ENDOVASCULAR TREATMENT OF A SYMPTOMATIC THORACIC AORTA THROMBI

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Abstract

Aortic mural thrombus is a rare condition with 0.45% incidence in the general population, being the thoracic aorta the most affected portion. In the absence of an atherosclerotic wall lesion, other specific conditions should be studied and excluded.

The authors describe two clinical cases of a 64 years old male and a 48 years old female that despite a non-atherosclerotic diseased aorta, had a thoracic mural thrombus which presented clinically with mesenteric and lower limb microembolization, respectively.

Once presented with peripheral embolization, the aim should be to exclude the embolic source and prevent end organ malfunction. TEVAR has been developed as a therapeutic solution to exclude the embolic source, with a high rate of technical success and few comorbidities associated. Long term anti-coagulation is debatable but may prevent further embolization events.

INTRODUCTION

Thoracic aortic mural thrombus developing, in the absence of a pre-existing aortic disorder, is an uncommon pathologic process with potential devastating outcomes, once it may complicate with multi-level embolization. Literature describes a 0.45% incidence in the general population, according to autopsy reports, with 17% of them showing evidence of distal embolization and in 6% even being considered the cause of death.[1]

CASE REPORTS

Clinical Case I

A 64 years old male was admitted in the emergency department with abdominal discomfort of approximately three days of evolution. The patient had no previous findings of atherosclerotic disease with only one cardiovascular risk factor, hypertension. On clinical evaluation, he was hemodynamically stable but revealed a mildly tender abdomen without peritoneal signs, and palpable pedal pulses.

The thoraco-abdominal computed tomography demonstrated a large sessile thrombus on the descending thoracic with significant lumen narrowing, no atherosclerotic plaques and signs of embolization to the superior mesenteric artery (SMA). An electrocardiogram-Holter monitoring showed sinus rhythm, absence of arrhythmic episodes or atrial fibrillation. Transthoracic echocardiogram showed normal cardiac chambers dimensions, normal wall thicknesses, and regional contractility, with a 58% ejection fraction, and normal aortic, mitral, and tricuspid valves structure.

Under intravenous unfractionated heparin, we excluded the thoracic aortic lesion with a Valiant Thoracic Stent Graft with Captivia Delivery System™ MedtronicÒ (TEVAR). Final angiogram showed excellent positioning of the stent-graft distal to the origin of the left subclavian artery without luminal defects. The luminal thrombus could not be visualized. Additionally, the SMA was cannulated and mechanical thrombectomy was performed with a catheter-directed rhyolitic/thrombolytic system (AngioJet™ Peripheral Thrombectomy System, Boston). Final angiogram demonstrated resolution of the SMA embolic lesions and flow to all major branches. Systemic heparin anticoagulation was converted to warfarin with a target international normalized ratio (INR) of 2.0-3.0 and the patient discharged five days after the last procedure.

Follow up study was negative for thrombophilia and autoimmunity diseases but revealed deviations on hemogram that led to subsequent study and diagnosis of chronic myelocytic leukemia, so we decided to keep the patient on long-term anticoagulation.

Figure 1 *Thoraco-abdominal computed tomography demonstrated a large sessile thrombus on the descending thoracic.*

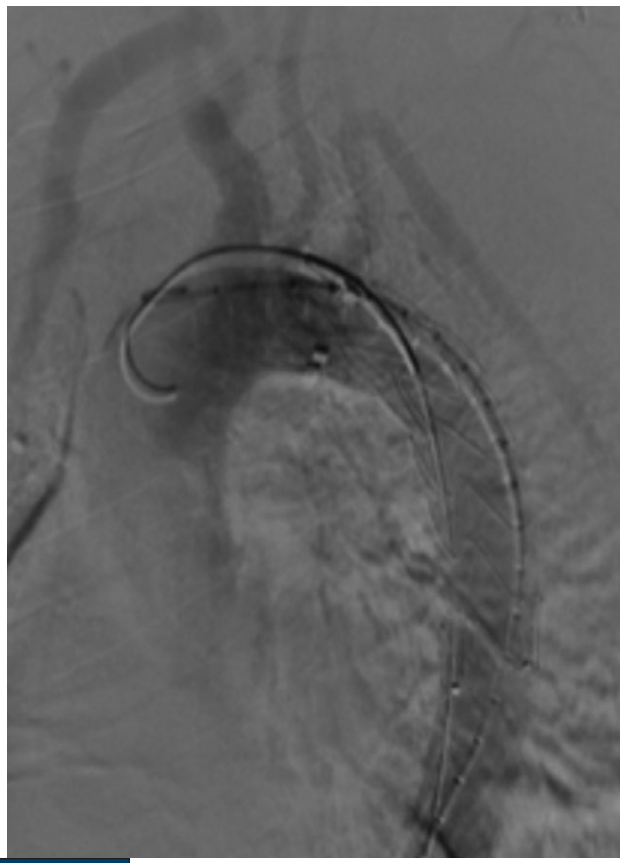

Figure 2 *Thoracic aortic lesion exclusion with a Valiant Thoracic Stent Graft with Captivia Delivery System™ Medtronic (TEVAR).*

Clinical Case II

A 48 years old female with a personal history of thyroid papillary carcinoma was admitted in the medical department with clinical signs of bilateral, acute (<24h), blue toe syndrome. The patient had no previous finding of atherosclerotic disease or cardiovascular risk factors. On presentation, she was hemodynamically stable, with bilateral, palpable distal pulses. Physical inspection also revealed a cyanotic discoloration prominently noted on right dorsum of the foot and distally on the second and third digits so as on the first and second digits of the left foot with toes being cold and painful.

Additional thoraco-abdominal computed tomography revealed a large pedicled thrombi in the descending thoracic aorta. Electrocardiogram-Holter monitoring showed sinus rhythm, absence of arrhythmic episodes or atrial fibrillation. Transthoracic echocardiogram showed normal cardiac chambers dimensions, normal wall thicknesses, and regional contractility, with a 64% ejection fraction, and normal aortic, mitral, and tricuspid valves structure.

Under intravenous unfractionated heparin, we excluded the thoracic aortic lesion with a Valiant Thoracic Stent Graft with Captivia Delivery System™ Medtronic (TEVAR). Final angiogram showed excellent positioning of the stent-graft distal to the origin of the left subclavian artery without luminal defects. The luminal thrombus could not be visualized. Completion angiogram to the lower limbs revealed peripheral micro-emboli causing, predominantly, luminal defects on the right anterior tibial artery and left posterior tibial artery. After thoracic aorta stent graft deployment, the peripheral emboli were treated with catheter-directed thrombolysis for 24 hours. Interval angiography demonstrated resolution of her embolic lesions with good runoff bilaterally and recover of bilateral pedal pulses. Systemic anticoagulation with heparin was converted to warfarin with a target INR of 2.0-3.0 and the patient discharged three days after the procedure.

Follow up study was negative for thrombophilia and autoimmunity diseases so as for malignancy recurrence. Despite these findings, attending her personal history, we decided for long-term anticoagulation.

Follow up

Patients have now 26 and 34 months after the initial event. The postoperative course of both patients was uneventful and no adverse event or thrombus recurrence was diagnosed during follow-up.

TEVAR follow up was orientated following the same guidelines from the European Society of Vascular Surgery for the intramural hematoma and penetrating aortic ulcer. They repeated thoraco-abdominal computed tomography at three and six months and then yearly. Future orientation is, once stable condition persists at three years, to extend the interval to three years.

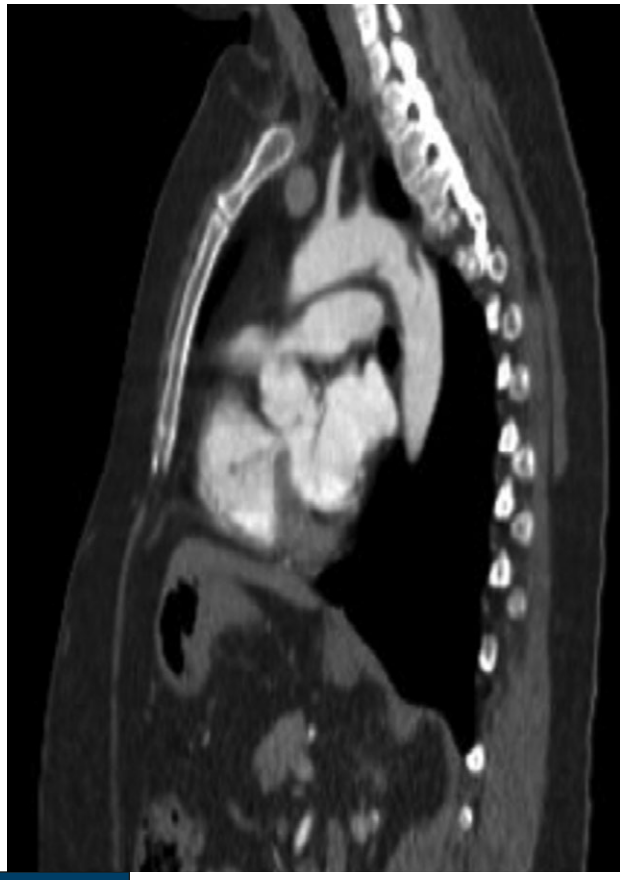

Figure 3 *Thoraco-abdominal computed tomography revealed a large pedicled thrombi in the descending thoracic aorta.*

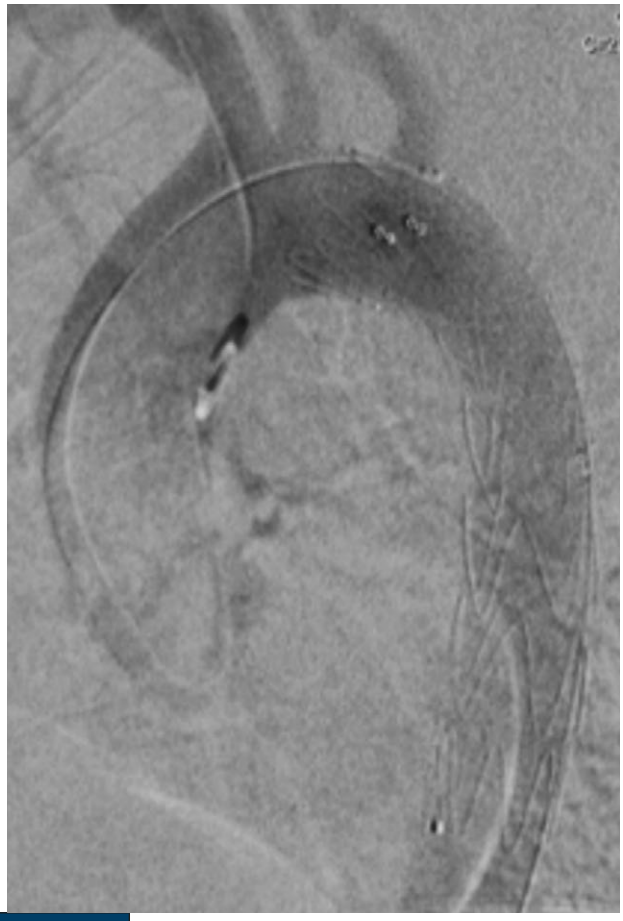

Figure 4 *Thoracic aortic lesion exclusion with a Valiant Thoracic Stent Graft with Captivia Delivery System™ MedtronicÒ (TEVAR).*

DISCUSSION

Aortic thrombus develops, mainly, from an atherosclerotic wall lesion or a hypercoagulable condition. Other, less frequent but still described causes, include smoking, steroid use, trauma, drug abuse, heparin-induced thrombotic thrombocytopenia, rheumatism, primary endothelial disorders, iatrogenic causes and history of vasculitis. Morphologically they normally present as sessile or pedunculated aortic thrombi, especially when symptomatic.

The thoracic descending aorta is the most common location, accounting for 37.5%.[2] This pathology may present asymptomatically being incidentally found, however, frequently, presents with multiple level embolism that leads to innumerous impediments including end-organ damage, acute limb ischemia and a high mortality associated. In case of embolization, there is a high risk of recurrence with potential dire consequences.[3-5]

Therapeutic options include anticoagulation alone,[6] thrombolysis, thromboaspiration, open thromboendarterectomy and exclusion using endoluminal stent grafts, nevertheless the best approach is still debatable.[7] Failure of each of the above-mentioned approaches is frequently defined by persistent thrombus, thrombus enlargement or recurrent embolization.

One of the most extensive and recent literature reviews were published by Karol Meyermann *et al*[8], with 74 patients, 43 (58%) females with a median age of 54.3 years described. In 56.8% the first presentation was lower extremity embolization. Medical therapy was found to be more likely associated with persistent thrombus compared with open thrombectomy or thoracic endovascular aortic repair (TEVAR; $P < .05$). In the open repair group which included 19 patients, 6 (31.6%) had persistent thrombus while in the endovascular group, which included 29 patients, only 3 (10%) had recurrent thrombi with recurrent emboli.

In another study by Patra *et al* recurrence was observed in 27% patients treated medically[9], and that is why we do not consider it as a good definite solution. The authors consider that anticoagulation should be started immediately once an embolization event occurred and then the embolic source excluded.

Considering these last subject, open aortic surgery has the advantage of histological examination, including immunohistochemical analysis, but comprises a recurrence rate up to 10-20% and a high morbidity and mortality up to 30%.[10]

Regarding an endovascular approach, although, experiences are still currently limited to few cases reported

in the literature, early results present a high technical success rate, approaching 100%. When bearing in mind the histological examination, intra-arterial biopsy has already been described in the interventional radiology literature[11] and may be a solution.

Reflecting about the embolization rate, the reported rate is considerably low and there are some technical aspects, that the authors believe should be taken into consideration: use a subclavian approach for the diagnostic aortography, use intravascular ultrasound for precisely identify the affected segment of the aorta, temporary balloon occlusion of selected visceral vessels to prevent embolization and a seal zone at least 2 cm proximal and distal to the thrombus.

The role of medical therapy as an adjuvant to surgical or endovascular intervention has traditionally been determined on an individualized basis. A number of reports endorse the use of continued, long-term, anticoagulation after either open surgical repair or TEVAR[12-14], which the authors believe is the best conduct.

In conclusion, when presented with a thoracic aorta thrombus complicated with distal embolization, the authors consider that anticoagulation complemented with embolic source exclusion with TEVAR should be the initial treatment strategy, whenever feasible.

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