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Resection of the abdominal aorta aneurysm in a patient with a transplanted kidney

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The number of kidney transplants in patients with end-stage chronic renal disease is annually increasing all over the world. But the incidence of abdominal aorta aneurysm in patients with allografted kidney can be assessed from very few published reports. D.C.Cron et al revealed 29 cases of aorta aneurysm among 2133 patients who underwent kidney transplantation, thus the incidence making 1.35%. Surgery for abdominal aorta aneurysm in this patient population still remains a rarity in the practice of a vascular surgeon and so puts a number of fundamental questions for us that do not have ready-published answers. In heterotopic transplantation, the kidney ischemia during aortic cross-clamping is a crucial aspect in the treatment of this patient population, and if underestimated, it can potentially lead to the graft loss. A number of authors

do not consider an additional protection of the kidney to be obligatory during the aortic cross-clamping, and they believe the surgery can be performed safely for the graft by using a quick suture of the prosthesis. Below we present our clinical case report of the infra-renal aorta aneurysm resection without a graft protection in a patient after heterotopic kidney transplantation.

Keywords: aortic aneurysm, kidney transplantation, transplant ischemia

Introduction

The number of kidney transplants in patients with end-stage chronic renal disease is annually increasing worldwide. The incidence of the abdominal aorta aneurysm (AAA) in patients with a transplanted kidney can be assessed from individual publications only. So, according to Cron, among 2133 patients who underwent kidney transplantation, the aortic aneurysm was detected in 29 cases, making 1.35% [1]. Some authors believe that the continuous intake of glucocorticoids aimed at preventing a graft rejection is the factor predisposing to the AAA development due to inhibiting the synthesis of chondroitin sulfate involved in the deceleration of the vessel wall remodeling [2, 3]. Surgery for AAA in this patient population continues to be a rarity in the practice of a vascular surgeon and so puts a number of fundamental questions that do not have ready-published textbook answers. When reviewing the literature, we found more than 100 reports on open and endovascular AAA repairs in patients after kidney transplantation. In heterotopic transplantation, the kidney ischemia during aortic cross-clamping is a crucial aspect in the treatment of this patient population, and if underestimated, it can potentially lead to a graft loss. A variety of

strategies for the renal allograft protection during the aorta cross-clamping have been described in available literature. These strategies include: a temporary axillofemoral shunt, an axillofemoral bypass, an aortofemoral bypass, femorofemoral and axillofemoral bypasses using the cardiopulmonary bypass pump, various modes of hypothermia (general hypothermia, in situ, cold renal perfusion) [4-9]. Moreover, there are reports of AAA resection performed without using any kidney protection during the aortic clamping phase. The choice of the surgical technique and the method to protect the graft is determined on an individual case-to-case basis and continues to be the subject of discussions.

Below we present a clinical case report of infrarenal aortic aneurysm resection without the graft protection in a patient after heterotopic kidney transplantation.

Clinical Case Report

Patient S. was admitted to the Vascular Surgery Department of *A.V. Vishnevsky Institute of Surgery* on June 16, 2016.

The patient had no complaints on admission. He had suffered from arterial hypertension since the age of 33 years old, having a maximum pressure increase of up to 200 mm Hg. He received a hypotensive therapy irregularly. On January 13, he underwent a cadaveric kidney allotransplantation into the left iliac fossa in the *Federal Science Center of Transplantation and Artificial Organs named after Academician V.I.Shumakov*.

An aortic aneurysm was identified during the kidney transplantation and the patient was referred for consultation to *A.V. Vishnevsky Institute of Surgery*. At the out-patient visit to the clinic, the color duplex scanning examination demonstrated the abdominal aorta diameter of 24.9 mm at the level of unpaired visceral branches. At about 6.5 cm from the visceral arteries, the aorta aneurysmatically dilated having maximum measurements of 64 x 63 mm, the aneurysm length was 113 mm. Semi-concentric thrombotic masses up to 30 mm thick were visualized in the aneurysm lumen; a patent aortic lumen was 33 x 29 mm. The left common iliac artery was not dilated, having the diameter of 12.8 mm at its ostium, being patent, with the main blood flow. The

external iliac artery was not altered; the implanted renal artery of 4.4 mm in diameter was visualized at 25 mm from its ostium. In the ostium: the right common iliac artery of up to 11 mm in diameter, the aneurysm of up to 23 mm in diameter is visualized in the middle third, extending almost to the bifurcation. Given the patient having a single functioning kidney, the computed tomography (CT) with contrast infusion was not performed.

On June 16, 2016, the patient was hospitalized to the Vascular Surgery Department of *A.V. Vishnevsky Institute of Surgery* for the aortic aneurysm resection to be performed. The patient's general condition on admission was satisfactory, there were no significant abnormalities in organs and systems. The blood tests showed hemoglobin level of 144 g/L, urea 4.41 mmol/L, creatinine 113 μmol/L.

On the following day the patient underwent the surgery that included: the infrarenal aorta aneurysm resection with linear prosthetic repair, the resection of the right common iliac artery aneurysm with a common iliac - common femoral prosthetic repair. The access to the aorta was obtained through the midline laparotomy, and then the aortic aneurysm extending from below the left renal artery to the bifurcation was exposed. The maximum diameter of the aortic aneurysm was 70 mm. After the heparinization and opening of the aneurysmal sac, the proximal and distal end-to-end anastomoses were performed in turn between the aorta and polytetrafluoroethylene prosthesis using a continuous blanket suture of polypropylene 3/0. The duration of the aorta clamping phase, and, accordingly, the warm ischemia time for the graft was 23 minutes. Further, the right common iliac artery was exposed down to its bifurcation; there was an aneurysm of up to 30 mm in diameter seen in the middle third. An attempt was made to resect the iliac artery aneurysm with further common iliac - external iliac prosthetic repair; however, the distal anastomosis has to be formed with the common femoral artery due to the sutures cutting the vessel wall.

On the first day, the diuresis was 1900 ml; on the following day, the patient was transferred from the Intensive Care Unit to the specialized clinical department. The control ultrasonography demonstrated the patent prostheses, the main blood flow in both common femoral arteries, the intrarenal blood flow in the transplanted kidney being depleted, but there was a laminar blood flow in the renal artery trunk with a linear blood flow velocity equal to 60 cm/s.

The postoperative course was uneventful; the patient was discharged home on the 5th day after surgery. In August, 2016, a control follow-up CT angiography was performed demonstrating patent aortic and right iliac artery prostheses, and a patent renal artery (Fig. 1, 2).

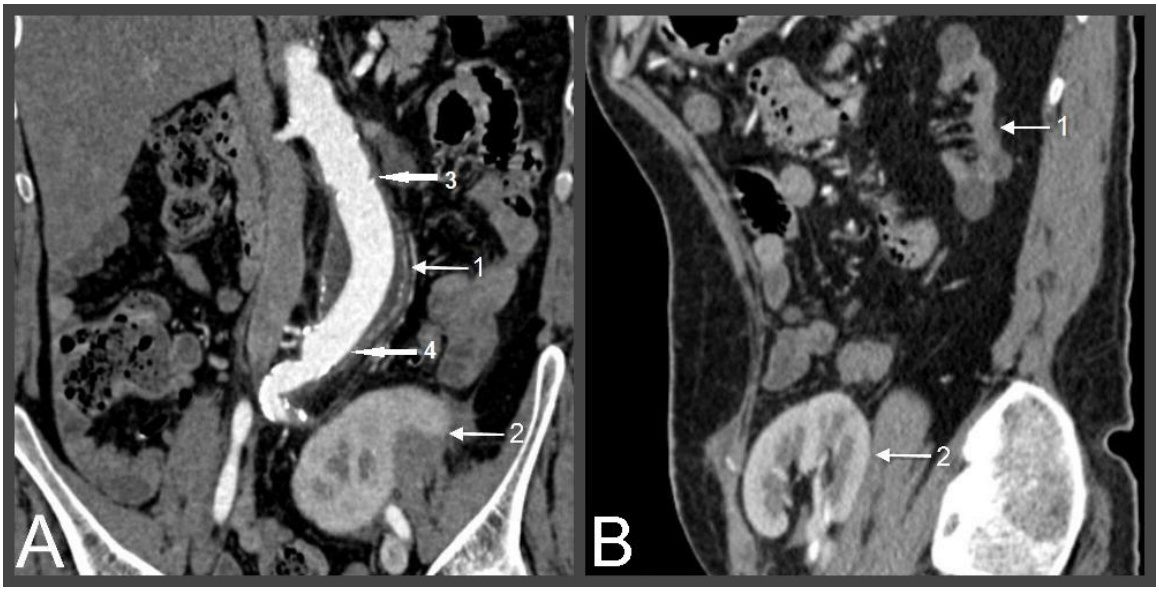

Fig. 1. Postoperative computed tomographic angiography. A. Coronary view: Aortic aneurysm (1); Transplanted kidney (2); Proximal anastomosis (3); Distal anastomosis (4). B. Sagittal view: Wrinkled kidney (1); Transplanted kidney (2)

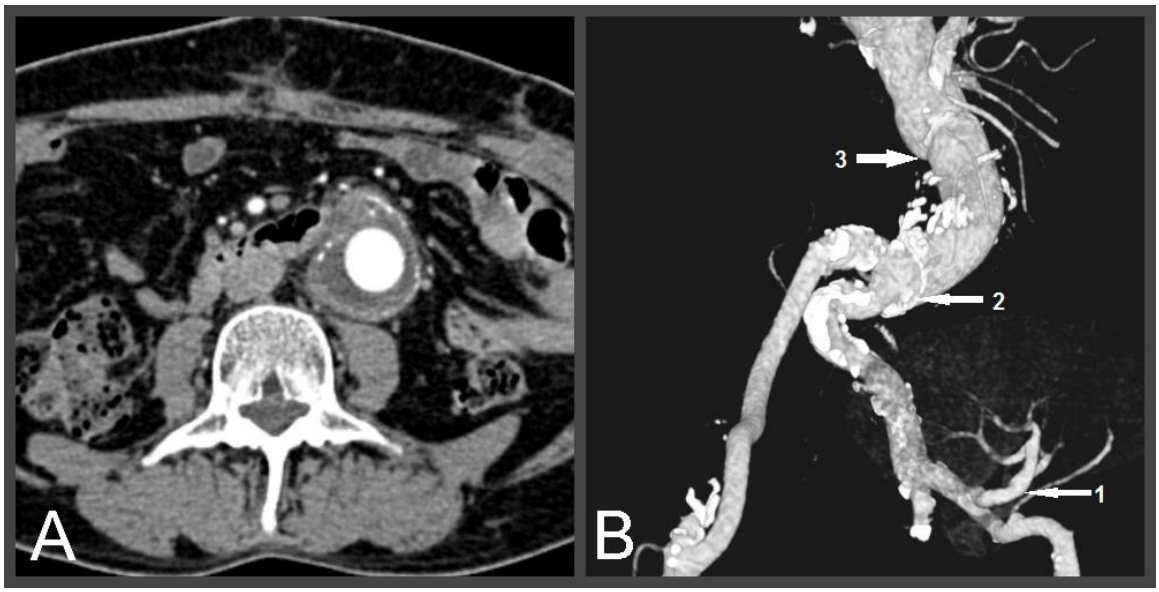

Fig. 2. Postoperative computed tomographic angiography. A. Axial view. B. 3D-reconstruction: A patent renal artery (1); Distal anastomosis (2); Proximal anastomosis (3)

Discussion

The first AAA resection in a patient with a transplanted kidney was reported in 1976: Shons et al. performed extra-anatomical axillofemoral bypass grafting and the resection of inflammatory aneurysm without its prosthetics. The patient died on the 106th day because of the bleeding from the aortic stump [5]. Endovascular prosthetic repair of the aorta in a patient with a transplanted kidney was first performed by Lepäntalo in 1999 [10]. In 2009, Leon presented a meta-analysis of AAA treatments in patients with a transplanted kidney [11]. According to his paper, 19 endovascular aortic aneurysm repairs (EVARs) and 138 open aortic resections had been performed in renal transplant patients by 2009. One emergency EVAR procedure was performed in a patient with a ruptured aortic aneurysm; after the surgery, the graft function was retained. In the group of endovascular procedures, complications were reported in 9 cases: type I endoleak in 2 patients, type II endoleak in 5, type IV endoleak; and 1 patient developed the lower limb acute ischemia signs postoperatively associated with the femoral artery dissection. Three of 19 patients died (15.7%) of colon cancer, hemorrhagic stroke, and sepsis, respectively, at 5, 7, and 13 months post-surgery. Mortality after an open surgery was 2.8% (4 cases); one death occurred in immediate perioperative period, and other deaths occurred after 1.5, 2 months, and 2 years. The causes of death were bleeding, sepsis, bleeding from the stump of the aorta, and the thoracic aorta dissection, respectively. The same group of authors summarized the graft protection options (Table).

Table. Kidney protection options in open AAA repair surgery (as summarized by Leon).

Kidney protection option	Number of cases
Permanent or temporary axillofemoral bypasses	29
Allograft cold perfusion	15
Femorofemoral and axillofemoral bypass using the cardiopulmonary bypass pump	10
Axillofemoral or aortofemoral shunt	6
Local allograft hypothermia with ice slush	3
Aortorenal shunt	3
Removal of the allograft with the subsequent replantation	1
Cardiopulmonary bypass	2
General hypothermia	1
Femorofemoral crossover bypass	4
No kidney protection	22
Data not available	39

There are two clinical reports in the Russian medical literature describing the treatment for AAA in patients with renal transplant. B.V.Fadin et al. chose and successfully performed the AAA resection with prosthetic repair, and the use of cold renal perfusion as the allograft protection [12]. The first endovascular prosthetic repair of the aorta in a renal transplant patient was reported by R.I. Khabazov [13]. A number of authors do not consider the additional protection of the kidney mandatory

during the aorta clamping, and the surgery can be performed without excessive risk to the transplant, provided a rapid prosthetics surgical technique is used.

The authors state there is no conflict of interests to declare

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