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Case Report

Long Clinical History of a Peritoneal Dialysis Patient after Endovascular Repair of Aorto-iliac Aneurysms

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Abstract

We present the clinical history of a peritoneal dialysis male patient who was diagnosed with rapidly progressing abdominal aortic and bilateral common iliac artery aneurysms after more than two years on CAPD treatment. The patient refused open repair of the aneurysms because he adhered to the convenient dialysis modality, so he underwent endovascular reconstruction. The next day after surgery he carried out CAPD treatment himself. We analyze the consequences of the complications and co-morbidities that 6 years after the procedure led to conversion to haemodialysis and 2 more years later the patient's death. We found the outcome of our patient outstanding compared to literature data of the clinical course and perioperative or late mortality of similar patients. High early mortality of end stage kidney disease patients after aneurysm surgery needs to be emphasized. To reduce this procedure is recommended as early as possible, ideally before starting dialysis. Open aneurysm repair is a lengthy, highly invasive procedure with the risk of significant blood loss that all contribute to higher morbidity and mortality. EVAR is recommended in this patient group in case of anatomical suitability. Postoperative complications of endovascular repair can remarkably be reduced by proper hydration and usage of as small amount of proper quality contrast material as possible. Regular follow-up is paramount to early reveal and treat complications that we deem substantial in our case.

ABBREVIATIONS

AAA: Abdominal Aortic Aneurysm; HD: Heamodialysis; PD: Peritoneal Dialysis; CAPD: Continuous Ambulatory Peritoneal Dialysis; CKD: Chronic Kidney Disease; CT: Computer Tomography; CTA: Computer Tomography with Angiography; DSA: Digital Substraction Angiography; GFR: Glomerular Filtration Rate; EVAR: Endovascular Aneurysm Repair; MR: Magnetic Resonance; OAR: Open Aneurysm Repair; US: Ultrasonography

INTRODUCTION

Cardio-vascular disorders are the most common causes of death for patients under chronic dialysis. One of the most severe of these is aneurysmal dilatation of the aorta. Reconstruction of an infrarenal aortic aneurysm is indicated for average risk patients when the maximum diameter of the aneurysm reaches 5.5cm. Open surgical transperitoneal repair with prosthetic graft implantation is a highly invasive procedure with significant morbidity and mortality. The treatment of peritoneal dialysis patients after open aneurysm repair, at least temporarily needs to be converted to haemodialysis. This did not happen to our patient who refused open reconstruction of his AAA because he adhered to CAPD that he successfully had had that time for more than two years.

CASE PRESENTATION

We presented in 2009 the first course of the clinical history of a male patient, born in 1931 whose renal follow-up started in 1999 when stage 4 CKD was diagnosed as part of investigations for persistent hypertension. Smaller kidneys were found on abdominal US as a sign of hypertensive nephropathy. As an incidental finding, dilatation of the infrarenal aorta with maximum diameter of 39mm was also revealed by the US. The aneurysm was completely asymptomatic. Because of worsening kidney function peritoneal dialysis was started to the patient's request in 2003, at his age of 72. CAPD was regularly carried out without complication and with the patient's satisfaction. His blood pressure became well controlled. In 2005 ischaemic infarct was verified by brain CT at the background of temporary hemispheral symptoms.

Half a year later abdominal US and CT were done because of epigastric pain that showed the size of AAA 56mm with bilateral common iliac artery aneurysms, 35mm on the right and 51mm on the left side. Surgical repair of the rapidly expanding,

significant size aneurysms was inevitable. The patient refused the planned transperitoneal open repair with bifurcated synthetic graft implantation because he was very contented with CAPD treatment. Endovascular option was then offered that the patient was agreeable to. In March 2006 after sizing the stent-grafts and without preceding embolization of internal iliac arteries he underwent an EVAR under general anaesthesia with cutdown of both groins. There were no intraoperative complications, the limbs of the graft ended in the external iliac arteries. In less than 24 hours after the procedure the patient carried out the CAPD treatment himself. On the seventh postoperative day he was discharged home without early complication. Endovascular repair was not a routine procedure at that time and it was the first time we performed this procedure for a patient on CAPD.

After early success smaller complications developed. First postoperative CTA verified a type II endoleak that needed only follow-up but not an intervention for several years (Figure 1). A lymphocyst developed in the left groin wound that needed surgical removal after several percutaneous drainages. He regularly underwent follow-up CT angiography and review at the vascular clinic every half a year.

One and a half years after the surgery he was permanently complaint-free. Peritoneal dialysis with 4 times 2 liter fluid exchange a day was carried out without technical issues. The weekly total creatinine clearance was 129 l/week at the time of surgery that decreased to 106 l/week a month after surgery and 91 l/week 14 months following the procedure; however the efficacy of the treatment remained in the ideal 75-120 l/week range. The reason for the decreasing total dialysis efficacy was the slow deterioration of the remaining kidney function, from 98.3 l/week at the time of repair to 71 l/week and then 55.5 l/week 14 months after surgery. At the same time PD clearance remained unchanged (30.7 l/week before surgery and 35.6 l/week 14 months later). His blood pressure was stable around 130/70 mmHg.

After 52 months of CAPD treatment, in July 2009 he had the first peritonitis that could be treated without discontinuation of peritoneal dialysis. It was in 2011 when he had the second peritonitis so in 6 years the peritonitis rate was only 1/36 months.

Early 2009 follow-up CTA found the aortic aneurysm sac growing (60mm) and type II endoleak expanding. Because of low rupture risk this time we decided against intervention. However, in December 2009 not only the aortic aneurysm sac was growing further (63mm) but also type Ia endoleak developed at the proximal anastomosis (Figure 2). Type I endoleak needed urgent intervention. In February 2010 he underwent stent-graft cuff implantation to the region of the aneurysm neck. Type I endoleak was not visible on the completion DSA but type II endoleak mostly through inferior mesenteric artery was obvious at the end of the procedure. We continued his follow-up. In 2011 endovascular intervention of type II endoleak was attempted twice, this time because of expansion of the left common iliac artery aneurysm. In May abdominal and pelvic DSA did not visualize endoleak but selective mesenteric angiogram showed the endoleak from inferior mesenteric artery. Unfortunately, the attempts of selective embolization then and in June were unsuccessful. Later he never attended the vascular clinic again and there are no more CT images available.

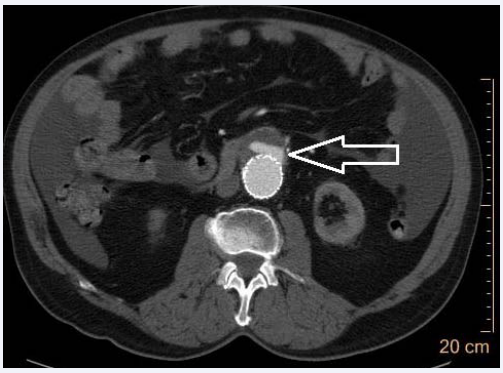

Figure 1 CT angiography axial image. Early postoperative type II endoleak indicated by the arrow.

Figure 2 CT angiography sagittal image. Late type I endoleak indicated by the arrow.

Because of worsening CAPD efficacy his treatment was converted to haemodialysis in 2011. He underwent an arteriovenous fistula formation in 2012 but it hasn't matured so dialysis was continued through a permanent dialysis catheter. In 2012 he was hospitalized with suspected pulmonary embolism but it was not confirmed. COPD and chronic bronchitis were diagnosed in the background of left ventricle hypertrophy with high left ventricular pressure found on echo-cardiogram. A week after his discharge he needed hospitalization again because of severe arrhythmia, weakness and dyspnea. His vital parameters could be stabilized and was discharged home again but was readmitted with sepsis and severe general conditions. He passed away in February 2013 due to cardio-pulmonary insufficiency at the age of 82.

DISCUSSION

Our previous paper presented the first one and a half years of follow up after successful endovascular repair of a peritoneal dialysis patient. We found the long clinical history with its complications worth to analyze [1].

First we need to answer the question why we decided to perform endovascular reconstruction of multiple aorto-iliac aneurysms for an elderly, peritoneal dialysis patient as the chances for long-term survival were low [2-4].

End stage kidney disease, even if the patients don't need dialysis yet significantly decreases survival rates after aneurysm surgery [2,3,5,6]. Norwood et al., were among the first in 2004 who published the outcome of AAA repair in dialysis patients. Thirteen ESRD patients underwent open aneurysm surgery, of whom 3 were under haemodilysis and 3 under CAPD. Two of HD patients died soon after the procedure, similarly only one CAPD patient survived the early postoperative period. Of the 7 patients who were not on dialysis 6 survived the surgery but later 4 of them needed permanent dialysis [7].

Abdominal aortic aneurysm is a common vascular complication of kidney failure patients. Two surgical options are available, OAR with transperitoneal approach combined with synthetic graft implantation or EVAR with deployment of a stent-graft excluding aneurysm sac from inside the artery. The risks and the benefits of the two procedures in kidney failure patients are still under debate. In 2014 Yuo et al., analyzed the data of United States Renal Data System of 1557 dialysis patients who underwent AAA repair, either OAR (261 cases) or EVAR (1296 patients). We highlight 11.3% 30 day mortality (EVAR 10.3%, OAR 16.1%, significant difference, p=0.01). One year survival was 66.5% (EVAR 66.2%, OAR 68%, not significant), while survival dropped to 37.4% at 3 years (EVAR 36.8%, OAR 40%, not significant). Average length of survival was 25 months after EVAR and 27.4 months after OAR. Mortality rate increased with age and diabetes while longer time on dialysis, hypertension and renal transplantation were protective [4].

The effect of chronic kidney disease on the outcome after AAA repair was assessed by Patel el al. They analyzed the National Surgical Quality Improvement Program (NSQIP) data of 8701 patients (EVAR 5811, OAR 2890). The patients were classified into 3 groups according to their preoperative GFR: mild CKD class 1-2 (GFR>60ml/min), moderate CKD class 3 (GFR: 59-30ml/min) and severe CKD class 4-5 (GFR: <30ml/min). Following this classification 63% of all patients were in mild group, 30% in moderate and 7% in severe group. Perioperative mortality increased with severety of kidney failure: CKD 1-2 class 1.7%, CKD 3 class 5.3%, CKD 4-5 class 7.7%. In severe CKD group perioperative mortality was 6.2% after EVAR and 10.3% after OAR. Morbidity also increased remarkably with severety of CKD. In the EVAR group morbidity was 8.3%, 12.8% and 19.2% of mild, moderate and severe CKD patients, respectively. Morbidity of OAR patients proved to be 25.2%, 32.4% and 39.6% in mild, moderate and severe groups, respectively. These results clearly demonstrate that the severety of renal failure is closely correlated with morbidiy and mortality after elective AAA repair. Therefor kidney function seriously needs to be considered in the indication process [3].

Patel et al. clarified in 2015 that postoperative deterioration of kidney function is an independent predictor of late mortality after AAA repair [6].

Data from the literature strongly supports that preoperative kidney function remarkably influences the outcome of aneurysm surgery and if possible elective repair is suggested in early stage of renal failure [2,3,5,8-10].

It is worth discussing what type of AAA repair could be the most beneficial for our patient. Because of rapid progression of the aneurysms urgent intervention was necessary. Transperitoneal open reconstruction, as the first option wouldn't have been adventageous from survival perspective. Longer procedure time, more blood loss and transfusion need would have increased the risk of complications compared to endovascular procedure [3,4,5,11,12]. We also had to consider that transperitoneal approach would have resulted in, at least temporarily the discontinuation of PD treatment and conversion to HD that was firmly refused by the patient. A few studies report successful initiation of PD after transabdominal AAA repair but in most of the cases postoperative intraabdominal adhesions reduce the efficacy of CAPD treatment that eventually needs to be discontinued [13,14]. Abdominal aneurysm repair via retroperitoneal approach is an option to maintain peritoneal dialysis but it hasn't become routine practice [15]. As a consequence endovascular repair was decided but we still had to be prepared for several complications. Renal failure similarly influences the outcome after EVAR and additionally the usage of intraoperative contrast material as a nephrotoxic agent can deteriorate the remainder kidney function. However, proper preoperative preventive measures (avoidance of nephrotoxic agents, perioperative hydration, possibly administration of N-acetylcysteine), usage of smallest possible amount of non-ionic and low osmolarity contrast material all contribute to the reduction of peri-operative decrease of renal function. Consequently, for renal failure patients, despite intraoperative usage of contrast agents EVAR is a safe procedure. Instead of CTA MR angiography is an option to reduce the amount of iodinated contrast material but it is not recommended for severe CKD patients because of high risk of nephrogenic systemic fibrosis (NSF). Duplex US can substitute CTA for EVAR follow-up that significantly can reduce the overall quantity of contrast material [8-12,16].

The outcome of our patient was influenced by several risk factors and co-morbidities. Besides his age hypertension, severe atherosclerosis, stroke in his medical history, COPD, left ventricle hypertrophy all contributed to higher risk of morbidity and mortality [6,11,17,18].

Regarding the surgical complications the groin lymphocyst certainly didn't influence our patient's long term outcome. It is worth mentioning that percutaneous EVAR is recommended recently to reduce the risk of groin complications [11,12]. Endoleaks are common complications of endovascular repair with estimated rate of over 20% in 5 years after the procedure. Type I or III endoleaks that need urgent intervention occur in 3-5%. Type II endoleaks that often resolve spontaneously and usually need only follow-up can persist in 10% of the cases after 2 years. Type II endoleak for our patient was demonstrated by the first follow-up CTA but the aneurysm sac was only slowly growing so we decided against intervention for several years. When more dangerous type I endoleak developed, aneurysm sac pressure could be controlled by urgent implantation of a cuff to the aneurysm neck. Later the sizes of the aneurysms further grew but it was completely asymptomatic and didn't result in the patient's death [11,12].

We can conclude that endovascular repair was beneficial for our patient. Open surgery for a high risk patient not only would have increased the number and severity of complications but also our patient explicitly refused it. We know now that the patient was right.

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