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Case Report

An Extensive Aortic Dissection Involving the Left Carotid Artery, The Left Renal Artery and the Left Common Iliac Artery: A Case Report and Literature Review

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Abstract

Aortic dissection (AD) is a tear in the intima of the aorta, leading to blood flow into the medial layer and creating a false lumen. It is a true medical emergency with high mortality, particularly for Type A dissections involving the ascending aorta0 Aortic dissection is a rare but catastrophic cardiovascular emergency.

This report details the case of a 62-year-old male presenting with an extensive aortic dissection, which spanned the entire length of the aorta—from the aortic root to the common iliac arteries. Remarkably, the dissection flap involved the ostia of several critical branch vessels, namely the left carotid artery, the left renal artery, and the left common iliac artery. The patient, presenting with non-specific chest pain initially treated as gastric distress, was diagnosed rapidly using Point-of-Care Ultrasound (POCUS) and confirmed with computer tomography (CT). This case underscores the challenges in diagnosing extensive aortic dissection and highlights the importance of timely and comprehensive imaging for planning management, which, unfortunately, was refused by the patient against medical advice (AMA).

Key Words: aortic dissection; pan-aortic dissection; malperfusion syndrome; type a dissection; carotid artery; renal artery; common iliac artery; pocus

Introduction

Aortic dissection (AD) is a tear in the intima of the aorta, leading to blood flow into the medial layer and creating a false lumen. It is a true medical emergency with high mortality, particularly for Type A dissections involving the ascending aorta. While most dissections are localized, the presentation of a pan-aortic dissection (involving the entire length of the aorta) is rare and presents an extreme challenge due to the high risk of widespread malperfusion syndrome impacting multiple organs (e.g., stroke, acute kidney injury, limb ischemia). This report details a rare and extensive case of pan-aortic dissection involving multiple critical branch vessels, illustrating the profound extent of the disease and the diagnostic utility of modern imaging techniques.

The Stanford system categorizes dissections into 2 types based on whether the ascending or descending part of the aorta is involved.

- Stanford Type A: This involves the ascending aorta, regardless of the site of the primary intimal tear and is defined as a dissection proximal to the brachiocephalic artery.
- Stanford Type B: This originates distal to the left subclavian artery and involves only the descending aorta; the Society for Vascular Surgery and the Society of Thoracic Surgeons define Stanford type B dissections as those where the entry tear occurs beyond the origin of the innominate artery. 1. The DeBakey system further subdivides dissections into 3 types based on the origin and extent of the dissection:
- DeBakey Type 1: Originates in the ascending aorta, aortic arch, and descending aorta

- DeBakey Type 2: Originates in and is limited to the ascending aorta
- DeBakey Type 3: Begins in the descending aorta and extends distally above the diaphragm (type 3a) or below the diaphragm (type 3b)

These classification systems, such as Stanford (A and B) and DeBakey (I, II, and III), are used to guide management. Ascending dissections (Stanford type A or DeBakey types 1 and 2) are nearly twice as common as descending dissections (Stanford type B or DeBakey type 3), necessitating an urgent, specialized approach to reduce the risk of fatal complications such as aortic rupture, stroke, or myocardial infarction (see Image. Aortic Dissection, Type A) [1, 3].

Case Presentation:

A 62 years old male with a history of primary hypertension with no compliance to treatment and no other remarkable medical history, was referred to our emergency room for a chest pain progressively worsening over a period of 02 weeks for which he had received a treatment for gastric pain. The persistence of the chest pain, associated with palpitation and dyspnea, prompted the visit.

On arrival all vitals were unremarkable except for a BP: 147/87 mmHg, a HR: 123 bpm and a RR: 24 ppm. Secondary physical examination was also unremarkable. A Point-of-care ultrasound (POCUS) quickly revealed an abdominal aortic dissection as seen in the transverse (Figure 1a) and longitudinal (Figure 1b) views of the aorta.

A comprehensive chest-abdominal-pelvic CT Scan with contrast revealed an extended dissection involving all the length of the Aorta, consistent with a Type A (DeBakey Type I) dissection, namely the ascending aorta, the aortic arch, Descending Thoracic Aorta: Extensive dissection visualized in the thoracic aorta (Figure 2a), Abdominal Aorta

Figure 1: POCUS images showing the abdominal aortic dissection in the transverse (Figure 1a: left) and longitudinal (Figure 1b: right) sub-xyphoid views of the aorta

(Figure 2b). The false lumen compromised the ostia of several critical branch vessels: Left Carotid Artery: Dissection flap extending into the proximal left carotid artery (Figure 2c), Left Renal Artery: The dissection extended to the level of the renal arteries, with clear involvement of the ostium of the left renal artery (Figure 2d), Left Common Iliac Artery: The dissection continued distally, involving the left common iliac artery.

A thorough counselling was made on the patient's condition and the extreme urgency for surgical intervention (due to the Type A nature and branch vessel involvement). He was immediately put on medical management, including Calcium channel blockers (to control BP) and Beta-blockers to keep HR and BP in the normal range, aiming for SBP <120 mmHg and HR < 60 bpm and analgesics (morphine) for pain management. Unfortunately, the patient requested to be discharged against medical advice (AMA) despite repeated explanations of the fatal risks. He refused surgical transfer and was discharged after signing the appropriate documents.

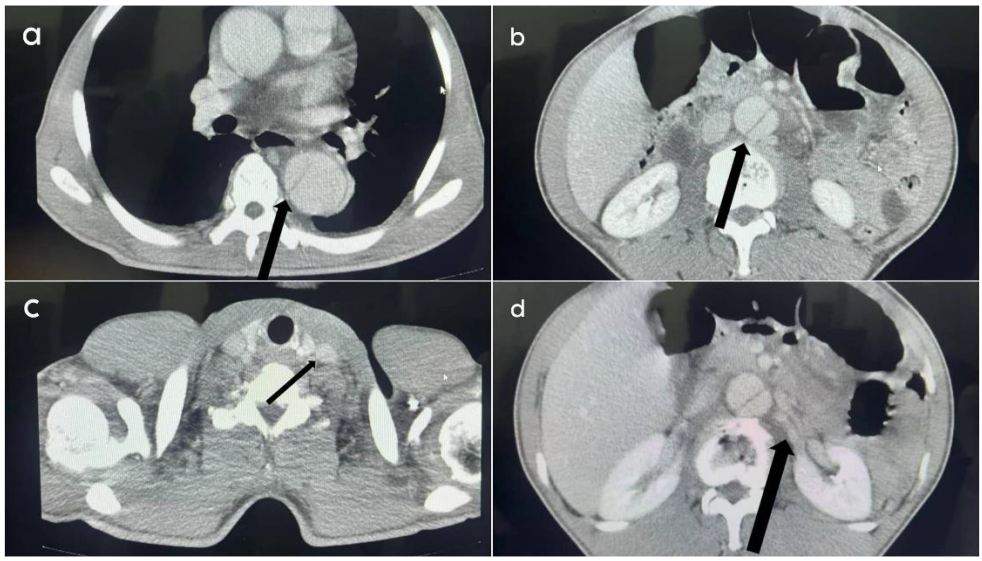

Figure 2: images of the CT scan: a- Arrow showing dissection of the descending thoracic aorta, b- Arrow showing dissection of the descending abdominal aorta, c- Arrow showing dissection of the left carotid artery, d- Arrow showing dissection of the left renal artery

Discussion

This case illustrates a catastrophic presentation of an acute Type A aortic dissection (DeBakey Type I), notable for its pan-aortic extent and the specific involvement of three critical branch arteries: the left carotid, the left renal, and the left common iliac artery.

Diagnosis and Imaging

The non-specific presentation of chest pain, often misdiagnosed as musculoskeletal or gastrointestinal issues, can delay the patient's presentation. The use of POCUS in the emergency room proved its usefulness, providing rapid visualization of the abdominal dissection flap (Figures 1a and 1b) and prompting the definitive CT angiography. CT angiography remains the gold standard for diagnosis, determining the Stanford/DeBakey type, entry/re-entry tears, and, most critically, identifying malperfusion syndromes involving branch vessel ostia, which directly impacts management and surgical planning [4].

Transthoracic echocardiography combined with transabdominal echocardiography can quickly and noninvasively evaluate the heart and different aortic segments, especially the root of the aorta, the proximal segment of the ascending aorta and part of the aortic arch and abdominal aorta through two-dimensional and color flow signals. Due to its high repeatability and convenience, echocardiography is recommended as the first-choice imaging modality in clinical suspicion of aortic dissection [4, 5, 6].

The concordance rate of ultrasound diagnosis of aortic dissection subtypes with computed tomography angiography (CTA) and/or intraoperative diagnosis is 93.5%, consistent with the findings of Luo et al.'s study [4, 7].

Due to echocardiographic reverberation artifacts, there were blind spots in scanning, and the resolution of the distal ascending aorta and proximal aortic arch was poor. Thus, it was impossible to make a comprehensive visual analysis of the aortic arch and partial descending aorta.[4, 8]

Branch Vessel Involvement and Malperfusion

Involvement of branch arteries leads to malperfusion syndrome, a major predictor of poor outcomes. In this patient's case, we expected: cerebral malperfusion as the left carotid artery involvement puts the patient at very high risk for stroke, necessitating urgent surgical repair and potential cerebral protection strategies. Renal malperfusion: the left renal artery ostial involvement risks acute kidney injury, a serious complication. Limb ischemia: the left common iliac artery involvement causes lower limb ischemia, requiring immediate revascularization or fenestration.

But in it also important, when looking for malperfusion syndromes, to consider the involment of others critical arteries like the coronary arteries, the Brachiocephalic trunk, the left subclavian artery, the celiac artery as well as the superior and inferior mesenteric arteries. Given the HR 123 bpm on presentation, there was also a high suspicion of possible aortic valve involvement causing aortic insufficiency, which further contributes to the urgency of Type A repair.

Management

The patient's decision to discharge AMA highlights a tragic clinical scenario where patient autonomy conflicts with a life-threatening, time-sensitive diagnosis. This underscores the need for effective, rapid communication and counseling in acute emergencies.

- **Monitoring and access**

Continuous monitoring with an arterial line for real-time blood pressure measurements Placement of a central venous catheter for hemodynamic monitoring and administration of medications Foley catheter insertion to monitor urine output, as oliguria or anuria may indicate renal hypoperfusion.

- **Analgesia**

Pain control is crucial. Morphine is the preferred analgesic as it controls pain and decreases sympathetic tone, which helps reduce blood pressure and heart rate.

- **Heart rate and blood pressure control**

Short-acting intravenous beta blockers (eg, esmolol or labetalol) are the first-line agents. The goal is to maintain a heart rate of approximately 60 beats per minute to reduce the force of left ventricular ejection against the aortic wall.

Beta blockers should be used with caution in the setting of acute aortic regurgitation, where compensatory tachycardia may be beneficial for maintaining cardiac output.

If beta blockers are contraindicated (eg, in patients with severe asthma or bronchospastic disease), no dihydropyridine calcium channel blockers like diltiazem can be used as alternatives.

- **Blood pressure target**

Systolic blood pressure should be lowered between 100 and 120 mm Hg, provided end-organ perfusion is not compromised. If additional blood pressure control is needed, nitroprusside can be added to the beta-blocker regimen. Other vasodilators, like nicardipine, may also be used.

- **Management of hypotension**

In hypotensive patients, intravenous fluid resuscitation is the first approach. However, excessive fluid can exacerbate aortic wall stress, so caution is warranted. If hypotension persists, vasopressors (eg, norepinephrine) can be administered to maintain perfusion, but these agents should be used carefully as they can increase the force of ventricular contraction and potentially worsen the dissection.

Literature Review

Pan-aortic dissections (DeBakey Type I) are historically associated with the worst prognosis. The complexity of this case, involving simultaneous compromise of visceral (renal), supra-aortic (carotid), and peripheral (iliac) vessels, places it among the highest-risk presentations. In the little to no other similar case has been reported. Future reports should emphasize multidisciplinary teams (cardiac surgeons, vascular surgeons, neurologists, nephrologists) for managing these complex malperfusion patterns.

Conclusion

This case report describes an extremely rare presentation of an acute Type A aortic dissection with pan-aortic extension and specific, critical involvement of the left carotid, left renal, and left common iliac arteries. The successful rapid diagnosis via POCUS and CT highlights the value of these imaging modalities. However, the subsequent refusal of definitive surgical management by the patient against medical advice resulted in an unfavorable clinical course. This case serves as a striking reminder of the high stakes involved in managing extensive aortic dissections and the ethical challenges posed by patient refusal of life-saving interventions

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