Aortic Subannular Left Ventricular Aneurysm: A Rare and Surgically Correctable Cause of Angina
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Aortic subannular left ventricular aneurysm is a rare form of cardiac pathology. We report a case, including noninvasive and intraoperative imaging, of this entity in a young woman presenting with angina. The patient underwent successful surgical repair and is now asymptomatic.

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Aortic subannular left ventricular aneurysm is a rare form of cardiac pathology. Only 25 cases have been reported in the literature, with the original description being published in 1812. Clinical presentation can involve symptoms of congestive heart failure or angina. Moreover, this pathology can be congenital or acquired in association with infective endocarditis or trauma.

A 37-year-old woman was referred for evaluation of chest pain and an abnormal echocardiogram. She had a history of hypertension, hyperlipidemia, and a family history of premature coronary artery disease. She presented with a 1-year history of chest pain. She described a deep, pressure-like pain in her chest, which occurred with exertion and occasionally at rest. It was not entirely predictable, but she said it was worsening in intensity and frequency, occurring two or three times per week. It was associated with a sensation of dyspnea, but she had no presyncope or syncope.

Her medical history was otherwise unremarkable. Specifically, there was no history of acute rheumatic fever, endocarditis, or chest trauma. She was a mother of two children, the youngest of whom was 7 years old. She had no cardiac difficulties with her pregnancies.

She was an anxious-appearing Caucasian woman. Vital signs demonstrated a blood pressure of 127/81 mm Hg, a heart rate of 80 beats per minute, and regular room air oxygen saturation 100%; she was 152.4 cm and weighed 74 kg. The only abnormal physical finding was a harsh, grade 2, crescendo-decrescendo systolic murmur that was loudest at the left upper sternal border. There was no evidence of heart failure.

The electrocardiogram was normal, as was the PA and lateral chest radiograph. An exercise nuclear perfusion stress test did not show evidence of ischemia. A trans-thoracic echocardiogram revealed an abnormal structure posterior to the aorta. A transesophageal echocardiogram confirmed an echolucent, cystic-appearing structure posterior to the ascending aorta, between the aortic root

Video 1 can be viewed in the online version of this article [http://dx.doi.org/10.1016/j.athoracsur.2013.04.130] on http://www.annalsthoracsurgery.org.
and the left atrium (Figs 1, 2). Doppler color flow imaging demonstrated blood flow into this space.

Cardiac magnetic resonance imaging demonstrated this structure to be an aortic subannular left ventricular aneurysm. The mouth of the aneurysm originated from the posterior aspect of the left ventricular outflow tract, immediately below the aortic valve annulus; beneath the non-coronary and left coronary sinuses of Valsalva. The aneurysm was non-spherical, measuring 50 by 21 by 22 mm. Bidirectional flow was noted between the left ventricular outflow tract and the aneurysm sac (Video 1). In addition, thrombus was observed in the aneurysm. The aneurysm was immediately related to the left main coronary artery.

The left ventricular dimensions and systolic function were normal. The mitral valve function was normal. The aortic valve was trileaflet and functioned normally without stenosis or regurgitation. Moreover, there was no sinus of Valsalva aneurysm and no dilation of the aortic root, sinotubular junction, or the tubular ascending aorta. The results of preoperative coronary angiography were normal.

Via a median sternotomy, the patient underwent surgical closure of the communication between the left ventricular outflow tract (LVOT) and the aneurysm. Upon opening the pericardium, the aneurysm was visible at the base of the aortic root between the noncoronary sinus and dome of the left atrium (Fig 3A). Standard aortic and dual-stage venous cannulation was used, and the patient was placed on cardiopulmonary bypass. Following aortic crossclamp and cardioplegic arrest of the heart, the aorta was opened by transverse incision just above the sinotubular junction, and a 2 × 2-mm defect with a fibrous ridge (Fig 3B) was visualized in the LVOT below the left coronary cusp of the aortic valve, which was a normal trileaflet valve. The defect was closed primarily with two interrupted, 2-0 braided polyester pledgeted sutures placed from the LVOT side below the defect (Fig 4A) and exiting posterior to the base of the left coronary cusp of the aortic valve through the supra-annular ridge on the aortic side below the left main coronary artery (Fig 4B). Being placed in this manner, the sutures did not interfere with the function of the left coronary cusp in any way, nor did they compromise the left main coronary, which was widely probe patent after the repair. The aortic crossclamp time was 35 min and the total bypass time 61 min. Intraoperative transesophageal echocardiography after repair demonstrated the absence of flow in the aneurysm. This approach is similar to the surgery described by Head and colleagues [1].

Six months postoperatively, an echocardiogram showed a small, echogenic space posterior to the aortic root, which is consistent with the thrombosed aneurysmal sac. There is no flow into the space by Doppler color flow echocardiography. The aortic valve function and left ventricular function remain normal. She can exert herself normally and has no chest discomfort.

Comment

Aortic subannular left ventricular aneurysm is an exceedingly rare clinical entity with only 25 cases, including this report, cited in the literature [1-3]. In this case, the most likely etiology is congenital, as there was no history of infective endocarditis or prior cardiac surgery. Primary surgical repair to obliterate the mouth of the aneurysm was successful for this individual, excluding the aneurysm...
without impairing coronary flow or degrading the function of either the aortic or the mitral valve.

References

Chimney Technique for Aortic Dissection Involving an Aberrant Right Subclavian Artery
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We report a case involving a ruptured acute type B aortic dissection originating from an aberrant right subclavian artery (ARSA). A thoracic stent-graft was deployed in the distal arch close to the origin of the ARSA; the entry site at the origin of the ARSA was embolized with metallic coils. Perfusion of the left subclavian artery was preserved without a surgical bypass by using a chimney graft. This procedure is a feasible and less invasive treatment for high-risk sternotomy patients and is an effective strategy for acute aortic dissections involving an ARSA.


An aberrant right subclavian artery (ARSA) is the most frequent anatomic variation associated with the aortic arch, with a reported incidence of 0.5% to 2% [1, 2]; 60% of patients with an ARSA have a Kommerell diverticulum (KD) and an increased risk of rupture and dissection [3, 4]. Moreover, the association of an ARSA with a complicated acute type B aortic dissection, without a KD, is extremely rare, as in the present case. Such variations lead to additional challenges in repairing any associated ruptures, resulting in the need for novel approaches, particularly in high-risk patients such as the individual described in the present case.

The patient was a 72-year-old woman who had a history of hypertension, chronic atrial fibrillation, chronic obstructive pulmonary disease, and thyroid cancer and was admitted to our hospital because of the sudden onset of chest and upper back pain. Her computed tomographic (CT) angiography showed an acute type B aortic dissection from the distal arch to the infrarenal abdominal aorta. Furthermore, an intimal flap extended into an ARSA that arose from the aortic arch, distal to the origin of the left subclavian artery (Fig 1A).

The dissection was uncomplicated and was managed with medical therapy. However, 4 days later the patient complained of upper back pain and a chest radiograph showed left-sided hemotorax; hematologic analysis showed severe anemia (hemoglobin level, 8.3 g/dL), and aortic rupture from a false lumen (Fig 1B) was diagnosed. Detailed analysis of the new CT angiography led to the consideration that the large entry site at the origin of the ARSA was the primary entry site and that the reentry site into the abdominal aorta was small. This resulted in increased pressure in the false lumen and accounted for the rupture into the left thorax (Fig 1C).

Because of the patient’s age and high surgical risk, less invasive endovascular therapy was selected for closing the origin of the ARSA at its primary entry site. In this case, to obtain an adequate proximal landing zone and to seal the origin of the ARSA, the proximal edge of a stent graft was deployed over the left subclavian artery. However, because the patient had an anatomic particularity, placement of the stent graft proximal to the left subclavian artery may have reduced blood flow to both vertebral arteries and led to brain stem ischemia. Therefore, perfusion of the left subclavian artery was preserved using an Excluder iliac extender (W. L. Gore and Associates, Newark, DE) as a chimney graft.

After a guidewire and a 22-Fr introducer sheath were inserted into the true lumen through the right common femoral artery, under transesophageal echocardiographic guidance, a TAG stent-graft (34 × 150 mm; W. L. Gore and Associates) was inserted. A 12-Fr introducer sheath was inserted through the left brachial artery. The Excluder iliac extender (16–14.5 × 70 mm) was introduced and positioned at the proximal edge of the TAG stent graft. Angiography was performed to confirm the positioning (Fig 2A). The TAG stent-graft was juxtaposition with the left common carotid artery, and the Excluder iliac extender was subsequently deployed. The TAG stent grafts were not dilated with a balloon because of the fragility of the aorta, and the Excluder iliac extender was dilated with an Equalizer balloon (Boston Scientific, Natick, MA). Finally, the origin of the ARSA was embolized with metallic coils. Postoperative CT angiography, conducted at the conclusion of the surgery, showed a patent left subclavian stent graft without endoleaks (Fig 2B). The patient did not experience perioperative stroke or spinal cord ischemia.

Follow-up CT angiography performed 3 months after surgery confirmed the patency of the left subclavian stent graft and the absence of endoleaks. There was almost complete thrombosis in the proximal part of the false lumen, but the false lumen of the abdominal aorta remained patent because of the second entry site (Fig 2C).