

Care of the Transplanted Kidney

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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

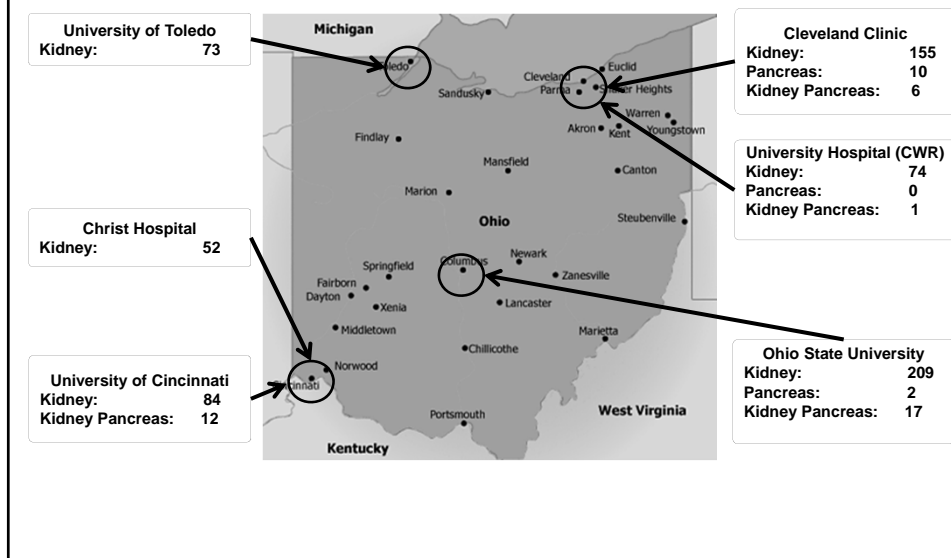


Kidney: 672

Pancreas: 9

Kidney/Pancreas: 38

2016 Adult Transplantation Statistics: Ohio



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

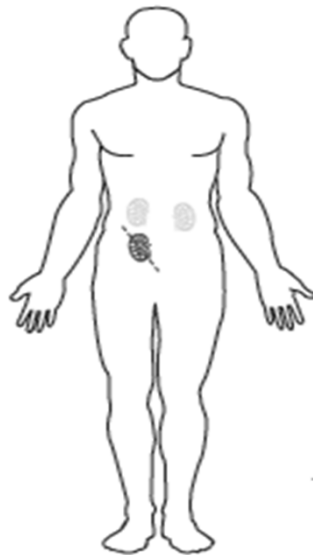
Ancillary Specialists

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



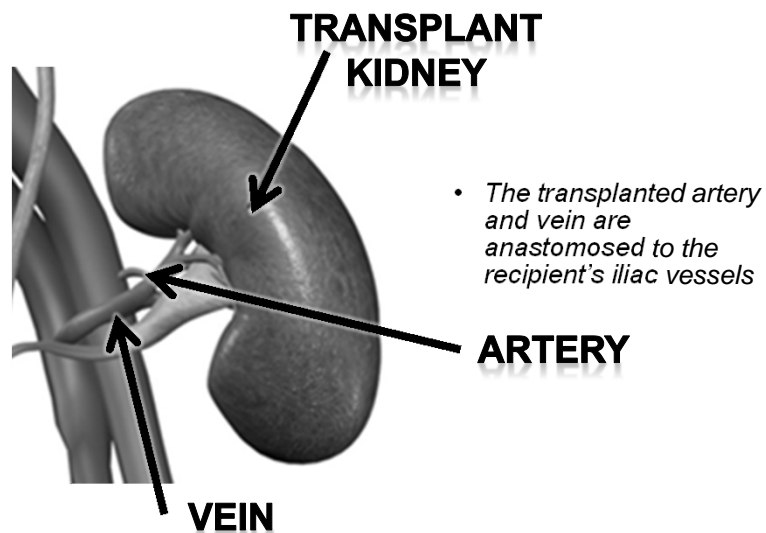
Transplanting a Kidney: The Nut and Bolts



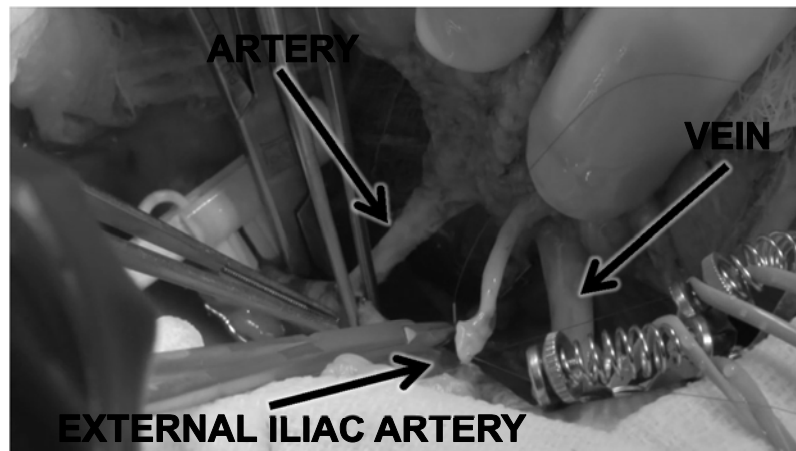
Transplanting a Kidney: The Nut and Bolts



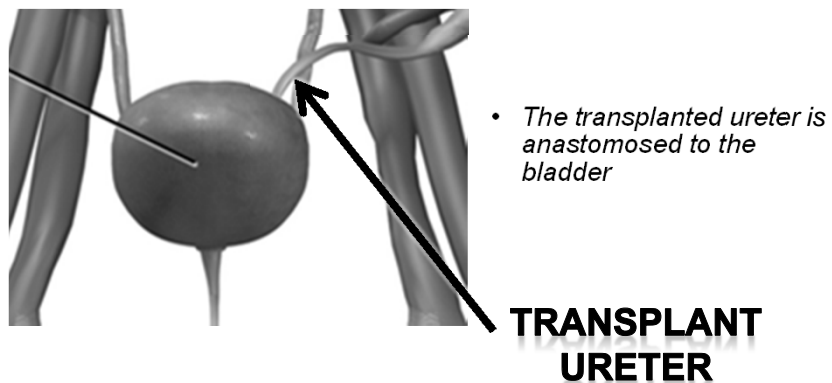
Transplanting a Kidney: The Nuts and Bolts



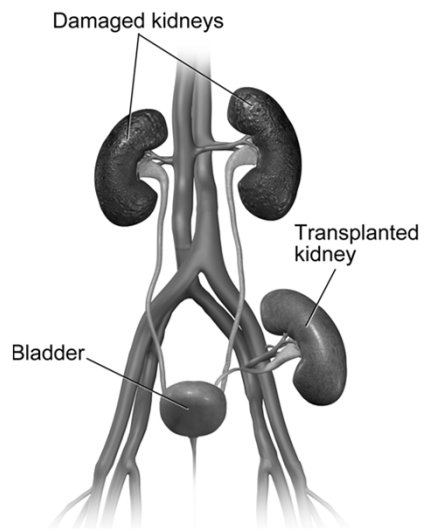
Transplanting a Kidney: The Nut and Bolts



Transplanting a Kidney: The Nuts and Bolts



Transplanting a Kidney: The Nut and Bolts



- **The Finished Product**

Author: BruceBlaus (CC BY-SA 4.0)

TRANSPLANT BEING A TEAM SPORT...



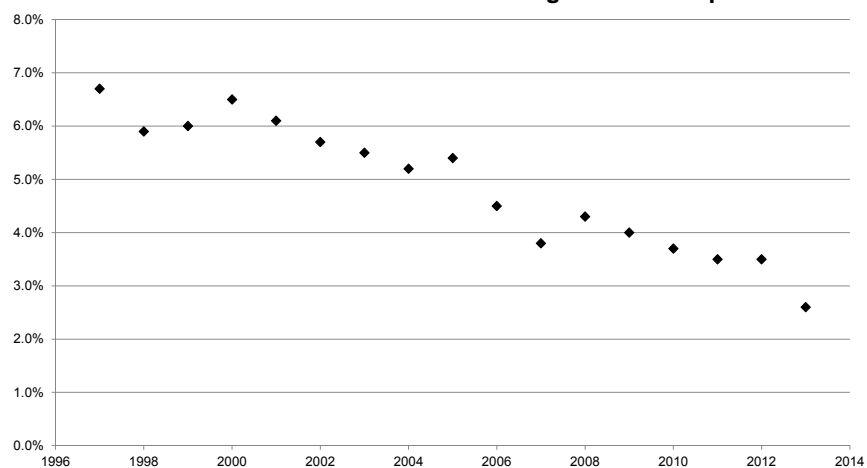


Implanting a Kidney is the First Step

Immunosuppression Medications Keep Things Going...

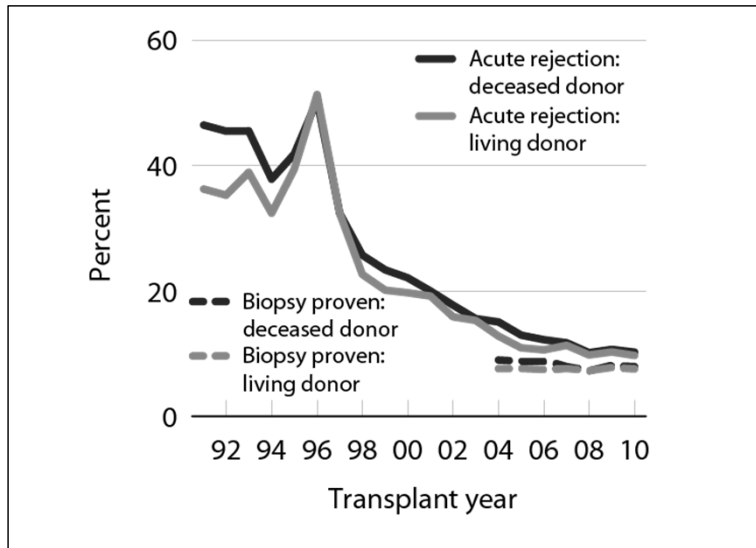
Advances in Immunosuppression
Have Increased Early Graft Survival

Graft Loss In the First Year Post Living Donor Transplant



Data from 2016 USRDS Annual Data Report:

Advances in Immunosuppression Have Increased Early Graft Survival

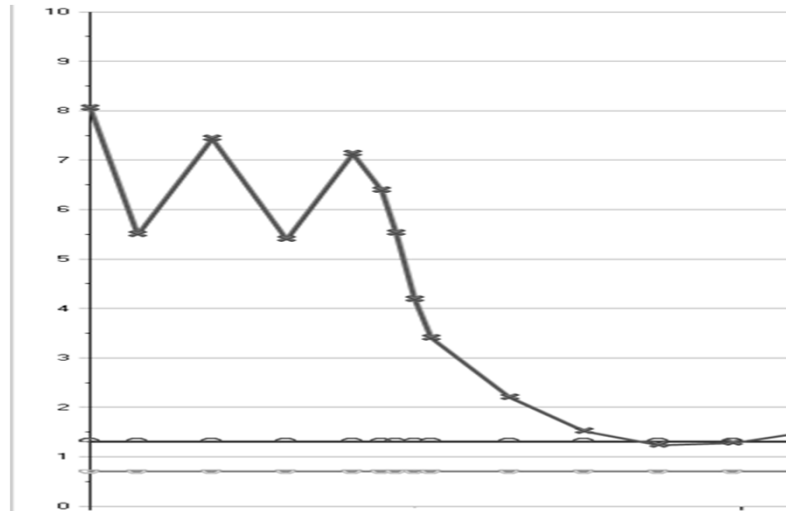


Source: USRDS 2013 ADR

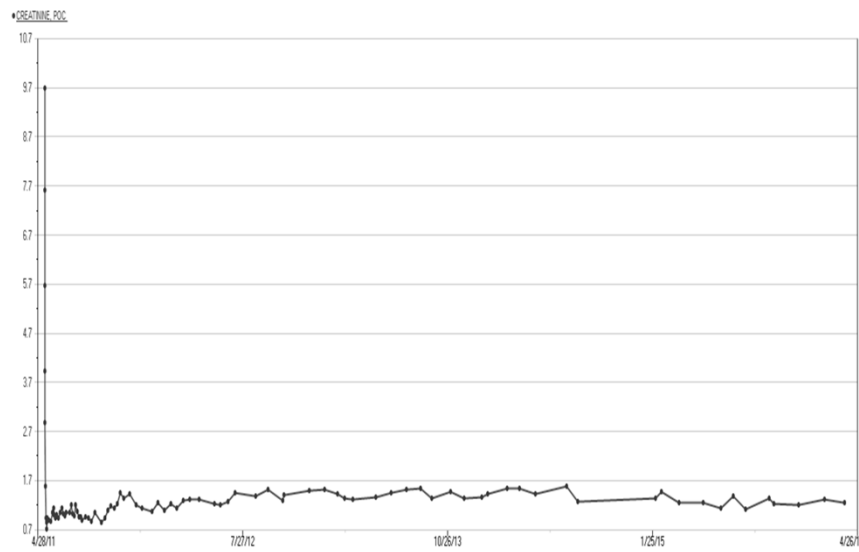
Maintenance Therapy

- **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**

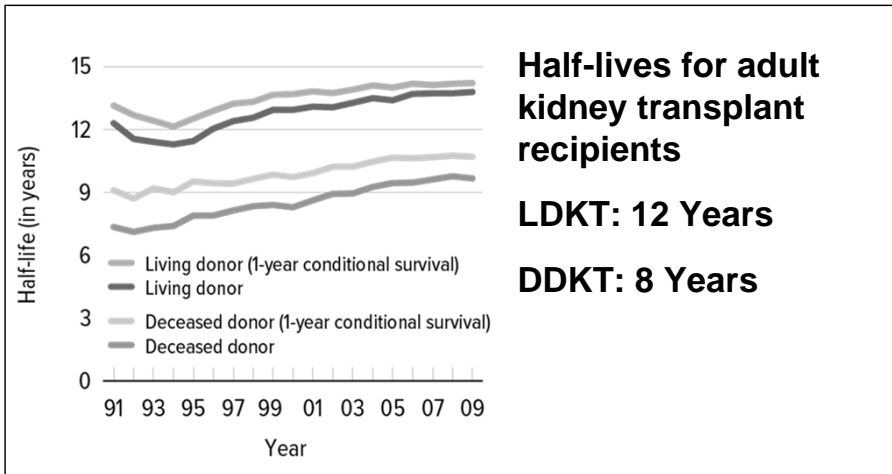
What we like to see...



What we really like to see...



Long-Term Kidney Transplant Outcomes

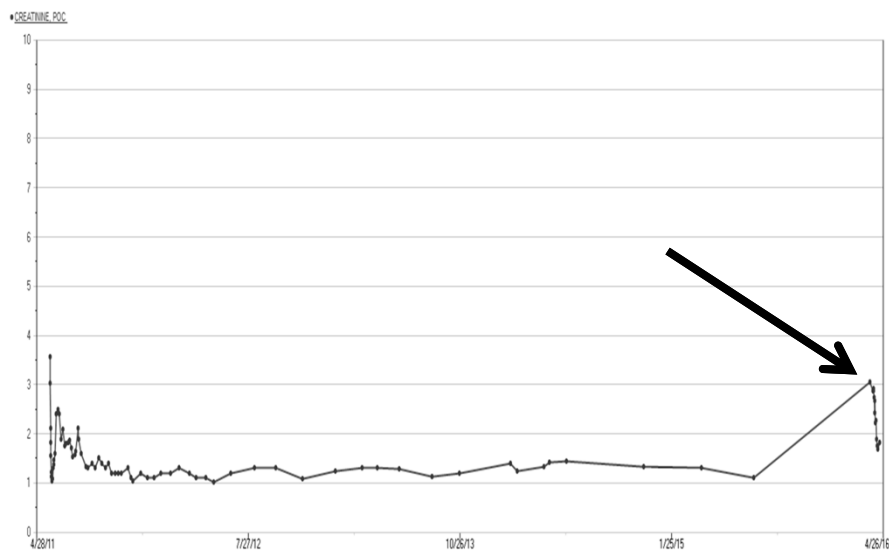


Source:

2011 OPTN/SRTR Annual Report

Solez K, Colvin RB, Racusen LC, et al. Banff '05 Meeting Report: differential diagnosis of chronic allograft injury and elimination of chronic allograft nephropathy ('CAN'). Am J Transplant. 2007;7:518-526

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)



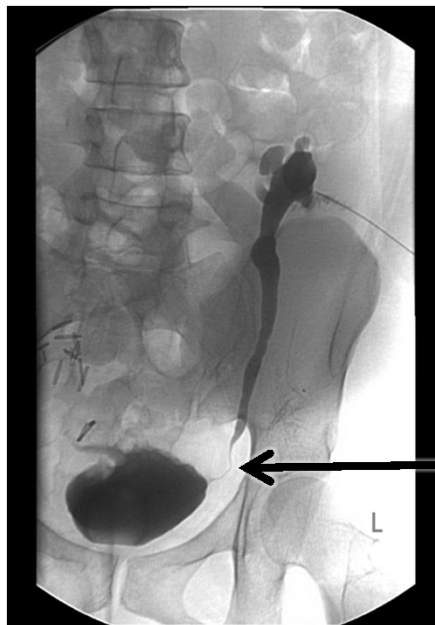
Structural Abnormalities



Structural Abnormalities

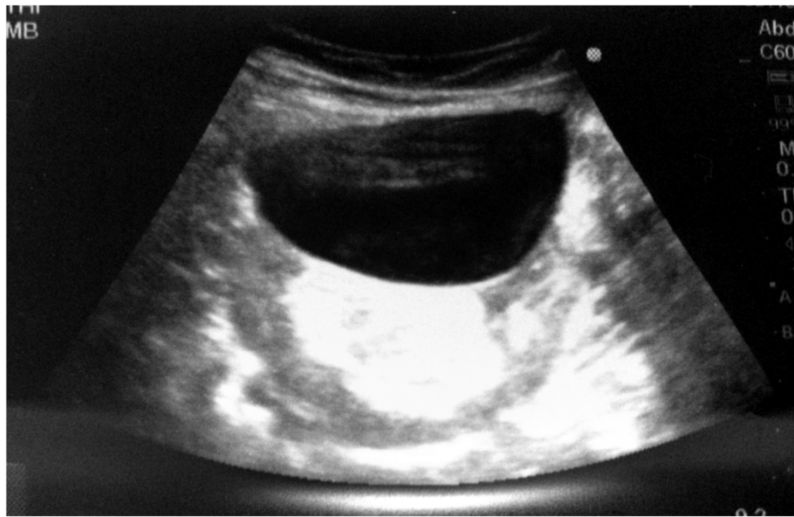


Structural Abnormalities

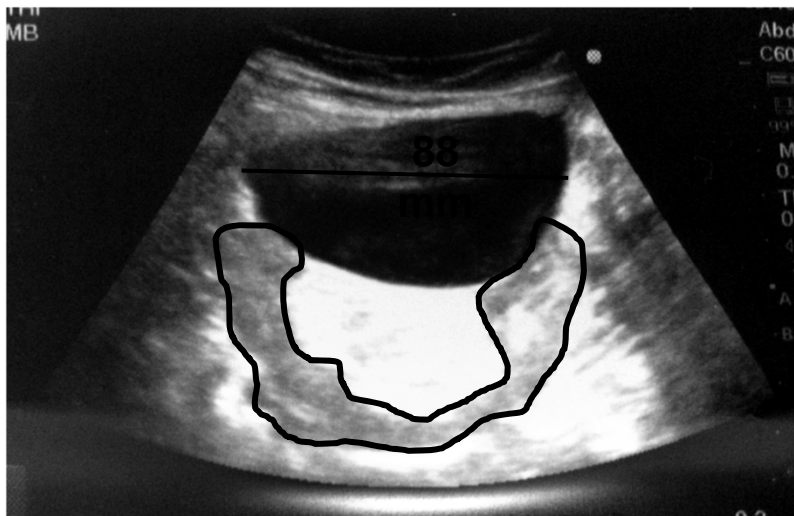


Transplant
Ureter
Stenosis

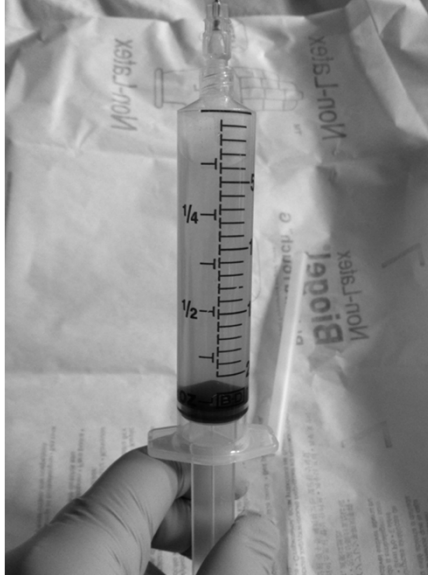
Structural Abnormalities



Structural Abnormalities



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*

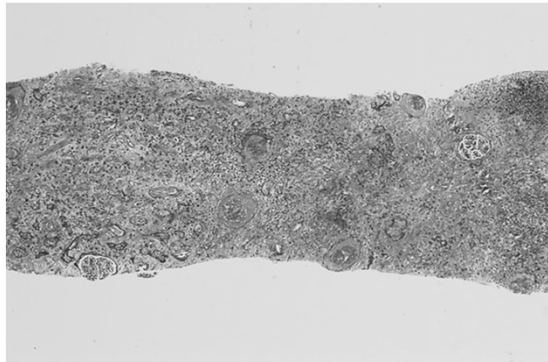


Image: Nadasdy / Diez (OSUWMC)

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Renal Causes

Pre-Renal

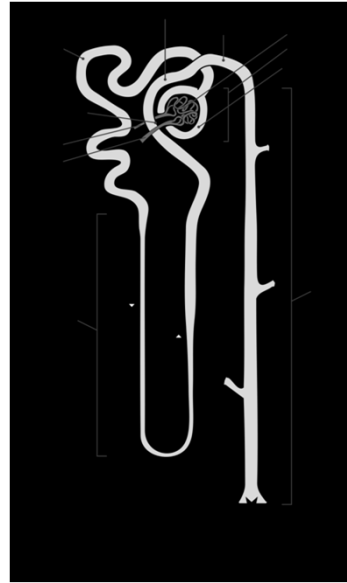
**Volume Depletion
Medications**

Renal

**Tubular Necrosis
Interstitial Nephritis
Recurrent Disease**

Post Renal

**Obstruction
BPH
Neurogenic Bladder**



Renal Causes

Pre-Renal

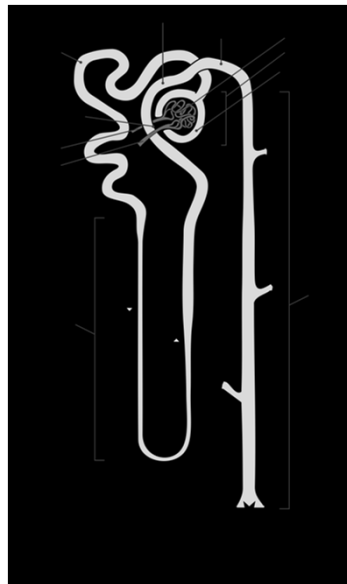
**Urinalysis
FENa*
Orthostatics**

Renal

**Urinalysis
Urine Protein*
Urine Eosinophils**

Post Renal

Renal Ultrasound / PVR



Fractional Excretion Sodium (FENa)

We Order:

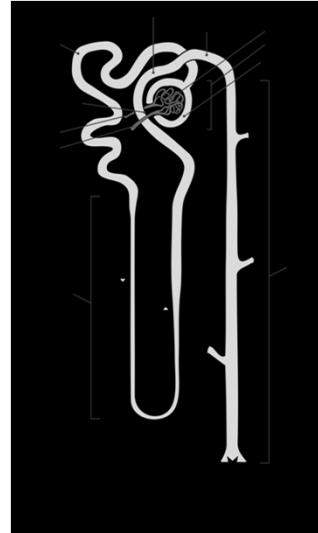
Urine Na / Creat
Serum Na / Creat

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!



Leukocytes 2 minutes	Negative	trace	small	mod	Large
			+	++	+++
Nitrite 60 seconds	Negative	Positive	Positive		
					(Any degree of uniform pink colour is positive)
Urobilinogen 60 seconds	Normal	Normal	mg/dl		
	0.2	1	2	4	8 (mg - approx. 100)
Protein 60 seconds	Negative	trace	mg/dl	100	300
			100	++	+++
pH 60 seconds	5.0	6.0	6.5	7.0	7.5
					8.0 9.0
Blood 60 seconds	Negative	few	few	many	mod
		red	red	red	++
Sp. Gr. 45 seconds	1000	1005	1010	1015	1020
					1025 1030
Ketone 40 seconds	Negative	mg/dl	trace	small	mod
			5	15	40
Bilirubin 30 seconds	Negative	Small	Moderate	Large	
			++	+++	
Glucose 30 seconds	Negative	g/dl (h)	1/10 (br.)	1/2	1
		mg/dl	100	250	500
					1000
					>2000

Rejection

We Order:

Biopsy

Alloscreen* (Anti-HLA Antibody Assay)

Reason:

Biopsy:

Gold Standard

Rejection Yes / No / Other

Severity Of Rejection

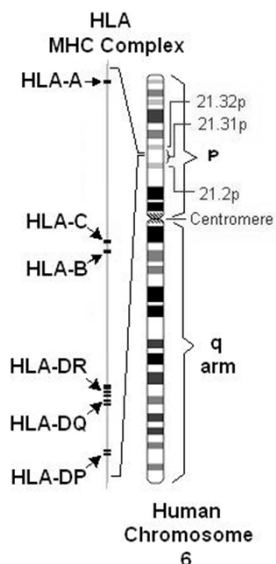
Guides Treatment

“Alloscreen” / “Luminex”:

Are there anti-HLA Antibodies?

Rejection: What the HLA Lab Sees

HLA Type: The “ID Tag”



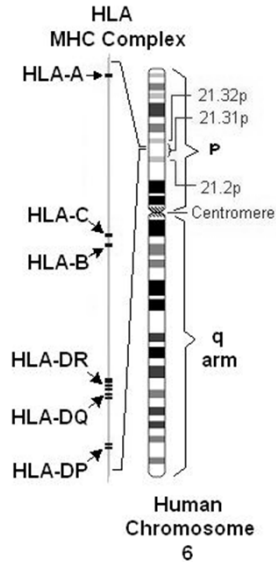
Donor:

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

Recipient:

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

Find The Mismatch:



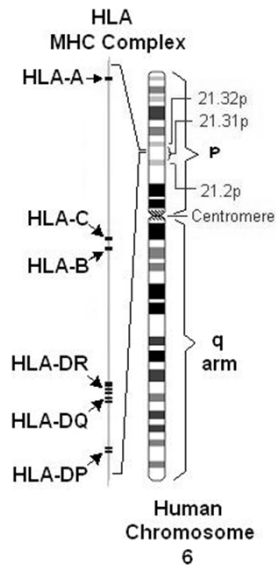
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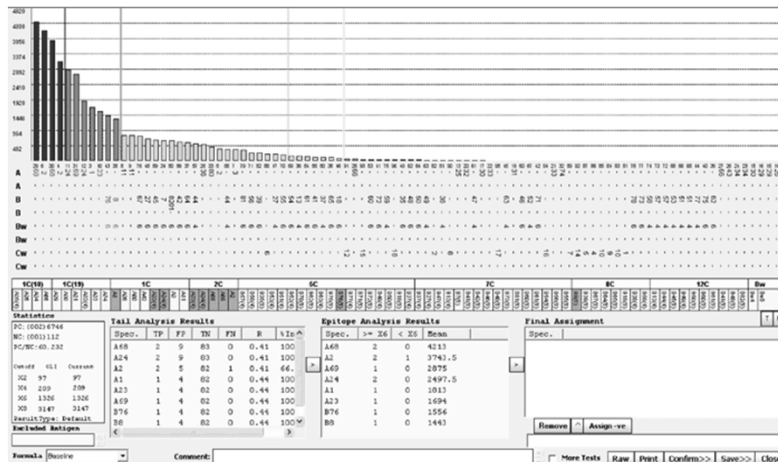
Recipient:

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

Answer:

2 Antigen Mismatch

Rejection: What the HLA Lab Sees



What the HLA Lab Tells Us:

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 2,3 B 5,16 DR 2,52

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

Rejection Biopsy: What The Pathologist Sees

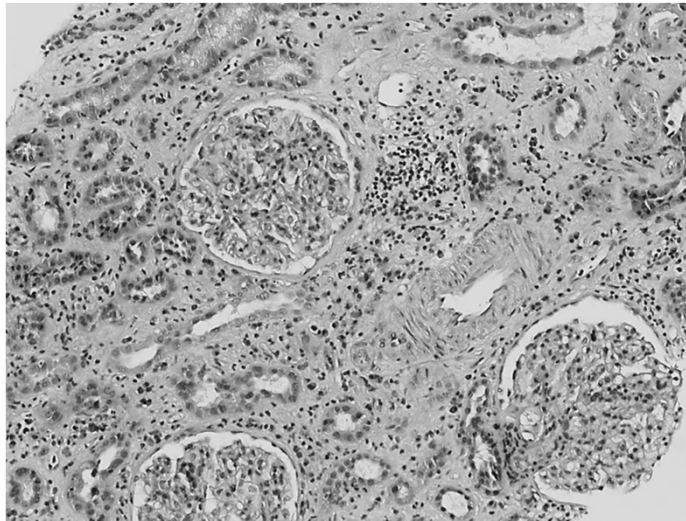


Image: Nadasdy / Diez (OSUWMC)

Rejection Biopsy: What The Pathologist Sees

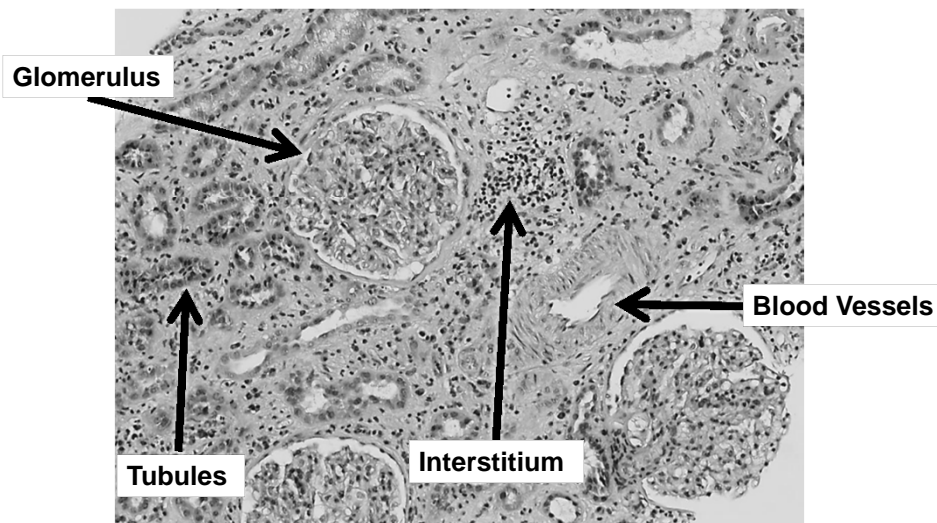
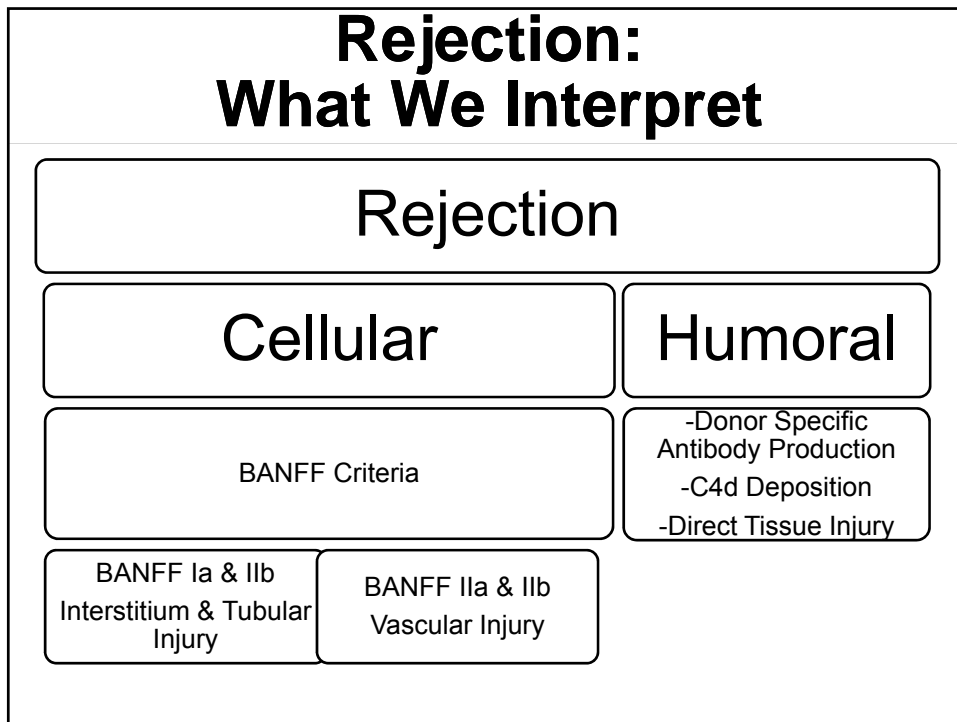
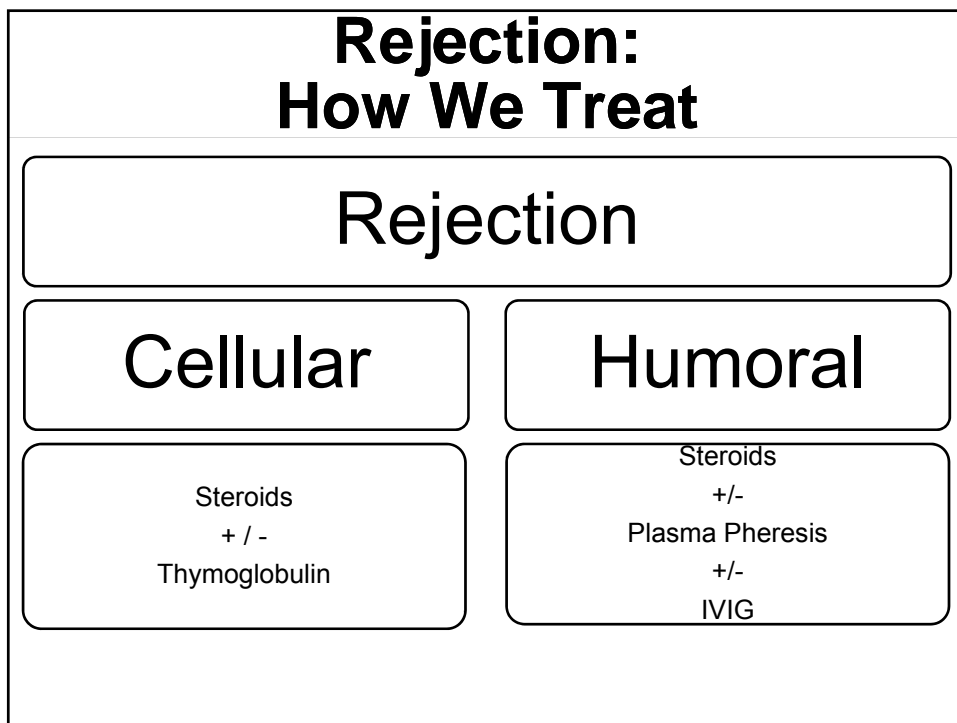


Image: Nadasdy / Diez (OSUWMC)

Rejection: What We Interpret



Rejection: How We Treat



Infection

We Look For:

The usual suspects

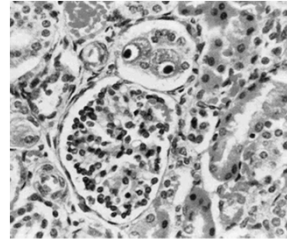
Sepsis

Bacteremia et al

Opportunistic Infections

CMV

BK



We Order:

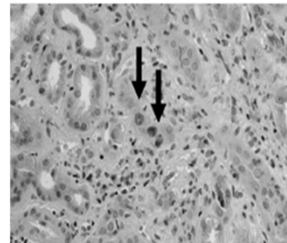
Urinalysis

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

Pearls

**Common things may be common;
but this population is quite eclectic.**

**There is no substitute for a good
clinical history.**

We are here to help.