

Management of Immediate Post Renal Transplant Complications

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Case presentation

- 60yr old female with PMHx of HTN and ESRD on CAPD since May 2000.
- Admitted for Deceased Donor Renal Transplantation (DDRT) on 7/13/2011.
- Uneventful standard renal transplantation into the right iliac fossa
- Significant plaque disease noted on right external iliac artery

Hospital course- POD#0

- Left intubated due to poor postoperative respiratory effort
- Standard post operative orders written as per protocol
- Immediate postoperative hourly urine outputs noted in the range of 75cc/hr-370cc/hr within first 6hrs
- Hourly fluid replacement protocol was altered by overnight MICU attending physician

POD#1

- Sharp decline in urine output noted in the following hours
- No response to fluid resuscitation
- Emergent Doppler USS demonstrated no arterial or venous blood flow in transplanted kidney
- Immediately taken back to OR

POD#1

- Wound exploration, thrombectomy of transplant renal artery and allograft biopsy
- Doppler USS- Restoration of arterial and venous flow into renal allograft.
- Intraoperative biopsies- renal allograft cellular edema and congested blood vessels

POD#2/#3

- Post operative MAG3 scan- diminished, delayed flow and decreased excretion consistent with allograft vascular thrombosis.
- Minimal urine output observed over the following day.
- Patient subsequently dialyzed for fluid overload

POD#4

- Taken back to OR on 7/17/2011 for renal transplant nephrectomy

Pathology

- Kidney- Extensive hemorrhagic infarction
- Renal artery-fresh thrombus
- Renal vein and Ureter- patent

Causes of immediate renal transplant complications

- Vascular complications
- Urologic complications
- Hypovolemia
- Hyperacute rejection (HAR)
- Delayed graft function (DGF)
- Preservation injury

Vascular thrombosis

- Incidence of 2%-6% of all renal transplants
- Renal vein thrombosis more common than renal artery thrombosis.
- Presentation-sudden pain and swelling of graft, oliguria and anuria.

Transplant renal artery thrombosis

Risk factors

- Endothelial damage
- Kinking due to positioning of allograft
- Extrinsic compression (hematoma/lymphocele)

Primary thrombosis - results in bland renal infarction

Transplant renal vein thrombosis

Causes

- Vein injury (preservation/implantation_)
- External compression
- Kinking - allograft positioning
- Thrombophilic state.

Pathology- characteristic hemorrhagic infarction of the allograft with thrombosis of the venous microcirculation.

Vascular thrombosis

- Salvage of allograft is possible if thrombosis is noted immediately after revascularization
- Window of opportunity for recovery of function is small as the non-perfused allograft will suffer irreversible injury at body temperature.

Management of renal allograft thrombosis

- Transplant nephrectomy

Donor risk factors for renal graft thrombosis

- Methods- Retrospective review of all renal transplants done between January 1990- December 2005.
- Vascular injuries, multiple donor vessels, and atheromas noted at organ procurement was documented.
- Pretransplant history of hypercoagulability, SLE and vascular access thrombosis were also noted.
- Patients that developed vascular thrombosis were compared to a control group of patients without vascular thrombosis.
- Analysis using logistic regression models.

Donor risk factors for renal graft thrombosis

- Results- total of 1308 patients were transplanted during this time frame.
- Potential risk factors (multiple vessels, vascular injuries and atheromas) were identified in 16% (208/1308).
- Renal artery and venous thrombosis occurred in 36 patients (2.8%).
- Univariate and multivariate analysis of risk factors evaluated

Table 1. Univariate Analysis of Risk Factors

Risk Factor	Thrombosis OR (CI)	Graft Loss OR (CI)	Mortality OR (CI)
Vascular injury	2.99 (1.02–8.78)*	2.2 (0.75–6.22)	N/A
Multiple vessels	1.18 (0.45–3.08)	1.25 (0.55–2.85)	1.47 (0.42–5.12)
Atheroma	6 (1.69–21.26)*	4.3 (1.24–15.25)*	13.4 (3.58–50.07)*

OR, odd ratio; CI, Confidence interval.

* $P < .05$.

Table 2. Multivariate Analysis of Risk Factors

Risk Factor	Thrombosis OR (CI)	Graft Loss OR (CI)	Mortality OR (CI)
Vascular injury	6.9 (0.63–5.98)	8.64 (0.70–6.61)	N/A
Multiple vessels	5.90 (0.79–3.94)	3.15 (0.48–2.73)	8.37 (0.59–7.63)
Atheroma	1884 (2.41–23.54)*	1.05 (1.12–16.41)*	16.491 (3.73–54.89)*

OR, odd ratio; CI, confidence interval.

* $P < .05$.

Comparison of transplant outcomes in peritoneal and hemodialysis patients

- Methods- UNOS registry of all patients transplanted between January 1995 and 1998.
- Rates and Outcomes of transplantation between peritoneal dialysis and hemodialysis patients were compared.
- Cox proportional hazard analysis were used for statistical analysis.
- Conclusions- Kidney transplantation was more frequent in peritoneal dialysis patients.
- Peritoneal dialysis associated with higher risk of early graft failure .

J Snyder , B Kasiske, D Gilbertson etal Kidney International 2002;62:1423-1430.

Comparison of transplant outcomes in peritoneal and hemodialysis patients

Table 4. Causes of graft failure (primary or contributing) for patients whose graft failed within the first 3 months^a

Cause	Percent with characteristic		<i>P</i> value ^b
	Among PD patients (% , <i>N</i>)	Among HD patients (% , <i>N</i>)	
Hyperacute rejection ^c	3 (3/95)	4 (7/195)	1.0000
Surgical complications ^c	3 (3/95)	6 (11/195)	0.5602
Acute rejection ^d	27 (42/156)	27 (95/349)	0.9446
Primary failure ^d	13 (21/156)	15 (52/349)	0.6711
Graft thrombosis ^d	41 (64/156)	30 (106/349)	0.0192
Infection ^d	8 (12/156)	10 (34/349)	0.4595
Urological complications ^d	2 (3/156)	2 (7/349)	1.0000
Recurrent disease ^d	3 (4/156)	2 (6/349)	0.5071
Other ^d	15 (23/156)	19 (66/349)	0.2561

^aPatients may have more than one cause of graft failure

^b*P* value from Fisher's exact test (when fewer than five expected events) or Chi-square test

^cFor patients whose graft failed immediately

^dFor patients whose graft failed immediately or after discharge

Urologic complications

- Ureteral obstruction - technical problem such as ureteral necrosis due to inadequate vascular supply or poor surgical uretero-vesicular anastomosis.
- External compressions from hematoma or kinking of the ureter.
- Imaging of the transplanted kidney will reveal any obvious obstruction

Urologic complications

- Urine extravasation - damage to the transplanted ureter or a faulty ureteroneo-cystostomy
- Diagnosis of a urine leak- fluid analysis
- Measurement of sodium, potassium and creatinine concentration in plasma and urine.

Urologic complications- Urine leak

- Diagnosis- Radionuclide imaging
- Confirmation- Cystoscopy or nephrostomy.
- Bladder outlet obstruction - prostatic hypertrophy or bladder dysfunction can also lead to oliguria

Management of urologic complications

Ureteral obstruction

- Ureteral stent placement
- Nephrostomy tube placement
- Re-operation and re-implantation of the ureter

Management of urologic complications

Urinary extravasation

- Internal drainage- Ureteral stenting
- External drainage- Nephrostomy tube
- Catheter drainage-Mild extravasation with intact anastomosis
- Reimplantation – significant extravasation or complete anastomotic dehiscence

Hypovolemia

- Overzealous dialysis prior to transplantation.
- Inadequate fluid replacement in the peri-operative period.
- Third spacing of fluid.
- Postoperative bleeding.
- Management- Adequate fluid resuscitation.

Hyper acute rejection (HAR)

- Presence of undetected anti-donor HLA antibodies in recipient at time of transplantation
- May be noticed immediately or few hours after revascularization.
- Softening, flaccidity, mottling or cyanosis of transplanted kidney.

Hyper acute rejection (HAR)

- Donor specific antibody detected in repeat cross match
- Delayed HAR - sudden severe graft dysfunction or thrombosis 24-48hrs after implantation.
- Biopsy- Polymorphonuclear leukocyte accumulation in glomerular & peritubular capillaries, endothelial damage & diffuse microcirculatory thrombosis.

Management - Hyper acute rejection

- Immediate graft nephrectomy

Delayed graft function (DGF)

- Need for dialysis during the first week following transplantation.
- Pathogenesis-Ischemia/reperfusion injuring resulting in tubular damage (ATN).
- Incidence of DGF is about 5-40% for DDRTs and 2%-5% in Living Donor Renal Transplants.

Delayed graft function

Risk factors

- Prolonged Cold (CIT) & Warm Ischemia Times (WIT)
- Expanded Criteria Donors (ECDs)
- Elevated Donor Creatinine
- Donor Hypertension
- Recipient Panel of Reactive Antibodies (PRA) >50%
- Recipient of prior transplantation
- Method of organ preservation.

Delayed graft function

- Associated with worse long term graft outcome
- AR+DGF- increased primary non function & worse long-term graft survival.
- Strategies to limit DGF- improved organ preservation, shorter cold and warm ischemic times and improved care of brain-dead donors.

Management-Delay graft function

- No specific treatment for DGF
- Balance adequate immunosuppression to prevent acute rejection against limited exposure to medications with a potential adverse impact on renal recovery
- Careful monitoring of allograft status
- Persistent DGF (7-10days) - Biopsy

Severe preservation injury

- Uncommon- following complications of organ recovery, preservation or implantation.
- May result from excessive warm or cold ischemic times
- Pathology-severe ATN, evidence of endothelial injury and thrombotic changes in glomerular microcirculation
- High primary non-function rate

Conclusions

- Immediate post renal transplantation complications are not uncommon and management is based on the etiology.

