Late aneurysm rupture after endovascular abdominal aneurysm repair

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Abstract

Objectives: The goal of endovascular repair is to protect the patient from aneurysm rupture. Careful surveillance should be performed postoperatively in order to select patients with aneurysm growth and, therefore, the highest rupture risk. The aim of the study was to present our experience with aneurysm rupture in long-term follow-up after endovascular abdominal aneurysm repair. Methods: Between 1998 and 2006, 445 patients with abdominal aortic aneurysms were treated endovascularly in our Department. All patients were followed-up postoperatively according to the EUROSTAR protocol, with a CT scan performed postoperatively in the 3rd, 6th and 12th month and annually thereafter with good compliance. Because of this we had the opportunity for early treatment of complications, especially endoleaks which may cause aneurysm growth and subsequent rupture. Results: In three presented patients aneurysm rupture occurred in the late follow-up period after endovascular treatment. In all cases open aneurysmectomy was performed without any major complications. We also analyzed the reason for the rupture: in all cases it was due to endoleak type I, that was not present during postoperative CT-scans. The mechanism of its recurrence was proximal cuff migration 29 months after endovascular aneurysm treatment in the first patient. In the second case endoleak type I appeared 32 months postoperatively due to aneurysm thickening, what could have been the consequence of persistent, small endoleak type II. In the third case the reason of aneurysm rupture was late endoleak type I due to migration of proximal seal of the stentgraft. Conclusions: Although the risk of aneurysm rupture after EVAR is low, all patients treated endovascularly should be routinely monitored, in order to select cases with potential endoleaks or stentgraft migration which may lead to fatal complications. When rupture occurs open aneurysmectomy is feasible, although it requires careful management in these high-risk patients.

Keywords: Endovascular aneurysm repair; Aneurysm rupture; Stentgraft; Complications

1. Objectives

The most serious and important complication of abdominal aortic aneurysm (AAA) is its rupture. There are a few known risk factors of which aneurysm diameter has a highest predictive value [1]. Therefore, size is the most important inclusion criteria for aneurysm surgical exclusion. Nowadays there are two methods of aneurysm treatment: open (OAR) and endovascular (EVAR). In OAR according to the Creech technique the aneurysmal sac is opened and replaced with a vascular prosthesis without the risk of postoperative aneurysm rupture [2]. In EVAR the goal is to exclude the aneurysm from the circulation completely. Incomplete exclusion produces the most frequent complication of EVAR, known as endoleak, and may cause aneurysm rupture [3, 4].

From the introduction of EVAR there is a need of careful postoperative surveillance for endoleak detection [5, 6]. Secondary interventions should be performed in such cases (i.e. stentgraft extensions, balloon angioplasty or side branches embolization) to minimize risk of rupture [7]. A few papers concerning open management of endoleaks, with or without stentgraft removal, were published recently [7–10]. Despite a strict postoperative follow-up program ruptures of AAA after EVAR were reported [3, 11–13].

2. Aim of the study

The aim of the study was to present our experience with aneurysm rupture in long-term follow-up after endovascular abdominal aneurysm repair.

3. Material and methods

Between 1998 and 2006, 445 patients with infrarenal abdominal aortic aneurysms were treated endovascularly at the Department of General, Vascular and Transplant Sur-
surgery, at the Medical University of Warsaw. The indication for stentgraft in our center was high risk of open surgery due to concomitant comorbidities. Morphological criteria were as follows:

- Proximal neck length of the aneurysm of at least 10 mm for suprarenal and 15 mm for infrarenal system,
- Proximal neck diameter of less than 31 mm,
- Proximal neck angulations smaller than 60 degrees,
- Proximal neck shape cylindrical,
- Iliac arteries of least 7 mm in diameter.

We have used 15 aorto-uni-iliac (11 home-made and 4 commercial) and 430 bifurcated devices (277 Zenith-Cook, 71 PowerLink-Endologix, 62 Excluder-Gore, 14 Talent – Medtronic and 6 Aorfix B-Lombard Medical). All patients were followed-up according to the EUROSTAR protocol. CT scans were performed immediately after the procedure in the 3rd, 6th, and 12th month and annually thereafter. All detected type I and III endoleaks (48 patients) were managed endovascularly with balloon angioplasty, additional stentgraft implantation or endoleak embolization. In nine cases of persistent type II endoleak with AAA diameter increase, side branches embolization were attempted. There was only one case of persistent endoleak type II with aneurysm diameter expansion, treated with aneurysmal sacotomy and open lumbar arteries ligation without stentgraft removal. In 16 cases small endoleak type II without aneurysm expansion was left without any interventions and in 12 cases resolved spontaneously.

4. Results

In three presented patients aneurysm rupture occurred in the late follow-up period after EVAR.

4.1. Case 1

A 77-year-old patient was admitted to our department 29 months after endovascular repair of an 81-millimeter infrarenal abdominal aortic aneurysm (Excluder®, Gore). At admission he presented with severe abdominal pain and hypovolemic shock treated with dopamine administration. A CT-scan confirmed aneurysm rupture with a large hematoma in the extraperitoneal space (Fig. 1).

The patient was transferred to the operating theatre. Peritoneal cavity was opened by midline incision. Abdominal aorta was clamped below renal arteries, aneurysmal sac was opened and stentgraft explanted. Aorto-bi-iliac graft was sewn-in and retroperitoneal hematoma removed. The postoperative period was complicated by transient spinal cord ischemia which resolved after 2 week of rehabilitation. The patient was discharged on 20th postoperative day in good condition and is still alive. Searching for the reason of aneurysm rupture, five sets of follow-up CT-scans were analyzed. There were neither endoleak nor aneurysm growth found. Intraoperative evaluation of stentgraft fixation proved migration of proximal extension implanted during the primary operation due to endoleak type I (Fig. 2). In our opinion the cause of aneurysm rupture was reappearance of the endoleak type I due to distal dislocation of proximal stentgraft extension (Fig. 3).
4.2. Case 2

A 68-year-old patient was admitted due to aneurysm rupture 32 months after EVAR (Zenith®-Cook) for a 74-mm AAA. He presented severe abdominal pain and hypovolemic shock. In CT we found large retroperitoneal hematoma due to aneurysm rupture. The blood flow to the aneurysm sac was from massive endoleak type I. Open aneurysmectomy was performed requiring suprarenal clamping, complicated by transient postoperative deterioration of renal function. The patient was discharged 21 days after the operation in good general condition with creatinine level 1.08 mg/dl. He remains in good general condition after nine months. Evaluation of follow-up CT scans showed a persistent type II endoleak from the lumbar arteries which did not require any intervention because of its small size and stable aneurysm diameter. Although enlargement of aneurysm diameter was not observed, there was an increase in its length demonstrated by aneurysm neck shortening (Fig. 4). Thus, new endoleak type I (proximal) appeared to cause aneurysm rupture (Fig. 5).

4.3. Case 3

A 59-year-old patient was admitted with acute abdominal pain, without any other signs of aneurysm rupture, 23 months after EVAR (PowerLink®-Endologix). On CT-scan he presented endoleak type I (proximal), aneurysm enlargement (both were not seen in any of the follow-up CTs) and aneurysm rupture to the left retroperitoneal space (Figs. 6 and 7). Open aneurysmectomy was performed without complications and the patient was discharged in good condition.

5. Discussion

In the last decade the EVAR became the best option for patients with high risk of open aneurysmectomy [1, 5, 14]. Introduction of this method significantly reduced mortality and morbidity caused by abdominal aortic aneurysm [15]. Although the results of such aneurysm management modality are good, this method of treatment is not free from various complications [8, 11–13, 16, 17]. The most common are endoleaks which occur in 6–50% cases [4, 8, 16, 18–20]. Among all types of endoleaks, type I and III are most common, believed to be responsible for aneurysm enlarge-
ment and supposedly lead to aneurysm rupture [12, 18]. There were also several reports of AAA rupture due to persistent endoleak type II [8, 12]. In our three cases rupture occurred due to endoleak type I. The mechanism of its recurrence was proximal cuff migration 29 months after EVAR in the first patient. In the second case, endoleak type I appeared 32 months postoperatively due to aneurysm lengthening, which could have been the consequence of persistent, small endoleak type II. Therefore, we conclude that in this case endoleak type II was the primary reason of aneurysm rupture. In the third case, the reason of aneurysm rupture was late endoleak type I due to migration of proximal seal of the stentgraft.

The EUROSTAR registry data show that the annual, cumulative AAA rupture risk after EVAR is approximately 2% at six years [5]. The peak incidence of rupture was observed 36 months after operation [11]. In our series of 445 patients there were only three documented ruptures (mean observation time 30 months). The underestimated rupture rate in our series seems to be responsible for this result. We have 72 patients lost from follow-up, of whom a few could have died because of aneurysm rupture.

According to other studies, in 69% of patients the rupture was caused by the presence of endoleak (particularly type I and III) [14, 18]. These types are easy to diagnose and uncomplicated to be treated endovascularly. The management of endoleak type II is more complex. It is usually conservative in the absence of aneurysmal expansion [8, 20]. Although measurement of aneurysmal growth rate by maximal diameter seems unreliable – it does not present length enlargement. In such cases the best diagnostic method would be volumetry [21–23].

6. Conclusion

Although the risk of aneurysm rupture after EVAR is low, all patients treated endovascularly should be routinely monitored, even in late postoperative period, in order to select cases with potential endoleaks or stentgraft migration which may lead to fatal complications. When rupture occurs open aneurysmectomy is feasible, although it requires careful management in these high-risk patients.

References


ICVTS on-line discussion A

Title: Restenting for ruptured aneurysm after EVAR
Author: Mehrab Marzban, Tehran Heart Center, North Kargar Ave, Tehran, 1411713138 Iran
doi:10.1510/icvts.2007.152447A
eComment: Congratulations to the authors for the excellent results and patient surveillance [1]. I just have a question about feasibility of re-stenting during such complications. Do you have any experience in this regard?

Reference