dissection is even more true, especially when considering the differential diagnosis with acute coronary syndromes, whose therapy is potentially harmful.^{4,20} Literature data support the use of computed tomography for diagnosis in cases showing an indicative or suspicious clinic;¹³ however, cases with

atypical presentation (Table 2²¹⁻³¹) escape the usual diagnostic algorithms, and the suspicion is formulated only after multiple imaging studies are performed, with considerable delay.

For this reason, the clinician in the emergency department must keep the suspicion of possible dissection of the aorta high and must have access to a versatile and quick-to-use diagnostic method that allows a multisystem approach to the patient.²¹ In this regard, the role of point-of-care ultrasound as an ally of the emergency physician is well known.²² In this case report, the three patients, showed palpitations, pain typical of biliary colic, and renal colic, respectively. A systematic approach for managing the thorax²³ and abdomen²⁴ with bedside ultrasound method allowed the diagnosis to be delayed to a minimum.

Conclusions

Dissection of the aorta represents a hidden possibility in the shadow of multiple, apparently non-specific clinical pictures. These conditions escape recognized diagnostic algorithms for diagnosing aortic dissection, although the incidence of such events is far from negligible. A clinical approach in the emergency setting that provides for systematic and standardized use of bedside ultrasound could help reduce the incidence of errors and diagnostic delay, addressing the gold standard instrumental diagnostics for the reference pathology.

References

1. Erbel R, Aboyans V, Boileau C, et al; ESC Committee for Practice Guidelines. 2014 ESC Guidelines on the diagnosis and treatment of aortic diseases: document covering acute and chronic aortic diseases of the thoracic and abdominal aorta of the adult. The Task Force for the Diagnosis and Treatment of Aortic Diseases of the European Society of Cardiology (ESC). *Eur Heart J* 2014;35:2873.

Table 2. Atypical presentation of aortic dissection.

Atypical presentation	Author
Dull pain deep to the suprasternal notch	Saunders and Suzuki, 2018 ¹⁴
Pain mimicking appendicitis	Azharuddin <i>et al.</i> , 2018 ²⁵
Fever	Yuan, 2017 ²⁶
Painless	Siddiqui <i>et al.</i> , 2018; ²⁷ Ayric <i>et al.</i> , 2006; ²⁸ Young <i>et al.</i> , 2002; ¹⁶ Rosen <i>et al.</i> , 1988; ¹⁷ Zull <i>et al.</i> , 1988 ¹⁸
Neurological presentation at the onset	Bekele <i>et al.</i> , 2017; ²⁹ Rosen <i>et al.</i> , 1988; ¹⁷ Zull <i>et al.</i> , 1988 ¹⁸
Pleuritic chest pain	Mohamed-Yassin <i>et al.</i> , 2019 ³⁰
Congestive heart failure	Xiuhua <i>et al.</i> , 2016 ³¹

2. Nazerian P, Mueller C, de Matos Soeiro A, et al; ADVISED Investigators. Diagnostic accuracy of the aortic dissection detection risk score plus D-Dimer for acute aortic syndromes: The ADVISED Prospective Multicenter Study. *Circulation* 2018;137:250-8.
3. Klompas M. Does this patient have an acute thoracic aortic dissection? *JAMA* 2002;287:2262-72.
4. Hansen MS, Nogareda GJ, Hutchison SJ. Frequency of and inappropriate treatment of misdiagnosis of acute aortic dissection. *Am J Cardiol* 2007;99:852-6.
5. Zhan S, Hong S, Shan-Shan L, et al. Misdiagnosis of aortic dissection: experience of 361 patients. *J Clin Hypertens (Greenwich)* 2012;14:256-60.
6. Baliga RR, Nienaber CA, Bossone E, et al. The role of imaging in aortic dissection and related syndromes. *JACC Cardiovasc Imaging* 2014;7:406-24.
7. Rogers AM, Hermann LK, Booher AM, et al.; IRAD Investigators. Sensitivity of the aortic dissection detection risk score, a novel guideline-based tool for identification of acute aortic dissection at initial presentation: results from the International Registry of Acute Aortic Dissection. *Circulation* 2011;123:2213-8.
8. Asha SE, Miers JW. A systematic review and meta-analysis of D-dimer as a rule-out test for suspected acute aortic dissection. *Ann Emerg Med* 2015;66:368-78.
9. Liu F, Huang L. Usefulness of ultrasound in the management of aortic dissection. *Rev Cardiovasc Med* 2018;19:103-9.
10. Abarca Rozas BA, Schwarze Fieldhouse MW, Contreras Bertolo RI, et al. Atypical presentation and late diagnosis of acute aortic dissection without timely surgical treatment: case report and literature review. *Medwave* 2018;18:e7249.
11. Erbel R, Alfonso F, Boileau C, et al. Diagnosis and management of aortic dissection. Task Force Report. *Eur Heart J* 2001;22:1642-81.
12. Asouhidou I, Asteri T. Acute aortic dissection: be aware of misdiagnosis. *BMC Res Notes* 2009;2:25.
13. Hagan PG, Nienaber CA, Isselbacher EM, et al. The international Registry of Acute Aortic Dissection (IRAD): new insights into an old disease. *JAMA* 2000;16;283:897-903.
14. Saunders T, Suzuki T. Atypical presentation of acute aortic dissection in a young competitive rower. *BMJ Case Rep* 2018;2018:bcr2018225712.
15. Ayrik C, Cece H, Aslan O, et al. Seeing the invisible: painless aortic dissection in the emergency setting. *Emerg Med J* 2006;23:24.
16. Young J, Herd AM. Painless acute aortic dissection and rupture presenting as syncope. *J Emerg Med* 2002; 22:171-4.
17. Rosen SA. Painless aortic dissection presenting as spinal cord ischemia. *Ann Emerg Med* 1988;17:840-2.
18. Zull DN, Cydulka R. Acute paraplegia: a presenting manifestation of aortic dissection. *Am J Med* 1988;84: 765-70.
19. Donovan EM, Seidel GK, Cohen A. Painless aortic dissection presenting as high paraplegia: a case report. *Arch Phys Med Rehabil* 2000;81:1436-8.
20. Kawano H, Tomichi Y, Fukae S, et al. Aortic dissection associated with acute myocardial infarction and stroke found at autopsy. *Intern Med* 2006;45:957-62.
21. Wroblewski R, Gibbons R, Costantino T. Point-of-care ultrasound diagnosis of an atypical acute aortic dissection. *Clin Pract Cases Emerg Med* 2018;2:300-3.
22. Chen L, Malek T. Point-of-care ultrasonography in emergency and critical care medicine. *Crit Care Nurs Q* 2018;41:94-101.
23. Lichtenstein DA. BLUE-protocol and FALLS-protocol: two applications of lung ultrasound in the critically ill. *Chest* 2015;147:1659-70.
24. Campbell SJ, Bechara R, Islam S. Point-of-care ultrasound in the intensive care unit. *Clin Chest Med* 2018;39:79-97.
25. Azharuddin M, Delacruz MA, Baughman D, Chandler P. Atypical presentation of type B aortic dissection mimicking appendicitis managed medically. *BMJ Case Rep* 2018;2018:bcr2018225378.
26. Yuan SM. Fever of unknown origin in aortic dissection. *Z Rheumatol* 2017;76:364-71.
27. Siddiqui WJ, Arif A, Khan MH, et al. An atypical case of silent aortic dissection in a peritoneal dialysis patient: a case report and review of literature. *Am J Case Rep* 2018;19:880-3.
28. Ayrik C, Cece H, Aslan O, et al. Seeing the invisible: painless aortic dissection in the emergency setting. *Emerg Med J* 2006;23:24.
29. Bekele E, Kagolalu DC, Kim M, Stephenson K. More than just muscle spasms: a rare presentation of aortic dissection. *BMJ Case Rep* 2017;2017:bcr2016218432.
30. Mohamed-Yassin MS, Baharudin N, Ramli AS, Hashim H. Pleuritic chest pain and fever: An unusual presentation of aortic dissection. *Malays Fam Physician* 2019;14:47-52.
31. Dong X, Lu J, Cheng W, Wang C. An atypical presentation of chronic Stanford type A aortic dissection during pregnancy. *J Clin Anesth* 2016;33:337-40.