CASE REPORT

Hemorrhagic shock due to bleeding from an arteriovenous fistula after allograft biopsy in a kidney transplant recipient: a case report

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Received: 23 August 2017 / Accepted: 16 October 2017 / Published online: 1 November 2017
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Abstract Arteriovenous fistula (AVF) after allograft biopsy occurs in 1.6–8.3% of kidney transplant patients and most cases remain asymptomatic. Here, we report a case of hemorrhagic shock in a kidney transplant recipient following bleeding from an AVF after graft biopsy. Immediate intensive care including angiographic embolization saved the patient and the allograft. A 62-year-old woman with end-stage renal disease caused by diabetic nephropathy underwent ABO-incompatible kidney transplantation. No complications occurred in the early postoperative period. However, serum creatinine levels did not decrease sufficiently and decreased graft diastolic blood flow was noted on ultrasound. Therefore, at 14 days after kidney transplantation, allograft biopsy was performed to elucidate the cause of allograft dysfunction. At 5 days after allograft biopsy, the patient developed hemorrhagic shock caused by bleeding from an AVF in the allograft. We immediately performed angiographic embolization, and her vital signs improved without deterioration in renal function. AVF can cause hemorrhagic shock, and angiographic embolization is effective for treating it.

Keywords Allograft biopsy · Arteriovenous fistula · Hemorrhagic shock · Angiographic embolization

Introduction

Allograft biopsy is an important diagnostic test for allograft dysfunction, particularly since Nahas et al. reported a difference rate of 43.7% between clinical and pathological diagnoses [1]. However, vascular complication following allograft biopsy occurs in 0.9–15% of renal transplant patients and is a serious problem for patients with decreased allograft function [2–4].

Arteriovenous fistula (AVF) is the most common complication of allograft biopsy [3]; it develops in 1.6–8.3% of allograft biopsies [5–7]. Most cases of AVF after allograft biopsy remain asymptomatic, with spontaneous resolution noted in 64–77% of patients, and AVF rarely requires percutaneous intervention [7, 8]. Although the clinical course of AVF is typically benign [7], a few reports have described life-threatening hematuria from AVF after kidney transplant biopsy [9]. Here, we report a case of hemorrhagic shock caused by bleeding from AVF after allograft biopsy in a renal transplant recipient who received immediate intensive care including angiographic embolization, which saved the patient and the allograft.

Case presentation

A 62-year-old woman with end-stage kidney disease due to diabetic nephropathy underwent ABO-incompatible kidney transplantation. No complications occurred in the early postoperative period, and her vital signs were normal. However, serum creatinine levels did not sufficiently decrease and decreased graft diastolic blood flow was noted on ultrasound. Therefore, at 14 days after kidney transplantation, allograft biopsy was performed to elucidate the cause of allograft dysfunction. We used a 16G bioptic gun, and

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obtained two sections. The finding at kidney biopsy was suggestive of acute antibody-mediated rejection. On the day after allograft biopsy, we observed a mosaic pattern at the lower pole of the allograft on ultrasound, corresponding to the point of the fine needle puncture, indicating the occurrence of AVF. However, we decided to carefully monitor the patient without intervention, because AVF-associated symptoms including hematuria were not observed. The laboratory findings were as follows: red blood cell (RBC), $243 \times 10^4/\mu\text{L}$; hemoglobin (Hb), 7.8 g/dL; hematocrit (Ht), 23.8%; platelet (Plt), $25.3 \times 10^4/\mu\text{L}$; blood urea nitrogen (BUN), 35.8 mg/dL; creatinine (Cr), 1.14 mg/dL; estimated glomerular filtration rate (eGFR), 38.0 mL/min/1.73 m²; activated partial thromboplastin time (APTT), 26.6 s; and prothrombin time-international normalized ratio (PT-INR), 0.99. We used immunosuppressive agents, as shown in Fig. 1. Other than immunosuppressive agents, she also received trimethoprim–sulfamethoxazole, lansoprazole,

solifenacin, entecavir, and nifedipine without anti-platelet and anti-coagulant agents.

At 5 days after allograft biopsy, the patient suddenly developed gross hematuria along with hypotension. Hemorrhagic shock was diagnosed, and she was immediately transferred to the intensive care unit (ICU) and got intubated, and blood transfusion was performed. The clinical course is shown in Fig. 1.

Vital signs on ICU admission showed hypotension (50/30 mmHg) and tachycardia (140 bpm). The patient went into a comatose state (G1C1S1). Laboratory findings were as follows: white blood cell, 9000/ μL ; RBC, $182 \times 10^4/\mu\text{L}$; Hb, 5.8 g/dL; Ht, 17.9%; Plt, $19.2 \times 10^4/\mu\text{L}$; BUN, 35.5 mg/dL; Cr, 1.39 mg/dL; and eGFR, 30.6 mL/min/1.73 m².

The cause of the hemorrhagic shock was thought to be bleeding from the AVF in the allograft. Therefore, we performed angiographic embolization (Fig. 2b). Consequently, the patient's general condition and graft function improved,

Fig. 1 Clinical course of transplant admission. Serum creatinine did not deteriorate after angiographic embolization. Basi basiliximab, RTX rituximab, TAC tacrolimus, MMF mycophenolate mofetil, mPSL methylprednisolone, PSL prednisolone, DDFP double filtration plasmapheresis

Fig. 2 **a** Before angiographic embolization. Lower pole of the allograft showed no obvious contrast medium (arrow). The common iliac vein showed contrast perfusion in the early phase of contrast infusion (arrow heads). **b** After angiographic embolization. After angiographic embolization was performed at two places (arrow), the entire allograft showed contrast perfusion

and she was discharged at 15 days after angiographic embolization. As of 2 years after this event, her serum creatinine level has remained stable at 1.2 mg/dL.

Discussion

This case illustrates two important clinical issues: (1) Bleeding from AVF after allograft biopsy can cause hemorrhagic shock, and (2) such shock can be effectively treated by the early angiographic embolization.

In general, the occurrence of AVF after allograft biopsy or native kidney biopsy is rare, and the clinical course of AVF is typically benign [10, 11]. The prevalence of AVF after native kidney biopsy is 0.4–15% [12, 13], while that after allograft biopsy is 1.6–8.3% [5–7]. Although AVF can sometimes lead to visible hematuria (typically recurrent and dark red, and often with blood clots), hypertension, and renal impairment, which requires embolization therapy [14], most AVFs are clinically silent and more than 95% resolve spontaneously within 2 years [15, 16]. Schwarz et al. prospectively evaluated AVFs after allograft biopsy and found no patients presenting with pathological changes in blood pressure [7]. Our search of the literature revealed few cases of hemorrhagic shock caused by bleeding from AVF after allograft biopsy [9]. The reason why our case developed AVF with hemorrhagic shock was not clear. Recently, Morgan et al. [17] reported that the complication rate was higher in “cause” biopsy, like our case, compared with “protocol” biopsy, and the risk of complication included older age, increased BUN, decreased PLT count, history of prior renal transplant, deceased donor transplant, and use of anti-coagulant medications but not aspirin. In our case, only older age matches the risk factor. However, we thought two mechanisms contributed to these events. We performed allograft biopsy at deep site for diagnosing both renal cortical and medullary lesion, and the AVF was formed at relatively deep

site that localized relatively thick artery wall (such as the arcuate artery). Although the previous study did not state the preferred site of AVF in allograft biopsy, and this might cause severe bleeding. Furthermore, although our case did not take any anti-platelet drugs and anti-coagulants and did not show decreased platelet count or abnormal coagulopathy, she might have the condition of bleeding tendency due to ABO-incompatible kidney transplantation [18].

In this case, early angiographic embolization was an effective therapy that allowed patient and graft survival. Angiographic embolization for AVF after allograft biopsy is controversial, and there are no guidelines for the indications of this therapy. While angiographic embolization has been recommended in some studies, since it does not lead to deterioration in allograft function [5, 6], Kitajima et al. concluded that angiographic embolization should not be performed for AVF following allograft biopsy due to the risk of renal infarction and subsequent allograft dysfunction [19]. In our patient, no deterioration in renal function occurred after angiographic embolization.

The management of asymptomatic AVF also remains controversial. Fossaceca et al. recommended that angiographic embolization should be performed when AVFs are symptomatic or deterioration in renal function following allograft biopsy [20]. The recommendation is because there is no strong evidence supporting angiographic embolization for asymptomatic AVF and spontaneous resolution noted in 64–77% of patients [7, 8].

However, Loffroy et al. recommended that the angiographic embolization was performed for AVFs even when they are asymptomatic because of the potential to cause renal ischemia, heart failure, and massive bleeding [5]. In the present case, despite the fact that the AVF was initially asymptomatic and no deterioration in renal function was noted following allograft biopsy, the patient developed hemorrhagic shock caused by bleeding from the AVF. Furthermore, the rate of spontaneous resolution of AVFs after

allograft biopsy are fewer than that of native kidney biopsy [7, 8, 15, 16]. From these facts, we think that angiographic embolization should be performed even if the AVF is initially asymptomatic and showed no apparent growth in the AVF size.

In conclusion, bleeding from an AVF after allograft biopsy can lead to hemorrhagic shock; this can be successfully treated by early angiographic embolization, which, in this case, saved the patient and the graft. Even if a patient with AVF is initially asymptomatic and showed no apparent growth in the AVF size, angiographic embolization should be performed.

Compliance with ethical standards

Conflict of interest All the authors have declared no competing interests.

Human and animal rights statement This article does not contain any studies with human participants performed by any of the authors.

Informed consent Informed consent was obtained from all individual participants included in this case report.

Funding None.

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