Surgical Assessment of the Potential Kidney Transplant Recipient

S. John Swanson, III, MD, FACS
Chief, Kidney Transplant
Christiana Care Health System
Outline

- Why transplant?
- Contraindications
  - Absolute
  - Relative
- Surgical Evaluation of the Potential Transplant Recipient
  - Major Concerns
    - Vascular
    - Urologic
    - Body Habitus
  - Clinical Evaluation
  - Clinical Examples
- KAS Tidbits
Myth: Transplant is for everyone!

Fact: Kidney tx is NOT considered a cure for kidney disease and may not be the best option for everyone.

Fact: Hemodialysis, peritoneal dialysis and transplantation are all valid methods of renal replacement therapy.

Personal or medical factors determine the best option for each patient.
ESRD Survival by Treatment Modality

Dialysis (post day 91 of ESRD)

- 1 yr: 77.8%
- 2 yrs: 62.9%
- 5 yrs: 31.9%
- 10 yrs: 9.0%

Posttransplant survival (deceased donor)

- 1 yr: 93.7%
- 2 yrs: 91.6%
- 5 yrs: 80.6%
- 10 yrs: 58.9%

Posttransplant survival (living donor)

- 1 yr: 97.6%
- 2 yrs: 96.4%
- 5 yrs: 90.4%
- 10 yrs: 77.8%

Transplant vs Hemodialysis

**Median Survival by Age**

- **With SCD Transplant**
- **Without Transplant**

Median lifespans with average SCD kidney and without any transplant are based on average of median survival estimated for candidates active on the waitlist on 1/1/2004.
Graft Survival in 2405 Paired-Kidney Transplants: Short vs Long ESRD Time

Contraindications

Absolute
- Active Cancer
- Irreversible Failure
  - Heart
  - Pulmonary
  - Hepatic
- Active Systemic Dz
  - Lupus, Sickle Cell
- Active Infection

Relative
- Treated Cancer
  - Grade, Stage, Site
- HCV, HIV, HBV
  - HOPE Act
- Morbid Obesity
- PVD
- Treatable CVD
- Unresolved Psychosocial Issues
  - Noncompliance
- Smoking
The Growing Waiting List

Kidney Waiting List and Transplants

OPTN data as of September 1, 2012
Importance of early referral

- Preemptive listing
  - Sensitized candidates receive additional priority
  - Identify issues that may complicate/prevent transplant
  - Waiting time accumulates while issues are addressed
  - Slowly progressive renal diseases could receive pre-emptive transplant

- Accrue Waiting Time with GFR $\leq 20\text{ml/min}$
  - Receive 0-ABDR mismatch offers

UNOS, 2014
Living Kidney Donation

- Best option for recipient
  - Enhanced survival relative to deceased donors
  - Eliminates issues of brain death, shock, trauma that activate innate immune response
  - Timed transplant when recipient health maximized
  - Immediate function routine

Direct vs Paired donation!
Paired Donation

**Traditional Paired Exchange**

*Two Pair Exchange*

*Three Pair Exchange*

**Chains**

*Non Directed Altruistic Donor*

*Cluster #1*

*Cluster #2*

*Cluster #3*

Etc.
Figure III-7. Unadjusted 1-Year (2005-2006), 5-Year (2001-2006), and 10-Year (1996-2006) Kidney Graft Survival*, by Donor Type

- Living Donor
- non-ECD
- ECD

Unadjusted Graft Survival (%)

1-Year: 96% (Living), 92% (non-ECD), 85% (ECD)
5-Year: 81% (Living), 71% (non-ECD), 55% (ECD)
10-Year: 58% (Living), 45% (non-ECD), 28% (ECD)

*Death is included as an event.

Source: 2008 OPTN/SRTR Annual Report, Tables 5.10a, b, d.
Figure III-6. Unadjusted 1-Year (2005-2006), 5-Year (2001-2006), and 10-Year (1996-2006) Kidney Recipient Survival, by Donor Type

- **Living Donor**
- **non-ECD**
- **ECD**

Unadjusted Patient Survival (%)

<table>
<thead>
<tr>
<th>Survival Period</th>
<th>Living Donor</th>
<th>non-ECD</th>
<th>ECD</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-Year</td>
<td>98%</td>
<td>96%</td>
<td>91%</td>
</tr>
<tr>
<td>5-Year</td>
<td>91%</td>
<td>83%</td>
<td>70%</td>
</tr>
<tr>
<td>10-Year</td>
<td>77%</td>
<td>64%</td>
<td>47%</td>
</tr>
</tbody>
</table>

Source: 2008 OPTN/SRTR Annual Report, Tables 5.14a, b, d.
Surgical Assessment of Potential Kidney Transplant Recipient
Kidney Transplant Standard Surgical Approach
Kidney Transplant Standard Surgical Approach

Vascular anastomoses

1. Anterior abdominal approach, yet extraperitoneal.
2. External iliac vessels
3. Vein first, then artery.

1. GU irrigant instilled per Foley catheter to 150-200 mls and Foley tubing clamped leaving bladder distended
2. Vessels done first, then ureter.
3. Spatulated ureter sewn to dome of bladder +/- ureteral double-J stent.
4. Tunnel closure approximates antireflux mechanism.
Vascular

- Risk factors in our patients
  - ESRD, HTN, DM, lipids, +/- smoking

- Silent disease – “asymptomatic” but relative to level of activity

- Anastomotic site vs proximal disease (or both)
  - Risk for future intervention
    - Abdominal aortic aneurysm
Transplant and Vascular Disease

- USRDS database
  - 23,699 met criteria
    - 22.86 on dialysis
    - 4.98 wait-listed
    - 4.86 for KTX
  
- Survival advantage with living donor transplant

- No survival advantage at any point with deceased donor

Not Just a Bone Problem
Genitourinary

- Longevity of oliguria/anuria
- Cytoxan use and risk of cancer
- Bladder assessment
  - Unrecognized Bladder Outlet Obstruction
  - TUR cannot be done in setting of anuria
  - Possible protocol – start with assessment while still voiding
    – Stage IV-V
- Pretransplant nephrectomy
  - Limited indication at this time
Alternative Plumbing

Reasons for alternate drainage

1. Some surgeons use as primary method
2. Short transplant ureter
3. Small bladder following years of anuria - unable to distend
4. Repair of urine leak with ureteral necrosis

Uretero-ureterostomy  Uretero-pyelostomy  Boari Flap/Psoas Hitch

Ellsworth, P, MD. Medscape, 2013
Pereria B etal, SJTREM, 2010
Alternative Plumbing

- Double ureter approaches
- Ileal loop (aka ileal conduit)
- Pediatric en bloc transplantation
“Blue Plate Special”

• Pre transplant operative package in the days of limited immunosuppression
  • Bilateral Nephrectomy
  • Splenectomy
  • Appendectomy
Pre-transplant Native Nephrectomy

- Symptomatic Polycystic Kidney Disease
  - Hemorrhage, pain, infected cysts
  - Anephric state – hypotension due to reduced renin

- Infectious etiology
  - Usually pediatrics – reflux, obstruction

- Prior obstruction and instrumentation
  - Colonized obstructed system

- Renal Masses – ACDD
  - Leave long ureter for potential use with transplant, unless limited by diagnosis
Body Habitus

- BMI standard is relatively high for area programs
  - Evaluation 41
  - Active listing 38
- Pannus transplantable or not
- Increases risk of surgical complication
  - Wound
  - Anastomosis time
- Obesity related metabolic, renal and liver disease
- Pre-transplant bariatric surgery
Prior Transplant Patients

- Transplant in place or explanted
- “Just move to the other side”
  - ?third transplant
    - Intraperitoneal or remove one kidney
  - Vascular disease worse on non-transplant side
Evaluation

• Clinical history
  • Smoking changes everything
  • Prior vascular surgery, amputation

• Clinical exam
  • Bruits, absent distal pulses, skin changes

• Abdominopelvic CT scan – noncontrast
  • Assess vascular disease
  • Assess native kidneys
  • Incidental findings

• Abdominal Ultrasound for younger patients
Abdominopelvic CT
Peripheral Vascular Disease
Aortoiliac disease s/p aortobifemoral graft
Kidney transplant
Native Kidneys
Acquired Cystic Disease of Dialysis

Without Contrast

With Contrast
Renal Mass
Aortic Abdominal Aneurysm
Abdominal Aortic Aneurysm
Normal External Iliac Vessels
Pre-transplant Repair
Endograft
Post-repair CT
Prior Transplant
Post-cancer therapy waiting times

- Untreated or metastatic – no transplant
- Risk relative to dialysis death rate
- Israel Penn International Transplant Tumor Registry (IPPITR) – consultation service
- Renal Cell Carcinoma
  - Stage 1 (usually includes ACDD) – no wait
  - Stage 2 or > - 2-5 years
- Breast, Melanoma, Lung, Colon
  - Usually five year wait but again relative to stage
- Prostate Cancer
  - Low stage, local surgical control and PSA remains low – 2 years
ESRD following Kidney Transplant

- Difficult transition from tx to ESRD
  - No need for ongoing immunosuppression
    - Usually antiproliferative then calcineurin then steroids
  - Steroids are long term taper
  - Most kidneys burn-out with chronic changes
    - History of past rejection is risk factor
- “old-school” rejection
  - Early – Erythropoietin resistance from inflammation
  - Acute rejection
    - Abdominal pain, tenderness and enlargement of kidney graft
    - Fever, worsening hypertension
    - Gross hematuria from fractured kidney
Allograft Nephrectomy

- Pretreatment with short course immunosuppression
  - Solumedrol and tacrolimus

- Subcapsular nephrectomy
  - Donor blood vessels and capsule remain

- Bladder irrigation
  - Remove clot
  - Irrigate with Gentamycin

- Post-op need more frequent assessment of PRA – q2weeks time three
Kidney Allocation System (KAS)
Policy Objectives

- Make the most of every donated kidney without diminishing access
- Promote graft survival for those at highest risk of re-transplant
- Minimize loss of potential graft function through better longevity matching
- Improve efficiency and utilization by providing better information about kidney offers

UNOS, 2014
<table>
<thead>
<tr>
<th>Major allocation components</th>
</tr>
</thead>
<tbody>
<tr>
<td>Replace SCD/ECD with KDPI</td>
</tr>
<tr>
<td>Incorporate $A_2/A_2B$ to B</td>
</tr>
<tr>
<td>Add longevity matching</td>
</tr>
<tr>
<td>Base pediatric priority on KDPI</td>
</tr>
<tr>
<td>(presently based on donor &lt; 35)</td>
</tr>
<tr>
<td>Increase priority for sensitized candidates/CPRA sliding scale</td>
</tr>
<tr>
<td>Remove payback system</td>
</tr>
<tr>
<td>Include pre-registration dialysis time</td>
</tr>
<tr>
<td>Remove variances</td>
</tr>
</tbody>
</table>

UNOS, 2014
Revised waiting time calculation

Old
Waiting time begins at/after registration with GFR $\leq 20$ ml/min OR On Dialysis

New
Waiting time points awarded for dialysis prior to registration (pediatric and adults)
• Recognizes time spent with ESRD as basis for priority

Reminder
Waiting time points based on GFR remains the same

UNOS, 2014
Sensitized candidates

**Old**

CPRA >=80% receive 4 additional points and zero points for moderately sensitized candidates

**New**

Points assigned based on a sliding scale starting at CPRA>=20%

UNOS, 2014
Tissue Typing: Who am I?

- Cytotoxic Assay
  - Known antibody mixed with unknown cells (recipient)
  - Identifies 6 HLA antigen sites
  - Class I: 2A, 2B
  - Class II: 2 DR
Panel Reactive Antibodies: What’s my immune history?

• Drawn monthly
• 0 % good!
• What factors have you been exposed to?
• How does this happen?
  • Prior transplants.
  • Pregnancies.
  • Blood product transfusions.
Point changes: Sensitization

CPRA Sliding Scale (Allocation Points) (CPRA<98%)

UNOS, 2014
Classifications: Very Highly Sensitized

- Candidates with CPRA >=98% face immense biological barriers
- Old policy only prioritized sensitized candidates at the local level.

<table>
<thead>
<tr>
<th>CPRA=100%</th>
<th>National</th>
</tr>
</thead>
<tbody>
<tr>
<td>CPRA=99%</td>
<td>Regional</td>
</tr>
<tr>
<td>CPRA=98%</td>
<td>Local</td>
</tr>
</tbody>
</table>

- To participate in Regional/National sharing, review & approval of unacceptable antigens will be required

UNOS, 2014
Crossmatching

• “Is this donor safe for me?”

• Unknown serum (recipient) mixed with unknown cells (donor), for both T and B cells.

• Positive bad!
Kidney Donor Profile Index (KDPI)

KDPI Variables

- Donor age
- Height
- Weight
- Ethnicity
- History of Hypertension
- History of Diabetes
- Cause of Death
- Serum Creatinine
- HCV Status
- DCD Status
Longevity Matching

- Estimated Post-Transplant Survival
  - Candidate age, time on dialysis, prior organ transplant, diabetes status

- Top 20% of candidates by EPTS to receive kidneys matched on longevity

- Applies only to kidneys with KDPI scores ≤20% not allocated for multi-organ, very highly sensitized, or pediatric candidates
Local + Regional for High KDPI Kidneys

- KDPI >85% kidneys are allocated to a combined local and regional list
- Promotes broader sharing of kidneys at higher risk of discard
- DSAs with longer waiting times are more likely to utilize these kidneys than DSAs with shorter waiting times

UNOS, 2014
B Candidates receiving \( A_2/A_2B \) Kidneys

- Candidates with blood type B who meet defined clinical criteria are eligible to accept kidneys from donors with blood type \( A_2 \) or \( A_2B \)
- Reported anti-A titer values required on regular schedule
- No titer values of greater than or equal to 1:8 allowed for candidate participation

Let’s not forget ABO!

UNOS, 2014
Background

§ KAS implemented Dec 4, 2014

§ Key goals:
  § Make better use of available kidneys
  § Increase transplant opportunities for difficult-to-match patients (increased equity)
  § Increase fairness by awarding waiting time points based on dialysis start date
  § Have minimal impact on most candidates
Summary: First Year of KAS

- Overall – KAS is meeting key goals
  - Decrease in longevity mismatches
  - Increase in the number of transplants among very highly sensitized patients
  - Increase in access to transplant for African Americans candidates
- “Bolus effects”: the percent of transplants to CPRA 99-100% and dialysis>10 years recipients are both tapering post-KAS
- Increase in A2/A2B indoB transplants, but still room for growth
- Transplant volume up 4.6%
Summary: First Year of KAS (cont’d)

- No change in waiting list mortality rates
- Six-month graft and patient survival rates similar to pre-KAS
- Several trends deserve further attention:
  - Fewer 0MM transplants
  - Slight drop in pediatric transplants will continue to be tracked closely
  - Logistical challenges in allocation
  - Increased CIT and DGF
  - Increase in discard rates, particularly KDPI>85% kidneys.
Questions?