CASE REPORTS

https://doi.org/10.23873/2074-0506-2024-16-4-483-490

Potential of X-ray endovascular technologies in the correction of rare vascular complications after kidney transplantation

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Abstract

Objective. *The paper aims at demonstrating the efficacy of endovascular interventional techniques in the treatment of rare vascular complications after kidney transplantation.*

Material and methods. *Recipients of renal grafts obtained from a deceased donor developed the following complications: a false aneurysm of the interlobar renal artery after lymphocele puncture in one case and a subintimal hematoma of the external iliac artery with subocclusion of the latter and impaired perfusion of the renal graft in the other one.*

Results. *These complications were successfully managed using X-ray endovascular technologies, which allowed saving the renal grafts in both cases with satisfactory long-term results.*

Conclusion. *Early diagnosis and endovascular technologies made it possible to cope with complications minimally invasively and prevent the development of adverse events in the long term.*

Keywords: kidney transplantation, false aneurysm of the segmental renal artery, subintimal hematoma of the external iliac artery

Conflict of interest The authors declare no conflict of interest

Financing The study was performed without external funding

For citation: Shabunin AV, Bedin VV, Arablinskii AV, Minina MG, Tsurkan VA, Drozdov PA, et al. Potential of X-ray endovascular technologies in the correction of rare vascular complications after kidney transplantation. *Transplantologiya. The Russian Journal of Transplantation.* 2024;16(4):483–490. (In Russ.). https://doi.org/10.23873/2074-0506-2024-16-4-483-490

EIA, external iliac artery

CFA, common femoral artery

US, ultrasound examination

Introduction

Kidney transplantation is the best method of renal replacement therapy in patients with end-stage chronic renal failure or stages 4–5 of chronic kidney disease [1]. At the same time, kidney transplantation, like any surgical intervention, is associated with the development of early and late postoperative complications, which can be threatening both for the kidney graft, and also recipient's life, and this is often a factor in refusing surgery in this category of patients [2, 3]. Surgical complications are predominantly of vascular etiology, their occurrence ranges from 3% to 15% [4]. Due to the dynamic development of the interventional radiology

endovascular service, it became possible to use these technologies to cope with vascular complications occurring after solid organ transplantation [5, 6]. The aim of this publication is to demonstrate the efficacy of interventional radiology endovascular techniques in the treatment of rare complications after kidney transplantation: a false aneurysm of the renal interlobar artery after lymphocele puncture in one case and a subintimal hematoma of the external iliac artery with subocclusion of the latter and impaired perfusion of the renal graft in another.

Clinical case No. 1

On July 7, 2022, patient Zh., 39 years old, underwent a cadaveric kidney allotransplantation for an end-stage chronic renal disease resulting from chronic glomerulonephritis. The kidney was obtained from a donor with irreversible cardiac arrest. In the postoperative period, a delayed renal graft function was observed; hemodialysis sessions were performed for 12 days after transplantation. The ureteral stent was removed on the 14th day. On day 4 after stent removal, the laboratory tests demonstrated an increase in plasma creatinine from 280 μmol/L to 310 μmol/L despite the undertaken conservative therapy. At ultrasound examination performed on the 21st day after stent removal, a fluid accumulation was diagnosed in the lower pole of the renal graft, adjacent to the bladder. For the purpose of diagnostic differentiation between a urinary leakage and lymphocele, a diagnostic puncture was performed with evacuating 20 ml of the contents for biochemical analysis. Based on the laboratory data, the diagnosis: "Lymphocele of the retroperitoneal space" was made; however, the next day after the puncture, according to ultrasound examination data, an anechoic mass measuring 17x10 mm with hyperechoic inclusions, with arterial blood flow and a "neck" from the interlobar renal artery was identified in the structure of the renal graft

closer to the upper pole, which most probably corresponded to the pattern of a false aneurysm and lymphocele of the previous volume. The next day, the control ultrasound examination showed the size of the aneurysm increased to 20x14 mm. The diagnosis was confirmed by multislice spiral computed tomography with intravenous contrast (Fig. 1).

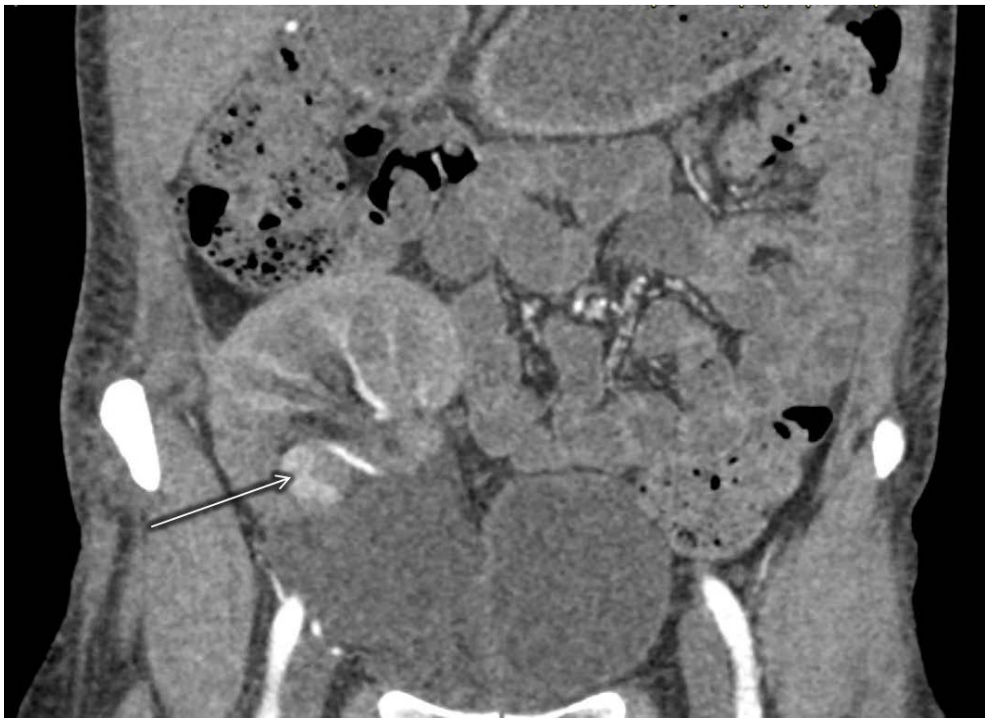

Fig. 1. Multislice spiral computed tomography of the pelvic organs and retroperitoneum with intravenous contrast. False aneurysm of the interlobar renal artery, retroperitoneal lymphocele (the arrow indicates a false aneurysm 24×10 mm)

Given the false aneurysm size was increasing over time, a decision was made at a multidisciplinary consultation to perform X-ray endovascular embolization of the interlobar renal artery.

In the interventional radiology operating room, the catheterization of the right common femoral artery was performed according to Seldinger technique, a 5F introducer was placed. On angiograms, the external iliac

artery (EIA) was patent, the anastomosis and renal artery were patent, the lumen was sufficient. In the projection of the upper pole of the organ (intraparenchymally), an oval-shaped mass of 32x19 mm in size with smooth contours accumulating contrast agent up to the venous phase, communicating with the interlobar branch of the renal artery was visualized (Fig. 2). Venous outflow from the graft was not impaired.

Fig. 2. Angiogram. False aneurysm of the interlobar renal artery of 32x19 mm in size (indicated by the arrow)

Endovascular coil occlusion of the aneurysm cavity was performed through the afferent branch with implantation of a detachable platinum microcoil (Hilal Embolization Microcoil, Cook Medical, USA), coated with hydrogel polymer. The exposure time was 5 minutes.

At control angiography study, the cavity of the false aneurysm was non-contrast, the trunk and segmental branches of the organ were patent, and venous outflow was not impaired (Fig. 3).

Fig. 3. Angiogram. The false aneurysm of the interlobar renal artery is non-contrast (the arrow indicates the microcoil in the false aneurysm lumen)

The control ultrasound examination on the following day showed a 20x12 cm mass with a smooth clear outline, heterogeneous “layered” contents, and no blood flow was detected in the upper pole of the renal graft when using color Doppler mapping (Fig. 4).

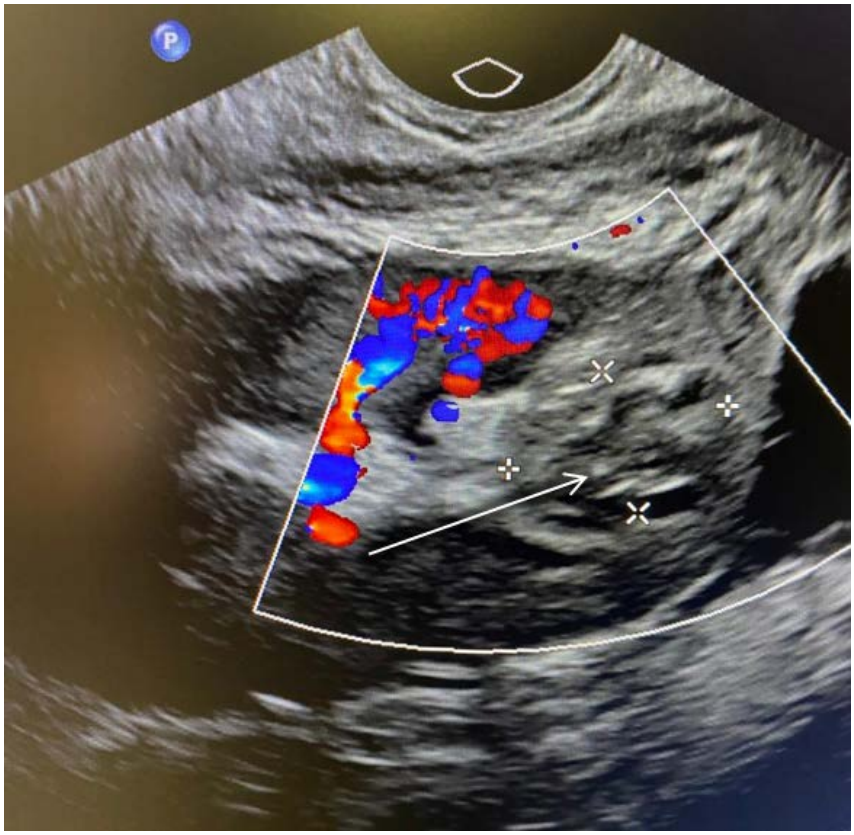

Fig. 4. The renal graft image at Doppler ultrasonography. No contrast enhancement of the false aneurysm sac after embolization (the arrow indicates the thrombosed false aneurysm sac)

Fourteen days after the radiological endovascular intervention, a laparoscopic fenestration of the peritoneum was performed for retroperitoneal lymphocele. The renal graft function was restored. The patient was discharged from hospital, having the serum creatinine of 182 μmol/L. Currently, the follow-up period has made 22 months, the renal graft is functioning, serum creatinine is 179 μmol/L.

Clinical case No. 2

Patient K., 42 years old, was treated for end-stage chronic renal failure as a result of global segmental glomerulosclerosis. On March 6, 2023, a cadaveric kidney allotransplantation from a deceased donor was performed using a standard technique, without technical difficulties. The

external iliac vessels were normal. On the first postoperative day, anuria, growth of urea and creatinine levels, hyperkalemia were noted. According to ultrasound examination of the renal transplant, the blood flow velocity in the renal artery was up to 200 cm/sec with marked turbulence, there was a collateral blood flow in the right common femoral artery (CFA), the intrarenal vascular pattern was differentiated to the subcapsular sections, being significantly depleted at the level of the cortical layer; the blood flow velocity in the intrarenal arteries was below normal values with a resistance index of 0.4.

The multidisciplinary council made a decision to perform an emergency angiography study. Seventeen hours after completion of the kidney transplantation, the catheterization of the right CFA was performed according to Salinger in the radiology operating room, a Pigtail 5F catheter was placed in the intracranial aorta; on the angiograms, the common iliac artery, CFA were passable, the external iliac artery (EIA) was sub totally steno tic, the renal graft artery passed from EIA distally from the site of stenosis and was patent (Fig. 5).

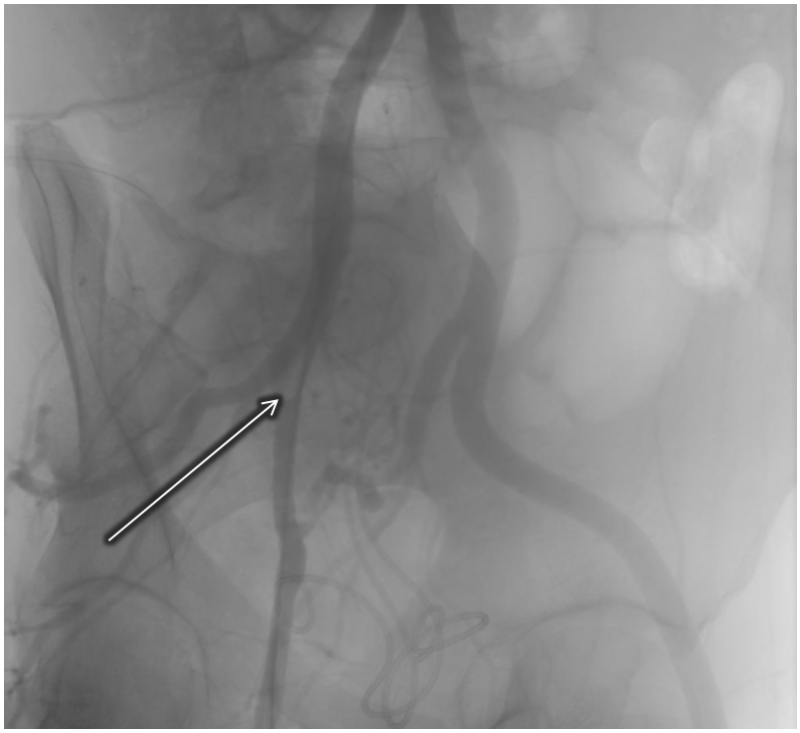

Fig. 5. Angiogram. Stenosis of the external iliac artery up to 90% (the arrow indicates the stenotic area)

A balloon-expandable stent was implanted (Protégé EverFlex, Medtronic, USA); the control angiography showed a complete restoration of the EIA lumen; pulsation in the arteries of the right lower limb was visualized at all levels (Fig. 6).

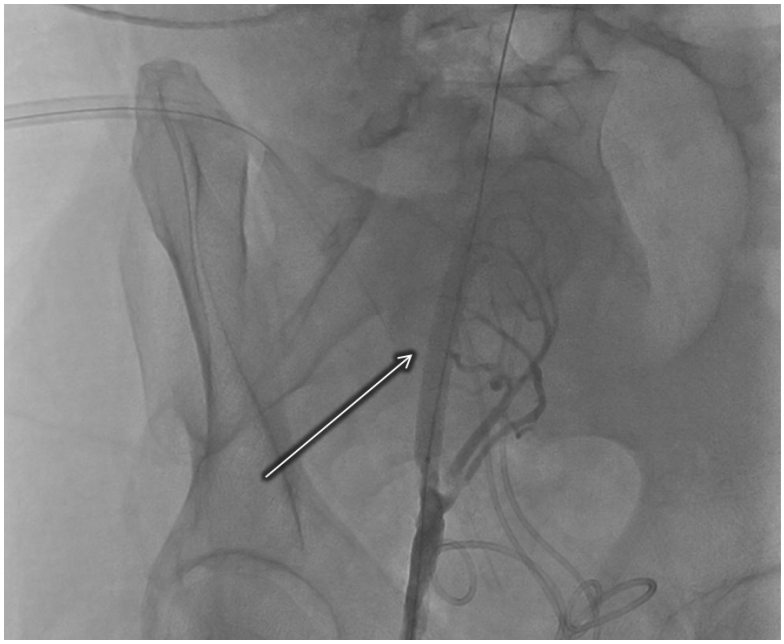

Fig.6. Angiogram. The stent is in the external iliac artery. The lumen patency has been restored (the arrow indicates the stent in the external iliac artery)

The ultrasound examination on the following day demonstrated the main blood stream in the right CFA, the right EIA was patent, the intrarenal vascular pattern could be differentiated to the subcapsular sections, the resistance index was 0.72. The patient was administered a dual antiplatelet therapy (clopidogrel 75 mg once a day + acetylsalicylic acid 100 mg once a day). In the postoperative period, slow recovery of the renal graft function was noted, the patient was discharged from hospital on the 29th day, having serum creatinine 250 μmol/L. Currently, the follow-up period has made 13 months; during a visit on 15.08.2024 to the Nephrology Center of the Moscow Multidisciplinary Scientific and Clinical Center n.a. S.P. Botkin, the plasma creatinine was 197 μmol/L.

Discussion

False aneurysm of the interlobar renal artery is a rare iatrogenic complication after puncture of retroperitoneal lymphocele. Over 6 years of

the kidney transplant program, we have encountered this complication only once. Potentially, this complication could lead to the loss of the renal graft, therefore, at present, after puncture biopsy of renal grafts and puncture of fluid collections around the renal graft, ultrasound screening is mandatory several hours after the procedure. Negative dynamics made an indication for active surgical tactics, the possibility of a multidisciplinary consultation with the involvement of emergency interventional radiology endovascular surgeons [7] with extensive experience in embolization of visceral arteries - all those made it possible to effectively cope with the developed complication with minimal impact on the renal graft parenchyma and maintain the graft with satisfactory function.

In the second case, early diagnostic measures and the use of interventional radiology endovascular technologies, as in the first case, made it possible to control the development of a rare vascular complication (subtotal stenosis of the EIA) and prevent negative consequences in the long term.

Conclusion

Early diagnosis and use of interventional radiology endovascular technologies are the key aspects of successfully treating rare iatrogenic vascular complications after kidney transplantation.

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The article was received on July 19, 2024;
Approved after reviewing on August 1, 2024;
Accepted for publication on September 18, 2024