



Acute Kidney Injury Post Kidney Transplant: Beyond the Perioperative Period



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Disclosures

- None





Objectives

- Review the differential diagnosis of acute kidney injury (AKI) in the kidney transplant recipient (beyond the peri-operative period)
- Outline an approach to the evaluation of AKI following kidney transplantation
- Distinguish AKI in the transplant and non-transplant populations





Case 1

- A 49 year-old man with a history of ESKD in the setting of longstanding DM2 underwent a successful deceased donor kidney transplant 4 months ago.
- Immediate graft function, nadir SCr 1.3 mg/dL
- He has been generally feeling well other than some diarrhea over the last 1-2 weeks. He is taking all of his medications, which include tacrolimus, mycophenolate mofetil, prednisone, and calcitriol, which he was taking pre-transplantation for secondary hyperparathyroidism.
- Routine clinic labs reveal a SCr 2.0 mg/dL
- Which of the following are potential etiologies for his AKI?
 - a) Allograft underperfusion secondary to GI fluid losses
 - b) Allograft underperfusion secondary to high tacrolimus level
 - c) Allograft underperfusion secondary to hypercalcemia
 - d) All of the above





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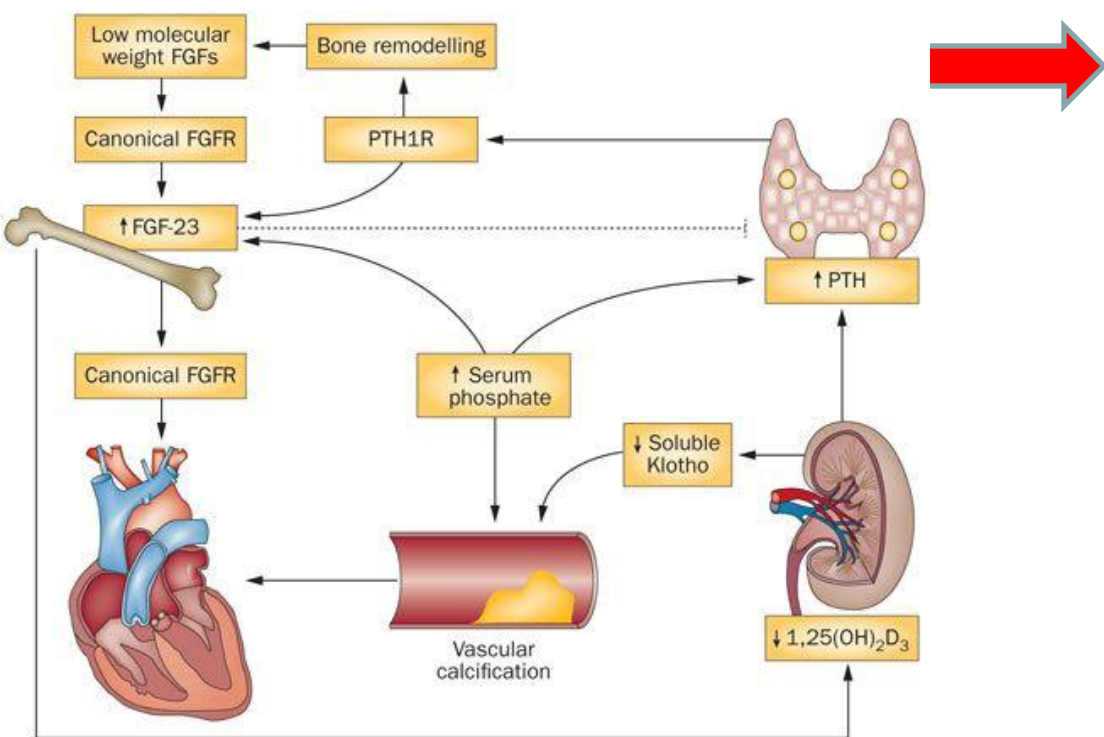
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Hypercalcemia is common following KTX

Secondary Hyperparathyroidism in ESKD



Silver J & Naveh-Many T Nature Rev Neph 2013

After transplant...

- Kidney can excrete PO_4 and make $1,25(\text{OH})_2\text{D}$ -> PTH production should decrease
- Some patients have ongoing autonomous secretion of PTH

Tertiary hyperparathyroidism

- Hypercalcemia
- Hypophosphatemia





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"Prerenal" until proven otherwise...



Transplantation 1987



AKI Beyond the First Week

- Underperfusion of the allograft
 - True or effective volume depletion
 - Acute CNI toxicity
- Urinary tract infection
- Urinary tract obstruction
- Acute rejection
- BK nephropathy
- Recurrent disease
- Thrombotic microangiopathy
- Other
 - Transplant renal artery stenosis, de novo glomerular disease, PTLN of the allograft





Case 2

- 56 year old man with a history of ESKD in the setting of ADPKD underwent a successful deceased donor kidney transplant 9 months ago.
- Immediate graft function, nadir SCr 1.2 mg/dL
- Early acute cellular rejection at month 3, treated with thymoglobulin and subsequently maintained on higher dose of tacrolimus and mycophenolate mofetil
- New “baseline” SCr 1.6-1.7 mg/dL
- Routine clinic labs reveal a SCr of 2.2 mg/dL, UA with 4-6 WBC/hpf, urine culture negative, tacrolimus level 9.5 ng/mL, no DSA
- Which of the following is the most likely cause of his AKI?
 - a) Acute cellular rejection
 - b) Urinary tract infection
 - c) Acute humoral rejection
 - d) BK nephropathy



Rationale for Individualizing Immunosuppression

Too Much

- *Cardiovascular Disease*
- *Infection*
- *Neoplasia*
- *Nephrotoxicity*



Too Little

- *Allograft Rejection*



Individualizing Immunosuppression Based on Immunologic Risk

PRE-TRANSPLANT
IMMUNOMODULATION

INDUCTION
ANTIBODY THERAPY

TRIPLE THERAPY
MAINTENANCE

MINIMIZATION
PROTOCOLS

HIGH RISK

HIGHLY SENSITIZED, +XM/ABOI

AFRICAN AMERICAN/HISPANIC
ETHNICITY

PEDIATRIC PATIENTS

DECEASED DONOR SOURCE

HLA MISMATCH, +DSA*

PROLONGED COLD ISCHEMIA

LOW RISK

NONSENSITIZED

ASIAN/CAUCASIAN ETHNICITY

THE ELDERLY, INFIRMITY

LIVING DONOR SOURCE

HLA IDENTICAL, NO DSA

*DSA = donor specific antibody



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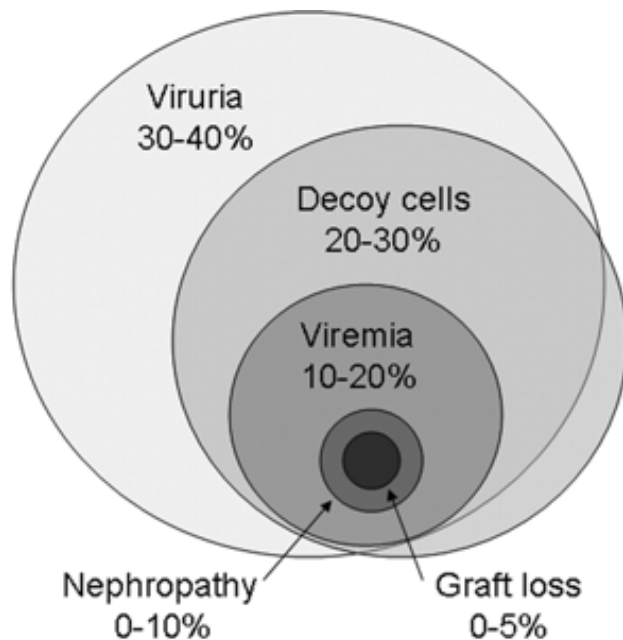
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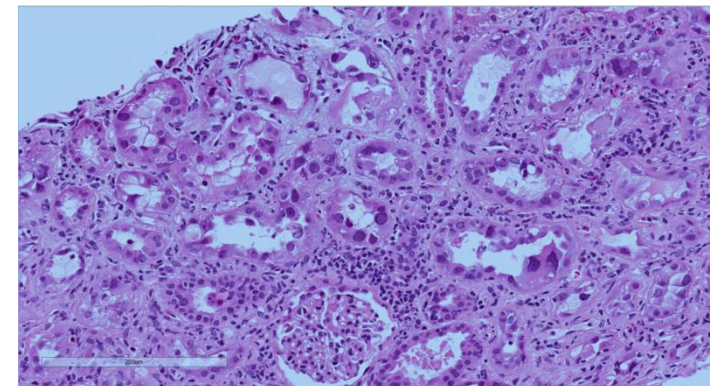
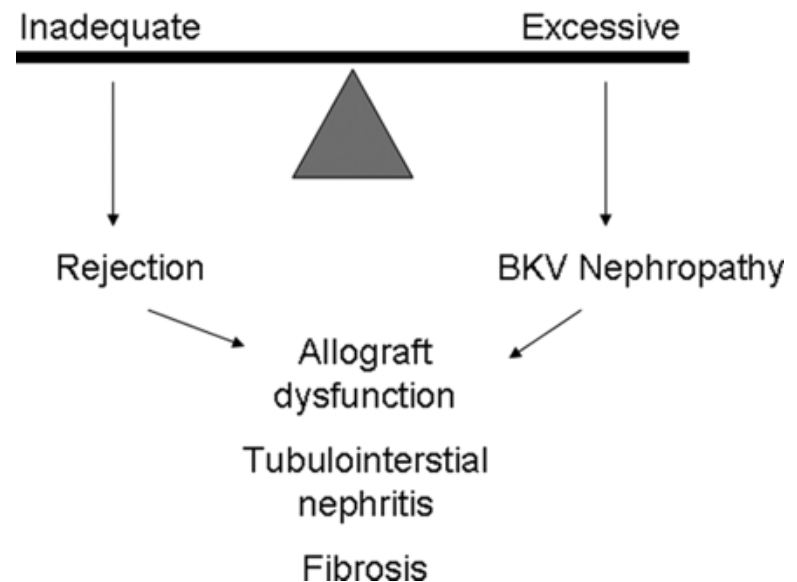
Polyoma Virus & BK Nephropathy



*Rare cases of nephropathy without viremia or viremia without viruria may occur

Figure 1. Type and prevalence of BK virus (BKV) infections in kidney transplant recipients.

Immune Suppression





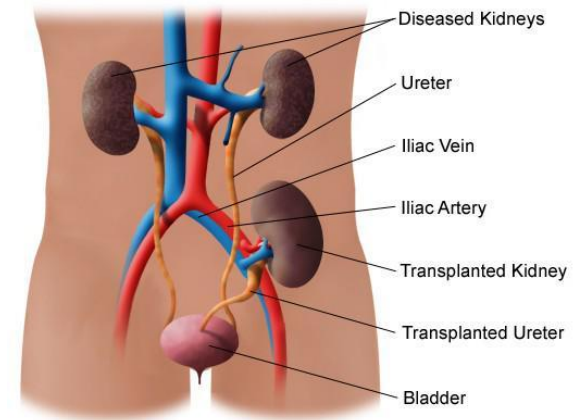
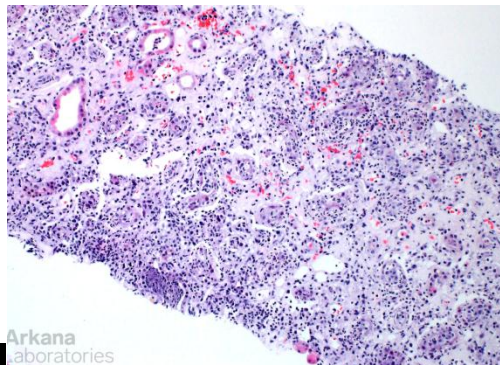
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- Urinary tract obstruction
- ✓ Acute rejection
- ✓ BK nephropathy
- Recurrent disease
- Thrombotic microangiopathy
- Other
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UTI in Transplant Recipients

- Often present as an asymptomatic rise in serum creatinine
- Not always associated with pyuria



- A urine culture is always part of the evaluation of AKI in the kidney transplant recipient





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Evaluation of AKI in the Kidney Transplant Recipient

- Empiric IVF
- Calcineurin inhibitor trough level
- Urinalysis and culture
- Serum BK PCR
- Ultrasound of the allograft
- Urine protein to creatinine ratio
- CBC
- Serum calcium level
- Allograft biopsy





Take Home Points

- AKI has a unique differential diagnosis in kidney transplant recipients
- Transplant patients are “prerenal” until proven otherwise and (almost) all deserve a trial of isotonic fluid
- Every patient requires careful consideration of individual risk of rejection v consequences of overimmunosuppression
- When in doubt, biopsy





Thank you!

