Care of the Transplanted Kidney

Alejandro Diez, MD, FASN
Assistant Professor of Clinical Medicine
The Ohio State University Comprehensive Transplant Center
The Ohio State University Wexner Medical Center

Why this topic is no longer esoteric…

Solid organ transplants have become more common.

The number organ recipient continues to grow.

As healthcare providers, we will care for a transplant patient at some point of our career.
2016 Transplantation Statistics: United States

Kidney: 19,061
Pancreas: 215
Kidney/Pancreas: 797

2016 Transplantation Statistics: Ohio

Kidney: 672
Pancreas: 9
Kidney/Pancreas: 38
2016 Adult Transplantation Statistics: Ohio

University of Toledo
Kidney: 73

University of Cincinnati
Kidney: 84
Kidney Pancreas: 12

Cleveland Clinic
Kidney: 155
Pancreas: 10
Kidney Pancreas: 6

University Hospital (CWR)
Kidney: 74
Pancreas: 0
Kidney Pancreas: 1

Ohio State University
Kidney: 209
Pancreas: 2
Kidney Pancreas: 17

Transplantation: The Ultimate Team Sport

Physician
Transplant Physicians
Transplant Surgeons

Nursing
Advanced Practice Providers
Inpatient Acute Care Nurses
Outpatient Transplant Nurse Coordinators

Transplant Specialists
Psychology
Infectious Disease
Endocrinology
Cardiology
Pulmonology
Dermatology
Urology

Ancillary Specialists
Social Worker
Finance
Pharmacists
Nutritionists
Case Management
Transplantation: The Ultimate Team Sport

Our Most Valued Partners / Players (MVP):

Community Nephrologists and Internists

Transplanting a Kidney: The Nut and Bolts

- Incision is in the right or left lower quadrant.
- Generally, the best lie will be left donor kidney to right and vice versa;
- The native kidneys are generally left in place.
Transplanting a Kidney: The Nut and Bolts
The transplanted artery and vein are anastomosed to the recipient’s iliac vessels.
Transplanting a Kidney: The Nut and Bolts

The transplanted ureter is anastomosed to the bladder.
Transplanting a Kidney: The Nut and Bolts

- The Finished Product

TRANSPLANT BEING A TEAM SPORT...
Implanting a Kidney is the First Step

Immunosuppression Medications Keep Things Going...

Advances in Immunosuppression Have Increased Early Graft Survival

Data from 2016 USRDS Annual Data Report
Advances in Immunosuppression Have Increased Early Graft Survival

![Graph showing the percentage of acute rejection and biopsy proven outcomes over time for deceased and living donors.](Image)

Source: USRDS 2013 ADR

Maintenance Therapy

- Calcineurin Inhibitors
  - Cyclosporin (Sandimmune* / Neoral*)
  - Tacrolimus (Prograf / FK 506)
- Antimetabolites
  - Azathioprine (Imuran)
  - Mycophenolate Mofetil (Cellcept)
  - Enteric-Coated Mycophenolic Acid (Myfortic)
- mTOR Inhibitors
  - Rapamycin (Sirolimus)
  - Zortress (Everolimus)
- Co-Receptor Blockers
  - Belatacept (Nujolix)
- Steroids
What we like to see…

What we really like to see…
Long-Term Kidney Transplant Outcomes

Half-lives for adult kidney transplant recipients

LDKT: 12 Years

DDKT: 8 Years

Source: 2011 OPTN/SRTR Annual Report

What we would rather not see...
What’s Next?

Initial Work-up for Increased Creatinine in a Renal Transplant Patient

- Structural Abnormalities
- Calcineurin Toxicity
- Allograft Glomerulopathy
- Renal Issues
- Rejection
- Infection
Structural Abnormalities

We Order:
Renal Ultrasound With Dopplers

Reason:
Vascular Anastomosis
Strictures
Collections (Urinomas / Seromas / Hematomas)
Blockages (Hydronephrosis)
Structural Abnormalities

Transplant Ureter Stenosis
Structural Abnormalities

![Image 1](image1.png)

Structural Abnormalities

![Image 2](image2.png)
Structural Abnormalities

We Order:
- CBC / Cell Count
- Creatinine (Fluid / Serum)
- Urea (Fluid / Serum)

Reason:
- Hematoma
- Seroma
- Urinoma

Calcineurin Toxicity

We Order:
- Drug Levels (Random)
  - Calcineurin Levels
  - Cyclosporin
  - Tacrolimus

Reason:
- If too high: Toxicity ?
- If too low: Rejection ?
Calcineurin Toxicity

Concern for the Internist:

Drug Interactions: P450-3A5

Enzyme Inducers:
  Decrease levels

Enzyme Blockers:
  Increase levels

Allograft (Transplant) Glomerulopathy

- Chronic “Burning Out” of the transplanted kidney

- Biopsy
  - Imaging
  - Clinical
  - Half Lives:
    - DDKT: 8  LDKT: 12*

Image: Nadasdy / Diez  (OSUWMC)
Renal Causes

Pre-Renal
- Volume Depletion
- Medications

Renal
- Tubular Necrosis
- Interstitial Nephritis
- Recurrent Disease

Post Renal
- Obstruction
- BPH
- Neurogenic Bladder

Renal Causes

Pre-Renal
- Urinalysis
- FENa*
- Orthostatics

Renal
- Urinalysis
- Urine Protein*
- Urine Eosinophils

Post Renal
- Renal Ultrasound / PVR
Fractional Excretion Sodium (FENa)

We Order:
  Urine Na / Creat
  Serum Na / Creat

Interpretation:
  If < 1%, then Pre-Renal***

Caution:
  Diuretics (Furosemide)
  Cardiac / Liver Failure
  Bladder Drained Pancreas

Urine Protein (Random)

We Order:
  Urine Protein
  Urine Creatinine
  Not a Urinalysis!
Rejection

We Order:

Biopsy
Alloscreen* (Anti-HLA Antibody Assay)

Reason:
Biopsy:
  Gold Standard
  Rejection Yes / No / Other
  Severity Of Rejection
  Guides Treatment
  “Alloscreen” / “Luminex”:
    Are there anti-HLA Antibodies?

Rejection: What the HLA Lab Sees
HLA Type: The “ID Tag”

Donor:
A 2,8 B 5,16 DR 2,52

Recipient:
A 2,10 B 5,5 DR 2,52
Find The Mismatch:

Donor:
A 2,8 B 5,16 DR 2,52

Recipient:
A 2,10 B 5,5 DR 2,52

Answer:
2 Antigen Mismatch

Find The Mismatch:

Donor:
A 2,8 B 5,16 DR 2,52

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Answer:
2 Antigen Mismatch
Rejection: What the HLA Lab Sees
Antibodies Against HLA

Donor:
A 2,8 B 5,16 DR 2,52

What the HLA Lab Tells Us:
Recipient:
A 2,10 B 5,5 DR 2,52

The patient has two HLA Antibodies:
A8 at 7000 MFI
DR51 at 10,000 MFI

Why this matters:
A8 is specific against the donated kidney (DSA)
DR1 is not specific to the donated kidney (non-DSA)

Donor:
A 2,8 B 5,16 DR 2,52

Recipient:
A 2,10 B 5,5 DR 2,52
<table>
<thead>
<tr>
<th>Rejection Biopsy: What The Pathologist Sees</th>
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<td>![Image: Nadasdy / Diez (OSUWMC)]</td>
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- Blood Vessels
- Interstitium
- Tubules
- Glomerulus

Image: Nadasdy / Diez (OSUWMC)
**Rejection: What We Interpret**

<table>
<thead>
<tr>
<th>Rejection</th>
<th>Cellular</th>
<th>Humoral</th>
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<tbody>
<tr>
<td></td>
<td>BANFF Criteria</td>
<td>- Donor Specific Antibody Production</td>
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<tr>
<td></td>
<td>BANFF Ia &amp; IIb Interstitium &amp; Tubular Injury</td>
<td>- C4d Deposition</td>
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<tr>
<td></td>
<td>BANFF Ila &amp; Iib Vascular Injury</td>
<td>- Direct Tissue Injury</td>
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**Rejection: How We Treat**

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<tr>
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<td>Steroids + / - Thymoglobulin</td>
<td>Steroids + / - Plasma Pheresis + / - IVIG</td>
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Infection

We Look For:
The usual suspects
  Sepsis
  Bacteremia et al
Opportunistic Infections
  CMV
  BK

We Order:
  Urinalysis
  Urine Cultures
  Blood Cultures
  BK PCR
  CMV PCR

Infection

Concerns for the Internist:

Urinary Tract Infections:
  Treat as a Complicated Infection
  Be aware of recurrent infections

Fever

Flu Vaccines

Low Threshold to Transfer Patient
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<td>Common things may be common; but this population is quite eclectic.</td>
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<td>There is no substitute for a good clinical history.</td>
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<td>We are here to help.</td>
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