Type A Aortic Dissection: A Call for Vigilance in Chest Pain Diagnosis

Introduction :

Acute aortic dissection is a rare but catastrophic condition (1), with mortality increasing by 1-2% per hour in the absence of treatment (2). It is defined by a sudden breach of the intima, releasing pressurized blood that dissects the wall longitudinally along its weakest component: the media (2/3 internal - 1/3 external), resulting in the formation of two lumens (3).The Stanford system classifies AD as either type A or type B. Type A dissections involve the ascending aorta and type B dissections include the descending aorta (4).

The typical clinical presentation involves intense chest pain, immediately maximal, tearing, radiating towards the back and the loins (5), but atypical presentations can also be present, leading to misdiagnoses (6).

Acute coronary syndrome represents a major complication of aortic dissection and can simultaneously serve as the presenting mode. In this case report, we describe the case of a 62-year-old patient admitted to the emergency department for acute chest pain.

Case presentation :

A 62-year-old female patient, with a history of poorly controlled hypertension on monotherapy, presents with retrosternal chest pain not radiating, with an intensity of 6/10, onset 7 hours prior to presentation, aggravated 2 hours ago by the onset of rapidly worsening dyspnea.

On clinical examination, the patient is conscious, without motor deficits, hemodynamically stable with a systolic blood pressure of 115 mmHg symmetric in both limbs, heart rate at 95 bpm. Cardiac auscultation reveals a 3/6 diastolic murmur over the aortic area. Pulmonary auscultation reveals crackling rales at the lung bases. Oxygen saturation was 95% in room air.

The ECG reveals sinus rhythm at 95 bpm, with repolarization disturbances such as negative T-waves in the anterior leads (Figure 1).

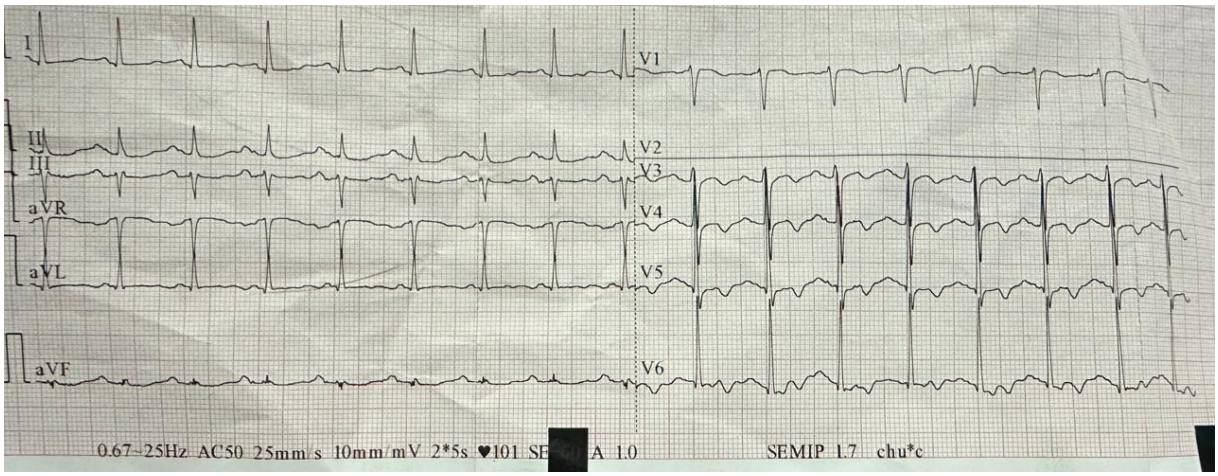

Figure 1 : negative T-waves in the anterior leads.

The chest X-ray shows significant mediastinal widening, and transthoracic echocardiography (TTE) identifies an image suggestive of an intimal flap extending from the aortic sinus on the parasternal long-axis view, with limited extension to the ascending aorta and massive dilation of the ascending aorta measuring 69 mm (Figure 2). The echocardiogram also indicates severe acute aortic insufficiency with hyperkinetic left ventricle (Figure 3) and a small amount of pericardial effusion, along with a dilated inferior vena cava measuring 22 mm.

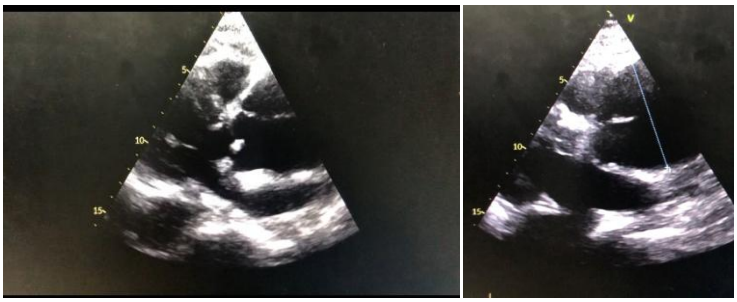

Figure 2 :Intimal flap extending from aortic sinus with a massive dilation of the ascending aorta.

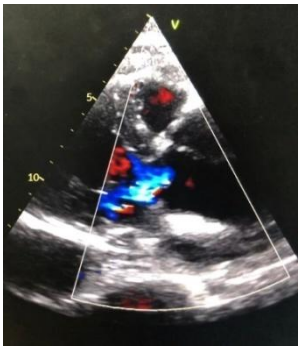

Figure 3 : Severe excentric aortic regurgitation

A computed tomography (CT) with intravenous contrast-enhancement confirmed a Stanford type A aortic dissection with an entry tear at the level of the aortic sinuses limited to the ascending aorta, with a diameter measuring 74 mm (Figure 4).

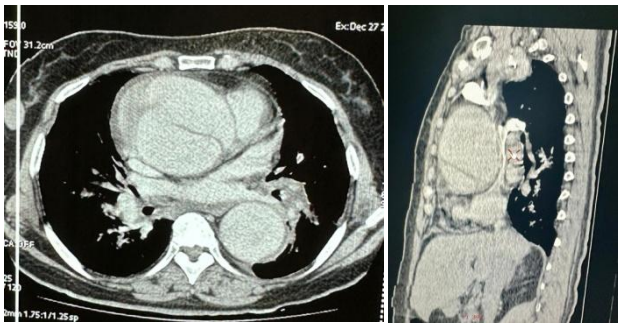

Figure 4 :Axial and Coronal views arterial phase contrast-enhanced CT of the chest showing a dissection involving the ascending aorta.

The patient was admitted to the intensive care unit, where she received a bolus of 40 mg furosemide due to signs of overload along with a bradycardic calcium channel blocker (Verapamil). Subsequently, she was transported to the operating room for a Bentall procedure ; the choice of Bentall procedure was made based on the presence of severe aortic insufficiency observed in transthoracic echocardiography and the intraoperative findings of significant lesions in the aortic semilunar valves. The patient's course was marked by her demise 24 hours later due to respiratory failure.

Discussion :

The incidence of acute AD is estimated to range from 2,6 to 3,5 per 100,000 person/year (7). Twenty percent of patients with AD die before reaching the hospital and 30% die during hospital admission (8).

The diagnoses to consider for patients referred to the emergency department with acute chest pain are limited and include, for cardiac etiologies: acute coronary syndrome, aortic dissection, pulmonary embolism, and pericarditis. It's important to note that acute coronary syndrome can be a complication of aortic dissection, as is the case with our patient, and the management is entirely different.

When patients present with specific electrocardiographic findings and positive cardiac markers for ischemia, they can be managed as acute coronary syndrome without further investigation. However, it is crucial to conduct additional

investigations for patients with unusual symptoms or those lacking specific findings in initial paraclinical investigations (9, 10, 11,12).

Aortic dissection typically presents with chest pain radiating to the back and loins, following the extension of the false channel (9). Conversely, a dissection limited to the ascending aorta may cause retrosternal pain (13), explaining the absence of blood pressure asymmetry.

Thus, an atypical presentation of acute coronary syndrome, such as acute heart failure and a murmur on auscultation, should prompt a transthoracic echocardiogram, particularly to explore alternative diagnoses like aortic dissection (14). This underscores the importance of a thorough and prompt assessment in the emergency setting to avoid missing crucial information.

Regarding management, aortic dissection is considered a medical and surgical emergency. Pharmacological treatment should include morphine for pain relief and administration of an injectable beta-blocker (BB) or a bradycardic calcium channel blocker in case of BB contraindication. Surgical treatment for type A aortic dissection should be initiated without delay (15).

Conclusion :

Aortic dissection has a well-known typical presentation, but atypical presentations are also common. Hence, it is crucial to always consider aortic dissection in the differential diagnosis of chest pain because the consequences of this condition in the absence of treatment are dramatic, and the management is entirely different.

References :

1. Levy D, Goyal A, Grigorova Y, et al. Aortic Dissection. [Updated 2023 Apr 23]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2023 Jan-. Available from: https://www.ncbi.nlm.nih.gov/books/NBK441963/
2. Harris KM, Nienaber CA, Peterson MD, et al. Early Mortality in Type A Acute Aortic Dissection: Insights From the International Registry of Acute Aortic Dissection. *JAMA Cardiol.* 2022;7(10):1009–1015. doi:10.1001/jamacardio.2022.2718
3. Raimund Erbel, Victor Aboyans, Catherine Boileau, Eduardo Bossone, Roberto Di Bartolomeo. 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), *European Heart Journal*, Volume 35, Issue 41, 1 November 2014, Pages 2873–2926, https://doi.org/10.1093/eurheartj/ehu281
4. Tsai TT, Nienaber CA, Eagle KA: Acute aortic syndromes. Circulation. 2005, 112:3802-13. 10.1161/CIRCULATIONAHA.105.534198
5. Hagan PG, Nienaber CA, Isselbacher EM, Bruckman D, Karavite DJ, Russman PL, Evangelista A, Fattori R, Suzuki T, Oh JK, Moore AG, Malouf JF, Pape LA, Gaca C, Sechtem U, Lenferink S, Deutsch HJ, Diedrichs H, Marcos y Robles J, Llovet A, Gilon D, Das SK, Armstrong WF, Deeb GM, Eagle KA. The International Registry of Acute Aortic Dissection (IRAD): new insights into an old disease. JAMA 2000; 283:897 –903
6. Zhan S, Hong S, Shan-Shan L, Chen-Ling Y, Lai W, et al. (2012) Misdiagnosis of aortic dissection: experience of 361 patients. J Clin Hypertens (Greenwich) 14: 256-260.
7. Clouse WD, Hallett JW Jr, Schaff HV, Spittell PC, Rowland CM, et al. (2004) Acute aortic dissection: population-based incidence compared with degenerative aortic aneurysm rupture. Mayo Clin Proc 79: 176-180.
8. Mehta RH, O'Gara PT, Bossone E, Nienaber CA, Myrmel T, et al. (2002) Acute type A aortic dissection in the elderly: clinical characteristics, management, and outcomes in the current era. J Am Coll Cardiol 40: 685-692.
9. Khan IA, Nair CK. Clinical, diagnostic, and management perspectives of aortic dissection. *Chest Journal.* 2002;122(1):311–28.
10. Spittell PC, Spittell JA, Joyce JW, Tajik AJ, Edwards WD, Schaff HV, et al., editors. Clinical features and differential diagnosis of aortic dissection: experience with 236 cases [1980 through 1990] *Mayo Clinic Proceedings.* 1993;68(7):642–51.
11. Ansari-Ramandi MM, Alemzadeh-Ansari MJ, Firoozi A.Acute Type A Aortic Dissection Missed as Acute Coronary Syndrome.J Clin of Diagn Res.2016; 10(5):OD33-OD34.
12. Tolefac PN, Dzudie A, Mouliom S, Aminde L, Hentchoya R, Abanda MH, Mvondo CM, Wanko VD, Luma HN. Acute type A aortic dissection involving the iliac and left renal arteries, misdiagnosed as myocardial infarction. Cardiovasc J Afr.

2018 Jan/Feb 23;29(1):e9-e13. doi: 10.5830/CVJA-2017-042. Epub 2017 Nov 3. PMID: 29125616; PMCID: PMC6002801.

13. Braunwald's Heart Disease. A Textbook of Cardiovascular Medicine 9thed. Bonow RO, Mann DL, Zipes DP, Libby P. Elsevier saunders Publisher. 2012:1319-31.

14. Robert A Byrne, Xavier Rossello, J J Coughlan, Emanuele Barbato, Colin Berry, Alaide Chieffo, Marc J Claeys, Gheorghe-Andrei Dan, Marc R Dweck, Mary Galbraith, Martine Gilard, Lynne Hinterbuchner, Ewa A Jankowska, Peter Jüni, Takeshi Kimura, Vijay Kunadian, Margret Leosdottir, Roberto Lorusso, Roberto F E Pedretti, Angelos G Rigopoulos, Maria Rubini Gimenez, Holger Thiele, Pascal Vranckx, Sven Wassmann, Nanette Kass Wenger, Borja Ibanez, ESC Scientific Document Group , 2023 ESC Guidelines for the management of acute coronary syndromes: Developed by the task force on the management of acute coronary syndromes of the European Society of Cardiology (ESC), *European Heart Journal*, Volume 44, Issue 38, 7 October 2023, Pages 3720–3826, https://doi.org/10.1093/eurheartj/ehad191

15. Weigang E, Nienaber CA, Rehders TC, Ince H, Vahl CF, Beyersdorf F. Management of patients with aortic dissection. Dtsch Arztebl Int. 2008 Sep;105(38):639-45. doi: 10.3238/arztebl.2008.0639. Epub 2008 Sep 19. PMID: 19471632; PMCID: PMC2680572.