BAOJ Urology and Nephrology

Martin Chari, et al., BAOJ Urol Nephrol 2018, 3: 2
3: 012

Research

Fluid Collections after Kidney Transplantation

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Abstract

Fluid collections after kidney transplantation include urinoma, haematoma, lymphocele, seroma and abscess. These can cause allograft dysfunction or loss and are associated with increased morbidity or mortality if was not recognized early and treated promptly. They can present early or after many months postoperatively. Clinical presentation, radiological imaging and biochemical composition of the aspirated fluid help in differentiating these fluid collections. Ultra sound and computed tomography scanning are the commonly used radiological imaging modalities for localising and characterising these collections. Management depends on the etiology of the collection, and is best done using the multidisciplinary team approach. Urine leaks post kidney transplantation can arise from the renal pelvis, ureter, lower down from the bladder or anastomoses. Most urine leaks except for very small ones deserve surgical intervention.

Keywords: Transplantation; Fluid Collection; Urine Leak; Urinoma; Surgical Complications and Management

Introduction

Surgical complications after kidney transplantation include fluid collections such as urinoma, haematoma, lymphocele, seroma and abscess. If not managed appropriately, these complications can lead to delayed allograft function (DGF), allograft loss and recipient morbidity and mortality. Therefore, surgical complications must be promptly excluded first before medical complications like rejection in case of allograft dysfunction [1,2,3]. Clinical presentation, radiological imaging and biochemical examination of aspirated fluid are vital in differentiating these fluid collections. Biochemical features of aspirated fluid should be compared with serum in order to interpret [4] .

This article examines clinical presentation, differential diagnosis, and management of a kidney recipient who had significant fluid drainage postoperatively. This was a male patient aged 28 years who drained 820 mL and 750 mL on day 2 and 3, respectively. The fluid had 28 mmol/L potassium and 16000 µmol/L creatinine compared to 5.1 mmol/L potassium and 416 µmol/L creatinine in serum.

Differential Diagnosis

Hematoma

Incidence of haemorrhage post kidney transplantation differs greatly among centres [5,6]. It usually occurs early (few days) postoperatively,[7] but late occurrence (couple of weeks) is not uncommon [8]. Distinguishing early from late postoperative haemorrhage is vital since the later is normally due to non-surgical factors like anticoagulation [9]. Early postoperative haemorrhage can be from the vessel anastomosis, hilum

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Sub Date: July 5th 2018 , **Acc Date:** July 9th 2018, **Pub Date:** July 11th 2018

Citation: Martin Chari, Ajay Sharma, Jon Jin Kim and Ahmed Halawa (2018) Fluid Collections after Kidney Transplantation. BAOJ Urol Nephrol 3: 012

vessels, traumatised perigraft tissues and iliac vessels. The haemorrhage can cause haemorrhagic shock presenting with swelling, sweating, pallor, cold periphery, tachycardia, hypotension, tachypnoea and oliguria. Diagnosis is made by noticing excessive bloody drainage or haematoma on imaging using ultrasonography or computed tomography (CT) scanning. However, blocked drains and lack of fall in haemoglobin can be misleading. The principle management is emergency exploration to save the allograft and patient [10] .

Urinomas

Incidence of urinary leaks is variable though it is quoted at 3% [11,12]. Leakage can be from ureteroneocystostomy anastomosis, ureter or renal pelvis. Ureteral devascularization during harvesting or during transplantation and poor surgical technique of ureteroneocystostomy anastomosis are common causes [13]. Urine leak can be prevented by careful dissection and handling of the allograft and periureteric tissue by preserving the 'golden triangle'. The presentation can be early (within a week) or late in case of DGF (delayed graft function) when the renal graft starts passing urine. The site of collection is often between the bladder and allograft. However, the thigh and scrotum are not unusual sites. Clinical manifestations encompass DGF, oliguria, elevated drainage, allograft tenderness, fullness, wound extravasation, fever (if infected) and ipsilateral scrotal, leg or labial swelling. If untreated, urinomas may burst leading to ascites, cause hydronephrosis or may get infected to form abscess. Classical biochemical features are: markedly elevated potassium and creatinine concentrations when compared to serum. Conversely, if the potassium and creatinine concentrations of the fluid and serum are similar, then the diagnosis is seroma or lymphocele. However, elevated serum creatinine due to peritoneal reabsorption of urinary ascites must be excluded [14].

Lymphoceles

Lymphocele is lymph accumulation around the kidney allograft. Lymphoceles are mainly due to lymph leakage from unligated lymphatics around recipient iliac vessels. Therefore, the key step in prevention is by ligating or clipping lymphatics rather than using diathermy. They can also arise from kidney allograft lymphatics [15]. Additionally, obesity, certain immunosuppressants, DGF and allograft rejection are risk factors for lymphocele development [16]. Incidence varies immensely from 0.6% to 40%, [17,18] peaking at six weeks postoperatively (range: two weeks to six months). Lymphoceles are largely asymptomatic if there is no ureteric obstruction and hydronephrosis. Big lymphoceles can present with inguinal region oedema, abdominal pain, oliguria, DGF, fever and inferior vena cava compression. Drain placement at transplantation reduces lymphocele incidence [19]. No intervention is necessary for asymptomatic lymphoceles as they usually resolve spontaneously. Ultrasound guided percutaneous aspiration is reasonable as a diagnostic step. External drain insertion is could be tried but there is risk of infection. The best treatment option for symptomatic lymphoceles that are accessible through the peritoneal cavity is laparoscopic drainage by marsupialisation into the peritoneum. However, open drainage into the peritoneal cavity can be done [20,21].

Abscesses

These can be primary or result from infected lymphoceles, haematomas or urinomas. They need urgent drainage and antibiotic therapy. The aspirated fluid should undergo microscopy, culture and sensitivity studies. The radiological, biochemical and clinical features of these abscesses and

Table 1: Characteristics of post kidney transplantation fluid collections[4]

Fluid Type	Onset Period	Radiological Features	Laboratory analysis	Presenataion
Haematoma	early	echogenic	blood	bloody drain (if not clotted), hemorrhagic shock
Urinoma	early (<2 weeks)	aseptate, anechoic	elevated potassium & creatinine than in serum	DGF, oliguria, wound leak, high drainage
Lymphocele	2 weeks	septate, anechoic	potassium& creatinine similar to serum	asymptomatic if no obstruction, decreased drainage
Abscess	early or late	echoic, +/- septations	pus, microbes	pyrexia, tachypnea, tachycardia

fluid collections mentioned above are summarised in Table 1 above.

Therefore, based on the above distinguishing characteristics, urinoma is the diagnosis in the index patient described.

Management of Urinoma

Urine leakage within 24 hours post transplantation is usually due to surgical complications [22]. Ureteral ischaemia, subsequent necrosis and anastomosis dehiscence is responsible for urinomas occurring 1-2 weeks later. Leakage from anastomosis is the commonest; although bladder and pelvic leakage can also occur [23]. Exclusion of Foley catheter blockage is a crucial step. Prophylactic intraoperative ureteroneocystostomy stenting is beneficial in preventing urinomas [24,25].Table 2 and Table 3 below, respectively, show causes and management of post-transplant urine leakage and their imaging characteristics.

Percutaneously inserted nephrostomy tube and urinary catheter insertion are initial steps in managing urine leaks. This allows drainage of extravasated urine. Antegrade nephrostogram is then used for leak evaluation, as shown in Figure 1 below. Small and distal leaks are treated conservatively. For this, maximum decompression using bladder catheter, ureteric stent and nephrostomy tube is required. Serial contrast imaging is then used to determine leak resolution. Bladder catheter and nephrostomy tube are removed upon leak resolution. Ureteric stent removal follows in 4-6 weeks. This approach has good outcomes [27] . Percutaneous drainage of large urinomas is mentioned in order to prevent ureteric obstruction

Table 2: Post Transplant Causes and Management of Urine Leakage[4]

Cause	Postoperative Onset	Location	Management
Surgical technique	within 24 hours (unless in DGF)	ureteroneocystostomy/pyeloureteral anastomoses	redo anastomosis
Dehiscence	early	bladder	catheter replacement/bladder repair if urinoma not resorbed
Obstruction	early or late	anastomosis/bladder	percutaneous nephrostomy & double J stenting
Ligated polar artery	first week	caliceal	conservative/partial nephrectomy if failure
Necrosis	2 weeks	ureter	resectnecrosed ureter segment &reimplant

Table 3: Advantages and Disadvantages of Urinoma Imaging Modalities [4,26]

Imaging modality	Advantages	Disadvantages
CT scan	can detect leakage source, more specific	expensive
Ultrasonography	cheaper, readily available	leakage source not shown, can't differentiate urinoma, seroma& abscess
Scintigraphy	enables tracer imaging	requires functioning allograft & no ureteric stasis, may miss focal leakage
Antegrade nephrostogram	locates& grades leakage	nephrostomy requires hydronephrosis, limited to certain patients
Cystography	detects bladder leakage & allows retrograde opacification	pyeloureteric anastomosis prevents use

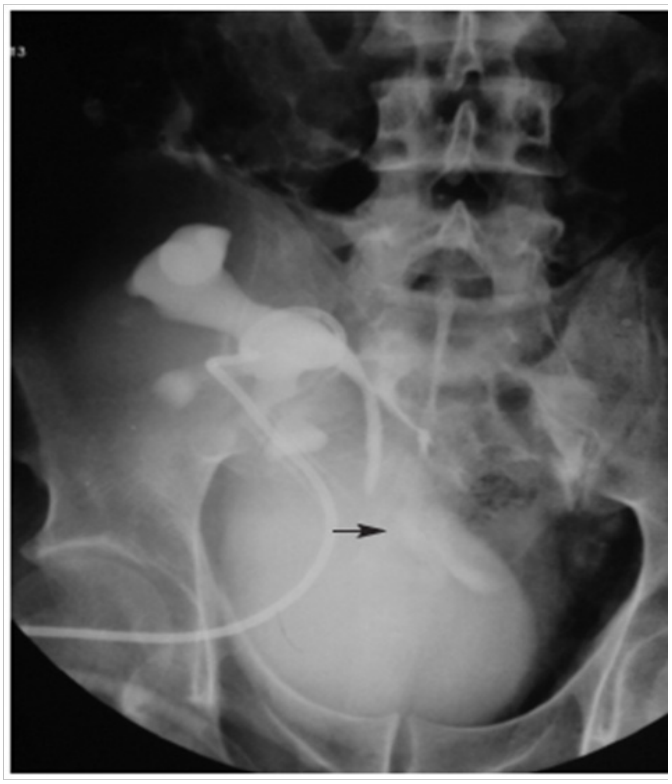

Figure 1: Antegrade nephrostogram showing urinoma (Arrow)4(adapted from Hamouda M, Sharma A, Halawa A. Urine Leak After Kidney Transplant: A Review of the Literature. ExpClin Transplant 2018; 1: 90-95.)

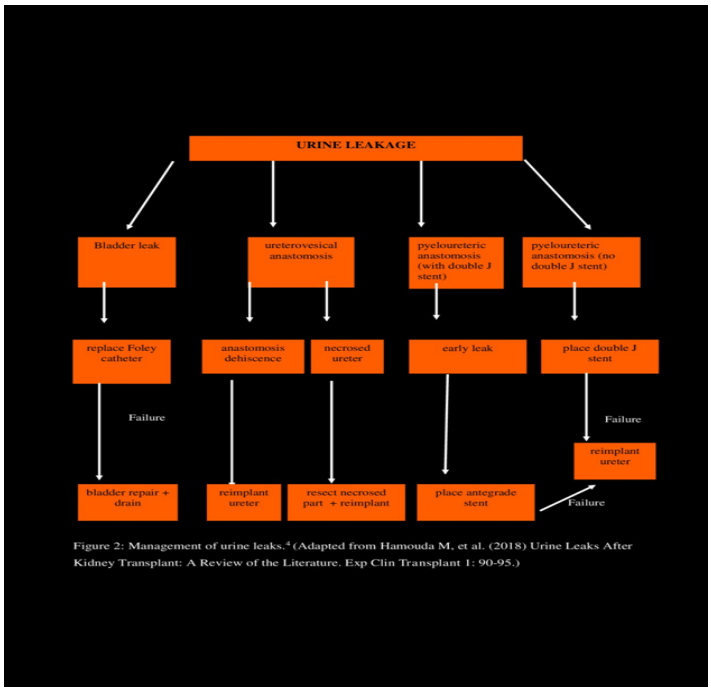

Figure 2: Management of urine leaks.[4] (Adapted from Hamouda M, et al. (2018) Urine Leaks After Kidney Transplant: A Review of the Literature. Exp Clin Transplant 1: 90-95.)

and infection. Surgical treatment is the mainstay of treatment in all patients except for those with small urine leaks which may respond to bladder drainage by Foley's catheter.

Surgical treatment involves urinoma drainage, resection of necrosed ureter segment and reimplantation. If the remaining healthy ureter is too short then end-to-side (or end-to-end) ureteroureterostomy with native ureter is the next step. Although ileum neoureter has been reported, the authors have never used that option [28,29]. Boari flap and/or psoas hitch are the next steps if native ureter is not available or is diseased. Bladder leakage is addressed by replacing a blocked urinary catheter and rarely requires surgical repair. Caliceal leakage is initially managed conservatively, after excluding obstruction as cause. If this fails, partial nephrectomy is an option although it is a surgical challange [30]. Figure 2 shows management of various types of urine leaks.

Conclusions

Urine leakage after kidney transplantation should be managed appropriately to minimize graft loss, patient morbidity and mortality. Factors affecting management of the leak are: magnitude, location and presence or absence of ureteric necrosis. Most urine leaks except for very small ones require surgical intervention. The surgical technique used depends on the etiology, location and extent of the leak. Gentle handling of ureter and routine use of double J stent insertion in all renal transplant recipients is the key to prevention. The ureter should not be under tension.

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