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Case Report

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Acute Ascending Aortic Pseudoaneurysm following Aortic Valve Replacement Complicated by Sternal Wound Infection

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Abstract

Pseudoaneurysm of the ascending aorta is a rare complication of cardiac surgery occurring in less than 0.5% of cases. Deep sternal wound infections (DSWI) increase the likelihood of aortic pseudoaneurysm. An ascending aortic pseudoaneurysm has high morbidity and the mortality rate has ranged from 29%-46% in the medical literature. We report a complex patient who underwent an AVR at an outside hospital complicated by DSWI requiring pectoral flap coverage. Months later, he was transferred to our institution with acute swelling of his sternum, diagnosed as massive aortic pseudoaneurysm originating from the cannulation site.

Clinical Summary

We report a 64yo male with a history of severe aortic stenosis who underwent Aortic Valve Replacement (AVR) in 2015 with a 21 mm Mitroflow bioprosthetic valve (Sorin, Arvada, CO) at an outside hospital. The postoperative course was complicated by pan-sensitive *Serratia Marcescens* deep sternal wound infection and mediastinitis requiring multiple debridements and treatment with a six-week course of intravenous vancomycin and ceftriaxone. He subsequently required a sternal reconstruction using bilateral pectoralis major flaps and a right rectus abdominis flap. He acutely did well from this hospitalization. However, he then presented three months after his index surgery with 2-3-day history of fevers, chills, and a new sternal mass. His surgeon considered acutely decompressing the mass at the bedside but decided to transfer the patient to our institution.

Upon arrival at our institution he was neurologically intact with an EKG showing sinus tachycardia, all other vitals within normal limits. His exam was impressive with a rapidly enlarging, erythematous, anterior chest wall

mass (**Figure 1a and b**). An urgent Computed Tomographic Angiogram (CTA) scan of the chest demonstrated a blush at the aortic cannulation site with active arterial extravasation into a massive pseudoaneurysm of the distal ascending aorta filling the entire anterior mediastinum (**Figure 2**). Echocardiogram demonstrated grossly normal Left Ventricle (LV) systolic function with poor visualization of the ascending aorta. Percutaneous coverage of the pseudoaneurysm as a temporizing measure was considered but not feasible due to a lack of distal landing zone or a small enough neck.

Figure 1: Upon arrival at our institution he was neurologically intact with an EKG showing sinus tachycardia, all other vitals within normal limits.

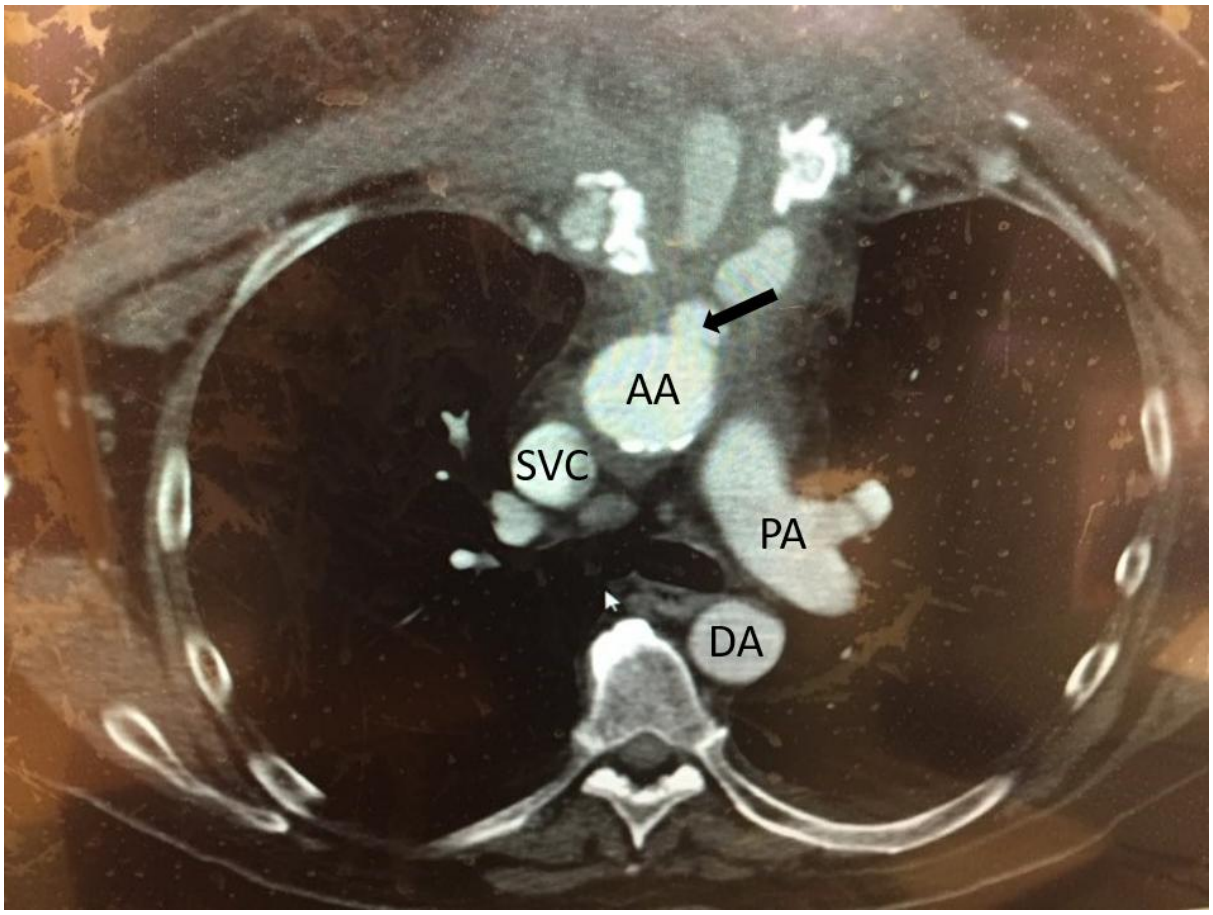

Figure 2: CT Angiogram demonstrating aortic pseudoaneurysm. AA – Ascending Aorta, PA – Pulmonary Artery, SVC – Superior Vena Cava, DA – Descending Aorta. Arrow demonstrates site of aortic defect.

Given the rapid expansion, he was taken emergently to the operating room for repair. The right femoral vein and artery were cannulated and patient was cooled. Due to several small aortic paravalular leaks and concern for LV distension, a left anterior thoracotomy was performed and an LV vent placed directly through the LV apex. Manual compression was also required to keep the LV from distending. By the time the patient's temperature reached 28ºC with the LV continuing to distend, a redo sternotomy was performed. Upon entering the anterior mediastinum, the large pseudoaneurysm was grossly entered with evidence if acute arterial hemorrhage. Circulatory arrest was initiated and the aorta was rapidly dissected out to identify the aortic cannulation site where multiple, pledgeted sutures were identified loosely attached at the original cannulation site. A cowhorn dilator was placed in the defect to control the aorta and Cardiopulmonary Bypass (CPB) was re-initiated. Now with some control of the aorta, a sternal retractor was placed and the aorta was dissected circumferentially. Under a second duration of hypothermic circulatory arrest. A large, bovine pericardial patch was then sewn in running fashion around the defect. This appeared to achieve hemostasis at the defect site and the patient was rewarmed and weaned off of CPB without difficulty. The right groin and left anterior thoracotomy were closed in standard fashion. The decision was made to pack the chest due to mild coagulopathy and prior complex closure. The patient remained intubated, sedated, and on vasopressors for the duration of the postoperative period. Total time on cardiopulmonary bypass was 171 minutes, with 24 minutes (6 minutes on entry, and 18

minutes while sewing patch) of total hypothermic circulatory arrest time. His postoperative course was complicated by seizures thought to be due to air embolism on subsequent MRI. His operative wound cultures grew *Candida albicans*. Although he underwent successful washout and closure of his flaps, he later become profoundly hypotensive with acute hemorrhage from his chest tubes. Upon emergently opening his chest, 3 liters of blood was noted in his mediastinum with bleeding from the left side of the bovine pericardial patch. The aorta quality was poor. Hemostasis was achieved with primary repair. Temporary closure was performed and the chest was packed. The patient was weaned off pressors. Ultimately, given the complex disease and concerning neurological status, the decision was made to transition to comfort care and the patient expired soon after.

Comment

Herein, we present a complicated case of an aortic cannulation site pseudoaneurysm that occurred after DSWI following an AVR **[1-4].** The original sternal infection was unlikely treated sufficiently and was most likely the cause of the late development of pseudoaneurysm. Ultimately, he had a challenging diagnosis and anatomy making emergent repair challenging. The surgical repair of aortic pseudoaneurysms are variable and largely patient dependent **[4-6].** In cases with a small defect and no sign of infection, a simple graft, composite replacement, patch, or primary closure with a simple suture can be considered **[4,7].** In the presence of active infection, aggressive debridement of the pseudoaneurysm including any grossly infected aorta with closure and repair using allograft, bovine or autologous pericardial patches **[4].** Our patient presented with a fungal mediastinal infection. *Candida* has found to be particularly associated with significantly worse outcomes, with twice as high mortality than bacterial causes of DSWI **[8].** It is likely that *Candida* mediastinal infection would require more aggressive debridement and replacement of the aorta. In a more elective setting, more complete aortic resection and replacement with homograft or rifampin-soaked graft, may be more resistant to rebleed and/ or reinfection. When considering approach to re-sternotomy in these patients, femoral artery cannulation, left ventricular venting, hypothermia, and circulatory arrest are typically required **[3,7,9,10].** In a non-emergent setting, deeper cooling, the use of CO2 on the field, and the ability to place an aortic root vent with sufficient exposure of the aorta all may have been beneficial in preventing air embolism **[11,12].** In summary, vigilance following DSWI should be maintained for several months postoperatively. Recurrent infection should warrant urgent imaging and a thoughtful approach when feasible. Multidisciplinary approaches should be considered when feasible for optimal chances of survival.

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