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CASE REPORT
Structural intervention

Atypical presentation and percutaneous repair of ascending aortic pseudoaneurysm: a case report

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Background Ascending aortic pseudoaneurysms (AAPs) are an unusual complication of cardiac or aortic surgery and are associated with a high risk of complications and mortality. Guidelines recommend surgical repair. There is few data concerning percutaneous occlusion of AAP. We present a case of syncope due to vascular and heart chamber compression by a large post-surgical AAP that was filled through a focal leak. Ascending aortic pseudoaneurysm was successfully occluded percutaneously.

Case summary A 66-year-old man with a mechanical aortic prosthesis and a Dacron tube in the ascending aorta presented with syncope due to compression of the right atrium and superior vena cava by a large peritube collection. A computed tomography angiography (CTA) showed a large AAP that was filled through a small focal dehiscence of the tube proximal suture. Patient was dismissed for surgery due to high surgical risk. Then, AAP was successfully occluded percutaneously via a 6-French radial access and local anaesthesia.

Discussion In patients with syncope and previous cardiac surgery, aortic complications should be ruled out. Although transthoracic echocardiography may be useful, CTA is the recommended diagnostic test for ruling out post-surgical AAP and allows the characterization of the number, localization, and size of the leaks. In selected patients with high surgical risk and favourable anatomic characteristics, a percutaneous closure could be indicated.

Keywords Aortic disease • Aortic Pseudoaneurysm • Percutaneous closure • Syncope • Case report

ESC curriculum 2.1 Imaging modalities • 2.4 Cardiac computed tomography • 5.2 Transient loss of consciousness • 9.1 Aortic disease • 9.2 Trauma to the aorta or the heart

Learning points

- Syncope is an unusual presentation of aortic disease, but aortic complication should be suspected in patients with previous cardiac or aortic surgery.
- Computed tomography angiography allows anatomic characterization of ascending aortic pseudoaneurysms (AAPs) and may establish the number, size, and location of the leaks.
- In selected patients with high surgical risk and favourable anatomical characteristics, percutaneous closure of AAP could be considered.

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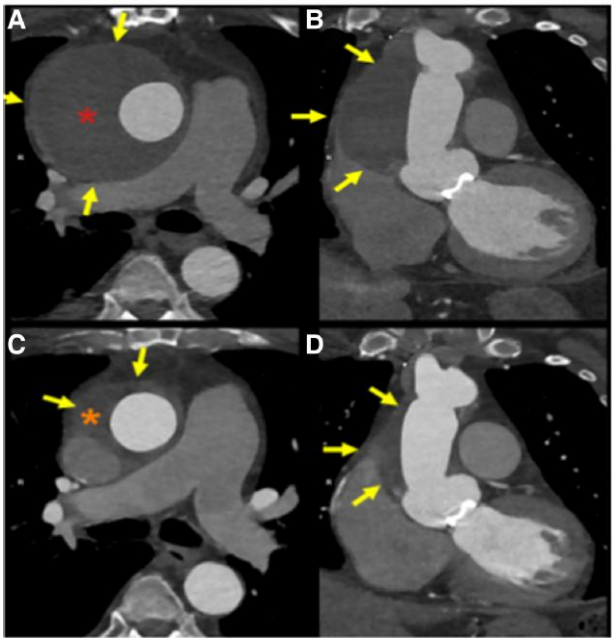
Introduction

Ascending aortic pseudoaneurysms (AAP) are unusual but are associated with an elevated risk of rupture, thrombosis, distal embolization, and death.[1] Syncope is an infrequent but a well-recognized symptom related to aortic disease, occurring in ~13% of aortic dissections.[2] Computed tomography angiography (CTA) is the recommended diagnostic test for ruling out post-surgical AAP and may allow to establish the number, localization, and size of the leaks.[3] Management of AAP requires multidisciplinary teams, but surgery is usually recommended. We report a case of syncope due to vascular and right heart chamber compression by a large post-surgical AAP that was successfully treated percutaneously.

Summary figure

Syncope in relation to a large post-surgical ascending aortic pseudoaneurysm with right atrium and superior vena cava compression. Successful percutaneous closure was made due to prohibitive surgical risk.
A, B at admission. C, D two years later.



Case report

A 66-year-old male was admitted due to syncope while sitting. The patient was a Jehovah's Witness and had hypertension, dyslipidaemia, and obesity. He had permanent atrial fibrillation (AF) and QRS duration was 120 ms with left bundle branch block (LBBB) morphology. Two years prior admission, the patient underwent aortic valve replacement with mechanical prosthesis (Carbomedics™ 25 mm) due to severe aortic regurgitation. One year later, an asymptomatic Stanford type A aortic dissection was documented in an electrocardiogram (ECG)-gated CTA. Therefore, ascending aortic replacement with a Dacron graft (Hemashield™ 34 mm) was successfully performed. Coronary artery disease was ruled out prior to both cardiac surgeries. He was in functional class I and without angina, and left ventricular ejection fraction (LVEF) was mildly reduced. On admission, blood pressure was 155/96 mmHg and heart rate 85 b.p.m. The patient did not report any symptoms before losing consciousness and had a quick recovery without neurological abnormalities, except for a mild cranial contusion. There were no signs of heart failure and a prosthetic valve closing click was present.

An ECG (*Figure 1A*) showed AF with a ventricular rate of 110 b.p.m. QRS duration was 120 ms with LBBB. Carotid sinus massage was negative, and supine and standing blood pressure measurements did not show abnormal blood pressure drop. A chest radiograph (*Figure 1B*) showed cardiomegaly and mediastinal widening. Blood test evidenced normal haemogram and renal function, international normalized ratio (INR) was 4.13, and a slight elevation of high-sensitivity troponin I was documented: 298–313 ng/L (normal value < 45 ng/L). A transthoracic echocardiogram (TTE), limited due to poor acoustic window, showed LVEF of 50%. There was neither evidence of aortic prosthesis dysfunction (medium gradient of 11 mmHg), dilatation of the right cavities, nor pericardial effusion. An ECG-gated CTA performed to rule out aortic complications showed (*Figures 2* and *3*) a large AAP (92 mm) compressing the right atrium and superior vena cava. A small focal dehiscence of the proximal tube suture (*Figure 3*) was detected, and a time-resolved CTA showed slow filling and drainage of the AAP through the proximal tube dehiscence (see Supplementary material online, *Video S1*). During hospitalization, telemetry did not show arrhythmias and syncope was attributed to compression of vascular structures and right heart cavities by AAP.

The case was discussed by the heart team and was considered of high surgical risk (Euroscore II 10.67%). In addition, surgical risk was underestimated since it did not take into account factors such as obesity, third sternotomy, and the fact that the patient was a Jehovah's Witness refusing blood transfusions. Then, percutaneous closure was considered as AAP was filled through a focal leak. Under local anaesthesia, a 6-French radial access and venous femoral access were gained. An intracardiac echocardiography (ICE) catheter (AcuNav, BiosenseWebster) was placed close to the superior vena cava to guide the procedure. A 5-French JR 4 LBT coronary guiding catheter (Cordis Corporation, USA) was used to probe the focal leak, and a workhorse coronary wire was looped inside the AAP. By inflating a 2.0 mm coronary balloon at the neck, the coronary guiding catheter was easily advanced and seated inside. Under angiographic (image 5; Supplementary material online, *Video S2*) and ICE guiding (image 5; Supplementary material online, *Video S3*), an Amplatzer Duct Occluder II (ADO II) 4/4 (waist diameter and nominal length 4 mm) (Abbot Vascular, Abbott Park, IL, USA) was deployed successfully, and an almost immediate thrombosis occurred (see Supplementary material online, *Videos S4* and *S5*) (*Figure 4*). The patient had no complications and was discharged the day after.

After 2 years of follow-up, the patient remains asymptomatic. A control CTA (*Figure 5*) showed a well-positioned ADO II with no evidence of leak and a significant reduction of the fully thrombosed AAP. In addition, the Dacron tube, the superior vena cava, and right atrium, previously distorted by AAP compression, regained their previous diameter and morphology.

Discussion

Ascending aortic pseudoaneurysms are unusual but are associated with an elevated risk of rupture, thrombosis, distal embolization, and death.[1] In post-surgical iatrogenic cases, these pseudoaneurysms may occur at the site of a graft anastomosis, aortotomy, or cannulation. Syncope is an infrequent but a well-recognized symptom related to aortic disease, occurring in ~13% of aortic dissections.[2] In our case, the clinical presentation of syncope, with a sudden onset, while sitting and resulting in a head trauma, suggested a cardiac origin. However, the first diagnostic suspicion was an arrhythmic syncope either bradyarrhythmia due to

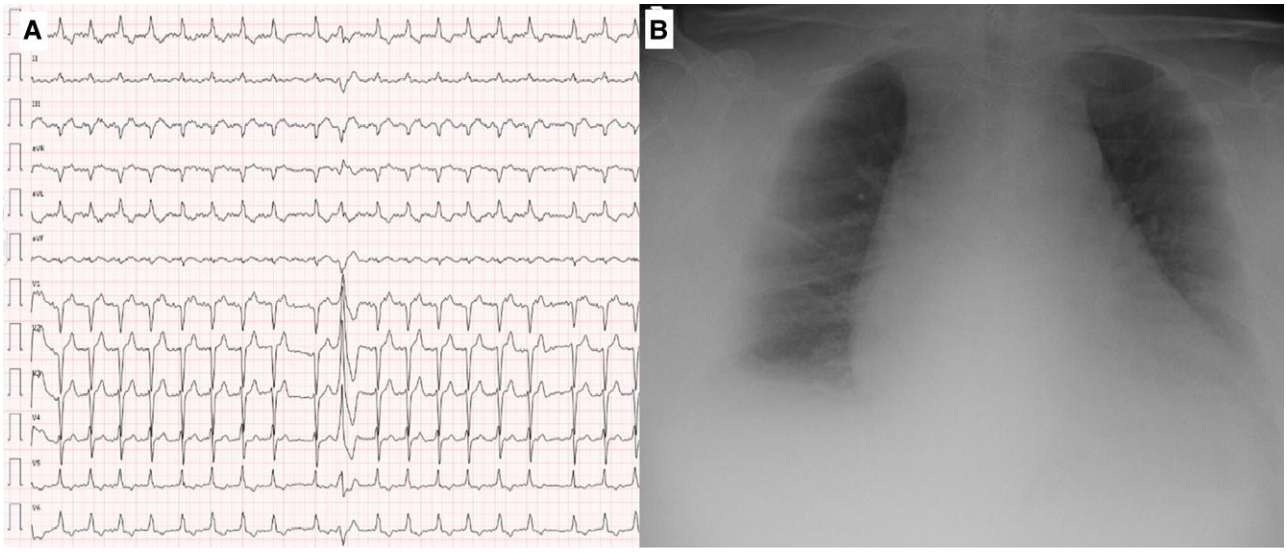


Figure 1 ECG (*A*) shows AF with LBBB, and a chest X-ray (*B*) shows cardiomegaly and widened mediastinum.

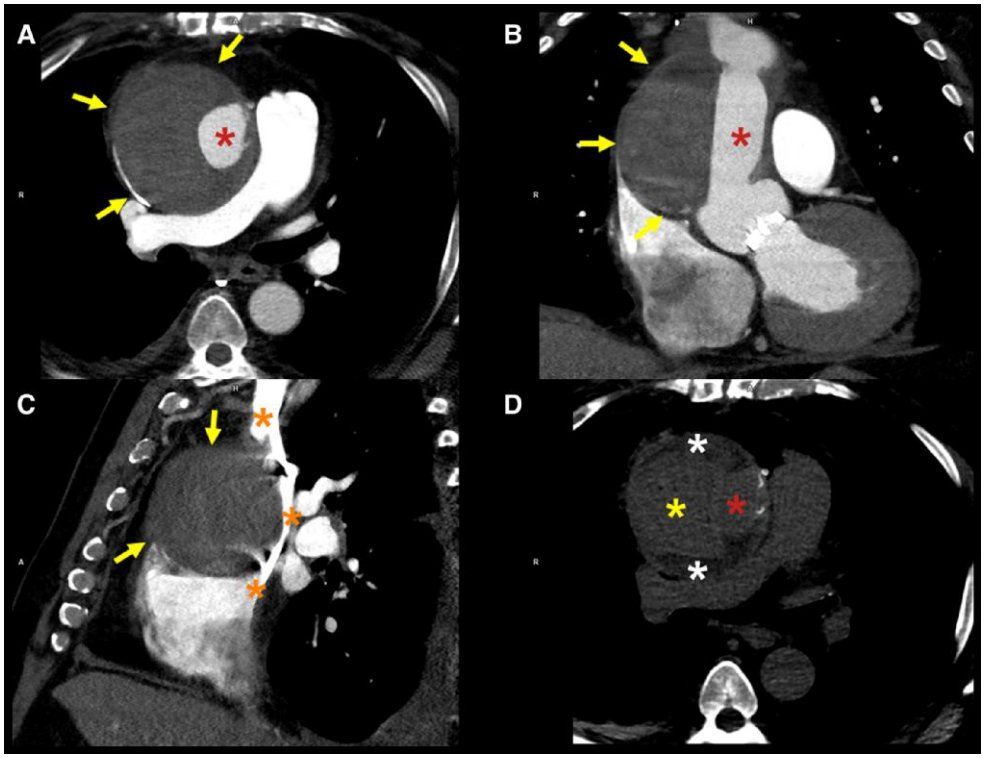


Figure 2 Axial (*A*), coronal (*B*), and sagittal (*C*) multiplanar reconstructions of an ECG-gated CTA showing a large pseudoaneurysm surrounding and distorting the aortic tube (*B*) and compressing the superior vena cava (*C*). An axial image in a late phase (*D*) shows partial central filling of the pseudoaneurysm and peripheral thrombosis.

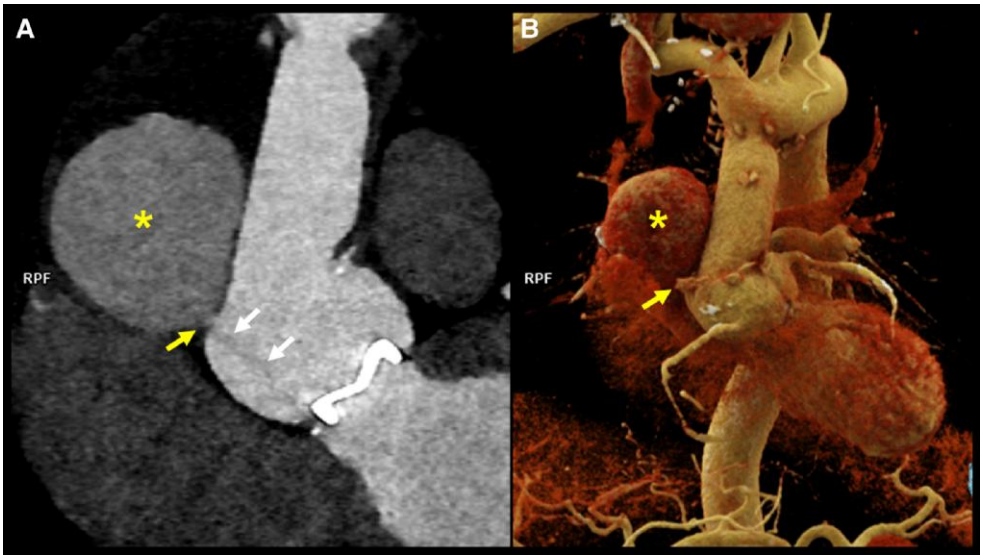


Figure 3 Coronal multiplanar reconstruction (*A*) and volume render (*B*) of an ECG-gated CTA showed AAP and the localization of the small single leak. Note regurgitating hypodense jet in the aortic root arising from the leak in (*B*).

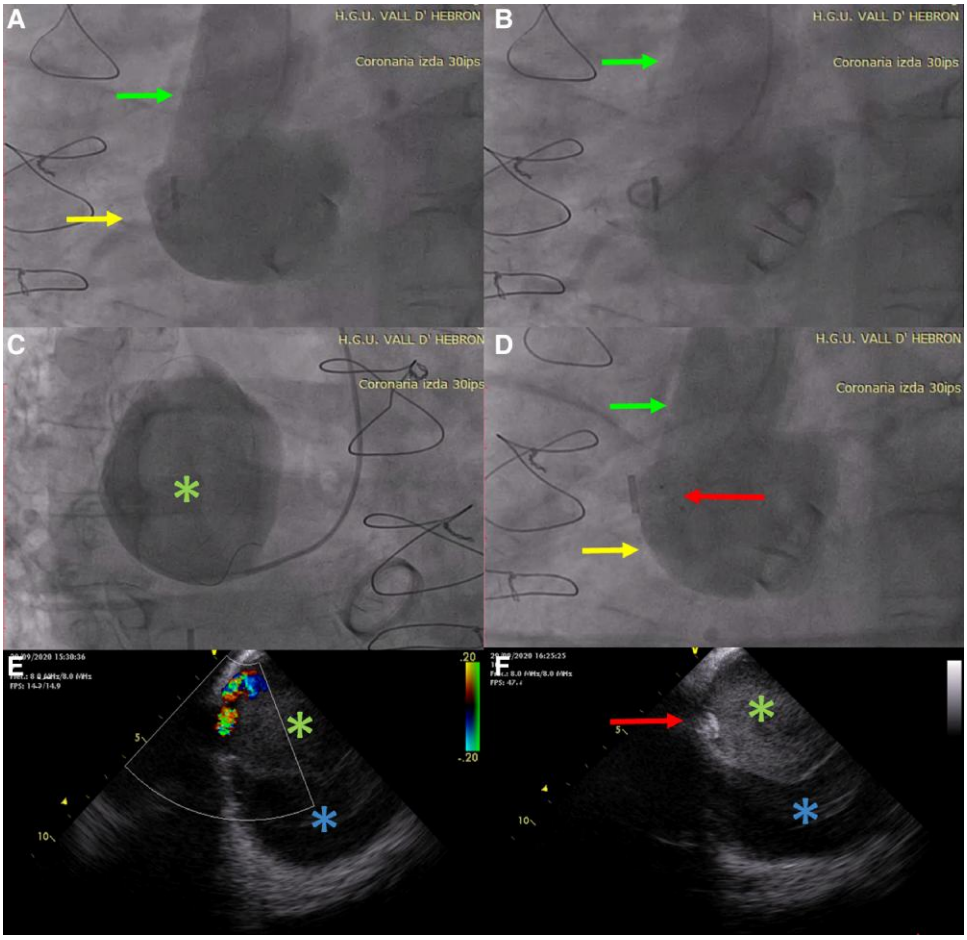


Figure 4 Angiography and ICE. Left anterior oblique (LAO) (*A*, *B*, *D*) and right anterior oblique (RAO) views showing a dilatated aortic root (arrows) and distorted aortic tube (arrows). Image (*C*) shows selective catheterization of the large pseudoaneurysm with contrast filling (asterisks). ICE (*E*, *F*) shows colour Doppler flow with Coanda effect into the pseudoaneurysm, compressing the aortic lumen (asterisks) with thrombosis after its closure. In image F, ADO II dispositive is shown (arrow).

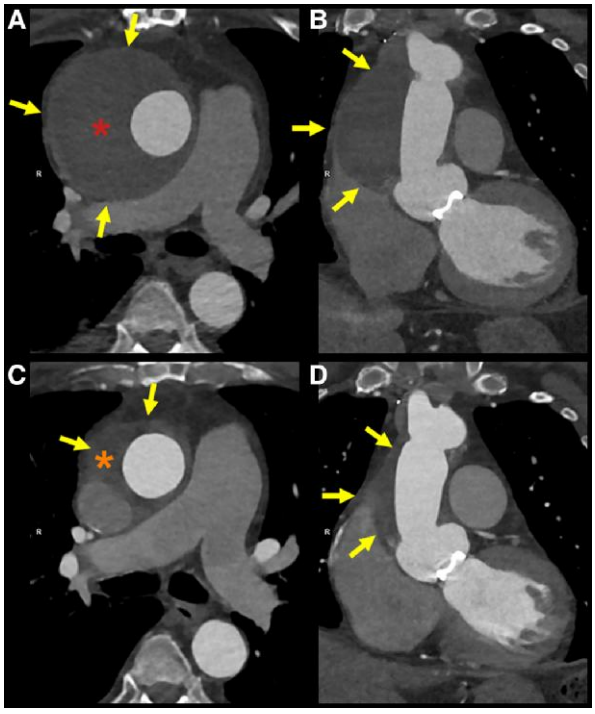


Figure 5 Axial (*A*, *C*) and coronal (*B*, *D*) multiplanar reconstructions of the pseudoaneurysm at the index CTA (*A*, *B*) and 2 years after intervention (*C*, *D*) showed reduction of the AAP size without detectable leaks.

an underlying conduction disturbance or tachyarrhythmia in a patient with structural heart disease. Subsequently, after cardiac imaging and prolonged monitoring, syncope was attributed to compression of right heart cavities and superior vena cava by a large AAP. However, jugular vein distension was not documented due to obesity and poor cervical anatomy. Chest X-ray is a poor test for the diagnosis of aortic injury, but a widened mediastinum should alert the presence of aortic disease. The aortic root and the ascending aorta can usually be well visualized with TTE[2]; unfortunately, acoustic window was poor, and the final diagnosis was reached by CTA. An ECG-gated and time-resolved CTA allowed us to diagnose and characterize the AAP and, thus, to decide whether a percutaneous approach was possible. Management of AAP requires multidisciplinary teams. Due to its low incidence, data are sparse and come from clinical case reports. According to the European Society of Cardiology (ESC) and American College of Cardiology (ACC)/American Heart Association (AHA) guidelines,[2,4] surgical repair of AAP is recommended, but is associated with high mortality and morbidity. Alternatively, percutaneous closure may be an effective treatment in selected patients. However, experience of catheter-based treatment is scarce and heterogeneous. The choice between a surgical or a percutaneous treatment should be based on surgical risk and anatomic characteristics. So far, only few case series[5,6] have been published and different techniques such as septal occluders, vascular plugs, or coil embolization have been described. In our case, a transcatheter-based strategy offered a low-risk procedure using local anaesthesia and radial access, with a high probability of success due to anatomic characteristics (focal small leak with thin neck). We chose an ADO II device because of its two flexible and symmetric retentional disks and an incomparable profile that is compatible with 4F sheaths and five to six guiding catheters. Potential complications of these procedures include incomplete closure of the defect and embolization of the device into the AAP or even to systemic circulation. In our experience, we have found this device safe and useful compared with standard devices that are more rigid and require large delivery sheaths.

In conclusion, in selected patients with high surgical risk and favourable anatomical characteristics, percutaneous closure of AAP could be considered.

Lead author biography

Pablo E. Tobías-Castillo received his medical degree with honours from San Carlos University in Guatemala, 2017. After that, he moved to Spain where he is currently in his fifth year of residency in cardiology at University Hospital Vall d'Hebron, Barcelona.

Supplementary material

Supplementary material is available at *European Heart Journal – Case Reports* online.

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Conflict of interest: None declared.

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Data availability

The data underlying this article are available in the article and in its online supplementary material.

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