

# AORTIC DUCTUS DIVERTICULUM MIMICKING AORTIC DISSECTION: A CASE OF DIAGNOSTIC AMBIGUITY IN TRANSTHORACIC ECHOCARDIOGRAPHY

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## ABSTRACT

**Background:** Aortic dissection is a critical condition often presenting with acute, severe chest pain and haemodynamic instability. Early diagnosis is essential to mitigate the high mortality risk. Imaging modalities play a pivotal role in diagnosing aortic conditions, but determining the appropriate method can be challenging.

**Case description:** We report an asymptomatic 55-year-old female undergoing transthoracic echocardiography (TTE) for mitral and aortic valve regurgitation surveillance. Incidentally, a suspicious flow jet at the distal aortic arch was discovered, raising concerns of aortic dissection. A subsequent CT angiogram (CTA) identified this as an aortic ductus diverticulum at the aortic isthmus, not a dissection.

**Discussion:** Aortic dissection has a high initial 48-hour mortality, with even surgically managed cases exhibiting a 26% risk. Imaging tools such as a transoesophageal echocardiogram (TEE), CT and MRI scans are instrumental for diagnosis, with their applicability depending on the patient's clinical situation. The aortic ductus diverticulum, a developmental outpouching, often mimics other aortic pathologies, emphasising the importance of accurate imaging interpretation.

**Conclusion:** Aortic ductus diverticulum presents diagnostic challenges due to its resemblance to other aortic conditions. Advancements in imaging modalities improve diagnostic accuracy, but awareness and careful interpretation are paramount to ensure timely and appropriate patient care.

## KEYWORDS

Aortic ductus diverticulum, cardiac imaging, aortic dissection

## LEARNING POINTS

- Distinguishing aortic anomalies: recognise the differences between aortic dissection and aortic ductus diverticulum using imaging findings.
- Evaluating imaging modalities: understand the pros and cons of transthoracic echocardiography (TTE), transoesophageal echocardiogram (TEE), CT and MRI scans for diagnosing aortic conditions.
- Addressing diagnostic pitfalls: identify potential ambiguities in imaging results, especially concerning the aortic isthmus, and ensure accurate diagnosis before treatment.

## INTRODUCTION

Aortic dissection is a fairly uncommon condition with potentially fatal complications including aortic regurgitation, cardiac tamponade, stroke, end-organ damage and death secondary to severe internal bleed. This catastrophic illness most often presents acutely with severe, tearing chest pain and haemodynamic compromise, making it a medical and surgical emergency.

Early identification of aortic dissection through imaging and clinical judgement is crucial to decrease morbidity and mortality. However, confirming aortic dissection can be challenging and the choice of imaging modality usually depends on the haemodynamic status of the patient and the resources available. Misdiagnosis can result in the delay of appropriate treatment and may result in lethal outcomes.

The following is a report of an asymptomatic 55-year-old female who underwent transthoracic echocardiography (TTE) for surveillance of mitral and aortic valve regurgitation in the outpatient setting, with an incidental finding of a small flow jet at the distal aortic arch that raised concern for a possible aortic dissection. A subsequent CT angiogram (CTA) ruled out aortic dissection and identified an aortic ductus diverticulum at the aortic isthmus as the cause of the abnormal flow.

## CASE DESCRIPTION

This case involves a 55-year-old asymptomatic female with a past medical history significant for migraine headaches, breast cancer, prothrombin gene mutation and mild mitral and aortic valvular insufficiency.

A TTE was ordered by her primary care provider for surveillance of valvular insufficiency, which showed normal biventricular size and systolic function with no evidence of mitral or aortic regurgitation. However, an abnormal flow jet was incidentally noted on colour Doppler imaging at the distal aortic arch from the suprasternal view. The jet appeared in a pulsatile manner at the end-systole and was juxtaposed with an area of lucency within the wall of the aortic arch, raising concern for aortic dissection (Fig. 1).

A CTA was performed, which ruled out an aortic dissection. The CTA showed an incidental aortic ductus diverticulum at the aortic isthmus creating an irregular surface (Fig. 2) that likely produced a flow vortex that gave rise to the flow jet seen on TTE. The patient was assured that this is a benign finding by itself, and she did not need further investigations or follow-up for this specific finding, so no intervention was done; the patient remains asymptomatic.

## DISCUSSION

Aortic dissection carries a very high risk of mortality which can reach up to 68% in the first 48 hours; even if surgically treated, aortic dissection still carries a 26% mortality risk.

A transoesophageal echocardiogram (TEE), CT and MRI scans can be used to identify an aortic dissection, but the sensitivity and specificity of these tests vary. For example, even though TEE is the fastest and most suitable to use

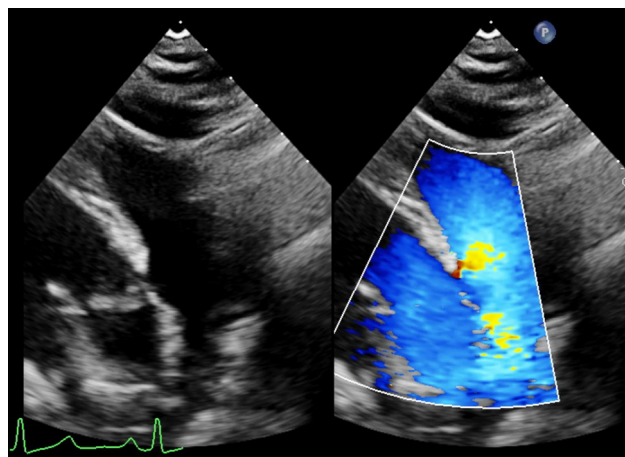


Figure 1. Suprasternal view with colour comparison showing the abnormal colour Doppler jet arising from the aortic arch.



Figure 2. Axial CTA showing the aortic ductus diverticulum as a focal convex bulge (arrows) along the anterior-inferior aspect of the aortic isthmus.

in haemodynamically unstable patients, it is operator-dependent and has higher false positive and false negative rates than CT and MRI scans. On the other hand, CT and MRI scans have a significantly lower false positive and false negative rates, but they are time consuming, increase the risk for contrast-induced kidney injury, and cannot evaluate if the patient has aortic regurgitation. Thus, use of these tests depends on the case<sup>[1]</sup>.

Aortic ductus diverticulum is a developmental outpouching of the thoracic aorta, which is most often mistaken for other aortic pathologies or injuries<sup>[2]</sup>. It is typically located at the location of the aortic isthmus, on the anteromedial part of the aorta. This is where the ligamentum arteriosum attaches and is one of the points to which the thoracic aorta is tethered. This is also the site where the majority of traumatic aortic injuries occur. Multiple case reports have been published emphasising the importance of differentiating aortic ductus diverticulum from other aortic injuries such as traumatic pseudoaneurysms, aneurysms or aortic spindles.

Most adults have variable appearances of the aortic isthmus on thoracic aortograms. One study reviewed 103 aortograms and 9% of patients were found to have a ductus diverticulum<sup>[3]</sup>. Interestingly, our patient had a ductus diverticulum that mimicked the appearance of an aortic dissection on her TTE.

Other variations of the aortic isthmus that can mimic an aortic dissection include the following.

1) An aneurysm of non-patent ductus arteriosus, usually from the aortic end of the ductus, may cause compression on the adjacent structures such as the oesophagus or trachea<sup>[4]</sup>. Moreover, some cases also have been reported on an aneurysm of the diverticulum of ductus arteriosus, which must be surgically resected because of a high risk of complications<sup>[5]</sup>.

2) An aneurysm of the aortic isthmus can arise from the dorsal side of the aortic arch. There has been controversy over whether it is a remnant of the ductus arteriosus or a remnant of the dorsal aortic root.

3) Calcification of the aortic isthmus or ligamentum arteriosum can be a common finding<sup>[6]</sup>.

Aortic ductus diverticulum by itself is a benign incidental finding and does not require any intervention. In contrast, aneurysms or pseudoaneurysms of the ductus diverticulum may need surgical intervention due to the high risk of bleeding or rupture<sup>[7]</sup>.

## CONCLUSION

Based on this report and other abstracts, aortic ductus diverticulum seems to have a long history of creating diagnostic ambiguity<sup>[8]</sup>. Our diagnostic accuracy has improved as a result of the development of technology and imaging techniques such as CT scans and ultrasounds.

The purpose of this study is to raise awareness, reduce additional interventions and ensure patients receive treatment in a timely manner when dealing with distinguishing ductus diverticulum from other serious aortic diseases such as aortic dissection.

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