



## Case Report

# A Case Report on a Successful Treatment of Late Abdominal Aortic Aneurysm Rupture after Endovascular Repair

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### Abstract

Endovascular repair of abdominal aortic aneurysm (EVAR) is currently indicated for most patients with abdominal aortic aneurysm (AAA). Complications that appear within the follow-up period may require quick endovascular or surgical intervention. Untreated type I and III endoleaks may cause aneurysmal sac enlargement and aneurysm rupture. This case report presents the technical aspects of an emergent operation for post-EVAR rupture of AAA in an elderly male patient who was admitted to the hospital due to a hypovolemic shock. The emergent tomographic scan revealed a massive type Ia endoleak and retroperitoneal hematoma. The constant decrease in the patient's blood pressure required traditional operation. After clamping of the abdominal aorta, the proximal part of the stent graft was extracted from the infrarenal aorta and shortened by 5 cm. This maneuver allowed the interposition of a tube graft between the infrarenal aorta and remaining part of the stent graft. This technique is commonly used for the primary operation of AAA; however, some issues may arise when it is performed after stent grafting. A thin-walled stent graft is out of proportion to the thick-walled Dacron prosthesis and may easily be damaged by the surgical suture. Our case proves that it was possible to bevel the body of the stent graft despite its metal parts; moreover, a special technique of applying the sutures between the prosthesis and the stent graft stump resulted in a good anastomosis and satisfactory final outcome.

**Key words:** Aorta; Stent graft; Endoleak; Rupture; Reoperation

### Introduction

Endovascular repair of abdominal aortic aneurysm (EVAR) has become an established method of treatment. Compared with open surgical repair, EVAR is associated with lower perioperative mortality and quicker postoperative recovery, and may prevent aneurysm rupture in up to 93% of operated patients at 9 years of follow-up [1]. Post-EVAR ruptures are infrequent and only affect 1.5 to 2% of cases within a 2-3 year period after the primary procedure [2,3]. Type I and III endoleaks are responsible for this complication in most instances [4,5]. Endovascular management of post-EVAR ruptures is focused on dealing with endoleaks and includes different endovascular techniques like deployment of a proximal aortic cuff, placement of secondary aortic stent graft, iliac limb extension and placement of an interposition stent graft [5]. More than half of post-EVAR ruptures require open surgery [5].

This case report presents the technical aspects of surgical treatment for post-EVAR rupture using the traditional operation method. All procedures were focused on limiting the operative time and the choice of surgical technique to achieve a good-quality vascular anastomosis between the stent graft and the Dacron prosthesis.

### Material and methods

An 80-year-old male patient consulted the emergency unit because of a sudden and severe abdominal pain that he had experienced 2 hours earlier. On admission, the patient was pale with a blood pressure below 90 mmHg but fully conscious and cooperative. The left flank of his abdomen was tender upon palpation but without rebound pain. He had a history of abdominal aortic aneurysm (AAA) treatment 4 years previously. The initial diameter of the aneurysm was 90 mm. He underwent EVAR and received a bifurcated device (Excluder) without any complication. He had been invited for regular control computed tomography

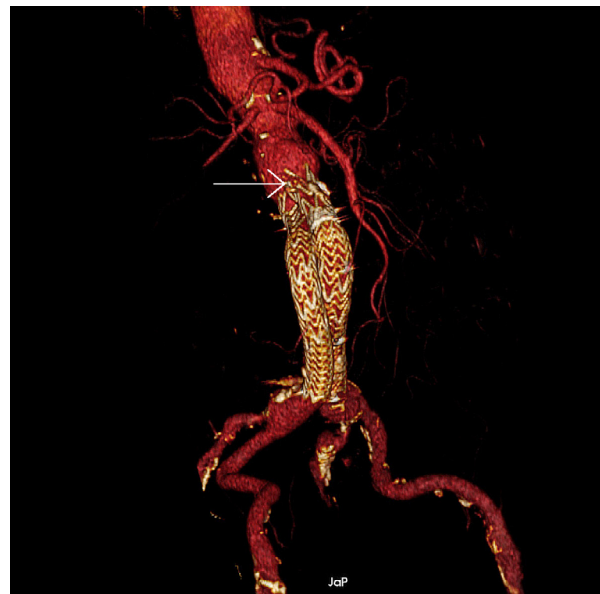
angiography, and 6 months before the aneurysm rupture, there was a slight suspicion of a type Ia endoleak with an aneurysm diameter of 62 mm. However, he was scheduled for another tomographic scan in 6 months. Consequently, it is emphasized that the authors of this report had not been involved in the patient's treatment prior to his visit to the emergency unit. Aneurysm rupture was anticipated from the very beginning, and emergent computed tomography angiography was performed. Standard injection protocol was utilized comprising of 80ml of contrast Ultravist 370 infused at the speed of 4ml/s *via* 18G intravenous catheter. Only arterial phase was obtained. CT revealed a large retroperitoneal hematoma and a massive type Ia endoleak (Figure 1).



**Figure 1:** Axial computed tomography angiography in arterial phase performed on admission demonstrating the stent graft and contrast gathering outside it in the aneurysmal sac by the left side [arrow] due to the endoleak type Ia.

The abrupt decrease in the patient's blood pressure necessitated his immediate transfer to the operating theater, and the abdomen was opened *via* a midline longitudinal incision. The large retroperitoneal hematoma required supraceliac aortic cross-clamping. The dissection of the hematoma enabled the visualization of the left-sided rupture of the aneurysmal sac. The clamp was removed and placed just below the origins of the renal arteries, and the sac was opened longitudinally. Any attempt to remove the clamp resulted in a rapid outflow of blood emerging from between the proximal part of the stent graft and the aortic wall on the left side. The distal part of the device was well indwelled into the aneurysmal sac. With some difficulty, the whole proximal part of the stent graft was extracted from the infrarenal aorta, and the distal part was clamped just above its bifurcation to prevent iliac

back-bleeding. It was decided to perform the smallest possible operation and so the body of the stent graft was shortened by two rows of stents and covering prosthesis using normal scissors. The diameter of the infrarenal aorta approximately measured 25-27 mm. A 5cm long and 24-mm-wide gelatin-coated straight Dacron prosthesis was anastomosed to the infrarenal aorta in an "end-to-end" fashion by means of a Prolene 3/0 suture. Similarly, the distal part of the prosthesis was attached to the remaining part of the stent graft body using Prolene 3/0. It is important that the Prolene suture in the distal anastomosis ran along that direction to encircle the metal ends of intact stents, and this technique allowed the achievement of a tight connection between the thin-walled body and the Dacron prosthesis. Aortic declamping was repeated three times because of profound blood pressure drop. Finally, a 90-mmHg blood pressure was established. The aneurysmal sac was sewn over the prosthesis. A Redon drain was left along the sac and a latex drain in the smaller pelvis. The abdomen was closed, and the patient was transferred to the intensive care unit. The patient recovered uneventfully and was discharged home on the 14th postoperative day. His ankle-brachial index was 1.0 on both legs, and he had a creatinine serum level of 1.33 mg%. He has been followed up for 5 years until the present time and he is still alive. Control computed tomography angiography performed 6 months after the operation showed (Figure 2) a properly working Dacron graft and an indwelled distal part of the stent graft.



**Figure 2:** Computed tomography angiography 3D-VR reconstruction performed 6 months after the reoperation showing the artificial prosthesis anastomosed to the infrarenal aorta and shortened stent graft body. The arrow points at the row of metal stents that had been cut during the reoperation.

## Discussion

EVAR, which is a less invasive procedure than the traditional operation, allows the prevention of aneurysm rupture in a majority of patients [1]. This modern method of treatment may be complicated by a late rupture that usually appears later than 2 years after the initial procedure [2,4-6]. The growing number of stent graft procedures for AAA is also associated with the number of complications such as endoleaks, which in a majority of cases are treated endoluminally. Some of which can lead to postoperative rupture. Endoleak detection by means of a regular computed tomography following the initial procedure may prevent this fatal complication, which has a high mortality rate accounting for 67% of cases during emergent procedure [3]. Late rupture such as in our case may be preceded by either the absence of aneurysmal sac shrinking or the increase of its diameter as reported in the literature [3,6]. Patients with late rupture are usually treated surgically [7,8] because they are in a state of profound hypovolemic shock, and there is insufficient time to consider another endovascular intervention. In most cases, the stent graft is removed from the aorta, and a typical bifurcated prosthesis is implanted [7]. Some authors ligate the infrarenal part of the aorta and perform extra-anatomical axillobifemoral bypasses to reestablish the blood supply to lower extremities [8]. In performing this technique, one must be mindful that the occurrence of aortic stump rupture within the follow-up period can affect even up to 39% of cases [9]. On the other hand, the elective classic repair of AAA with bifurcated prosthesis is thought to be a more complex procedure than the interposition of a tube graft into the infrarenal aorta and its bifurcation only [10]. Moreover, the deployment of a bifurcated prosthesis in an unstable patient with massive blood loss and hypotension can be a time-consuming procedure, resulting in a worse postoperative outcome. For this reason, we omitted this procedure. The idea of endovascular repair was not taken into consideration because of the lack of time and proper device at hand. In our case, the bifurcation of the stent graft and both branches were connected tightly with the surrounding vascular bed. The stent graft itself is thought to be a high-quality device; nevertheless, even minor problems with the deployment process may be responsible for later endoleaks due to structural damage [11]. The possibility of stent graft body damage had been the only issue before we decided to shorten it. In addition, the anastomosis of the thin-walled stent graft and Dacron prosthesis appeared to be safe; however, we consider that its quality was improved by attaching the Dacron prosthesis directly to the remaining untouched metal stents. Furthermore, the presence of blood leakage through the needle punctures on the stent graft body after aortic declamping was acceptable. The application of this technique allowed for the completion of the operation in the abdomen and reduction of the operation time.

## Conclusions

Although the aortic stent graft seems to be a high-quality device, it may be successfully beveled if necessary during open operation and can provide a safe anastomosis with traditional artificial prosthesis.

Post-EVAR rupture of AAA, if treated via an open operation, requires the shortest possible procedure for a patient who was previously classified as unfit for this method of treatment.

This case also serves as a reminder that even the smallest endoleaks should be thoroughly diagnosed or confirmed by means of classic angiography due to the risk of impending rupture at any time.

## Conflict of interest

Authors declare that there is no conflict of interest regarding the publication of this article.

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