Surgical treatment of thoracoabdominal aortic mural and floating thrombi extending to infrarenal aorta

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The case of a 49-year-old man with thoracoabdominal aortic mural and floating thrombi extending to the infrarenal aorta and occlusion of the common iliac artery is described. He had no factors promoting thrombosis, with a history of thrombectomy of the femoral artery. The thoracoabdominal aortic thrombi were successfully removed with a Forgaty catheter through a thoracotomy under simple aortic clamping and subsequent femoro-femoral cardiopulmonary bypass. Intravascular ultrasound performed through the femoral artery after thrombectomy revealed that little mural thrombi remained and that the celiac, superior mesenteric, and bilateral renal arteries were all patent. (J Vasc Surg 2003;37: 1324-7.)

Mural aortic thrombi are an important cause of distal embolization, and may represent a relevant segment of the cryptogenic sources of arterial embolization.[1] There have been several reports of thrombectomy of the ascending aorta,[1-3] the aortic arch,[3-5] the descending thoracic aorta,[1,5-10] or the abdominal aorta.[1] To our knowledge, however, only one case of thoracoabdominal aortic thrombus extending through the celiac axis[7] has been described. In the present article, we describe a case with thoracoabdominal aortic mural and floating thrombi extending to the infrarenal aorta, and successful thrombectomy with intravascular ultrasound (IVUS).

CASE REPORT

A 49-year-old man with right hip and thigh pain at rest was referred to our department. He had undergone thrombectomy because of acute occlusion of the left femoral artery 5 years before, and mural thrombi in the descending thoracic aorta were recognized at transesophageal echocardiography after the operation. He was given warfarin sodium after the thrombectomy, but this anticoagulation therapy was discontinued at another hospital 2 years previously.

At presentation, the right femoral artery and the arteries distal to it were not palpable, and pulsation of the left popliteal artery and the arteries distal to it was weak. Ankle brachial index on the left side was 0.59, and on the right side was not measurable. Aortograms showed narrowing of the infrarenal abdominal aorta, occlusion of the right common iliac artery, and patent celiac, superior mesenteric, and bilateral renal arteries (Fig 1). Electrocardiograms indicated sinus rhythm. Coronary artery disease was thought to be absent because of neither abnormal Q wave nor change in ST-T segment and no depression of the ST segment in transesophageal atrial pacing. Echocardiograms demonstrated no thrombi in the left atrium and ventricle, with normal wall motion. Computed tomography (CT) scans showed mural and floating thrombi in the thoracoabdominal aorta, including an infrarenal segment (Fig 2). Erythrocyte and thrombocyte counts, antithrombin III, lupus anticoagulant, anticardiolipin antibody, and proteins C and S levels were all within normal limits. Heparin was continuously administered intravenously to maintain activated coagulation time at more than 150 minutes until surgery.

A left thoracotomy through the seventh intercostal space was performed, and the descending thoracic aorta was examined with epiaortic ultrasound. Cardiopulmonary bypass cannulas were inserted into the right atrium through the right femoral vein and the patent left femoral artery. First, the midthoracic aorta, in which no mural thrombi were observed at epiaortic ultrasound, was simply clamped, and the aorta distal to the clamped site was circumferetially and subtotally incised. Blood from the aorta distal to the aortotomy was sucked and transfused rapidly through the venous cannula inserted into the right femoral vein. Thrombi in the descending thoracic aorta were removed with forceps, and thrombectomy of the abdominal aorta was repeatedly performed with an 8F Forgaty catheter. A fine fiberoscopy probe was inserted into the abdominal aorta through the aortotomy, and residual mural thrombi were revealed (Fig 3). Therefore repeat thrombectomy was performed. Thrombectomy was completed 26 minutes after simple aortic clamping. Air and detached thrombi were evacuated with blood perfused through the cannula inserted into the left femoral artery. The aorta distal to the aortotomy was clamped, and femoro-femoral partial cardiopulmonary bypass was established. The aortotomy was closed with 3-0 polypropylene monofilament running suture during cardiopulmonary bypass. Cardiopulmonary bypass time was 21 minutes. An IVUS catheter was inserted into the abdominal aorta through the left femoral artery after cardiopulmonary bypass weaning, and the arterial cannula was removed from the femoral artery. IVUS revealed that little mural thrombi

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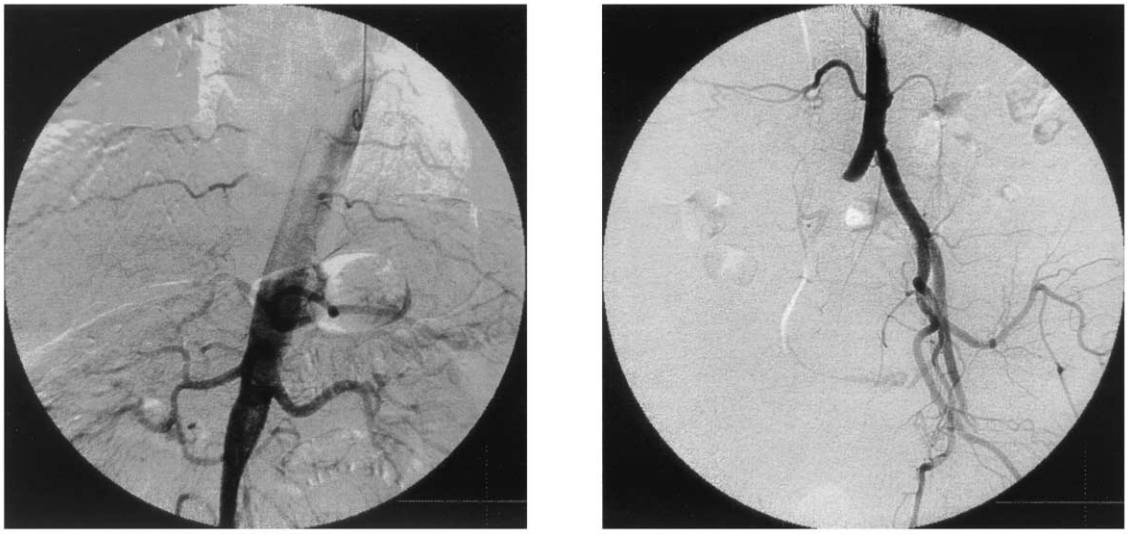

Fig 1. Aortogram shows narrowing of the infrarenal abdominal aorta, and patent celiac, superior mesenteric, and bilateral renal arteries (*left*), and occlusion of the right common iliac artery (*right*).

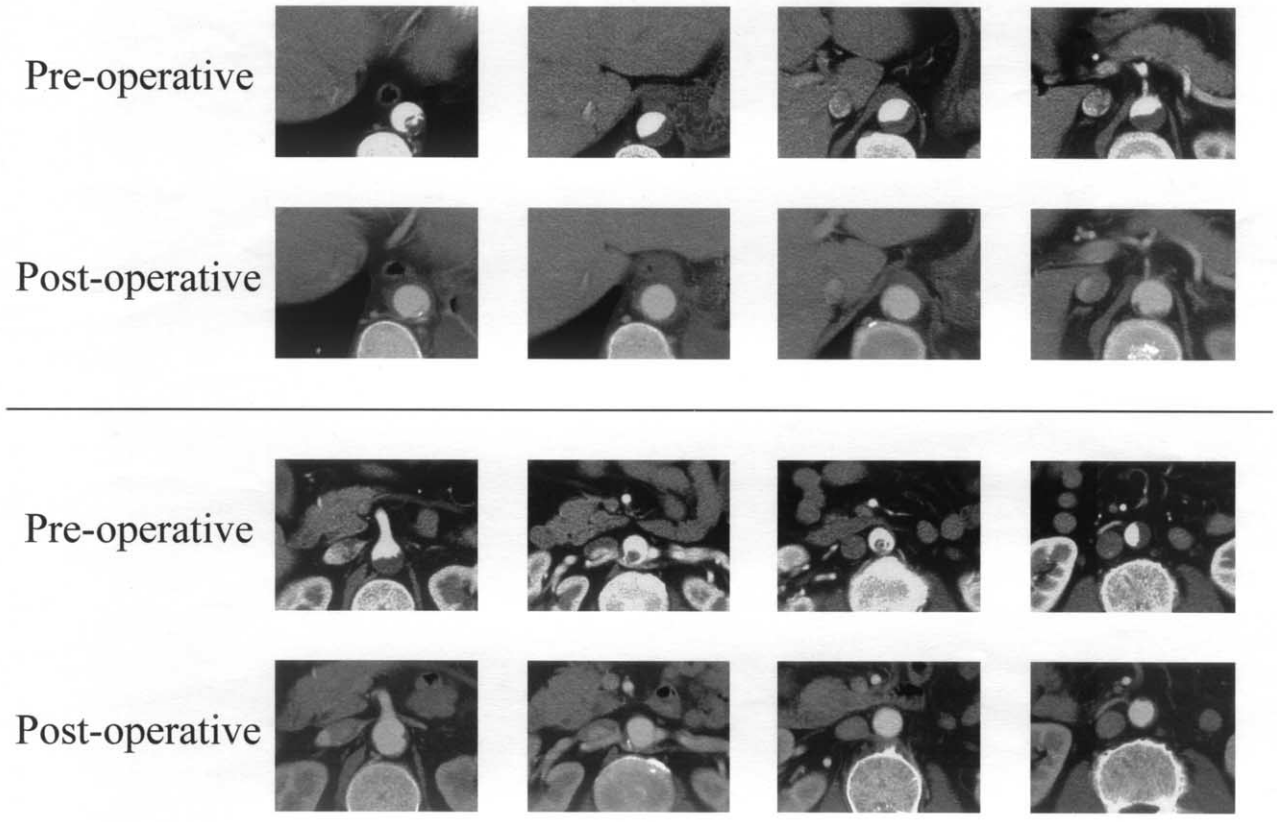

Fig 2. CT scans reveal mural and floating thrombi in the thoracoabdominal aorta, including an infrarenal segement, preoperatively (*upper panel*), and little mural thrombi in the thoracoabdominal aorta postoperatively (*lower panel*).

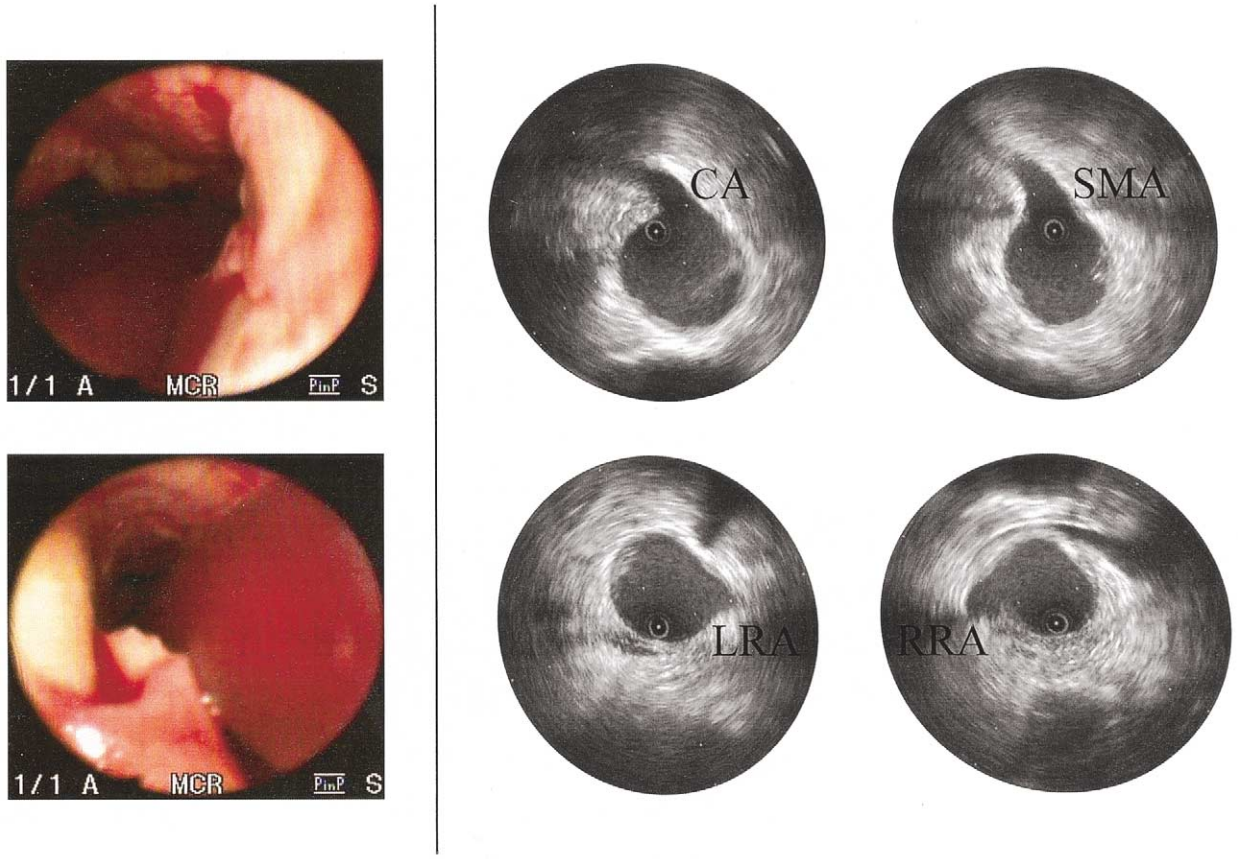

Fig 3. Residual mural thrombi were revealed with a fine fiberscopy probe inserted into the abdominal aorta through the aortotomy (*left panel*). Intravascular ultrasound revealed little remaining mural thrombi and that the celiac artery (*CA*), superior mesenteric artery (*SMA*), and left renal artery (*LRA*) and right renal artery (*RRA*) were patent (*right panel*).

remained and that the celiac, superior mesenteric, and bilateral renal arteries were all patent (Fig 3). Additional thrombectomy of the right iliac, femoral, and popliteal arteries was performed through the right femoral artery, and thrombectomy of the left femoral and popliteal arteries was performed through the left femoral artery. After thrombectomy, all peripheral arteries of both lower extremities were well palpable. Pathologic examination demonstrated old thrombi without organization.

Postoperative course was uneventful, without dysfunction of the liver and kidney, and no symptoms of gastrointestinal ischemia were recognized. Little mural thrombi in the thoracoabdominal aorta were evident on a CT scan (Fig 2). After the operation, warfarin with ticlopidine and aspirin were administrated to keep international normalized ratio approximately 2.0. The patient was discharged on postoperative day 17 and was doing well 3 months after thrombectomy, without thromboembolic events.

DISCUSSION

Most systemic embolisms are caused by thrombi in the left side of the heart. Mural aortic thrombi, however, are another important cause of arterial thromboembolism.[1] Some hypercoagulable states, eg, primary polycythemia vera,[6] antiphospholipid antibody syndrome,[4] protein C deficiency,[4] depressed activation of protein C,[1] and factor V Leiden deficiency,[10] have been associated with aortic mural thrombi. Laperche et al[4] reported that 17% of patients with thrombosis of the aortic arch had evidence of a hemostatic disorder. Our patient had no factors promoting thrombosis.

Treatment of aortic mural thrombi, including surgical indications, remains undefined. Although resolution of primary aortic mural thrombi with warfarin therapy[11] has been demonstrated, warfarin-related cholesterol microembolization[12] is known. The value of antiplatelet agents, ie, aspirin, ticlopidine, and cilostazol, has not been determined. Meanwhile, successful thrombolysis of an aortic arch thrombus with alteplase (recombinant tissue plasminogen activator) in a patient after mesenteric embolism has been reported.[13] Reber et al,[1] however, discussed the potential danger of thrombolytic agents selectively lysing the

stalk of pedunculated lesions, releasing the bulk of the lesions into the bloodstream and thus causing massive embolization. Thrombolysis for pedunculated thrombi may be contraindicated. In selected patients, surgical treatment has been successful.[1-10] Mean age of 29 described patients,[1-10] including the present case, was 51.4 Å 12.9 years. Therefore surgery may not be indicated in elderly patients. The exact surgical risk and long-term results are not known, although no embolization recurred during median follow-up of 13 months.[1]

Surgical treatment of descending thoracic aortic thrombi, ie, thrombectomy only[1,6,9,10] or graft replacement,[8] is performed through a thoracotomy[1,6,8-10] or transabdominally[1] with simple aortic clamping[1,6,8,9] or left atrial to femoral artery bypass.[10] As for thoracoabdominal aortic thrombus, to our knowledge there has been only one case in which thrombus extended through the celiac axis.[7] In the present case the thoracoabdominal aortic mural thrombi extended farther, to the infrarenal aorta. Although intraoperative transesophageal echocardiography is invaluable in determining extent of thoracic aortic thrombus and in confirming complete excision,[7] it cannot be used to observe a thrombus extending to the abdominal aorta. There have been no reports on intraoperative use of IVUS to detect aortic thrombi. Epiaortic ultrasound was performed to ascertain that the aortic clamp was proximal to the thrombi, and IVUS through the femoral artery was performed to confirm whether thrombi in the abdominal aorta remained after thrombectomy.

In conclusion, thoracoabdominal aortic mural and floating thrombi extending to the infrarenal aorta were successfully removed through a thoracotomy with simple aortic clamping and subsequent femoro-femoral partial cardiopulmonary bypass with IVUS.

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