Case Report

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Crater-Like Ulceration of Aortic Arch

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Abstract

We report the case of a 78-year-old female who presented to our hospital with signs of hemorrhagic shock and breathlessness. A transthoracic echocardiography demonstrated pericardial effusion. Computed tomography of the chest showed a penetrating atherosclerotic ulcer of the aortic arch with an intramural hematoma of the ascending and descending aorta. Endovascular repair with stent-grafting was urgently performed and a pericardial window placement was done to reduce mediastinal bleeding.

Key Words

Aorta · Endovascular cardiography · Computed tomography scan

Introduction

In 1934, Shennan [1] was the first author to describe penetrating atheromatous ulcers (PAUs) of the thoracic aorta. In 1986 Stanson et al. [2] delineated PAU as a distinct clinical and pathological entity. Today PAU is considered one of the three forms of acute aortic syndrome, including also intramural hematoma (IMH) and classic aortic dissection. Distinctive for PAU is an entrance tear into the media, without reentrance tear back into the lumen. PAUs usually involve the descending thoracic aorta but may also be located in arch and ascending aorta. Our elderly patient with PAU in the aortic arch had the chance to be treated immediately with endovascular prosthesis and pericardial drainage, solving the problem with a less invasive procedure and preserving hemodynamic stability in a fragile patient.

Case Report

A 78-year-old female with a history of severe hypertension and hypercholesterolemia presented to the emergency room of our hospital. A few hours earlier the patient had suffered rapid onset of interscapular pain radiating to the anterior chest with progressively increasing discomfort. At first clinical evaluation she had signs of hemorrhagic shock, cardiac tamponade, and breathlessness progressing to respiratory insufficiency. She remained conscious just before being sedated, intubated, and ventilated. Urgent transthoracic echocardiography confirmed pericardial effusion (PE) with signs of cardiac tamponade. Chest computed tomography (CT) demonstrated a PAU in the aortic arch (10 × 13 mm) with an IMH involving the ascending and descending aortas (Figs. 1 and 2). The patient was immediately transferred to the operating room, progressively regaining stable hemodynamic conditions following appropriate supportive treatment. Transesophageal echocardiography confirmed the diagnosis of PAU and PE (Fig. 3). A rapid meeting of cardiac and vascular teams prompted a hybrid approach. As the first step, an endoprosthesis was deployed in the aortic arch (Val-

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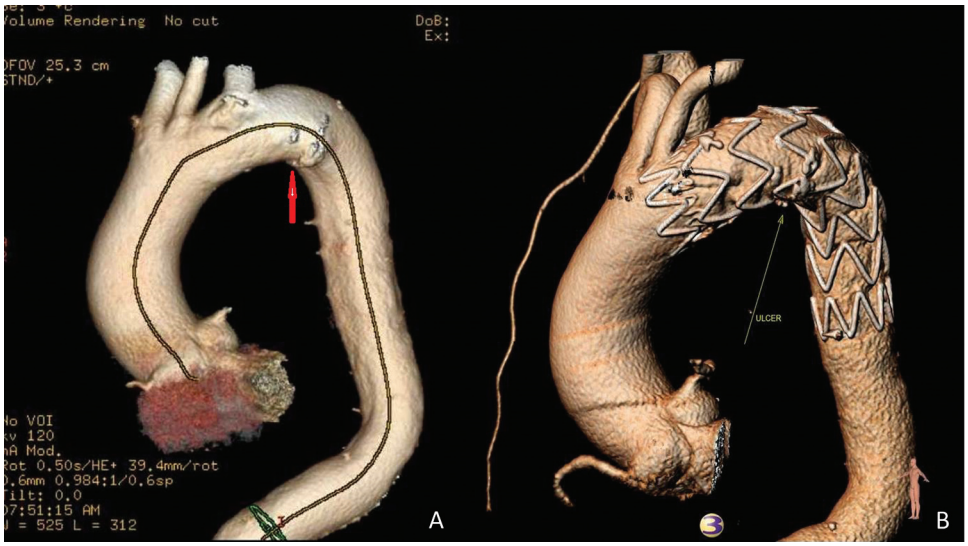

Figure 1. 3D reconstruction. A. Preoperative CT scan of the aorta, showing an atherosclerotic ulcer in the distal part of the aortic arch. B. Postoperative CT scan of the aorta showing reduction of the intramural hematoma, and no leaks.

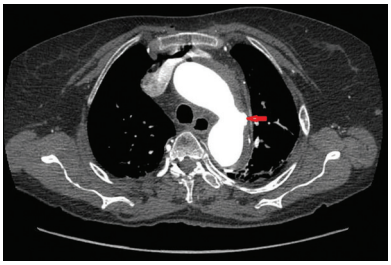

Figure 2. Preoperative CT scan of the aorta: an atherosclerotic ulcer in the distal part of the aortic arch.

iant® Captivia® 36 mm, Medtronic Inc., Minneapolis, MN, USA) with an adequate landing zone incorporating total left subclavian artery exclusion. Then, through midline subxiphoid access, the cardiac surgeon performed a pericardial window and chest tube placement, relieving cardiac tamponade and restoring stable and good hemodynamic conditions. At the end of the procedure a transesophageal echocardiography confirmed the closure of the PAU (Fig. 3). The intensive care course was uneventful, with the patient extubated and discharged to the cardiac ward on day 1. On the fourth postoperative day a CT scan confirmed good results of the procedure, with marked reduction of the IMH with only a minimal residual in the descending aorta, and absence of PE (Fig. 1). On day 7 the patient was discharged to a rehabilitation program.

Discussion

PAU is defined as an atherosclerotic ulceration that penetrates from pathologically thickened intima through the internal elastic lamina into the media of the aortic wall [1,2]. PAU often involves the descending aorta and more rarely the ascending aorta and the aortic arch. The typical profile of a patient with PAU is an elderly individual with multiple risk factors for atherosclerosis and often already documented manifestations of atherosclerotic disease, such as coronary and/or aortic disease, cardiovascular disease, and/or peripheral arterial disease. The true incidence of PAU is unknown. The acute clinical presentation of PAU is similar to that of other acute aortic pathologies including aortic dissection.

In a study from Yale University, ulcers were identifiable retrospectively among 7.6% of patients admitted with diagnosis of acute dissection [3]. Ganaha et al. [4] studied symptomatic IMH, with and without PAUs, and found that the presence of PAU conferred a worse prognosis and that the maximum diameter and depth of the PAU were predictors of disease progression.

Irrespective of their location, PAUs tend to have a bad prognosis, with a high incidence of rupture and aortic dissection. Based on the unpredictable and, in many cases, unfavorable clinical progress of these patients, emergent surgical therapy has been advocated. Therefore, an early diagnosis is essential.

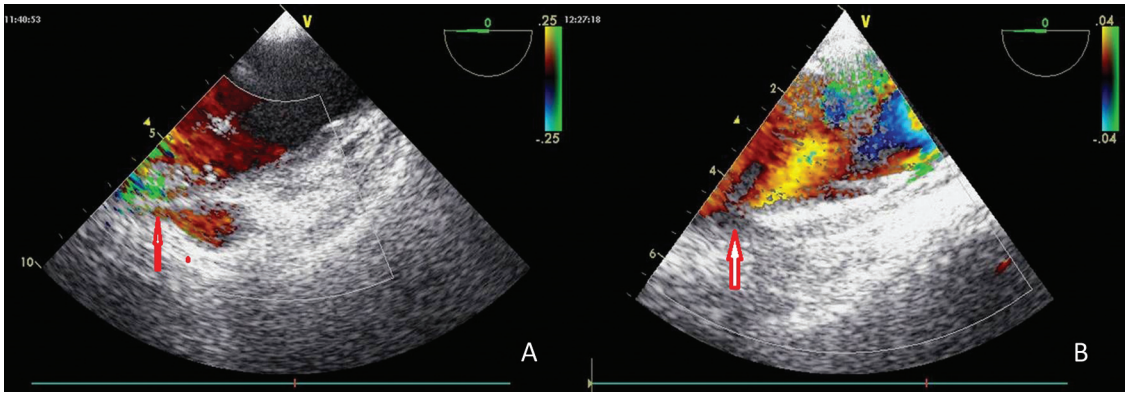

Figure 3. A. Preoperative transesophageal echocardiography (TEE) at the aortic arch revealed an atherosclerotic ulcer and a tear. B. Postoperative TEE showed no evidence of a tear.

PAUs in the aortic arch are a rare condition and only a few cases are reported in the literature. Coady et al. [3] retrospectively reviewed the images of 198 patients initially diagnosed with aortic dissection and concluded that 15 of them had penetrating atheromatous ulcer; only 2 patients had PAU in the ascending aorta, and none in the arch. Nathan et al. [5] retrospectively analyzed 388 patients admitted to their hospital with diagnosis of PAU; the results suggested that especially symptomatic patients had to be urgently treated.

It is known that when an atherosclerotic plaque penetrates into the media, the media is exposed to pulsatile arterial flow, causing hemorrhage into the wall, initially without an intimal flap. PAU can develop in a late pseudoaneurysm, rupture, or dissection. The rupture rate has been reported to be as high as 38% for PAU, presenting as acute aortic syndrome [5]. The results of traditional open surgery may be disappointing due to the age of patients and the magnitude of the surgery. The advent of new endovascular stent grafts offers a good option in the management of these complex patients and highlights the importance of a multidisciplinary approach to their care.

Conflict of Interest

The authors have no conflict of interest relevant to this publication.

Comment on this Article or Ask a Question

References

1. Shennan T. Dissecting aneurysms. Medical Research Council. Special Report Series, No. 193. 1934.
2. Stanson AW, Kazmier FJ, Hollier LH, Edwards WD, Pairolero PC, Sheedy PF, et al. Penetrating atherosclerotic ulcers of the thoracic aorta: natural history and clinicopathologic correlations. Ann Vasc Surg. 1986;1:15–23. 10.1007/BF02732450
3. Coady MA, Rizzo JA, Hammond GL, Pierce JG, Kopf GS, Elefteriades JA. Penetrating ulcer of the thoracic aorta: what is it? How do we recognize it? How do we manage it? J Vasc Surg. 1998;27:1006–1016. 10.1016/S0741-5214(98)70003-5
4. Ganaha F, Miller DC, Sugimoto K, Do YS, Minamiguchi H, Saito H, et al. Prognosis of aortic intramural hematoma with and without penetrating atherosclerotic ulcer: a clinical and radiological analysis. Circulation. 2002;106:342–348. 10.1161/01.CIR.0000022164.26075.5A
5. Nathan DP, Boonn W, Lai E, Wang GJ, Desai N, Woo EY, et al. Presentation, complications, and natural history of penetrating atherosclerotic ulcer disease. J Vasc Surg. 2012;55:10–15. 10.1016/j.jvs.2011.08.005

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EDITOR'S QUESTIONS:

1. Please comment on how the penetrating ulcer in the arch caused the PE. If you believe that the ulcer did not cause the effusion, please comment on why you expected that simple pericardial drainage would satisfactorily resolve the ascending issue and associated PE.

PE is a reaction to the penetrating ulcer in the arch; in fact, it is serous and not a blood effusion. A simple pericardial drainage will be able to stabilize the patient but it will not resolve the ascending issue. To resolve the possible complication of the penetrating ulcer you need the endovascular prosthesis. The combination of endovascular stent graft and pericardial window will be able to stabilize the patient.

2. Please comment on your choice of endovascular prosthesis.

This endovascular prosthesis has an adequate landing zone incorporating total left subclavian artery exclusion.

3. Please comment on how you had confidence that the placement of an endovascular device would not disrupt the intimal layer of the ascending and descending aortas, leading to severe iatrogenic complications.

We look to a penetrating ulcer diameter of about 2-3 mm and we know that in the small PAU the probability of severe iatrogenic complications will be lower, and we trust in the team experience.