

MINI-FOCUS ISSUE: VASCULAR MEDICINE

BEGINNER

CASE REPORT: CLINICAL CASE

Pseudoaneurysm as a Late Complication of Chronic Stanford Type A Intramural Hematoma Requiring Endovascular Repair



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ABSTRACT

Aortic intramural hematoma accounts for 5% to 20% of patients with acute aortic syndrome. Endovascular grafts have evolved as minimally invasive alternatives for treatment in some highly selected patients. We present the case of a patient who had late complications of a chronic Stanford type A intramural hematoma requiring thoracic endovascular aortic repair. (**Level of Difficulty: Beginner.**) (J Am Coll Cardiol Case Rep 2020;2:2470-5) © 2020 The Authors. Published by Elsevier on behalf of the American College of Cardiology Foundation. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

HISTORY OF PRESENT ILLNESS

An 83-year-old man presented with acute onset abdominal pain that subsequently radiated to his chest and back. Symptoms persisted for nearly 12 h, at

which point he decided to come to the emergency department for evaluation. On arrival, his blood pressure was 219/126 mm Hg and was equal in both arms. An electrocardiogram showed sinus rhythm with first-degree atrioventricular block, nonspecific T-wave changes, and a heart rate of 86 beats/min. Results of the first set of cardiac enzyme tests were negative. The chest radiograph showed no widening of the mediastinum. He received intravenous labetalol and morphine, with only a modest improvement in symptoms.

Computed tomography (CT) angiography of the chest, abdomen, and pelvis was planned. The estimated glomerular filtration rate on admission was 18 ml/min. We did not proceed with the study given the patient's concerns about possible contrast-induced nephropathy and subsequent renal failure. An emergency transesophageal echocardiogram was performed. The images showed an intramural

LEARNING OBJECTIVES

- To appreciate potential late complications of Stanford type A IMH.
- To better understand the utility of TEVAR in treating patients with pseudoaneurysm formation as a late complication of Stanford type A IMH when performed at high-volume centers by multidisciplinary teams with experience in these procedures.
- To understand the importance of strict follow-up of patients with acute aortic syndrome, especially when managed conservatively.

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hematoma (IMH) extending from the ascending aorta through the aortic arch and propagating down the descending thoracic aorta at least to the origin of the celiac artery. Left ventricular size and systolic function were normal. There was a small circumferential pericardial effusion (Figure 1, Videos 1 and 2).

PAST MEDICAL HISTORY

Past medical history included resistant hypertension, traumatic subdural hematoma, coronary artery disease, prostate cancer, stage 4 chronic kidney disease, and hyperlipidemia.

DIFFERENTIAL DIAGNOSIS

The differential diagnosis included type A dissection, expanding thoracic aortic aneurysm, pseudoaneurysm, acute coronary syndrome, and pancreatitis.

INVESTIGATIONS

Following the transesophageal echocardiogram, noncontrast CT of the chest, abdomen, and pelvis was ordered. Images showed that the intramural hematoma originated at the aortic root and propagated to the descending thoracic aorta (Figure 2).

MANAGEMENT

The patient was admitted to the intensive care unit for treatment of Stanford Type A IMH. He was started on a labetalol infusion that was titrated to maintain a blood pressure of <120/80 mm Hg. Cardiothoracic

surgery was consulted to evaluate the patient. The calculated risk of in-hospital mortality for a non-coronary artery bypass graft major procedure was 16.85% on the basis of the EuroSCORE II score (1). This was discussed with the patient, and a decision was made to follow a more conservative approach. We were able to transition to oral labetalol, 600 mg 3 times a day, and amlodipine, 10 mg once daily. He was subsequently transferred to the telemetry floor where, on the sixth day of his hospital stay, he started to report dyspnea at rest. An audible wheeze was appreciated on physical examination. A subsequent chest radiograph showed clear lung fields, but it also revealed widening of the mediastinum that was not present on the initial study. A transthoracic echocardiogram was performed and showed no change in the luminal diameter of the ascending aorta, but a possible increase in thickness.

We considered possible intervention by thoracic endovascular aortic repair (TEVAR). He was thoroughly evaluated but again was deemed too high a risk for surgery. Blood pressure and renal function remained stable, and he was discharged home.

He was seen regularly in follow-up with office visits every 1 to 3 months. Serial imaging was not performed during these visits because the patient had expressed his wishes not to have any further aggressive measures taken. However, 1 year after his initial hospitalization, he presented with unexplained hypotension. A transthoracic echocardiogram was performed and showed that the ascending aortic

ABBREVIATIONS AND ACRONYMS

- CT = computed tomography
- IMH = intramural hematoma
- TEVAR = thoracic endovascular aortic repair

FIGURE 1 Transesophageal Echocardiography Cross-Plane Images Showing Intramural Hematoma in the Descending Thoracic Aorta

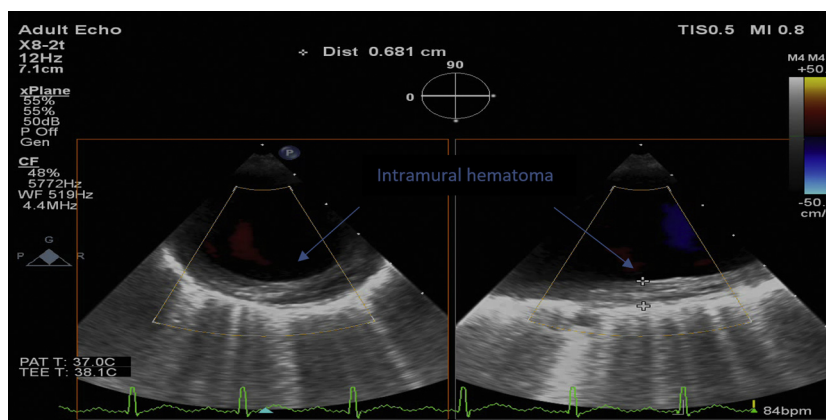
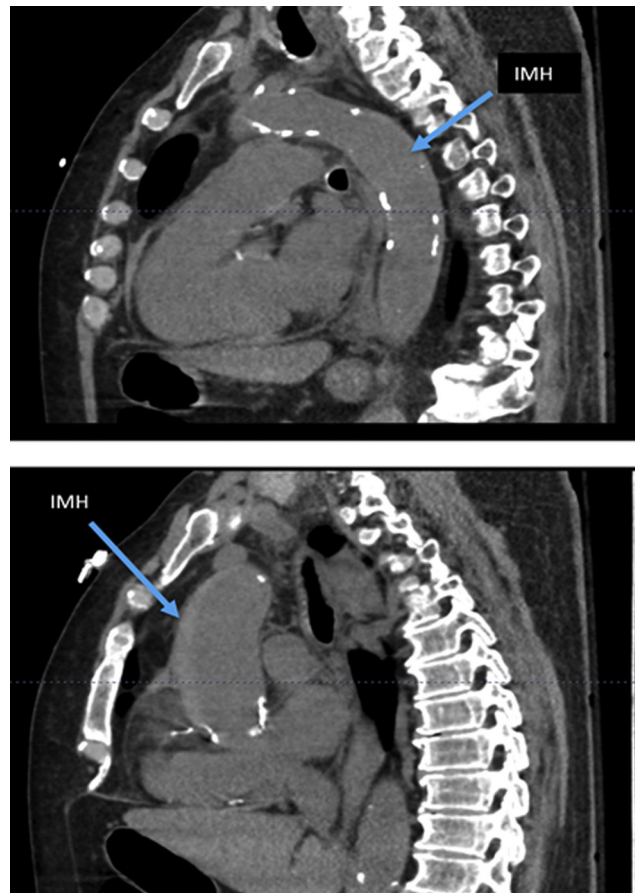
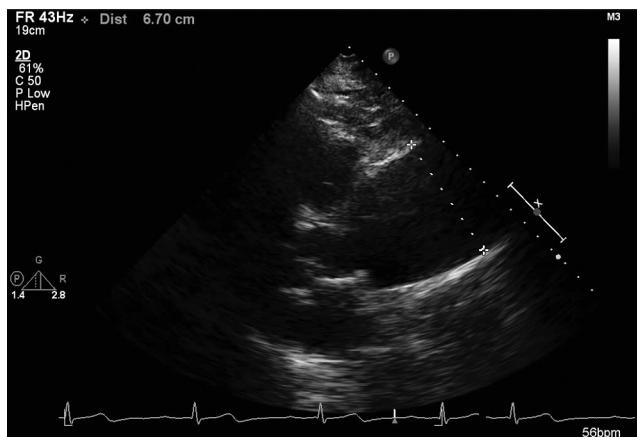


FIGURE 2 Initial Noncontrast Computed Tomography of the Chest, Abdomen, and Pelvis Showing an Ascending Aortic Aneurysm and IMH

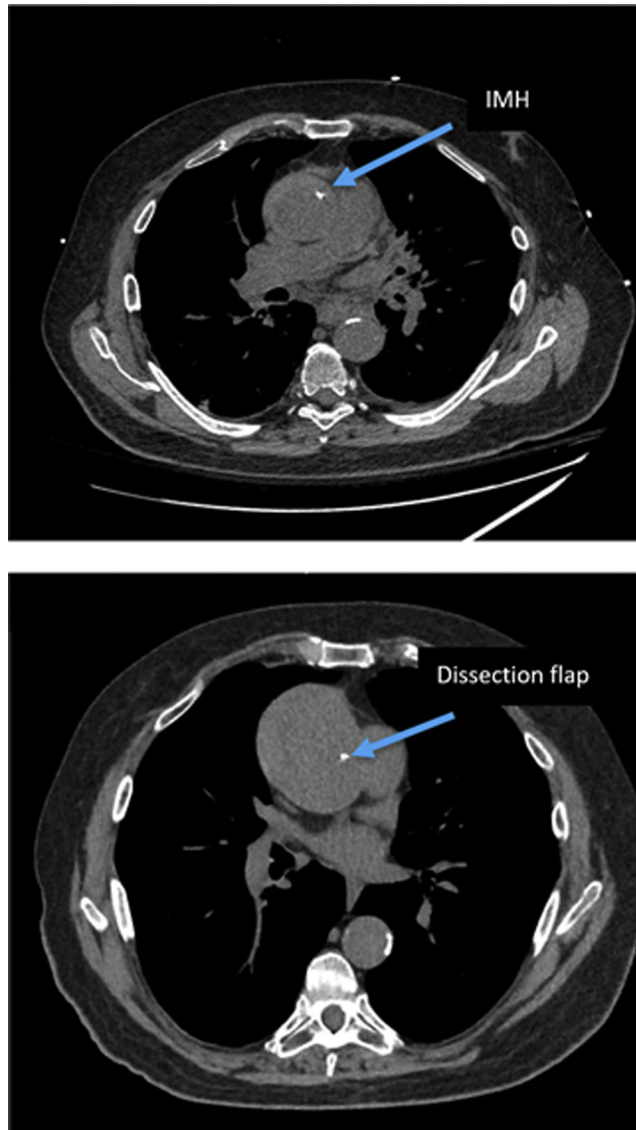
The aneurysm and intramural hematoma (IMH) originate from the aortic root and extend to just below the origins of the bilateral renal arteries (Stanford type A). The ascending aortic aneurysm measures 5.2 cm in greatest diameter.

FIGURE 3 Repeat Transthoracic Echocardiography Showing That the Ascending Aortic Aneurysm Is Now 6.7 cm in Diameter

aneurysm had increased in size, with a new diameter of 6.7 cm and a possible dissection flap (Figure 3). He was sent on an emergency basis to the hospital for further care. Initial noncontrast CT showed aneurysmal dilation of the ascending aorta that was 7.46 cm in greatest diameter and a possible dissection flap (Figure 4). A subsequent magnetic resonance angiogram with contrast confirmed the presence of a Stanford type A dissection, but it also revealed a pseudoaneurysm of the ascending aorta (Figure 5, Video 3). He was admitted to the intensive care unit, and a labetalol infusion was initiated in preparation for transcatheter repair.

The aortic valve was crossed, and a Lunderquist wire (Cook Medical, Bloomington, Indiana) was placed in the left ventricle. The first endograft, Cook Alpha 42 × 42 × 80 mm (proximal), was advanced to the ascending aorta over the stiff wire. The correct

FIGURE 4 Noncontrast Computed Tomography Showing an Enlarging Aneurysm When Compared With the Study Obtained on Initial Presentation



Calcification seen in both images suggests true and false lumina. The **arrow in the bottom panel** indicates a possible dissection flap. IMH = intramural hematoma.

position was verified, and the graft was deployed just above the sinotubular junction under rapid pacing, thus providing 2 cm of seal. A second graft, Cook Alpha 42× 42 × 80 mm (distal), was placed after removal of the delivery system of the first stent graft and was similarly deployed with considerable overlap, landing 1 cm proximal to the innominate artery. The overlap portion was ballooned with a 46-mm CODA balloon (Cook Medical) (Videos 4 and 5). Two

stents were used, as opposed to a single longer stent, to prevent a “bird’s beak” where the proximal portion of the stent graft can be very angulated. Using 2 stents also allowed for better conformation of the curvature of the ascending aorta and to prevent late graft failure. The Cook stent was chosen because of its low profile and stable deployment. It can also be modified and cut to shorter lengths if needed. Balloon expansion was not performed at the proximal or distal

FIGURE 5 Magnetic Resonance Angiography of Stanford Type A Dissection With Pseudoaneurysm



FIGURE 6 Post-Operative Noncontrast Computed Tomography Images Showing Thoracic Endovascular Aortic Repair Present in the Ascending Aorta



F = foot; H = head.

segments of the stent graft to reduce the risk of creating a type A or B dissection.

A renal angiogram was performed that revealed severe ostial stenosis of the left renal artery. The decision was made to proceed with renal artery angioplasty given the patient's history of resistant hypertension that likely led to his acute aortic syndrome. Angioplasty was performed with a 4 mm × 40 mm balloon. Residual stenosis was noted. The left renal artery was then stented with a pair of 6 mm × 14 mm balloon expandable stents.

DISCUSSION

Aortic IMH accounts for 5% to 20% of patients with acute aortic syndrome (2). Aortic IMH is defined as a hematoma confined to the tunica media of the aorta in the absence of a detectable intimal tear (3). Some investigators have suggested that IMH represents acute aortic dissection where thrombus has formed to obliterate the false lumen (4). Fewer than 10% of these cases resolve spontaneously, with 16% to 47% progressing to dissection. Mussa et al. (5) evaluated 6 studies including 309 patients with either type A or type B IMH. The 30-day mortality rates were 4% to 19% for medical management, 11% to 24% for open surgical repair, and 0% to 6% for TEVAR.

In this case, the patient's age and comorbidities put him at a significantly increased risk of complications from open repair. In a comprehensive review performed by Muetterties et al. (6), the most common diseases of the ascending aorta treated with TEVAR were dissection, followed by pseudoaneurysm, penetrating aortic ulcer, aortic rupture, and aneurysm. TEVAR for the treatment of IMH is relatively less common (7,8). Our patient had an exceedingly rare aortic syndrome of ascending aortic aneurysm of 6.5 cm, dissection, intramural hematoma, and pseudoaneurysm. Also of interest was the timing of his intervention, almost 1 year after his initial presentation. He was successfully treated with TEVAR without any complications.

FOLLOW-UP

At the time this paper was written, 4 months after his operation, the patient remained hemodynamically stable. He tolerated the procedure well. We continue to manage his blood pressure with labetalol 300 mg three times daily, amlodipine 10 mg daily, and torsemide 10 mg daily. His post-operative noncontrast CT scan showed good endograft expansion and no pericardial effusion (Figure 6). We plan to perform a

magnetic resonance angiogram of the chest in the future to evaluate for aortic graft endoleak.

CONCLUSIONS

When performed by an experienced multidisciplinary team, TEVAR may be a reasonable alternative to surgical repair for patients with serious ascending aortic disease and who have a high operative risk.

AUTHOR DISCLOSURES

The authors have reported that they have no relationships relevant to the contents of this paper to disclose.

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KEY WORDS aorta, complication, dissection, vascular disease

APPENDIX For supplemental videos, please see the online version of this paper.