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Case Report

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A Rare Complication of Renal Transplantation: Spontaneous Allograft Rupture

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Abstract

Spontaneous allograft rupture (SAR) is very rare in the posttransplant period. It is a life-threatening complication that affects the survival of the graft. It is associated with high rates of graft loss. SAR is most commonly associated with immunological processes. Acute rejection is the most common cause of SAR. Here we report the case of a child who had SAR with life-threatening complications and his treatment and follow-up.

Keywords: Children, renal transplantation, spontaneous allograft rupture

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INTRODUCTION

Renal transplantation is the treatment of choice for end-stage renal failure. Spontaneous allograft rupture (SAR) is rare, and it typically occurs within the first few weeks after transplantation. It presents with allograft sensitivity, sudden onset pain, hematoma, shock-causing hypotension, and oliguria. It is a potentially life-threatening complication of renal transplantation. It is associated with high rates of graft loss. Surgically, the graft requires nephrectomy or surgical repair. The first renal graft rupture in Turkey was reported by Haberal et al. (1). According to the literature, its frequency is 0.8%-6% (1). At present, it is a rare complication. However, 53% of cases result in graft loss and 6% in death (2). SAR is most commonly accompanied by immunological reactions. Updated immunosuppressive treatments have led to a reduction in the incidence of SAR. Acute rejection is the most common cause. Advances in immunosuppressive treatments have led to a reduction in the incidence of SAR. Acute tubular necrosis, vascular thrombosis (3), hypertension (4), trauma, and infections are other causes of SAR. In this report, we present the case of a child with SAR, which is rarely observed in all age groups.

CASE PRESENTATION

A 14-year-old boy with neurogenic bladder due to congenital anomalies of the kidney and urinary system was diagnosed with initial chronic kidney disease at the age of 7 months and with end-stage renal disease (ESRD) at the age of 8 years. His parents were cousins. He had been on peritoneal dialysis for 5 years and hemodialysis program for the previous year.

The donor was a 10-year-old boy who was followed up in the intensive care unit owing to a fall from a height. Empirical piperacillin-tazobactam and teicoplanin were started without signs of infection. Although the donor in the intensive care unit received noradrenaline infusion for 2 days, his blood pressure was 47/37 mmHg and he had tachycardia; his serum creatinine level was 1.09 mg/dL.

On 12 December 2006, renal transplantation with a 5 HLA mismatch 1DR compliance and blood type-matched deceased donor with a cold ischemia time of 19 hours was performed. Panel reactive antibody (PRA) Classes 1 and 2, Complement-dependent cytotoxicity

(CDC) crossmatch, and flow-lymphocyte crossmatch were all negative. Donor-specific antibody (DSA) test, a flow cytometry method that detects HLA antibodies against the donor using microparticles coated with recombinant or soluble HLA antigens, was performed. DSA was found to be Class 1 negative and Class 2 positive (MFI: 122) (normal value<2000). Induction therapy was started with 270 mg methylprednisolone according to the protocol before surgery and was continued with 270 mg methylprednisolone and 3 mg/kg/dose antithymocyte globulin (ATG) after transplantation. Enoxaparin sodium was started at 1 mg/kg/dose.

The patient was taken to the pediatric intensive care unit and intubated postoperatively. His blood pressure was 127/84 mm/Hg, and although he received a total of 1000 mL intravenous (IV) fluids during the surgery, he had a urine output of 40 mL. Isotonic saline loading was performed intravenously, and he had a urine output of 20 mL. Based on these findings, acute tubular necrosis (ATN) causing delayed graft function was considered for the patient who did not have sufficient urine output. The fluids he received were adjusted to his urine output and daily needs. Renal Doppler ultrasonography (USG) findings were unremarkable. His urine output was 313, 220, and 210 mL and daily creatinine values were 5.2, 6.82, and 5.25 mg/dL, for the first 3 days of transplantation, respectively. The need for hemodialysis (HD) and ultrafiltration (UF) occurred on the 3rd day. Renal biopsy was planned on the 3rd posttransplant day but could not be performed because the clinical status was not appropriate. In addition to induction therapy, 30 mg/kg/dose with a total of 600 mg pulse methyl prednisolone was added to the treatment considering the development of cellular rejection. There was a need for intermittent UF and hemodialysis between the 4th and 8th day posttransplantation. PRA levels were negative for Class 1-2. His serum creatinine level was 4.4 mg/dL and urine output was 800 mL/day on the 8th day posttransplantation. He mobilized on the 9th day posttransplantation, and suddenly, 300 mL of bloody fluid was drained from his kidney came from his drain. He had experienced no previous abdominal pain and no sensitivity in the transplant kidney in his daily examination. Fluid was given for a possible development of rapid shock due to bleeding, and vital signs were followed up. Urgent renal Doppler USG showed that the left lower-quadrant transplant kidney size was 95 mm, the parenchymal echo increased to Grade 1, intrarenal systolic acceleration increased, renal arterial resistive indexes increased to above 1 (N: 0.7), parenchymal biphasic flow was present, with high-resistance findings (evaluation for rejection). Diffuse free liquid with a depth of 5 cm was noted in the deepest part of the pelvis. The patient was urgently explored. Graft rupture was detected, and primary repair was performed. Figure 1 shows the ruptured graft. On the 2nd day after primary repair, renal artery flow and velocity were measured at 65/15 cm/sec on renal Doppler USG, and its velocity and form were normal. The size of the transplanted kidney was 88 mm, the resistive index was 0.51-0.52, and no lymphocele was observed. There was a decrease in free fluid in the abdomen. During primary repair, a biopsy was taken from the ruptured margin of the transplant kidney. At the end of the biopsy, 65 glomeruli were noted; there were no glomeruli with global sclerosis, segmental sclerosis, and necrosis. There was brush border loss in the tubules, necrotic findings, and fibrinoid necrosis in the arteries; however, since the biopsy was taken from the rupture margin, it was reported that it could not be associated with acute humoral rejection due to the absence of endotheliitis and fibrin thrombi, and although C4D was found to be positive in the peritubular capillaries, immunohistochemical staining was reported to be unreliable due to tissue trauma.

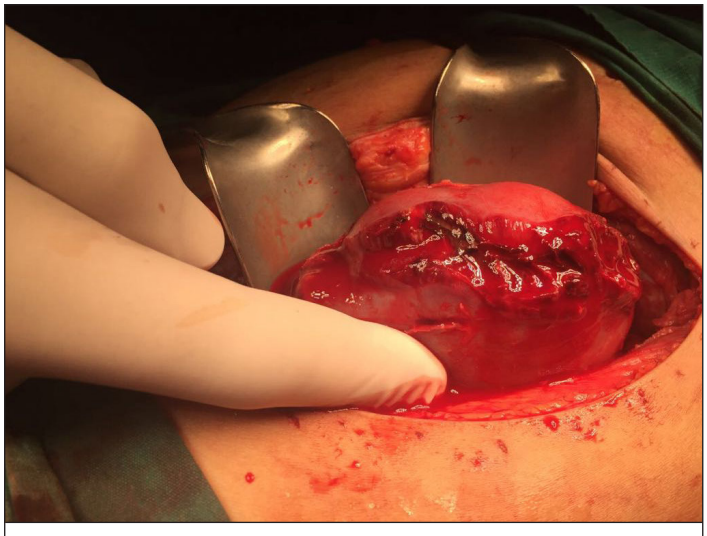

Figure 1. Appearance of a ruptured kidney during exploration (our case who developed SAR at posttransplant Day 9).

The patient's urine output was 863 mL on the 13th day posttransplantation and on the 4th day of primary repair. Immunosuppressive therapy comprising steroids, tacrolimus, and mycophenolate mofetil was administered. During the follow-up, his urine output gradually increased and renal function improved. He subsequently did not need hemodialysis. While his serum creatinine level was 1 mg/dL and cystatin C level was 1.98 mg/L in the first month posttransplantation, at the end of the 18th month, his serum creatinine level was 1.12 mg/dL and cystatin C level was 1.88 mg/L. His condition was stable.

DISCUSSION

Spontaneous allograft rupture is defined as the laceration of the renal capsule and parenchyma in the kidney without any injury before and during transplantation (5, 6). Although SAR typically occurs within the first 3 weeks after transplantation, late ruptures have also been described (7). Previously, SAR was reported to occur after the immunosuppressive treatment change at the 63rd month posttransplantation (8). It was first reported worldwide by Ray et al. (9). The prevalence of SAR varies between 0.3% and 9.6% (9). Among the causes of SAR, acute graft rejection has been reported most commonly, with an incidence of 60%-80% (10). Other etiological factors include ATN,

renal vein thrombosis, hydronephrosis due to ureteral obstruction, lymphocele, local ischemia, septic infarction, and tumors developing in the transplanted kidney (10). The condition may rarely develop after renal biopsy (11). Although its pathogenic mechanism is not fully understood, it is accepted that it results in the infiltration of inflammatory cells, ischemia, and rupture due to an increase in capsular tension in the transplanted kidney with interstitial edema during the immune-mediated rejection. However, high-dose intravenous immunoglobulin (IVIG) is used in the treatment of antibody-mediated rejection. The use of a high-dose IVIG results in platelet activation, which leads to thrombosis via increased plasma viscosity and the contamination of Factor 13. It has been reported in a single case that vascular thrombosis after IVIG treatment causes SAR (3). Spontaneous subcapsular hematomas in the renal allograft cause hypoperfused areas due to pressure on the kidney. Hypoperfusion and renal microvascular ischemia activate the renin–angiotensin–aldosterone (RAA) system. RAA activation causes hypertension, which in turn causes SAR (4). Articles have reported the spontaneous resolution of subcapsular hematoma (12, 13). In these articles, a conservative follow-up was performed in terms of spontaneous resolution by serial USG examinations. In one case, it was reported that subcapsular hematoma maturned into SAR during follow-up; which required surgical intervention (4). Similarly, lymphocele and urinomas developing after transplantation increase the risk of SAR with the same mechanism (14, 15). In particular, obstruction-induced hydronephrosis and lymphocele transplantation both prevent drainage of the kidney and increase ischemia on the kidney surface and cause hypertension, as well as associated subcapsular hematoma and SAR, by activating the RAA system (4). In our case, the graft was rescued via surgical repair. Because of its high morbidity and mortality, SAR requires an experienced pediatric nephrology and transplant team familiar with treatment management.

Ray et al. (9) reported that heparin used in hemodialysis during the posttransplant period is one of the possible factors of SAR. In our case, we demonstrated that the etiologic causes of SAR described above, i.e., lymphocele, hydronephrosis, renal vein thrombosis, and tumors, were absent, which was demonstrated using Doppler and renal USG findings. USG has a sensitivity of 87% and specificity of 100% in the diagnosis (9). In our case, lymphocele, hydronephrosis, and mass-forming cancer findings were also not observed during surgery. Considering the donor's condition in the present case, the patient being hospitalized in the intensive care unit, having a high serum creatinine level, and the kidney being transferred from a hypotensive cadaver despite receiving inotropic agent suggested a delayed graft function after transplantation. During the follow-up, while biopsy was planned, the transplanted kidney developed spontaneous rupture. The sample taken from the rupture area at the time of surgery was suspicious for antibody-mediated rejection, and endotheliitis and fibrin thrombi were not detected in the histopathological examination, although the C4D staining was positive for antibody-mediated rejection markers at biopsy. In the diagnosis of antibody-mediated rejection, DSA was planned as a serological compliance test. However, because the donor blood sample was insufficient, PRA screening was performed. Follow-up PRAs of the patient were Class 1 and 2 negative. The results did not support our diagnosis, although we considered the antibody-mediated rejection in our case.

Renal transplantation is still the best treatment option in patients with ESRD. Our patient had renal transplantation from a marginal donor. We attributed the lack of adequate urine output after renal transplantation and the lack of expected improvement in renal function to delayed graft function. ATN can cause both delayed graft function and SAR.

CONCLUSION

Spontaneous allograft rupture is a clinical entity that requires rapid intervention and can affect life and graft survival. Our patient was a 14-year-old boy who had a renal transplant. Because of the limited literature available on children with SAR, we aimed to present the case here. Delayed graft function is an expected situation in transplantation from marginal donors. However, rejection should be kept in mind as we did to determine the etiology in our case, and performing rapid laboratory investigations including biopsy for diagnosis is an important requirement for graft survival. Graft removal is the safest option. In particular, because of the long waiting lists for transplantation from cadaveric donors and low chance of second transplantation, repair is recommended if the patient can be stabilized and the damage of the graft can be ignored.

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