Endovascular Repair of Symptomatic (Non-ruptured) Abdominal Aortic Aneurysm in the University Hospital Centre Split

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Abstract: The aim of this study is an overview of endovascular sAAA (symptomatic abdominal aortic aneurysm) treatment in the University Hospital Centre Split. The sAAA refers to a number of symptoms associated with aneurysm. EVAR (endovascular aortic repair) is increasingly used as an alternative to an open method that carries a number of advantages. Between January 2016 and February 2017, eight patients were admitted to the University Hospital Centre Split due to sAAA, following clinical and diagnostic treatment by a team of vascular surgeons and emergency radiologists, and ultimately treated with EVAR. Two patients had femoral endarterectomy. One patient had fistula of the right external iliac artery with left common iliac vein. After EVAR with embolization of the right internal iliac artery, the fistula was resolved. Also, one patient had occluded left external iliac artery and femoral-femoral bypass graft was made. After the procedure, two patients had endoleak of type II. Perioperative mortality was zero. On control examinations, all patients were in good general condition and without complications. A prompt diagnosis of sAAA and good team working will result in emergency endovascular procedure and resolve the risk for abdominal aortic aneurysm rupture.

Key words: sAAA, EVAR, type II endoleak.

1. Introduction

Patients with infrarenal AAA (abdominal aortic aneurysms) are often separated into three groups: elective or asymptomatic patients, patients with ruptured aneurysm and symptomatic or emergency patients without rupture [1-3]. The sAAA (symptomatic abdominal aortic aneurysm) refers to any of numerous symptoms that are associated with the aneurysm. Those symptoms are abdominal pain, back pain often extending into the groin, a tender aneurysm on clinical examination, oedema of the feet, a limb ischaemia, blue toe syndrome, dysuria, fewer, weight in the abdomen or and nausea [2, 4-7]. The presence of symptoms increases the risk for AAA rupture [8]. The mortality rate of sAAA is 26% [2]. Epidemiologically it is most commonly in men over fifty years old, and among those with a family history [9]. There is a strong coexistence of atherosclerosis and AAA [10]. The risk factors are smoking, high blood pressure, and other heart or blood vessel diseases [11]. The complications include rupture, peripheral embolization, acute aortic occlusion, aortocaval or aortoduodenal fistulae [12]. EVAR (endovascular aortic aneurysm repair) is a treatment option for sAAA. Potential advantages of EVAR over traditional open repair include less invasive and less peri-operative mortality [13]. Also it reduces time under general anaesthesia, elimination of the pain and trauma associated with major abdominal surgery, reduced length of stay in the hospital, and reduced blood loss [14]. There are disadvantages of EVAR like anatomical constraints, equipment, experience, and in extraordinary situations it presents many challenges. Over the past few years there have...
been significant developments in stent-graft technology and an improved understanding of how best to utilize stent-grafts at treating aortic disease [15].

2. Method and Materials

Between January 2016 and February 2017, eight patients were urgently admitted in the clinic for surgery of the University Hospital Centre Split due to sAAA. At the urgent surgical reception, the history of disease was taken. They had physical examination and blood testing. Six patients knew that they have AAA and had symptoms that could be related to subsequent (five of them had abdominal pain and one had pain in the back with the spread of the belly). Two patients did not know about the existing of the AAA and had signs of critical ischaemia to lower extremity. One had rest pain and another the pain of open sores (ulcers that will not heal). After diagnostic treatment (emergency MDCT angiography of abdominal aorta and peripheral vessels), the AAA was confirmed. They were situated in the intensive care unit. A team of vascular surgeons and emergency radiologists decided to treat them with EVAR. After anesthesiological examination and premedication, the procedure was held in hybrid operating room. Three patients had spinal, and five general anesthesia. The urinary catheterization was done. The vascular surgeon made an incision of the femoral region and afterward dissection of the common femoral artery with branches. After general heparinization, the interventional radiologist started EVAR. The stent graft was delivered into the aorta within a long flexible sheath which allowed it to be remotely positioned within the abdominal aorta. For modular devices, composed of two parts, the main component (body) was inserted first. The undeployed device was then positioned, so that the proximal margin of the device was immediately below the renal artery. Once deployment had started, a control angiogram was undertaken. The main body was released and the device extended so that both distal ends were within the common iliac artery. The vascular surgeon sewed the entrance on femoral artery with 5-0 prolene suture. The subfascial drain was put and a wound was sewn in layers. The patients stayed one day in surgical intensive care unit, and next day were situated in the Department of Vascular Surgery. They were treated with crystalline solutions, low molecular weight heparin, antibiotic, gastroprotective and analgetic therapy with the regular folding of the wound. The drain was pulled out on the second postoperative day.

3. Results

Eight patients were admitted in the hospital. Seven patients are male, and one is female. Their average age is 69 years (from 60 to 82 years). Their co-morbidities are: arterial hypertension (5 of them), hypercholesterolemia (4), cardiomyopathy and diabetes mellitus type II (3), pulmonary disease and stroke (2), myocardial infarction, colon cancer, depression and benign prostatic hyperplasia (1). Four of them were smokers. Those six patients who knew about existence of AAA before symptoms were followed in the ambulance of vascular surgery. First they had ultrasound and then CT angiography of the abdomen, pelvis and lower extremities. Three of them had growth of AAA more than 0.5 cm in period of six months that was obvious on emergency CT scan. Two patients who did not know about AAA had general atherosclerosis with significant stenosis of femoral artery. One had occluded external iliac artery. The sAAA was fusiform ($N=5$) and saccular ($N=3$) with one being with the dissection. A diameter was 56 mm (from 43 to 72 mm). Two endarterectomies of distal part of the external iliac and femoral arteries have been done (Fig. 1). One patient had fistula of the right common iliac artery with left common iliac vein, and EVAR with embolization of the right internal iliac artery resolved fistula (Fig. 2). Also, another patient had an occluded left external iliac artery. After EVAR, femoral-femoral bypass with graft prosthesis was done (Fig. 3). After endovascular procedure, two patients
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Fig. 1 The patient with patch angioplasty of femoral arteries after endarterectomy as hybrid operation with EVAR.

Fig. 2 The image of the patient with fistula of the right common iliac artery with left common iliac vein that was resolved with EVAR and embolization of the right internal iliac artery.
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Fig. 3  The patient who had hybrid procedure of EVAR and femoral-femoral bypass.

Fig. 4  The complication of EVAR is type II endoleak.
had type II endoleak (Fig. 4). Perioperative mortality was zero. Two patients developed pneumonia, and one had hematoma in the femoral region. All patients were in good general condition, without pain or claudications, and with regularly peripheral pulsations. The patient with ulcers on feet was treated with hydrocolloid and hydrofiber wound dressing, and healing was properly. The average duration of hospital treatment was 8 days (from 5 to 14 days). On control diagnostic examinations (after 2 days and a month), all patients were found to be orderly.

4. Discussion

An arterial aneurysm is defined as a focal dilation of a blood vessel with respect to the original artery [13]. AAA is a localized enlargement of the abdominal aorta such that the diameter is greater than 3 cm or more than 50% larger than normal diameter [9]. The risk factors associated with AAA include age, sex, ethnicity, smoking, and other cardiovascular comorbidities. The majority of AAA is asymptomatic. But it can also present with pain and complications such as thrombosis, embolization and rupture. About 22% of AAA are symptomatic [2, 16, 17]. Over the last year in our hospital, 35% of all patients with AAA were symptomatic. In our study, patients with sAAA were almost all men with age median 69 which follows the global incidence (between 2% and 8% of males over the age of 65) [9]. From other comorbidities, they mostly had the arterial hypertension and hipercholesterolemy. This confirmed well known association between AAA and atherosclerosis [18-20]. Patients who determined to have sAAA, were situated in a intensive care unit setting. To perform emergent endovascular AAA repair, the patient’s aneurysm must meet anatomic criteria for EVAR and the institution must have a defined program for emergency endovascular surgery. Abdominal CT, which is obtained in hemodynamically stable patients, will determine whether the patient with symptomatic (non-ruptured) or ruptured AAA is anatomically suited to EVAR. Four patients with sAAA who were admitted to our hospital during the last year were not suitable for EVAR and they were treated by open repair. Eight patients with sAAA were treated with EVAR because they fulfilled anatomical inclusion criteria for stent grafting, equipment was available and they had no other acute pathology e.g. malignancy. In emergency repair of patients with symptomatic non-ruptured abdominal aortic aneurysms stent graft treatment may have several advantages compared to an open procedure [21]. The advantages of EVAR are in lower 30-day mortality, shorter intensive care, hospitalization length, lower bleeding rate, cardio and respiratory complications, and better quality of life after the first few months. The aortic endografting under emergency circumstances presents many challenges. This approach requires both a permanent team that is well trained in endovascular techniques and the availability of a wide variety of endografts in the hospital [22]. Those eight patients with sAAA were treated by EVAR in median time of two days. A large scale multicenter study is needed to confirm that emergency EVAR for acute symptomatic and ruptured aneurysms (rAAA) is associated with improved survival. Late complications associated with EVAR included the occurrence of endoleaks [21]. Two our patients had the type II endoleak but they did not needed reintervention. EVAR has been increasingly used to treat rAAA, yielding encouraging results and a possible improvement in the number of operative deaths [23]. At our department, two patients with rAAA were successfully treated with EVAR. Although majority of rAAA have been repaired by surgery. Our aim is to improve emergency EVAR for rAAA.

5. Conclusions

Timely diagnosis of sAAA and team work can will result in taken care of the patient on time and with an urgent endovascular procedure resolved the threatening ruptured AAA. The significance of this study is confirmation of ability to treat patients with sAAA less
invasive (endovascular) procedure with excellent results. The limitation is that this is a review study. The follow up of these patients should be taken. Also it could be compared with open repair of sAAA for follow up of these patients should be taken. Also it could be compared with open repair of sAAA for longer follow up with more outcome variables. Further studies of a larger study population to confirm our findings are needed.

Conflict of Interest

No potential conflict of interest was reported.

References