

# Surgical Complications and Outcome of Renal Transplantation in Recipient Patients A single centre retrospective study

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## ABSTRACT

**Objectives :** To review the surgical complications post renal transplantation in recipient patients .

**Methods :** This is a retrospective single centred study , conducted on recipient patients post renal transplantation at Royal Medical Services between the period of January 2015 and August 2021 at King Hussein Medical Centre.

**Results :** Among 252 eligible patients in the study , 66 (26.2%) patients developed surgical complications. Surgical site wound infection was reported in 9 (3.6%) patients. Lymphocele was found in 21 (8.3%) of patients .Vascular Complications were reported in 14 (5.6 %) patient .Urological complications frequency was 7.1 %.

**Conclusion :** Surgical complications in kidney transplant recipients represent a major cause of morbidity among these patients .

Early identification and prompt management of these serious problems can leads to improvement of kidney graft survival and patient quality of life .

**Key Words:** Surgical , Vascular , Urological , kidney transplantation , recipient

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## INTRODUCTION

Kidney transplantation plays a major vital role in the management of individuals with end-stage renal disease. In addition to being cost effective, it has improved the rate of survival and quality of life of chronic kidney disease patients and has reflected positively on the morbidity and mortality rates among these patients (1). Despite the recent improvements in the techniques of kidney transplantation in recipient patients as well as in perioperative care, surgical complications, which occur in 10-20% of kidney transplant recipients, are still considered a challenging obstacle that might endanger the kidney endograft survival as well as the kidney recipient (2). These complications are divided into four major categories: surgical site wound infection, vascular ,complications , lymphocele and urological complications.

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These complications threaten the clinical outcome and increase the burden on the health care system. The aim of the study is to describe and review these complications post renal transplantation in recipient patients and to explore the association between these complications and the gender as a demographic parameter.

## **METHODS**

This is a retrospective descriptive analytical single center study conducted on patients who underwent kidney transplantation during the period of January 2015 and August 2021 in our Urology and Transplant Center at King Hussein Medical Center. Patient's data were collected from hospital's electronic comprehensive database as well as outpatient's file records. Inclusion criteria included all kidney transplantation recipients who have completed successfully their pre-transplant protocol assessment evaluation, which includes cardiovascular and infectious assessment and social evaluation, and have signed the informed consent form. Kidney recipients' data, including their demographics, details of surgical procedures and all intra-operative and post-operative surgical complications were analyzed with at least 3 months follow-up for each patient (3-48 months). By convention, these complications were divided into four major categories: surgical site wound infection, lymphocele, vascular complications (hemorrhage, renal artery stenosis, renal artery thrombosis, renal vein thrombosis) and urological complications including urine leak (urinomas) and obstructive uropathy (ureterovesical stenosis).

### **Transplantation procedure**

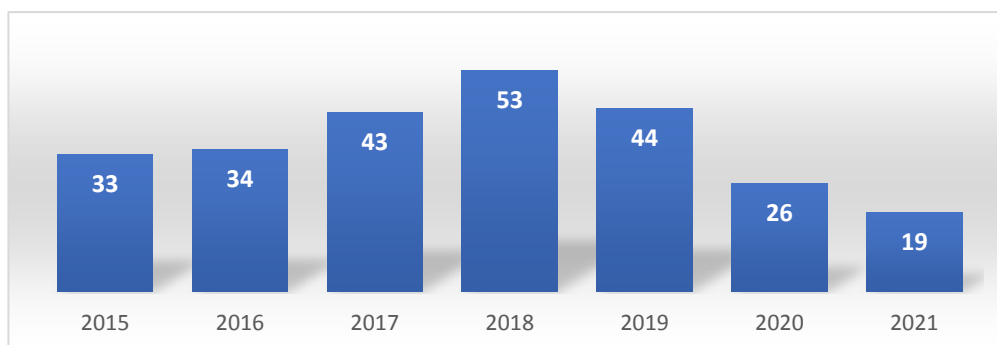
Kidney transplantation procedure is considered a well-established surgical intervention in the Royal Medical Services since 1972, which has rapidly advanced over the years with increasing numbers of cases, including both adult and pediatric cases. Kidney transplantation is performed by two teams at Prince Hussein Bin Abdullah II Center for Urology and Organ Transplant. The urology team starts by harvesting the kidney from the living related donor. On-table preparation of the allograft vessels and flushing using custodiol HTK perfusion fluid wash is carried out. The vascular team seats the kidney in the iliac fossa of the recipient retroperitoneal space and vascular anastomosis is completed, where the allograft renal artery is sutured in end-to-side fashion to the iliac artery system and the vein is connected in an end-to-side fashion to the iliac vein system in most cases. The urology team further performed the extra vesical ureteroneocystostomy. The recipient patient will be transferred later to the intensive treatment unit in isolation room, where they will be followed up by the nephrology team as well as the two previous operating teams, the vascular and urology teams, until discharge and are followed-up on regular basis at the nephrology clinic.

### **Statistical analysis**

The categorical data were expressed in frequency and percentage while the continuous data expressed in median, Chi-square of independence was used for the association between the categorical data, alpha set at less than 0.05 deemed statistically significant, and SPSS IBM software Version 25 was used to analyze the data.

## RESULTS

During the period of January 2015 and the beginning of August 2021, 252 recipient patients had met the eligibility criteria to be included in the study, with a progressive increase in the total number of cases done from 2015 (33 cases) till 2018 (53 cases). However, there was a reduction in the number of cases owing to COVID-19 crisis restrictions as shown in Figure 1.



**Figure 1:** Kidney transplant cases from 2015 to 2021

All kidney recipient records were analyzed. The median age was 35 years (age range: 9-61 years). Among all the patients, 178 (70.6%) were males and 74 (29.3%) were females. Thirty-five patients (13.88%) belonged to the pediatric age group, among which 19 (7.5%) were females and 16 (6.3%) were males as shown in Table I. Pediatric age group was defined as any patient with age less or equal to 14 years old .

**Table I:** Demographic characteristics of study participants

Variable	N	%	Median
<i>Age</i>			35
<i>All patients</i>			
Male	178	70.6	
Female	74	29.4	
<i>Pediatric patients</i>			
Male	19	7.5	
Female	16	6.3	

The patient's clinical and pathological characteristics and variables were shown in Table II , in which the most common identified indication for renal transplantation in recipients was chronic glomerulonephritis accounting for 113 ( 21.6%) patients , while 221 (42.1%) patients had hypertension on antihypertensive medications.

**Table II .** Clinical and pathological variables of renal transplant recipients. (abbreviations , NSAIDS : NON-STEROIDALS ANTI-INFLAMMATORY DRUGS , BMI :BODY MASS INDEX)

Variables	Percentage (number of patients)
<b>INDICATION OF RENAL TRASPLANT</b>	
DIABETIC NEPHROPATHY	18.1% ( 95 patients )
HYPERTENSIVE NEPHROPATHY	6.8% (36 patients)
CHRONIC GLOMERULONEPHRITIS	21.6% (113 patients )
ADULT POLUCYSTIC KIDNEY DISEASE	4% (21 patients)
OBSTRUCTIVE NEPHROPATHY	12.7% (67 patients)
MEDICATIONS( NSAIDS )*	2.1% (11 patients)
UNKNOWN CAUSE	34.6% (182 patients)
<b>COMRBIDITIES</b>	
SEVERE OBESITY ( BMI Above 40) *	9.7% ( 51 patients )
HYPERTENSION	42.1% (221 patients)
DIABETES	36% (189 patients)
PERIPHERAL VASCULAR DISEASE	16% ( 84 patients )
CARDIOVASCULAR DISEASE	18.6% (98 patients )

Among all kidney recipient patients, 66 (26.2%) patients developed surgical complications. Wound infection at surgical site was reported in 9 (3.6%) patients; most of them were managed conservatively using regular dressing except for 2 cases where surgical wound debridement was necessitated. The most common type of complications was lymphocele which was observed in 21 cases (8.3%). Vascular complications were reported in 14 (5.6%) cases as shown in Table III.

**Table III:** Frequency distribution for the health-related complications after kidney transplant

Variable	N	%
<i>Wound infection</i>	9	3.6
<i>Lymphocele</i>	21	8.3
<i>Vascular complications</i>	14	5.6
Renal Artery thrombosis	1	0.4
Renal Artery stenosis	7	2.8
Renal Vein thrombosis	3	1.2
Hemorrhage/hematoma	3	1.2
Pseudoaneurysm	2	0.8
<b>Urological complications</b>	18	7.1
Uretrovesical stenosis	10	3.9
Urine leakage (urinoma)	8	3.2

Among the vascular complications encountered, renal artery thrombosis developed in one (0.4%) patient, who underwent successful surgical thrombectomy and revision of anastomosis. Renal vein thrombosis was reported in three (1.2%) patients. One of them underwent successful urgent surgical thrombectomy while the other two needed nephrectomy. Renal artery stenosis occurred in seven (2.8%) patients. Of them, five patients were managed conservatively by medical therapy and two patients underwent renal artery percutaneous angioplasty to preserve graft survival due to refractory hypertension and deterioration in kidney functions.

Post-operative immediate bleeding, which warranted urgent reopening and exploration, was observed in three (1.2%) patients, while post-operative anastomotic pseudoaneurysm was reported in two (0.8%) patients who were managed by percutaneous angioplasty covered stenting.

Urological complications were observed in 18 (7.1%) patients. Ten (3.9%) patients developed ureterovesical stenosis, seven of them underwent percutaneous balloon dilatation with double J tube insertion for four weeks as a temporary stenting, while the other three patients who developed ureteral stenosis underwent successful re-implantation of the ureter or ureteroneocystostomy. Eight (3.2%) patients had extraperitoneal urine leakage (urinoma). These patients who present with urine leakage were treated successfully with conservative measures, including urinary diversion using Foley's catheter and decompression with a percutaneous nephrostomy tube, and the result was successful resolution of the urine leak within 4-6 weeks.

In this study, we have examined the association between the gender, as a demographic parameter, and the complications mentioned. To explore the association between gender and the complications, a chi-square of independence test yielded that there was no statistical significant association between gender and complications namely (wound infection  $p=0.790$ , lymphocele  $p=0.113$ , vascular complications  $p=0.202$  and urological complication  $p=0.145$ ), as shown in Table IV

**Table IV:** Chi-square test results for association between Gender and Surgical complications

Complication		Gender		X <sup>2</sup>	Df	p value
		Male N(%)	Female N(%)			
wound infection	Yes	6(3.4)	3(4.1)	0.071	1	0.790
	No	172(96.6)	71(95.9)			
Lymphocele	Yes	18(10.1)	3(4.1)	2.511	1	0.113
	No	160(89.9)	71(95.9)			
Vascular complications	Yes	12(6.7)	2(2.7)	1.625	1	0.202
	No	166(93.3)	72(97.3)			
Urological complications	Yes	10(5.6)	8(10.8)	2.125	1	0.145
	No	168(94.4)	66(89.2)			

## DISCUSSION

End-stage kidney disease is considered as one of the most devastating medical ailments worldwide. Kidney transplantation plays a vital role in the management of renal failure patients. This procedure has improved their quality of life and prolonged their survival. Many serious postoperative complications post-kidney transplantation in recipient patients have been recorded despite recent improvements in perioperative care and management. Most of these complications, which otherwise increase the morbidity and mortality rates, were considered avoidable though close follow-up, post-operative monitoring (1, 2, 3).

This study was performed at Prince Hussein Bin Abdullah II Center for urology and Organ Transplant in the Royal Medical Services. The kidney transplantation procedure has advanced progressively over years since early 1970s, with rapid increase in the total number of cases being operated per year. However, the COVID-19 pandemic crisis has negatively affected the succession of our transplant program by slowing the pace of cases accomplished. This has led to unavoidable delays in schedules and increased the burden on our waiting surgical lists, due to the restrictions and the modifications of global guidelines imposed on our health system.

Surgical complications post kidney transplantation continue to impose major challenging obstacles that affect the survival and quality of life of kidney recipients, increasing the load on our medical system and hospital staff. In literature, the incidence of these surgical complications was reported to be 10-20% of transplant recipients in some series, while it is about 35.5% in other studies (3, 4). In our study, the incidence of the surgical complications was 26.2%, wherein they were divided into four groups: surgical site wound infections, lymphocele, vascular complications and urological complications.

Surgical site wound infection is considered one of the common complications that warrant extra attention. Their incidence ranges between 3-15%, with obesity and diabetes mellitus being major risk factors for infection, in addition to the risk of immunosuppressant medications (4, 5, 6). Utilizing sterile meticulous techniques during and after surgical interventions on top of the use of perioperative antibiotics prophylaxis have been reported to minimize the threat of surgical site infection (4, 5, 6). In our study, we have reported an incidence of 4.3% (11 cases). Two patients required surgical debridement and vacuum-assisted closure (VAC) device application for one week to enhance wound healing, whereas the rest were managed conservatively with regular bedside dressing.

Despite the recent advances in surgical techniques, vascular complications continue to be reported in many studies post kidney transplantation. In literature, the incidence of these complications ranged between 0.8% to 6% (1, 2, 3, 7, 8). In our study, vascular complications developed in 5.6% of all cases. These complications included renal artery thrombosis and stenosis, renal vein thrombosis, pseudo-aneurysm and hemorrhage.

In our data, lymphocele development was considered the most commonly encountered among all the surgical complications reported in this study, with an incidence rate of 8.3%, which was in agreement with the range of incidence rate (0.6-40%) reported previously (1, 2, 4, 5, 9). Lymphocele is defined as collection of fluids around the kidney allograft in the retroperitoneal bed that is mainly due to lymph leak from injured and non-ligated lymphatic channels in the operative bed and kidney hilum. Most of the patients remain asymptomatic and their condition is usually spontaneously resolved. Rarely, the patients may present with an elevation of creatinine levels and abdominal swelling (1, 2, 4, 5, 9). In our study, most of the lymphoceles resolved spontaneously except in three patients. One of them underwent surgical evacuation and two patients were treated using retroperitoneal povidone iodine injection with excellent results.

Renal artery thrombosis is considered as major devastating complication post kidney transplantation in recipient patients. It is associated with a high rate of kidney allograft loss, mounting up to kidney loss in 47% of patients in the first 3 months, with a reported incidence between 0.5-3.5% (1-5, 10, 11). The most common cause of this ailment is technical failure. Patients usually present with sudden decrease in urine output and rise in creatinine levels (1, 2, 5, 10, 11). In our cohort, we reported an incidence of 0.4%. Being a surgical emergency, one of the patients of our cohort had successful exploration with surgical thrombectomy and reperfusion with revision anastomosis.

Renal artery stenosis has been declared as the most common vascular complication in many studies published previously with an incidence rate ranging between 19% and 23%. The most common presentation is refractory hypertension and deterioration in kidney function tests. It is caused by intimal hyperplasia and scarring due to previous vigorous traumatic dissection during surgical intervention. It is usually diagnosed by renal doppler ultrasonography (1, 2, 5, 10-13). In our patient records, we have reported an incidence of 2.7% (seven patients). Five patients were managed

conservatively, while two patients, who failed the medical therapy, were successfully treated with renal artery percutaneous angioplasty and stenting to preserve graft survival.

Renal vein thrombosis was observed in three (1.2%) patients of our cohort. It is a major cause of early allograft kidney failure and loss and develops primarily due to technical errors and hypercoagulability. The incidence rate of this complication ranges from 0.1% to 8.2% in some major studies. The typical presentation of this complication is sudden decrease in urine output and deterioration in kidney function tests with development of hypovolemic shock as a result of hemorrhage due to graft rupture that mandates emergency exploration (1, 2, 4, 5, 11, 14, 15). Among our patients who developed this devastating complication, one patient underwent successful surgical venous thrombectomy with good post-operative outcome, whereas the remaining two patients presented with kidney graft rupture and managed through nephrectomy.

Post-operative bleeding and large hematoma formation have been reported in 1.2% of our cohort, with the major cause being anastomotic leak and technical failure. These patients presented with active bleeding and circulatory shock. All such patients underwent immediate surgical exploration and control of the bleeding with good post-operative outcome.

Anastomotic pseudo-aneurysms are generally a rare post-operative complication with an incidence rate of 0.3% (16, 17). It is mainly caused by technical suture failure and injury, infection and, occasionally, post-renal allograft biopsy (16-18). In our study, this complication was observed in two (0.8%) patients. Both of them were treated successfully with endovascular technique using covered stent without the need for open repair.

Urological complications have been considered among the most prevalent problems in recipient patients, with an incidence range of 2.5-30% worldwide (1, 2, 5, 19, 20, 21, 22). Angelico et al showed in their study that the occurrence of the urological complications was reported in 32 (7%) cases among the 459 patients enrolled in the study, with urinary leaks were considered the most frequent urological complication in their study. They have mentioned that 65.5% of these complications occurred within three months of the surgical intervention (19). In our study, we have reported an incidence rate of 7.1% (18 patients).

Ureterovesical stenosis were the commonest urological complications in our data. It has been reported in ten (3.9%) patients in our study. The global incidence of this complication ranges from 2% to 10%. This complication usually occurs in the early post-operative period.

The most common cause of this complication is ureteric ischemia that arises due to technical errors, fluid collection and hematoma formation, with the ureterovesical anastomosis was reported to be the most frequent site of occurrence (1, 2, 5, 19-24). Irdam et al have mentioned in their study that was published in the year 2021 that donor and recipient age along with prolonged warm ischemia time and multiple renal arteries were associated with ureteral stenosis after renal transplantation (24). Fontana et al reported the same association between donor age and ureteral stenosis occurrence in renal transplantation patients and that has been attributed to the general vascular problems that these older patients usually have in their medical history (24). Endourological percutaneous interventions that includes balloon dilatation with the use of metallic stenting in resistant cases, has been suggestive to be the first line in the management of ureteral stenosis and strictures post renal transplantation (22,23,24). Surgical interventions were reserved to cases that failed percutaneous endourological treatment, these include ureteral reimplantation or ureteroureterostomy using the native ureter (1,2,3,21,22,23,24). Of the ten patients who presented with ureteral stenosis in our study, seven patients underwent percutaneous balloon dilatation with double J tube insertion for four weeks as a temporary stenting, while the other three underwent successful re-implantation of the ureter or ureteroneocystostomy with a smooth course in the post operative period.

One of the early post operative complications following kidney transplantation is Urine leakage (urinoma) that usually occur in the first two weeks post operatively. A high volume of clear fluid in the drain usually raises the suspicion of urinoma, that further investigations are needed to rule out other differential diagnoses like lymphocele, hematoma and abscesses (25,26,27). In many kidney transplant centers around the world, the incidence of urine leak ranges from 0.1% to 8.9%. While

in our center, it has been estimated to be 2.3% with the most common site of urine leakage found to be the ureteroneocystostomy anastomotic site. The major causes of this complication include devascularization and ureteric necrosis as well as technical failure due to poor reconstruction of the ureteroneocystostomy (1, 2, 5, 19-23).

This complication usually arises in the early post-operative period as mentioned previously, with high drain output and swelling at the wound site with clear fluid discharge and might present with swelling of the ipsilateral lower limb. The diagnosis is usually made using ultrasonography which identify a well defined collection around or near the renal graft without internal echoes and septa unless they got infected. Biochemical analysis of the fluid drain confirms the diagnosis of urine leak if the creatinine in drain fluid is more than six times higher than creatinine level in plasma, with the urine creatinine less than three times than of drain creatinine. Scintigraphic  $^{99m}\text{Tc}$ -DTPArenography have a major role in the diagnosis of urine leak, in addition to CT scan with contrast, retrograde cystography and antegrade pyelogram (25,26,27). Temporary ureteral stenting have been used to prevent urine leak post operatively, despite that its role in prevention of urine leakage is controversial (26,27). Conservative measures are usually used in the management of low-volume urine leak with success rate reaching up to 60%, in which the urine is diverted using a Foleys catheter and decompression using nephrostomy tube as well as ureteral stenting in situ which is usually removed in 4-6 weeks (26,27). Failure of conservative measures and in the case of high-volume urine leakage make the surgical exploration and management mandatory. Gunawansa et al recommended in their research article an early aggressive approach with surgical repair for the urine leakage, to decrease the long term effect of sepsis and ureteric stricture, and improve outcomes and survival (27). The surgical management options include urinoma open drainage, removal of the necrotic ischemic part of the ureter and ureteral reimplantation. In rare cases bladder flap may be needed (1,2,5,25,26,27).

In our series, all of these patients who present with urine leakage were treated successfully with conservative measures, including urinary diversion using Foley's catheter and decompression using a percutaneous nephrostomy tube to resolve the urine leak within 4 weeks.

The major limitation in our study was the difficulty in maintaining the follow up of some patients included in our data being collected, due to poor compliance of treatment post surgical intervention and obstacles of contacting them. And this has resulted in another significant limitation that worths to be mentioned, which was the lack of survival outcome results, as we were not able to accurately estimate the survival outcomes, and this

was also attributed to the absence of documentation related to long term follow up in some patients.

## **CONCLUSION**

Despite the recent advances in the surgical techniques and perioperative care, surgical complications in kidney transplant recipients still represent a major cause of morbidity and disability in these patients, in addition to the great impact on health system and hospital resources. There is a poor correlation between gender as a demographic parameter and the frequency of the complications. Early identification and prompt management of these issues can lead to improvement in kidney graft survival and patient's quality of life.



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