Eight-Year Follow-Up of a High-Risk Patient Treated for Crawford Type II Thoracoabdominal Aortic Aneurysm (TAAA) with a Multistage Hybrid Open-Endovascular Repair

Dariusz Janczak, MD, PhD,1,3 Jerzy Garcarek, MD, PhD,2 Robert Bogdanik, MD,3 Tomasz Szydelko, MD, PhD,1,3 Mariusz Chabowski, MD, PhD,1,3 and Maciej Wojtanowski, MD, PhD3

The case of a patient with type II TAAA (thoracoabdominal aortic aneurysm), who underwent multistage hybrid procedure, is presented. This high-risk patient was excluded as ineligible for conventional open repair. At first, the bypass between both common carotid arteries was inserted. Then, the transperitoneal viscerorenal revascularization was performed to ensure blood perfusion. At the end, the stent graft from the aorta arch to its bifurcation was deployed with endovascular techniques. This stent graft covered left common carotid artery, left subclavian artery, visceral trunk, superior mesenteric artery and both renal arteries. The patient had been observed for eight years with relatively low complication rate. The hybrid open-endovascular repair (HOER) shows promising results in patients at prohibitive risk for classic reconstruction.

Keywords: thoracoabdominal aortic aneurysm, endovascular repair, Crawford classification, hybrid procedure, viscerorenal revascularization

Introduction

Thoracoabdominal aortic aneurysm (TAAA) is relatively uncommon disease, which is mostly caused by atherosclerosis. It constitutes about 6% of all aorta aneurysms and about 10% in patients over 70.1-2) According to the Crawford classification, there are five types of TAAA. Crawford type II means the aneurysm distal of the left subclavian artery down to below the left renal artery. Its treatment is still challenging for the surgeon, as both pleural and abdominal cavities must be opened, as well as the sufficient blood supply to vital organs through bypass has to be provided.

There is growing interest in combining various procedures in TAAA, e.g., debranching visceral and aorta arch arteries followed by endovascular stent-graft implantation without using extracorporeal circulation.3,4) Hybrid operations of TAAA require a reversed Y forked stent from the ascending aorta to the brachiocephalic trunk and left common carotid artery, or bypass between subclavian and carotid arteries, in debilitated patients.5) The revascularization of visceral and renal arteries with the following endovascular exclusion is performed.6,7)

Case Report

A 72-year-old male patient was admitted to the Department of Surgery in 2003 due to severe pain in the
A High-Risk Patient Treated for Crawford Type II (TAAA)

The emergency preoperative computed tomography angiography (CTA) displayed a large Crawford type II TAAA, involving the left subclavian artery and reaching the Dacron vascular prosthesis that was inserted earlier in 1995, due to an abdominal aorta aneurysm. Its transverse diameter was 8 cm in the thorax, and 9 cm in the abdomen, respectively. The patient was unfit for traditional, open thoracoabdominal reconstruction. Therefore, a multistage, hybrid procedure was advocated.

The first stage consisted of a brachiocephalic trunk to the left common carotid artery bypass, anastomosed in a side-to-side manner. The prosthetic conduit of reinforced GoreTex was located subcutaneously in the pretracheal area.

The second stage consisted of bilateral renal arteries, superior mesenteric artery, and visceral trunk debranching via transperitoneal access. The extra anatomic bypass was anastomosed end-to-side to a Dacron prosthesis of the abdominal aorta (Fig. 1). The bifurcated bypass was debranching renal artery, upper mesenteric arteries and visceral trunk. An end-to-end anastomoses were performed (Fig. 2).

Six days later, the third stage was performed. The stent graft (Gore) was deployed at the distal aortic arch from the origin of left common carotid artery till the upper part of a conventional, vascular prosthesis in the abdominal aorta. The stent graft covered the renal and superior mesenteric arteries and visceral trunk.

The postoperative course was uneventful. The patient did not develop any procedure-related neurological deficits. He was discharged in a good, general condition. Follow-up studies were conducted at 6 and 12 months, and yearly, thereafter. Patient evaluations included CTA. He was administered the antiplatelet drugs.

After six years, the patient was readmitted to the hospital, due to abdominal pain. The clinical examination revealed a palpable pulsating mass in the left middle abdominal area. The CT angiograph showed a large 5-cm pseudoaneurysm of the aorta with secondary endoleak at the junction between the stent graft and vascular abdominal prosthesis, which had a high risk of rupture. All endografts and conventional visceral and renal bypasses were patent (Fig. 3). The reason for this serious complication was chronic compression on the aortic wall by the stent graft. Successful endovascular treatment was applied. Another stent graft was inserted through the right femoral artery.

After one year, the patient was admitted in critical condition with massive gastrointestinal bleeding. The endoscopic and CT angiographic evaluation confirmed an aorto-esophageal fistula. A stent graft and esophageal prosthesis were implanted. Unfortunately, the octogenarian patient expired shortly thereafter, due to hemorrhagic shock and multi organ failure.
Discussion

There are three accepted treatment options for TAAA: conventional open surgery, fenestrated stent graft implantation and visceral vessel bypass, followed by an endovascular graft. Good surgical candidates are still treated with open TAAA surgical repair. Hybrid operations provide a highly successful option in high-risk patients. The operations are safer, better tolerated, more effective, and less invasive. The possible complications of hybrid operation are: endoleak, fistula, pseudoaneurysm, or occlusion of the stent graft.8) There are many benefits of hybrid procedures: reduced blood loss, reduced visceral and lower extremity perfusion, avoidance of thoracolaparotomy, no need for lung collapse, avoidance of thoracic aortic cross-clamping, and no need for hypothermic circulatory arrest.9,10) What is more, hybrid procedures diminish the extent of the operation, decrease the complication rate and shorten the hospital stay. The proper surgical approach must be established preoperatively, based on the results of imaging methods, i.e. computed tomography angiography (CTA), magnetic resonance angiography (MRA), or calibrated angiography11,12) CT scan with 3D reconstructions allows the precise recognition of anatomic relationship between visceral and renal arteries as well as the aortic arch branches. The decision of choosing either a stent graft or vascular prosthesis had to be taken preoperatively.13) All these factors improve results, even in high cardiac risk patients who were not earlier planned to undergo the open Crawford operation, due to an almost 100% mortality rate.14–16) Catheter techniques and endovascular procedures have changed modern vascular surgery. The concept of the endovascular method, combined with revascularization of renal and visceral arteries, is a new, promising strategy.

Conclusion

The present case of long survival of a poor-risk patient with TAAA, who had prior aortic surgery, confirms that combined endovascular and open surgical treatment (hybrid repair) is an appealing alternative to the open Crawford procedure.

Disclosure Statement

The authors do not declare any disclosure statements about potential conflicts of interest.

References

1) Resch TA, Greenberg RK, Lyden SP, et al. Combined...