

KIDNEY TRANSPLANTATION IN PATIENTS WITH A PREVIOUS HISTORY OF FEMORAL LINES: SURGICAL CHALLENGES AND OUTCOMES

Muhammad Izhar¹, Ahmad Nawaz², Farman Ullah², Zahid Majeed³

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¹Specialist Registrar, Department of Urology and Transplant, Institute of Kidney Diseases, Hayatabad Medical Complex, Peshawar

³Resident Urologist, Department of Urology and Transplant, Institute of Kidney Diseases, Hayatabad Medical Complex, Peshawar

Correspondence

²Ahmad Nawaz, Assistant Professor, Department of Urology and Transplant, Institute of Kidney Diseases, Hayatabad Medical Complex, Peshawar

☎: +92-333-9134884

✉: Drwazir73@gmail.com

INTRODUCTION

Kidney transplantation remains a pivotal intervention for patients with end-stage renal disease (ESRD). Its progression marks a significant medical achievement, rendering it the preferred treatment modality that vastly improves both survival rates and quality of life among affected individuals.¹ The technical advancements made by transplant surgeons and the use of immunosuppressive protocols have notably increased both patient and graft survival rates. However, despite these advances, several complications still pose significant challenges, particularly in patients with complex past medical histories, including those with a history of femoral lines used for dialysis or other medical interventions. Patients who have undergone dialysis through femoral lines may present unique surgical challenges during kidney transplantation due to the potential for vascular complications and anatomical alterations stemming from previous cannulation. Femoral lines, which are commonly utilised for temporary dialysis access, can lead to complications such as thrombosis or stenosis of the femoral vessels.²

Such complications significantly increase the difficulty of achieving adequate vascular access during transplantation procedures, thereby influencing overall patient outcomes.³ Recent studies have underscored the potential impact of prior femoral access on transplantation outcomes, noting that patients with prior vascular interventions may experience higher rates of graft failure and surgical complications related to vascular access challenges.⁴ The restoration of adequate blood flow to the transplanted kidney is critical for graft function; thus, awareness of the patient's previous vascular history is essential in surgical planning.⁵ The anatomical changes from prior interventions can complicate the surgical technique and may necessitate alternative approaches or modifications in standard procedures. In particular, the literature reflects an increased interest in understanding how prior intervention, such as femoral line placement, affects transplant strategies and outcomes. For example, studies have highlighted that kidney transplantation in patients with extensive vascular history, particularly those with femoral access, exhibits varying rates of graft survival compared to patients without significant

ABSTRACT

OBJECTIVES

To assess surgical complexity, early complications, and short-term graft outcomes in kidney transplant recipients with a history of femoral lines.

METHODOLOGY

This prospective cohort study included 47 adult renal transplant recipients with prior femoral catheterisation who underwent living donor transplantation at the Institute of Kidney Diseases, Peshawar, Pakistan. Data on demographics, intraoperative events, and postoperative outcomes were analysed using SPSS ($p < 0.05$). Complications were classified by the Clavien–Dindo system.

RESULTS

Recipients had a mean age of 39.8 ± 10.7 years, and 80.9% were male. Hypertension (76.6%) and diabetes (25.5%) were common. All transplants were performed in the right iliac fossa, using the external iliac vessels in most cases. Difficult venous exposure occurred in 19.1%, and venous injury in 6.4%. Delayed graft function developed in 19.1%, while 6-month graft and patient survival were 91.5% and 97.9%, respectively. Patients with venous abnormalities had longer operative times and greater blood loss ($p < 0.05$) but similar graft survival.

CONCLUSION

Kidney transplantation in patients with prior femoral lines is feasible and yields favourable early outcomes. Pre-operative vascular imaging, meticulous surgical technique, and multidisciplinary coordination are essential to mitigate intraoperative risks and optimise graft success.

KEYWORDS: Kidney transplantation, Femoral line, Vascular access, Graft survival

vascular history.⁶ Specifically, the results indicate that graft survival and patient-related outcomes are significantly influenced by the presence of complications arising from prior interventions, such as thrombus formation during the perioperative phase. Moreover, immune responses elicited due to prior vascular access devices can heighten the risk of postoperative infections and impact overall graft viability.⁷ Given the immunosuppressive regimens required post-transplant, patients with complicated vascular histories are at an elevated risk for infectious complications, which can subsequently lead to acute rejection episodes and graft deterioration.⁸ The long-term management of these patients requires a multidisciplinary approach, involving nephrologists, surgeons, and interventional radiologists to assess potential vascular complications pre-operatively and to devise strategic management plans tailored to their unique challenges.⁹ Recent guidelines emphasise the need for comprehensive pre-operative evaluations, including advanced imaging techniques to ascertain the status of the vascular structures involved in potential graft placement, thereby mitigating the associated risks.¹⁰ In low- to middle-income countries, the prevalence of ESRD, exacerbated by conditions such as hypertension and diabetes, underscores the urgent need for effective transplantation protocols to manage kidney failure. The use of femoral lines in such settings may increase complications related to kidney transplantation.¹¹ Therefore, understanding the interplay between past interventions and transplantation outcomes in these populations is crucial for improving survival rates and patient quality of life after transplantation. While kidney transplantation remains a critical intervention for those suffering from ESRD, the surgical challenges posed by previous histories of femoral line placements must be diligently addressed. A thorough understanding of the complications associated with these interventions and their outcomes is crucial for optimising graft success and improving the overall health of the transplant population, especially within unique healthcare contexts.

METHODOLOGY

This was a single-centre prospective cohort study conducted at the Renal Transplant Unit, Institute of Kidney Diseases Peshawar. The study period extended from 1st February 2023 to 31st August 2025, during which all adult patients undergoing living donor kidney transplantation with a history of prior femoral vascular access for hemodialysis were included. The study adhered to the principles of the Declaration of Helsinki, and institutional ethical approval was obtained from the Institutional Review Board (14-01/Chairman/R &

E/Committee/IKD). A total of 47 consecutive kidney transplant recipients with a documented history of femoral hemodialysis catheterisation were enrolled. Patients were included if they were ≥ 18 years of age, underwent living donor kidney transplantation during the study period, and had at least one prior femoral dialysis catheterisation before transplantation. Exclusion criteria included Recipients of multi-organ transplants, patients undergoing re-transplantation, recipients of pre-emptive transplantation without prior dialysis, and incomplete medical records or loss to follow-up within the first three postoperative months. Data were extracted from electronic medical records and operative reports using a standardised proforma. Demographic and baseline clinical variables collected included age, sex, body mass index (BMI), comorbidities, and aetiology of end-stage renal disease (ESRD). Dialysis-related variables included modality, duration of dialysis (also known as vintage), and the number of femoral catheterisations. Donor-related information (living vs deceased donor) and transplant fossa laterality were also documented. Pre-operative imaging, including Doppler ultrasonography and computed tomography venography, was reviewed to identify venous abnormalities. Two transplant radiologists independently assessed all imaging reports to confirm findings. All transplants were performed by experienced transplant surgeons using a standardised extraperitoneal approach to the right iliac fossa. Arterial anastomosis was fashioned end-to-side to the external or common iliac artery. Venous anastomosis was preferentially performed to the external iliac vein; however, alternative sites (common iliac vein or inferior vena cava) were used in cases with venous abnormalities or injury. Ureteroneocystostomy was performed using the Lich-Gregoir technique, with routine placement of a double-J stent. Cold ischemia time (CIT) and warm ischemia time (WIT) were recorded during the operation. Intraoperative events such as venous injury, arterial spasm, and difficult venous exposure were documented. Post-transplant immunosuppression included induction with basiliximab or antithymocyte globulin according to immunological risk, followed by maintenance with tacrolimus, mycophenolate mofetil, and prednisolone as per institutional protocol. Recipients were monitored postoperatively with serial measurements of serum creatinine and urine output. Renal Doppler ultrasonography was performed if graft dysfunction was suspected. Protocol- or indication-based biopsies were carried out to confirm acute rejection. The primary outcomes included delayed graft function (DGF, defined as the need for dialysis within the first seven days post-transplant), primary non-function, biopsy-proven acute rejection, and graft survival at 90 days and

six months. Secondary outcomes included intraoperative variables (operative time, estimated blood loss, need for alternative venous outflow), postoperative complications (vascular thrombosis, urological complications, surgical site infection, lymphocele), and patient survival. Complications were categorised according to the Clavien–Dindo classification system. Early postoperative outcomes were defined as events occurring within 30 days of transplantation. Data analysis was performed using Statistical Package for the Social Sciences (SPSS) version 26.0. A p-value of <0.05 was considered statistically significant.

RESULTS

The study included 47 renal transplant recipients with a mean age of 39.8 ± 10.7 years (range 18–61 years). The majority were male (38; 80.9%), and the mean BMI was 24.9 ± 3.1 kg/m², indicating that most recipients had a normal to mildly overweight profile. Common comorbidities included hypertension (76.6%), diabetes mellitus (25.5%), and ischemic heart disease (8.5%). The primary etiologies of ESRD were diabetic nephropathy (31.9%), glomerulonephritis (29.8%), and hypertensive nephrosclerosis (25.5%), while a small proportion had obstructive uropathy (2.1%) or an unknown cause (10.6%). All recipients were on hemodialysis prior to transplant, with a median dialysis duration of 22 months (IQR 14–34), and all received kidneys from living donors (100%). (Table 1)

Table 1: Recipient Demographics and Pre-Transplant Profile (n = 47)

	Variable	n (%age)
Comorbidities	Hypertension	36 (76.6)
	Diabetes	12 (25.5)
	IHD	4 (8.5)
ESRD aetiology	Glomerulonephritis	14 (29.8)
	Diabetic nephropathy	15 (31.9)
	Hypertensive nephrosclerosis	12 (25.5)
	Obstructive uropathy	1 (2.1)
	Unknown	5 (10.6)
Dialysis before Treatment	Hemodialysis	47 (100)

All transplantations were performed in the right iliac fossa (100%). Arterial anastomosis was most frequently constructed with the external iliac artery (87.2%), while venous anastomosis commonly involved the external iliac vein (80.9%), with some requiring the common iliac vein (21.3%) or IVC (10.6%). The mean operative time was 165 ± 32 minutes, and the mean warm ischemia time was 31.2 ± 6.5 minutes. The median cold ischemia time was 2.4 hours (IQR 1.8–6.7). Median estimated blood loss was 30 mL (IQR 20–50). Intraoperative complications included difficult venous exposure (19.1%), venous injury (6.4%), arterial spasm

(4.3%), and conversion to higher venous outflow (8.5%). (Table 2)

Table 2: Intraoperative Characteristics (n = 47)

	Variable	n (%age)
Arterial anastomosis	External iliac	41 (87.2)
	Common iliac	6 (12.8)
Venous anastomosis	External iliac	38 (80.85)
	Common iliac	10 (21.3)
	IVC	5 (10.64)
Intraop events	Difficult venous exposure	9 (19.1)
	Venous injury	3 (6.4)
	Arterial spasm	2 (4.3)

The median ICU stay was 8 days (IQR 6–11). Delayed graft function (DGF), defined as dialysis requirement within 7 days, occurred in 7 patients (19.1%), while primary non-function was observed in 1 patient (2.1%). Biopsy-proven acute rejection within 90 days occurred in 2 patients (4.3%), and there were no vascular thromboses. Urological complications included urinary leaks and ureteric stenosis in one patient only. Wound complications were infrequent: superficial/deep SSI in 1 patient (2.1%) and lymphocele ≥ 5 cm in 1 patient (2.1%). Readmission within 30 days occurred in 8 patients (17.0%), and no 30-day mortality was recorded. (Table 3)

Table 3: Early Postoperative Outcomes (≤ 30 days) (n = 47)

Outcome	n (%age)
DGF (dialysis within 7 days)	7 (19.1)
Primary non-function	1 (2.1)
Biopsy-proven acute rejection ≤ 90 days	2 (4.3)
Vascular thrombosis (renal artery/vein)	0 (0)
Urological complications	Urinary leak 1; Ureteric stenosis 1
Wound complications	Superficial/deep SSI 1 (2.1); Lymphocele ≥ 5 cm 1 (2.1)
30-day readmission	8 (17.0)
30-day mortality	0 (0)

The median serum creatinine declined from 1.4 mg/dL (1.1–1.8) at discharge to 1.3 mg/dL (1.0–1.6) at 1 month, indicating satisfactory graft function. The mean eGFR at 3 months was 54 ± 13 mL/min/1.73 m². Graft survival was 93.6% at 90 days and 91.5% at 6 months, while patient survival at 6 months was 97.9% (46/47)—demonstrating favourable short-term outcomes. (Table 4)

Table 4: Graft Survival

Metric	%age (n/N)
90-day graft survival	93.6% (44/47)
6-month graft survival	91.5% (43/47)
6-month patient survival	97.9% (46/47)

The majority of complications were minor (Grade I–II; 38.3%), primarily involving transient ileus or electrolyte disturbances. Only one Grade IIIa event (2.1%) required percutaneous drainage of lymphocele,

and one Grade IIb event (2.1%) involved re-exploration for bleeding. A single Grade IV event (2.1%) was recorded for sepsis requiring ICU care, with no mortality (Grade V = 0). (Table 5)

Table 5: Complications by Clavien–Dindo Grade (30 days)

Grade	n(%)	Typical events
I–II	18 (38.3)	Transient ileus and electrolyte correction
IIIa	1 (2.1)	Percutaneous lymphocele drainage (n=1)
IIIb	1 (2.1)	Re-exploration for bleeding (n=1)
IV	1 (2.1)	ICU for sepsis without mortality
V	0 (0)	—

Among 15 patients with venous abnormalities detected on pre-transplant imaging, alternative venous outflow via the common iliac or IVC was required significantly more often (33.3% vs 6.3%; $p = 0.020$). These patients also had longer operative times (177 ± 30 min vs 159 ± 31 min; $p = 0.040$) and higher median blood loss (450 mL vs 250 mL; $p = 0.030$). Although DGF was more common (33.3% vs 12.5%) and 6-month graft survival slightly lower (86.7% vs 93.8%), these differences were not statistically significant. (Table 6)

Table 6: Outcomes by the Presence of Venous Abnormality on Imaging

Outcome	Abnormal (n=15)	Normal (n=32)	p-value
Alternative venous outflow (common iliac/IVC), n (%)	5 (33.3)	2 (6.3)	0.020
Operative time, min, mean $\pm$ SD	177 ± 30	159 ± 31	0.040
Estimated blood loss, mL, median (IQR)	450 (300–650)	250 (200–400)	0.030
Intraoperative venous injury, n (%)	2 (13.3)	1 (3.1)	0.240
DGF, n (%)	5 (33.3)	4 (12.5)	0.110
6-month graft survival, %(n/N)	86.7 (13/15)	93.8 (30/32)	0.390

Recipients with ≥ 2 prior femoral dialysis lines ($n = 20$) were significantly more likely to have venous abnormalities (50.0% vs 18.5%; $p = 0.020$). Rates of DGF (30.0% vs 11.1%), wound infection (20.0% vs 7.4%), and readmission (25.0% vs 11.1%) were higher but did not reach statistical significance. Six-month graft survival was comparable between groups (90.0% vs 92.6%; $p = 0.750$), suggesting that although multiple catheterisations predispose to venous abnormalities and intraoperative challenges, they may not significantly affect short-term graft outcomes. (Table 7)

Table 7: Outcomes by Number of Prior Femoral Catheterisations

Outcome	≥ 2 lines(n=20)	1 line (n=27)	p-value
Venous abnormality on imaging, n (%)	10 (50.0)	5 (18.5)	0.020
DGF, n (%)	6 (30.0)	3 (11.1)	0.140
Wound infection, n (%)	4 (20.0)	2 (7.4)	0.180
30-day readmission, n (%)	5 (25.0)	3 (11.1)	0.270
6-month graft survival, % (n/N)	90.0 (18/20)	92.6(25/27)	0.750

DISCUSSION

The femoral line is a type of angioaccess through which dialysis can be done. This is usually done when a patient cannot be positioned for an internal jugular line during an emergency. The intended study, engaging with a cohort of 47 renal transplant recipients, reveals significant clinical insights pertaining to recipient demographics, intraoperative characteristics, postoperative complications, and graft survival. These findings can be analysed and compared with relevant literature to provide a comprehensive understanding of current standards in renal transplantation outcomes. The study highlighted a mean age of 39.8 years in renal transplant recipients, with an overwhelming majority being male (80.9%). The mean BMI of the patients is 24.9 kg/m², indicating that most recipients were generally within a healthy weight range. The intended study reflects a higher prevalence of hypertension (76.6%) and diabetes mellitus (25.5%), consistent with results from Dickson et al., who identified similar comorbidities in their cohort, underlining the importance of comprehensive pre-operative assessments.¹² The aetiology of end-stage renal disease (ESRD) in our study aligns with previous literature, confirming diabetic nephropathy and glomerulonephritis as leading causes of renal failure.¹³ The surgical approach in our study involved 100% right iliac fossa transplants, utilising the external iliac artery for arterial anastomoses (87.2%) and favouring the external iliac vein for venous connections (80.9%). These findings corroborate the observations of Wondmagegn et al., who noted that vascular anatomy impacts surgical choice and the potential for graft complications.¹⁴ The mean operative time recorded was consistent with observed averages in recent literature, where optimal surgical techniques have been correlated with improved patient outcomes.¹⁵ Notably, complications such as venous injury (6.4%) and arterial spasms (4.3%) reflect challenges paralleled in similar

cohorts.¹⁶ The rate of delayed graft function (DGF) at 19.1%, with primary non-function observed in 2.1% of cases, demonstrates a satisfactory outcome when contextualised within recent benchmarks; however, it remains critical given the implications for long-term graft viability. Previous studies have shown that DGF rates can vary significantly based on donor type, with higher incidences in deceased donor scenarios.¹⁷ In a similar vein, the acute rejection observed in 4.3% of patients aligns with findings by Clayton et al., who noted that acute rejection episodes profoundly impact long-term graft survival.¹⁸ Moreover, the approximately 17% readmission rate within 30 days echoes observations made by Gupta et al., indicating that comorbidities continue to challenge postoperative recovery.¹⁹ The study's findings of a decline in median serum creatinine from 1.4 mg/dL to 1.3 mg/dL in the initial month post-transplant support assertions made by Ramirez-Sandoval et al., which illustrated favourable early graft function metrics among a similar cohort.²⁰ Furthermore, with 90-day graft survival at 93.6% and 6-month graft survival at 91.5%, our outcomes resonate with those observed by Ghelichi-Ghojogh et al., who reported above-average graft survival rates post-transplant.²¹ Equally noteworthy is the 6-month patient survival rate of 97.9%, illuminating the efficacy of current immunosuppression protocols.²² The majority of complications in our cohort were classified as Grade I and II, with only minor morbidity impacting overall patient outcomes, consistent with findings from Territo et al., who similarly concluded that early complications do not significantly impact long-term survival.¹⁵ The presence of venous abnormalities necessitating alternative venous outflow was noted in 33% of patients, a finding that significantly influenced operative times and estimated blood loss, further corroborating the work by John et al., where pre-existing venous issues were noted to complicate surgical procedures.²³ Acknowledging these concurrent medical conditions with past vascular histories can significantly enhance strategic frameworks for kidney transplantation, ultimately improving patient survival and quality of life. Comprehensive pre-operative evaluations and tailored surgical plans can substantially mitigate risks associated with previous femoral access, leading to better global transplant outcomes. Thus, the findings from our study reinforce existing literature while contributing novel insights into specific challenges faced by kidney transplant recipients with prior femoral vascular access. By establishing a comprehensive understanding of these complex interactions, we can continue refining surgical protocols and postoperative management to enhance patient care and outcomes in kidney transplantation.

LIMITATIONS

The study lacks an explicit limitations section, but methodological constraints include a small sample size of 47 patients and a single-center design at the Institute of Kidney Diseases in Peshawar. Additionally, the research is limited by short-term six-month follow-ups, a lack of a comparative control group, and a demographic skew favoring male patients. You can read the study abstract and details at the Institute of Kidney Diseases.

CONCLUSIONS

Kidney transplantation in patients with a history of femoral lines is achievable with good short-term outcomes. Still, it requires meticulous pre-operative planning and surgical expertise to overcome vascular challenges and minimise complications.

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AUTHORS CONTRIBUTION

Muhammad Izhar - Concept & Design; Data Acquisition; Data Analysis/Interpretation; Drafting Manuscript; Critical Revision; Supervision; Final Approval

Ahmad Nawaz - Concept & Design; Data Acquisition; Data Analysis/Interpretation; Drafting Manuscript; Critical Revision; Final Approval

Farman Ullah - Concept & Design; Data Acquisition; Data Analysis/Interpretation; Drafting Manuscript; Final Approval

Zahid Majeed - Concept & Design; Data Acquisition; Drafting Manuscript; Final Approval

The authors accept responsibility for all aspects of the work and will ensure that any concerns regarding the accuracy or integrity of any part are properly investigated and resolved.



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