Journal of Renal Transplantation Science
JRTS, 1(1): 14-19
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Original Review: Open Access

# Approach to Increased Drain Output Post-Kidney Transplantation

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*Received August 8, 2018; Accepted August 9, 2018; Published October 6, 2018*

**ABSTRACT**

Urologic complications following kidney transplantation are mentioned to be occurring in about 3% of patients. Early identification and prompt management of such complications are crucial. Since the immunosuppression is at its peak within the first six weeks of post-transplant period, urological complications lead to life-threatening infections if not treated expeditiously.

Increased drain output early in the post-transplant period can be caused by a variety of causes. Careful clinical examinations, supported by appropriate biochemical tests and imaging studies, are the key to accurate diagnosis. Transplant teams need to be aware of the serious potential of a major complication such as allograft dysfunction or systemic sepsis even following apparently 'minor' surgical issues. This review aims to define a pragmatic approach in the diagnosis and management of urine leak that may manifest as perigraft collection or increased drain output in early post-kidney transplantation period.

**Keywords:** Urine leak; Increased drain output; Perigraft collection; Urological complications; Renal transplantation

## INTRODUCTION

Increased drain volume in the early post-transplantation period is caused by a variety of causes [1-4]. The clinical presentation, biochemical examination, presence or absence of renal dysfunction and imaging provide clues to the diagnosis. The most common differential diagnosis for increased drainage or perigraft fluid collection are- (a) haemorrhage, (b) lymphocele, (c) perinephric abscess and (d) urine leak.

### Haemorrhage

The reported incidence of bleeding after renal transplantation surgery varies widely from 0.2 to 14% [5,6]. Haemorrhage as a cause of increased drain volume can present either in a dramatic fashion with swelling of wound site, hypotension, tachycardia, renal dysfunction with associated drop in haemoglobin or have a subtle presentation. Significant blood loss can lead to delayed graft function. However, in certain situations where the drain tube is blocked by a blood clot or when there is no significant fall in haemoglobin, the diagnosis of haemorrhage can be easily overlooked.

The risk factors for haemorrhage include medications like antiplatelet therapy, anticoagulants, technical errors in vascular anastomosis and severe hypertension.

The origin of haemorrhage could be from the vascular anastomoses, abdominal muscles and drain site tearing through blood vessels in the abdominal wall, blood vessels in the peri-vesical region or bleeding from the hilum following reperfusion. Haemorrhage may also originate from fine blood vessels traversing through retroperitoneal tissues which may have been torn inadvertently as a swab may be

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**Citation:** Palli S, Zayan T, Sharma A & Halawa A. (2018) Approach to Increased Drain Post-Kidney Transplantation. J Renal Transplant Sci, 1(1): 14-19.

pushed to keep unhindered view of vascular dissection in iliac fossa.

The diagnosis of haemorrhage is dependent on clinical suspicion based on common clinical signs like hypotension, tachycardia, swelling over the graft with bulging incision and fall in haemoglobin in the presence of reddish or brownish coloured drain fluid. The biochemical analysis would reveal the drain creatinine and potassium to be similar to the serum. If there is a suspicion of haemorrhage as the cause of delayed graft function, the surgical wound must be re-explored immediately. If the bleed is minor, the withdrawal of the antiplatelet would be sufficient. However, stopping heparin or low molecular heparin is indicated if there is continued bleeding.

Ultrasonography may or may not show hematoma because it is not sensitive in imaging the retroperitoneum. On duplex scanning, the hematoma appears as an echogenic mass with or without septations and there is no flow on Doppler (**Figure 1**) [7].


**Figure 1.** Longitudinal ultrasound image demonstrating a complex echogenic mass in relation to the upper pole of the transplanted kidney [7].

**Lymphocele**

Lymphoceles are the most common type of peritransplant fluid collection which is seen in up to 20% of cases [8]. Lymphoceles usually present in the first few weeks after transplantation. Clinically, most of the lymphoceles are small and asymptomatic and detected incidentally on routine imaging. However, larger lymphoceles can cause obstruction of the collecting system or even the vascular pedicle and result in graft dysfunction.

Lymphocele is usually the result of injury to the lymphatics accompanying the iliac vessels but can also be due to injury to lymphatic channels along the hilar vasculature. The diagnosis is based on an initial biochemical evaluation of the drain or the aspirated fluid, which shows creatinine and potassium levels similar to blood though it may have few lymphocytes. Imaging with ultrasound scan might show delineated anechoic mass with or without thin septations [9]. Since most of the lymphoceles are asymptomatic and clinically not significant, no intervention is needed. However, when they are causing compression of the ureter, renal vessels, lymphatic outflow of lower limb or lymphatic outflow of external genitalia, an intervention is indicated. Simple aspiration of the lymphocele is usually not sufficient. Percutaneous drainage of the collection along with frequent injections of sclerosants like alcohol, povidone-iodine or tetracycline though described in literature should never be attempted. External drainage would always lead to infection of lymphocele. The procedure of preference is laparoscopic marsupialization (**Figures 2 and 3**) [9].

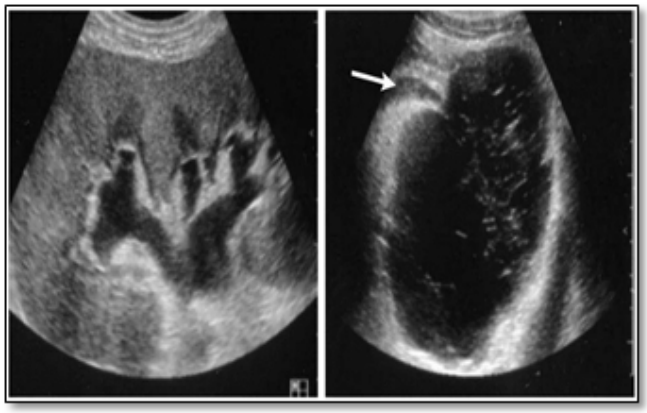

**Figure 2.** Ultrasound scanning showing dilatation of the pelvi-calyceal system and ureter (arrow) with a large anechoic pelvic collection [9].

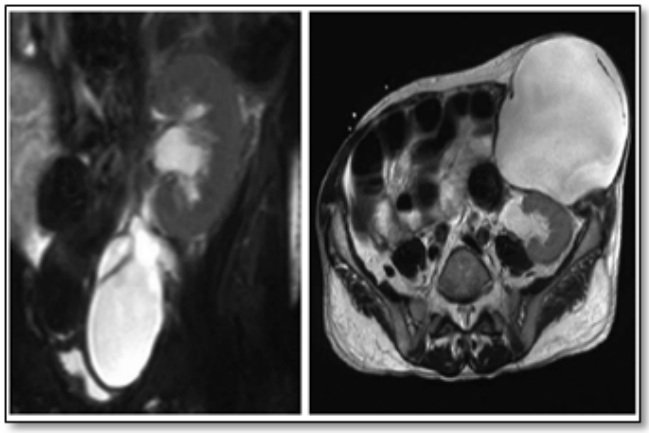

**Figure 3.** T2-weighted coronal and axial MR images showing the location of the lymphocele which is seated inferior and anterior to the allograft [9].

**Perinephric Abscess**

Infection of the peritransplant tissues can lead to drainage of purulent or seropurulent fluid. Perinephric infections are not very common in the early post-operative period and are usually seen few weeks after transplantation. Any fluid collection can get infected and become an abscess. Though abscesses usually present with fever and raised acute phase reactants, this may not be seen in the post-transplant period due to the immunosuppression. Therefore, the correct diagnosis depends on the gram staining and culture of aspirated fluid [10]. Imaging may not be very helpful as ultrasound cannot differentiate between hematoma and an abscess since both would appear as echoic lesions with or without septations. A perinephric abscess in the post-transplant situation is managed with antibiotics and drainage (radiological or surgical) (**Figures 4 and 5**) [9].


**Figure 4.** Flow sonogram showing fluid (pus) around the graft with minimal internal echoes [9].

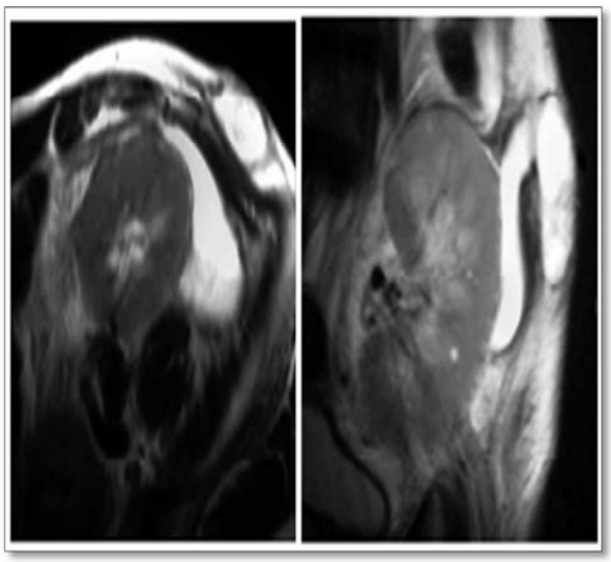

**Figure 5.** T2-weighted MR images showing perigraft abscess [9].

**Urine Leak**

Urine leak, also known as urinary fistula or urinoma (in the presence of a collection) is a relatively common complication of kidney transplantation. It is seen in 2 to 9% of cases [11,12]. The cause of urine leak can be due to:

- Ischemic necrosis of the distal ureter.
- Delayed healing of a dysfunctional bladder in anuric patients.
- Necrosis of parenchyma due to non-implantation of the polar artery.
- Trauma to pelvi-calyceal system by incorrect use of guidewire during the placement of a double-J stent.

Therefore, it is very important to ensure that all peri-ureteric fat and connective tissue between the lower pole of donor kidney and the gonadal vein ureters (called the Golden triangle) should be preserved during organ retrieval and bench dissection. Short ureter is better than a longer ureter.

Urine leak clinically presents in the first week after transplantation with graft dysfunction [13]. It is demonstrated by analysis of drain fluid which shows creatinine and potassium levels similar to urine. When the drain is removed, it can present as cutaneous oedema that may extend up to external genitalia. Ultrasound scan can demonstrate the perinephric collection. Urethrocystography might help in visualization of the urinary fistula and confirms the leak. Urine leak that occurs early during the first few post-operative days is due to a technical error and usually requires urgent reoperation for re-implantation of the ureter is indicated (**Figure 6**) [9].


**Figure 6.** Ultrasound scan showing anechoic collection in between the lower pole of transplant kidney and bladder in a case with urine leak [9].

An obstruction of urinary outflow in the early post-transplant period would exert back pressure and causes leak from the bladder anastomotic site. A Cochrane review showed that the routine use of double-J stent results in a lower incidence of urine leaks but at the expense of

increased rates of infections and increased expenditure because of the need for another theatre slot to remove the double J stent [14].

As mentioned previously, the necrosis of distal ureter is the most common cause of ureteric leak. This generally presents within 2 weeks after surgery with reduced urine output and increased renal parameters. The risk factors for ureteric necrosis include [13]:

- Long length of ureter
- Increased donor age
- Extensive dissection of connective tissue surrounding the ureters
- Acute allograft rejection
- Presence of multiple renal arteries and thrombosis of lower polar artery

Dehiscence of the uretero-vesical anastomosis occurs in the early post-operative period either due to urinary obstruction or improper surgical technique. The management involves relieving the obstruction with urinary catheterization and/or nephrostomy with placement of antegarde double-J stent. If needed, reoperation for bladder repair has to be performed [15].

Diagnosis of urine leaks relies on clinical features like fluid leak from the wound, increased drain volume, reduced urine output, swelling of the wound and renal dysfunction. Ultrasound scan usually show a well-defined anechoic lesion without any septations [7,9]. Urinomas can increase in size very quickly and cause hydronephrosis. Renal scintigraphy can help in differentiating urine leak from other collections. However, the disadvantage is that scintigraphy needs good renal function and it cannot identify a focal leak (**Figure 7**) [16].

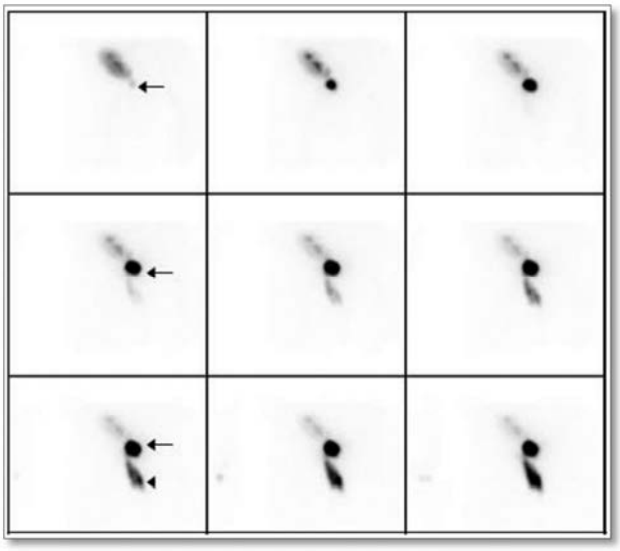

**Figure 7.** Delayed images on renal scintigraphy showing the urinary collection at the junction of ureter and urinary bladder [16].

Antegrade nephrostogram is considered the standard modality for localization of leak, but it can be performed only in the presence of demonstrable hydronephrosis (**Figure 8**) [9,15].

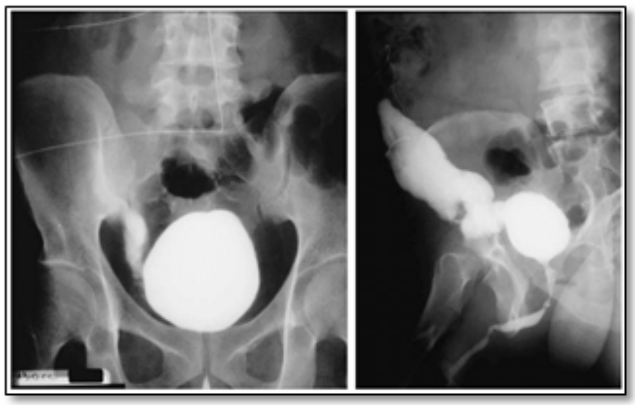

**Figure 8.** Antegrade and voiding cystography showing extravasation of contrast from the anastomotic site [9].

### Treatment Of Urine Leaks

Treatment of urine leak depends on the site and severity of the urine leak. Occasionally a small urine leak if associated with hydronephrosis, can be treated with maximal decompression (with Foley catheter, ureteral stent and percutaneous nephrostomy). Most urine leaks require surgical repair (**Figure 9**) [17].

Based on the site of leak the following treatment is considered [15]:

- Uretero-vesical anastomosis – Re-implantation (in anastomotic failure) or resection of necrotic ureter with reimplantation (in ureteric necrosis).
- Bladder leak – Place a large lumen urinary catheter and possibly proximal diversion in the form of nephrostomy. If it is not resolved, a surgical repair is needed.
- Pyelo-ureteral anastomosis with native ipsilateral ureter

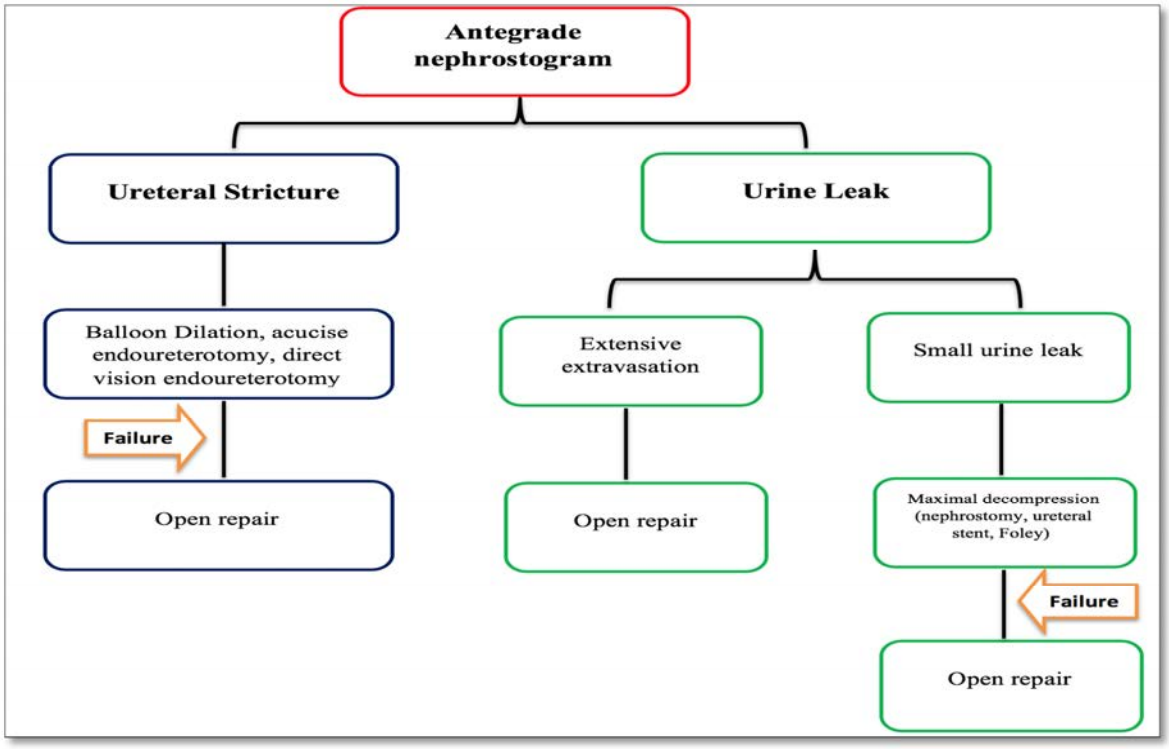


**Figure 9.** Approach to management of ureteral complications [17].

## SUMMARY

- Urine leak is not so uncommon complication of kidney transplant surgery.
- Clinical presentation can vary and analysis of drain fluid or aspirate is crucial to identify a urine leak.
- Imaging with ultrasound scan provides the extent of urine leak and shows if urinoma is causing hydronephrosis.
- MR urogram and renal scintigraphy may be, but not often, necessary to confirm the diagnosis and identify the site of urine leak.
- Antegrade nephrostogram is helpful in locating the urine leak and placing a stent if necessary.
- Maximal decompression is the first step in the management. Occasionally small leaks resolve with conservative approach. Open repair is often indicated in most cases.

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