Pseudoaneurysm of the Ascending Aorta at the Cannulation Site Diagnosed More Than Four Decades After Repair of Ventricular Septal Defect

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Described herein is a 69-year-old woman who developed a large saccular aortic aneurysm at a previous cannulation site for repair of a ventricular septal defect at age 25 years. The aneurysm was resected and proved histologically to be a false one. The long interval between operations (44 years) exceeds those reported previously. © 2019 Published by Elsevier Inc. (Am J Cardiol 2019;124:1962−1965)

Although a pseudoaneurysm of the ascending aorta has many causes, the main one is a consequence of a previous penetration of the aortic wall during a cardiac or ascending aortic operation[1−6] (Figure 1). A number of publications have described results of reoperation to remove or repair the false aneurysm. None have provided gross or histologic descriptions of the pseudoaneurysm or emphasized the interval between the first operation and the reoperation. Such is the purpose of this report.

Case Description

A 69-year-old white woman, who was born in December 1949, had a ventricular septal defect closed when she was 25 years of age. She thereafter was well until the age of 65 when she noted some transient nonspecific symptoms that prompted a chest radiograph which disclosed a right "suprahilar opacity" of uncertain etiology. A computed tomographic study then disclosed a saccular outpouching on the right side of the ascending aorta measuring up to 3.5 cm in maximal diameter (Figure 2). The aneurysm corresponded to the "suprahilar opacity" seen on chest radiograph.

The patient declined operative intervention on the aorta at that time and thereafter remained well until about a week before hospitalization at Baylor University Medical Center in May 2019, for transient nonspecific symptoms including nausea. Her body mass index was now 32 kg/m^2, up from 25 kg/m^2 4 years earlier. Repeat thoracic computed tomography now showed the saccular aneurysm to have a maximal diameter of 5.2 cm, a 33% increase during the previous 4 years. Coronary angiography showed a 70% diameter narrowing of the left anterior descending coronary artery and "irregularities" in the other major epicardial coronary

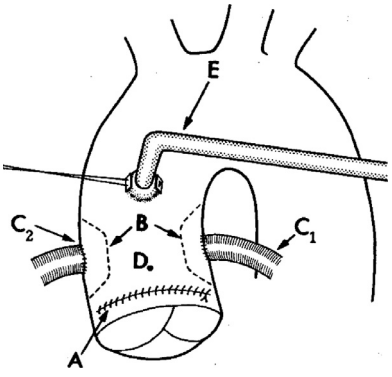

Figure 1. Drawing of the ascending aorta showing potential sites for development of pseudoaneurysm after a previous cardiac or ascending aortic operation. A = valvulotomy site; B = clamping site; C_1 and C_2 = anastomosis site; D = needle site; and E = cannulation site. Reproduced from Sullivan et al[1] with permission from publisher.

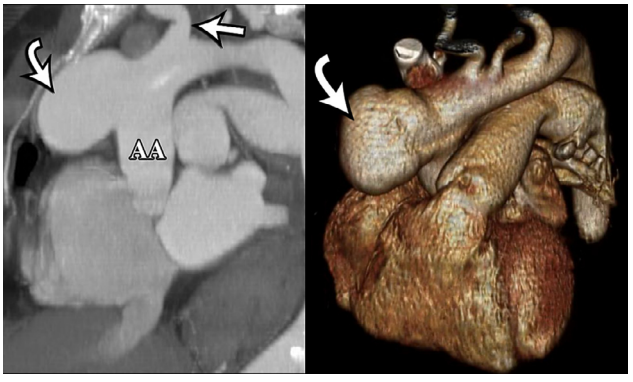

Figure 2. A computed tomography view (*left*) of the aneurysm in the ascending aorta (AA) aneurysm (*left arrow*) and a 3-dimensional volume rendering (*right*) derived from computed tomographic angiography. The off-axis oblique sagittal maximal intensity projection demonstrates the focal, saccular pouching-out (*curved arrow*) with a narrowed neck originating from the anteriolateral aspect of the mid tubular ascending aorta proximal to the origin of the innominate artery (*straight arrow*).

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See page 1965 for disclosure information.

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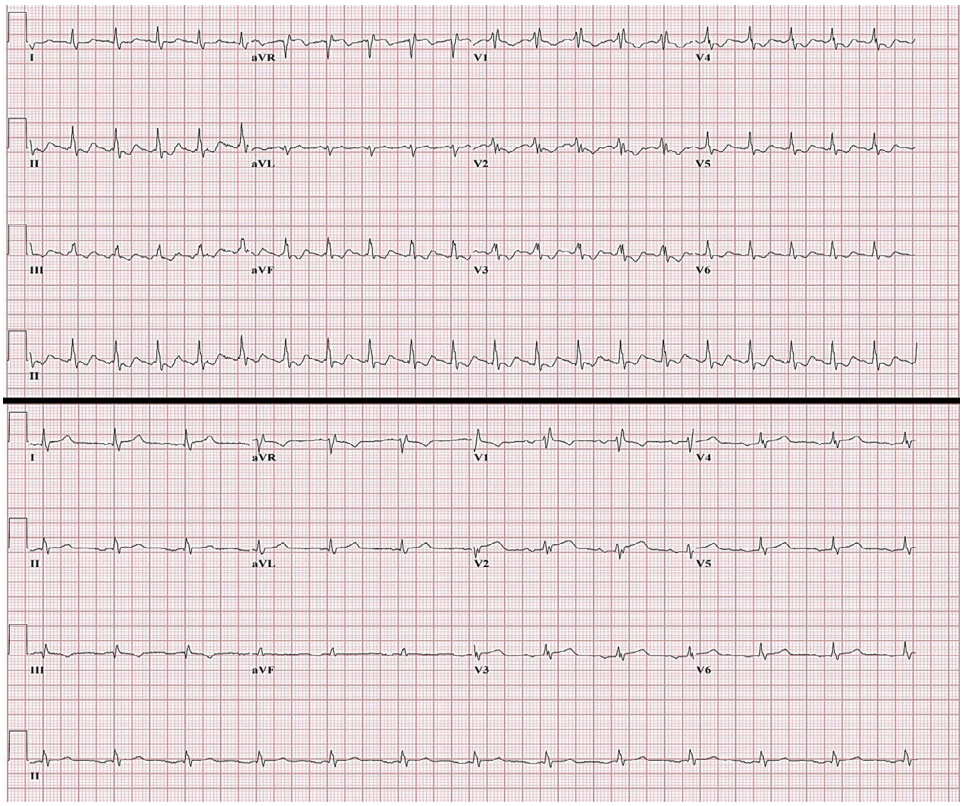

Figure 3. Electrocardiograms recorded just before (*upper*) and 1 day after resection of the aortic pseudoaneurysm (*lower*). Preoperatively, rapid atrial flutter is present and immediately postoperatively, sinus rhythm is present.

arteries. Her blood hemoglobin was 7.4 g/L and the hematocrit was 25 mm/hour. The anemia proved to be an iron deficiency. One day before the operation, she was in atrial flutter; 1 day postoperatively she was in sinus rhythm (Figure 3).

At operation, the redo-sternotomy was uneventful, and aortic and atrial cannulation sites were prepared. After cardiopulmonary bypass was established, a high aortic crossclamp was applied and antegrade cardiologia delivered. A full segment of aorta, including the mouth of the saccular aneurysm and the aneurysm itself, was resected, and replaced with a short, interposition 24 mm Dacron graft. No intraoperative or postoperative complication occurred.

Sutures partially covered by fibrous tissue were present at the junction of the normal-appearing aorta and the wall of the aneurysm. The wall of the aneurysm was much thinner than the wall of the adjacent aorta. The resected aneurysm weighed 9.6 g (Figure 4). Histologically, the wall of the adjacent aorta was normal. The wall of the aneurysm consisted of fibrous tissue, in most areas devoid of elastic fibers. No thrombus was present in the interior of the aneurysm (Figure 5).

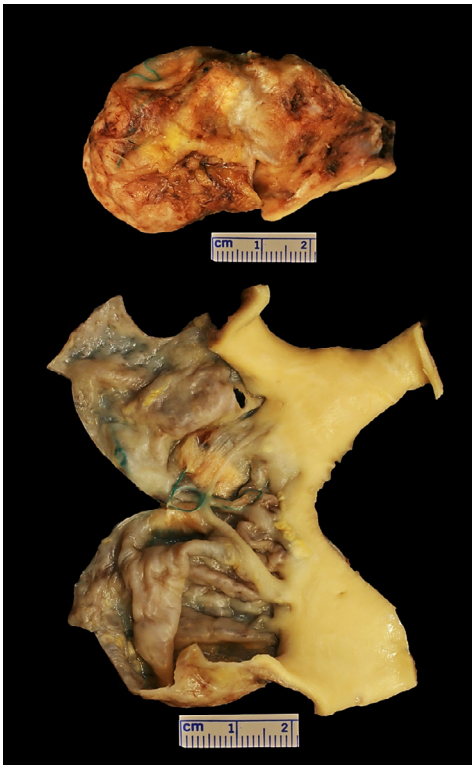

Figure 4. The intact false aneurysm (*upper*) and opened adjacent aorta and the aneurysm (*lower*). Sutures utilized 44 years earlier are shown by the arrows.

Discussion

The unique features of the present case are (1) the extremely long interval (44 years) between the aortic cannulation (used for cardiopulmonary bypass to close a

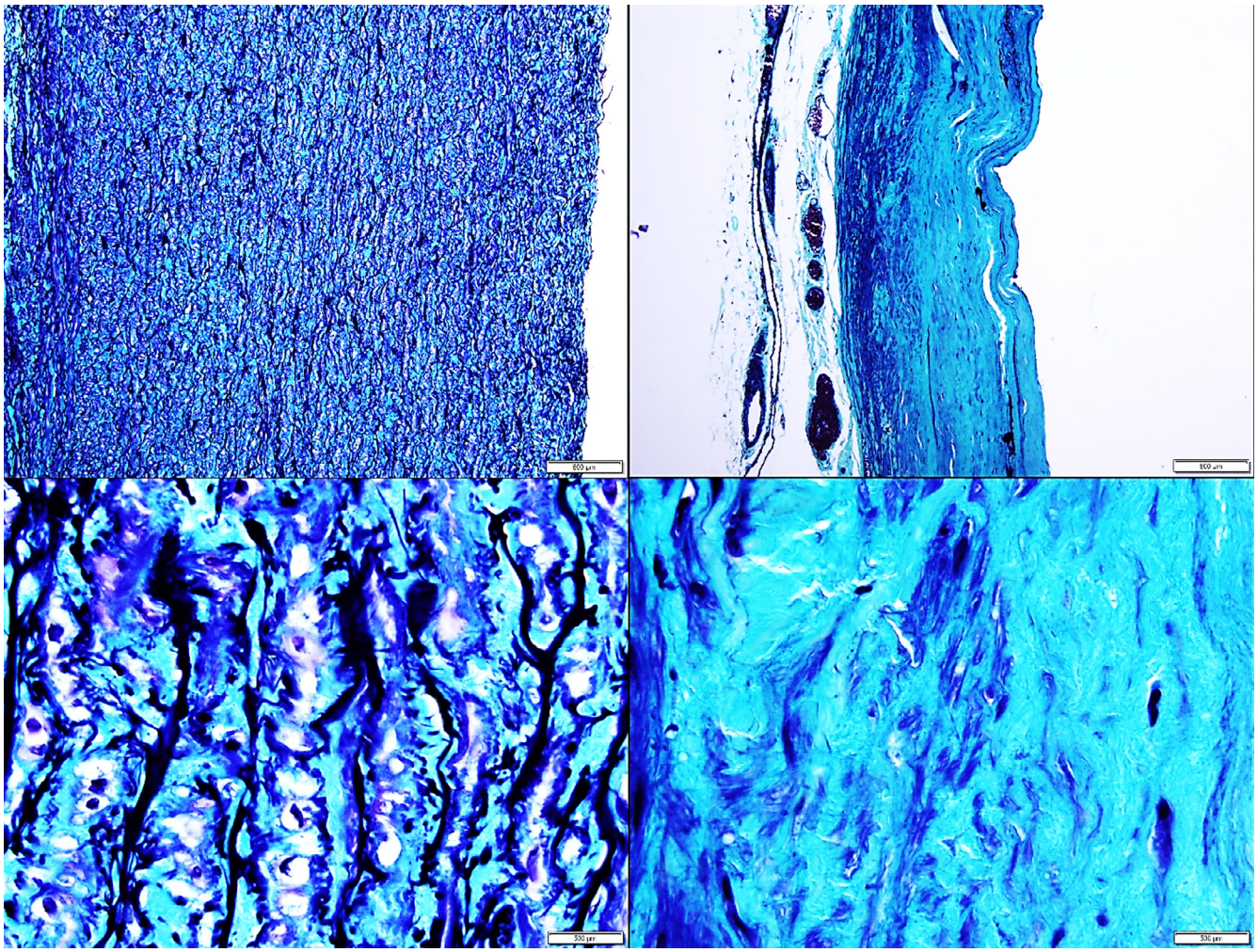

Figure 5. Photomicrographs of the aorta (*top left* and *bottom left*) and of the wall of the aneurysm (*top right* and *bottom right*). The aneurysmal wall is much thinner than the wall of the aorta. Movat stains: ×100 (*top left* and *top right*) and ×400 (*bottom left* and *bottom right*). Elastic fibers (black staining in the aortic media − *top left* and *bottom left*) and no elastic fibers in the wall of the aneurysm (*top right* and *bottom right*).

ventricular septal defect) and the subsequent diagnosis of a saccular aneurysm in the ascending aorta, and (2) the presentation of the morphologic features (gross and histologic) of the saccular aneurysm, something not reported previously. Sullivan et al[1] summarized in 1988, thirty-one[1] previously reported false aneurysms of the ascending aorta after previous operative penetration of the aortic wall: the mouth of the saccular aneurysm was at a previous aortic cannulation site in 11; at a saphenous venous insertion site for coronary artery bypass grafting in 8, and at the aortic incision done for an aortic valve operation in 12. The interval from the earlier operation to diagnosis of the pseudoaneurysm ranged from 1 to 108 months, with the interval in 13 being <6 months, mainly with superimposed infection and >30 months in only 9 patients, the longest being 108 months (9 years). Katsumata et al[2] described 10 patients with ascending aorta pseudoaneurysms and the longest interval between the 2 operations was 70 months (<12 months in 6, infection appearing to be the major culprit). Atik et al[3] described results in 42 patients who underwent ascending aortic pseudoaneurysm resection but the interval between the 2 operations is unclear. Malvindi et al[4] reviewed their experience with 43 patients who underwent a reoperation for postoperative development of an ascending aortic false aneurysm. The interval between the 2 operations ranged from 0.2 to 37 years (mean 8). Eusanio et al[5] encountered 22 ascending aortic false aneurysms after a previous operation but without information on the interval between operations. The stated interval in none of these reports was nearly as long as in the present patient.

Little data is available on the sizes of these false aneurysms. In none of the above reports was the size of the pseudoaneurysm described. Doria et al[7] reported an 8-cm-sized ascending aortic pseudoaneurysm and Parihas et al[8] described a 35-year-old man who had undergone aortic valve replacement and developed an ascending aortic pseudoaneurysm 5 months later. The aneurysm eroded through the sternum and reached a diameter of 10 cm.

The largest diameter of the pseudoaneurysm in the patient described herein was 5.2 cm. The inside of the aneurysm was devoid of thrombus. The wall of the adjacent

aorta was histologically normal. In contrast, the wall of the aneurysm was much thinner than the wall of the adjacent aorta and it contained no elastic fibers, confirming that its wall was composed of structures different from the 3 layers of the aortic wall, the definition of a false one.

Disclosures

The Authors have no commercial conflict of interest.

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