CASE REPORT

UDC: 616.136-007.64-08
DOI: 10.2298/VSP1401078S

Endovascular repair of ruptured abdominal aortic aneurysm

Endovaskularno lečenje rupture aneurizme abdominalne aorte

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Abstract

Introduction. Rupture of an abdominal aortic aneurysm (AAA) is a potentially lethal state. Only half of patients with ruptured AAA reach the hospital alive. The alternative for open reconstruction of this condition is endovascular repair (EVAR). We presented a successful endovascular reapir of ruptured AAA in a patient with a number of comorbidities. **Case report.** A 60-year-old man was admitted to our institution due to diffuse abdominal pain with flatulence and belching. Initial abdominal ultrasonography showed an AAA that was confirmed on multislice computed tomography scan angiography which revealed a large retroperitoneal haematoma. Because of patient's comorbidites (previous surgery of laryngeal carcinoma and one-third laryngeal stenosis, arterial hypertension and cardiomyopathy with left ventricle ejection fraction of 30%, stenosis of the right internal carotid artery of 80%) it was decided that endovascular repair of ruptured AAA in local anaesthesia and analgosedation would be treatment of choice. Endovascular grafting was achieved with aorto-bi-iliac bifurcated excluder endoprosthesis with complete exclusion of the aneurysmal sac, without further enlargment of haemathoma and no contrast leakage. The postoperative course of the patient was eventless, without complications. On recall examination 3 months after, the state of the patient was well. **Conclusion.** The alternative for open reconstruction of ruptured AAA in haemodynamically stable patients with suitable anatomy and comorbidities could be emergency EVAR in local anesthesia. This technique could provide greater chances for survival with lower intraoperative and postoperative morbidity and mortality, as shown in the presented patient.

Key words:
aortic aneurysm, abdominal; aortic rupture; comorbidity; diagnosis; vascular surgical procedures; blood vessel prosthesis; treatment outcome.

Apstrakt

Uvod. Ruptura aneurizme abdominalne aorte (AAA) predstavlja potencijalno smrtonosno stanje. Samo polovina bolesnika sa rupturom AAA stigne živa u bolnicu. Alternativa otvorenoj hirurškoj rekonstrukciji ovog stanja je endovaskularno lečenje. U radu je prikazano uspešno izvedeno endovaskularno lečenje rupturisane AAA kod bolesnika sa velikim brojem pratećih oboljenja. **Prikaz bolesnika.** Muškarac star 60 godina, primljen je u našu instituciju zbog difuznih bolova u trbuhu praćenih nadimanjem i podrigivanjem. Na ultrazvučnom pregledu abdomena viđena je AAA, što je potvrđeno i multislajsnom kompjuterizovanom angiografiji abdomena, koja je ukazala i na postojanje velikog retroperitonealnog hematoma. Zbog pratećih bolesti (prethodna operacija karcinoma larinksa i suženje larinksa na jednu trećinu, arterijska hipertenzija i kardiomiopatija sa ejekcionom frakcijom leve komore od 30%, stenoza desne unutrašnje karotidne arterije od 80%) odlučeno je da je lečenje izbora rupture AAA endovaskularno, u lokalnoj anesteziji i analgosedaciji. Endovaskularni grafting postignut je ugrađivanjem aortobiilijačne bifurkacione ekskluder endoproteze sa potpunom ekskluzijom aneurizmatske vreće, bez daljeg uvećanja hematoma i isticanja kontrasta. Postoperativni tok protekao je uredno, bez komplikacija. Na kontrolnom pregledu tri meseca kasnije, stanje bolesnika bilo je dobro. **Zaključak.** Endovaskularno lečenje rupturisane AAA može biti terapija izbora kod hemodinamski stabilnih bolesnika sa značajnim komorbiditetima ukoliko morfologija aneurizme to dozvaljava. Ova tehnika pruža veću šansu za preživljavanje, uz manji stepen intraoperativnog i postoperativnog morbiditeta i mortaliteta što potvrđuje i prikaz našeg bolesnika.

Ključne reči:
aorta, abdominalna, aneurizma; aorta, ruptura; komorbiditet; dijagnoza; hirurgija, vaskularna, procedure; krvni sud, proteza; lečenje, ishod.

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Introduction

Abdominal aortic aneurysm (AAA) is the pathological, over 50%, enlargement of the aorta. It could develop in both men and women, usually in the elderly [1]. The incidence and prevalence of both AAA and ruptured AAA continues to increase. In the United Kingdom this is the 8th commonest cause of death, responsible for 10,000 to 12,000 deaths *per* year [2, 3]. Progressive aneurysm enlargement can lead to rupture and massive intra-abdominal bleeding with fatal outcome, unless timely repair can be achieved. There were 6,800 deaths in the 2000 in England and Wales due to rupture of AAA [3]. Despite improvements in perioperative and postoperative management, the mortality rate remains high after conventional open surgical repair. The overall mortality rate from aneurysm rupture ranges between 65% and 85%[4]. The half of deaths from ruptured AAA not even reach the hospital and for those who survive the initial period the mortality rate in open emergency surgical repair ranges between 30% and 70% [4, 5]. As a newer minimally invasive technique, endovascular repair showed improvement in reduction of an early morbidity and mortality, as compared to conventional open surgery repair for elective treatment of AAA [6, 7]. As elective endovascular aneurysm repair (EVAR) provides a significant reduction in aneurysm-related mortality for 30 days (as well in 4 years follow-up), it may be speculated that this technique could offer an improvement in long-term survival for patients with ruptured AAA [8]. Emergency EVAR in the treatment of ruptured AAA has been used with success, proving that it is feasible in selected patients. However, it is not known yet will emergency EVAR provide significant improvement in early and late mortality for these patients, nor could it replace conventional open repair as the preferred treatment of this lethal condition.

Case report

A 60-year-old man was admitted to our institution due to diffuse abdominal pain with propagation to the sacroiliac region more to the left side, lasted for 2 days and accompained by flatulence and belching. Initial abdominal ultrasonography showed AAA with maximum diameter 70 mm with retroperitoneal haemathoma in the left paracolic space. As the patient's clinical state was haemodynamically stable, urgent computed tomography (CT) scan aortography was performed. CT showed infrarenal AAA with a maximum anteroposterior diameter of 72 mm. There were a large retroperitoneal haematoma extending into the left iliopsoas muscle and left paracolic gutter (Figure 1).

The patient omentioned the previous surgery of laryngeal carcinoma in another medical institution (2 years before), and showed recent otorhinolaryngological findings with the confirmed existence of one-third laryngeal stenosis. Also, the patient had arterial hypertension with irregular drugs intake, and cardiomyopathy with documented left ventricle ejection fraction of 30% confirmed by the cardiologist on admission to our institution. Visual disturbances (amaurosis fugax) verified a high grade stenosis of the right internal carotid artery (80%) with elevation of systolic blood

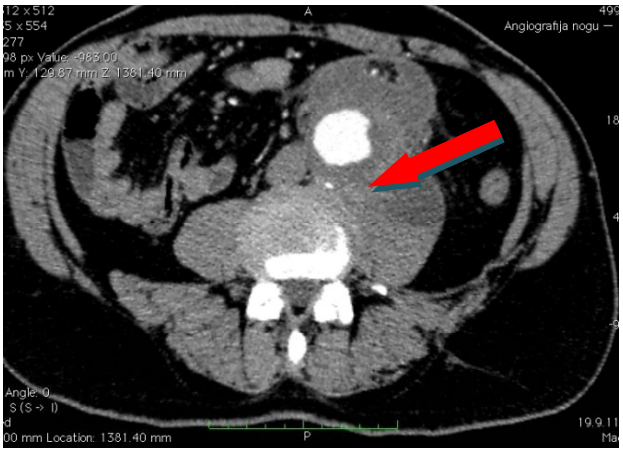

Fig. 1 – Infrarenal suprailiac aneurysm of the abdominal aorta with the maximal anteroposterior diameter of 72 mm and the large retroperitoneal haematoma extending into the left iliopsoas muscle and left paracolic gutter on multislice computed tomography scan angiography.
(Retroperitineal hematoma marked with a red arrow)

flow velocity and turbulence on colour doppler ultrasound in another medical institution. In view of high comorbidities the patient was considered unfit for open surgery and general anaesthesia. The appearance of CT (aneurysm's neck length 20 mm and favourable iliac arteries) suggested that the patient was suitable for endoluminal stent grafting. Under local anesthesia (20 mL of lidocaine-chloride in concetration of 2%) and analgosedation followed by continuous monitoring of vital function the emergency EVAR was performed. We selected an aorto-bi-iliac endovascular stent graft using a Siemens Siremobil® Iso-C Image Intensifier (Siemens AG, Erlangen, Germany). Access was gained *via* bilateral femoral approach. Table angiogram with a measuring catheter showed infrarenal AAA without extension into the common iliac arteries. An aorto-bi-iliac bifurcated excluder endoprosthesis (WL Gore, USA; size PXT 231416 and contralateral PXC 141400) was positioned and deployed infrarenally under fluoroscopy guidance using standard techniques.

Control angiography showed complete exclusion of aneurysmal sac, without further enlargment of haemathoma and no contrast leakage (Figures 2 and 3). During operation the patient received 5000 I.U. /mL of heparin-sodium solution and 1.5 g of cefuroxime intravenously. The procedure lasted for 70 min, without complications. The patient was transferred to the surgical intensive care unit where he was closely monitored for one day, with administering of two units of fresh blood supstitution therapy followed by standard therapy. On the 7th postoperative day an endarterectomy of the right internal carotid artery was performed in general anaesthesia and video-assisted tracheal intubation, without intraoperative and postoperative complications. Further state of the patient was eventless, without complication and he was discharged from the hospital after 12 days of the second operation. On recall examination 3 months after patient's discharge from the hospital, the state of the patient was well, with no complaints related to AAA.

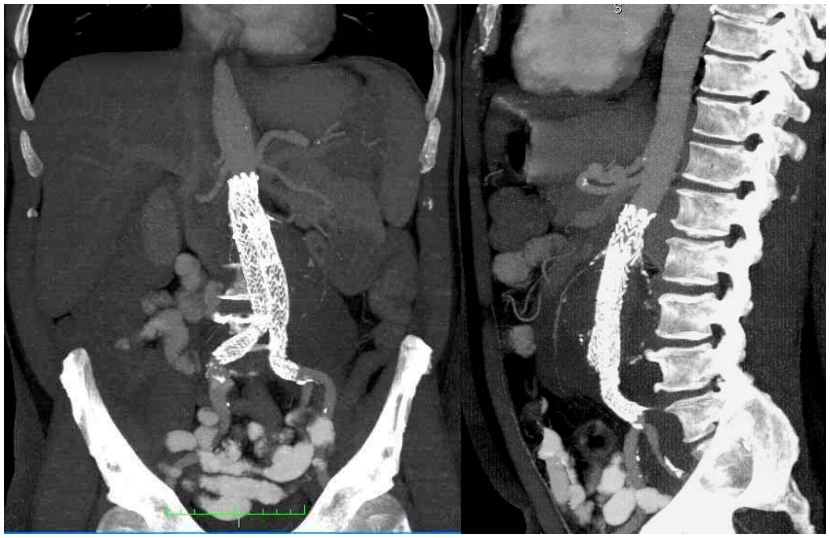

Fig. 2 – An aorto-bi-iliac bifurcated excluder endoprosthesis positioned and deployed infrarenally.

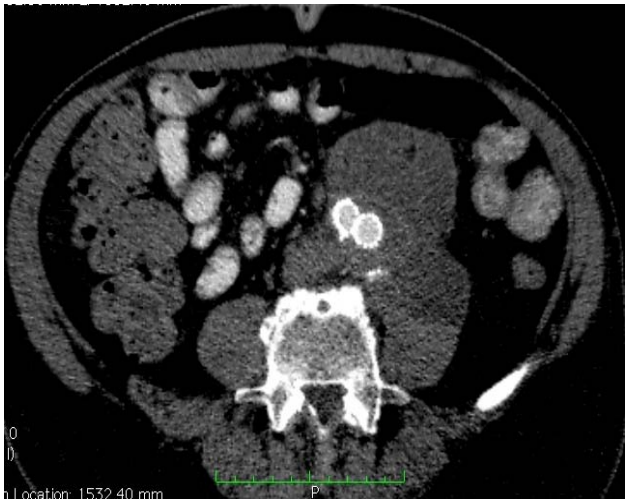

Fig. 3 – Complete exclusion of the aneurysmal sac, without enlargment of haemathoma and no contrast leakage on post deployment computed tomography scan angiography.

Discussion

Following rupture of AAA, only 38–64% of patients reach the hospital alive [9]. Rupture of AAA can result in haemodynamic collapse and death before hospital admission of patients. Operative treatment of ruptured AAA is associated with mortality rates between 25% and 60% [10]. In such patients with ruptured slowly blood leaking AAA, the clinical picture is ussualy presenting with abdominal pain, pulsating abdominal mass and hypotension. AAA rupture is more frequent in patients with chronic obstructive pulmonary disease, cardiac disease, stroke and aneurysm size greater than 5 cm [11]. The same factors in addition to malignancy, chronic renal failure, recent myocardial or cerebal infarction, dementia, coexistent severe acute pancreatitis and oral anticoagulant therapy make patients unfit for open surgery repair [10, 12].

Endovascular repair of AAA is minimally invasive procedure accompanied with the reduction in morbidity and mortality during and after the procedure, regarding the need for surgical exposure of the aorta and aortic cross clamping in open surgical reconstruction [13, 14]. Further, usage of endoprosthesis can considerably reduce cardiac strain during the procedure as compared to open surgery and hence is particularly advantageous in surgically high risk patients [15]. During endovascular repair of AAA, an endograft is positioned within the aorta by the transfemoral approach to exclude aneurysmal sac from circulation [13]. It was showed that covering by stent seal off AAA immediately after stent placement, followed with gradual obliteration of aneurysm sac by collagen reduce risk of further aneurysm expansion and rupture [16]. The data from the Registry of Endovascular Treatment of Abdominal Aortic Aneurysms (RETA) show that only 30–50% of aneurysms are suitable for endovascular repair [14]. The procedure requires accurate determination of aneurysm morphology with contrast enhanced MSCT angiography. In symptomatic and ruptured AAA, MSCT scan can rapidly assess the feasibility of endovascular treatment [14, 16]. It is provided in patients with haemodynamically stable condition, as in our case. Due to simplicity, reduction in haemodynamic manipulations, reduced requirement for both intravenous fluid administration and subsequent monitoring of patients, the need for stay in intensive care units and less of hospital beds, local anaesthesia combined with analgosedation is an acceptable technique for endovascular repair of aneurysms [15]. Also, this type of anaesthesia provides a particular advantage in patients with high risk for cardiovascular complications, since it does not change the haemodynamic situation in contrast to general anaesthesia [15, 17]. Comparing the usage of general, epidural and local anaesthesia for endovascular repair of aneurysms, Bettex et al. [15] successfully used local anaesthesia in 63 of 91 patients, including 4 patients with ruptured aneurysm. The poor cardiopulmonary reserve in the presented patient made him unsuitable for general anaesthesia. For now, it seems that endoluminal repair of ruptured AAA is only applicable in selected haemodynamically stable patients, unfit for open surgical

procedure [12, 13]. Since the report by Yusuf et al. [18] in 1994 showed the feasibility of EVAR in ruptured AAA, there have been others from specialised vascular units limited to selected cases and in haemodynamically stable patients. Those series included variety of aortic ruptures, such as aorto-caval, aorto-renal vein and enteric fistulas, and rupture of false aneurysms following open surgical repair [19–22]. In the last ten years various series and prospective studies showed that EVAR could offer another option for the patients with ruptured AAA [19–23]. The presented patient is the second reported case with ruptured AAA treated by EVAR in Serbia [24], but the first one successfully treated due to acute ruptured AAA.

The main disadvatage of EVAR is the high costs of stent-grafts and their delivery systems, plus the cost of any adjunctive procedures. Also, the need for lifelong follow-up imaging and long-term durability of graft material is yet to be proven [25]. Considering the fact that each patient requires the appropriate stent-graft, at least one day is needed for its procurement even in the most developed countries. The shortest period to purchase appropriate stent-graft in Serbia is two days [24]. Regarding the presented patient we had an appropriate stent graft which was intended for another patient. Although a recently published retrospective analysis of 651 patients who underwent EVAR and open repair of elective infrarenal AAA shows that the 30-day mortality rate after open repair is similar to that after EVAR in patients younger than 60 years [26], it is not known yet if emergency EVAR will lead to significant improvements in outcomes for these patients, nor could it replace conventional open repair as the preferred treatment for ruptured AAA. The Immediate Management of the Patient with Rupture (IMPROVE aneurysm trial open *versus* endovascular repair) will in the near future answer to the question if patients with ruptured AAA derive benefit from EVAR regarding 30-day mortality, 24 hours in-hospital and one year mortality, complications and morbidities, as weel as quality of life, costs and cost-effectivenes [27, 28].

Conclusion

The half of patients with ruptured AAA die before reaching the hospital. Intraoperative and postoperative mortality rate of open surgical repair is high especially in patients with comorbidities. The alternative for open reconstruction of ruptured AAA in haemodynamically stable patients with suitable anatomy and comorbidities could be emergency EVAR in local anaesthesia.

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Received on March 30, 2012.
Revised on December 5, 2012.
Accepted on December 10, 2012.