Living Donor Kidney Transplantation: A Golden Opportunity

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Surgical Director, CNMC Pediatric Kidney Transplant Program

Disclosures

I have no financial disclosures.
Objectives

- Appreciate the prevalence of kidney disease in our community.
- Discuss the benefits of living donation.
- Explain the risks of living donation.
- Examine how African Americans fare in our current process.
- Discuss possible process improvement measures to improve access for living donor transplants.
As of October 8, 2018…

- 95,203 waiting list candidates for a kidney nationally
- 1048 pediatric patients on waiting list
- Most recipients will wait 3-5 years for a deceased donor kidney, 50% of pediatric patients wait less than 1 year
- Most common causes of kidney failure:

<table>
<thead>
<tr>
<th>Adult</th>
<th>Pediatric</th>
</tr>
</thead>
<tbody>
<tr>
<td>DIABETES</td>
<td>Congenital Anomalies</td>
</tr>
<tr>
<td>Hypertension</td>
<td>FSGS</td>
</tr>
<tr>
<td>Glomerulonephritis</td>
<td>Glomerulonephritis</td>
</tr>
<tr>
<td>Polycystic Kidney Disease</td>
<td></td>
</tr>
</tbody>
</table>

Why Kidney Transplant?

- Successful
- Live Longer
- Better Quality of life
- Decrease Costs
Transplant-Related Quality-of-Life Benefits

- Relatively unrestricted diet
- Freedom to travel
- Ability to become pregnant and bear children
- Can engage in training for athletic competition
- Lifestyle free of dialysis

ESRD Survival by Treatment Modality

- Dialysis (Day 91) ESRD
- Post-transplant Survival DECEASED DONOR
- Post-transplant Survival LIVING DONOR

<table>
<thead>
<tr>
<th>Time</th>
<th>Dialysis</th>
<th>Deceased Donor</th>
<th>Living Donor</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 yr</td>
<td>77.8%</td>
<td>93.7%</td>
<td>97.6%</td>
</tr>
<tr>
<td>2 yrs</td>
<td>62.9%</td>
<td>91.6%</td>
<td>96.4%</td>
</tr>
<tr>
<td>5 yrs</td>
<td>31.9%</td>
<td>80.6%</td>
<td>91.6%</td>
</tr>
<tr>
<td>10 yrs</td>
<td>9.0%</td>
<td>55.5%</td>
<td>77.8%</td>
</tr>
</tbody>
</table>

Knowledge and Compassion Focused on You
Pediatric patients waiting for a kidney transplant

Pediatric Kidney Transplants in the United States 2000 - 2016
Centers performing pediatric kidney transplants, Donation Service Areas (DSAs)
Centers performing pediatric kidney transplants in 2012, within Donation Service Areas (DSAs)

Distribution of pediatric patients waiting for a kidney transplant

Knowledge and Compassion Focused on You
The Growing Waiting List

Kidney Waiting List and Transplants

Based on OPTN data as of Sept 19, 2014

- Number of Kidney Candidates on the Waiting List
- Deceased Donor Transplants per year
- Living Donor Transplants per year
- All Kidney Transplants per year

New Kidney Allocation System (KAS) December 2014

- Pediatric patients – 1% of the waitlist
- Priority for only the highest quality organs
  - Donors less than 35 years old
  - Donors with KDPI less than 35
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

KDPI values now displayed with all organ offers in DonorNet®

New Kidney Allocation System (KAS)
December 2014

- Behind recipients with 100% and 99% PRA
- After KAS, pediatric transplants decreased from 4.2% to 3.7%.
Disparities in Transplant are an old story

Why Black People Get Fewer Organ Transplants Than Whites

African-Americans less likely to receive kidney donation, study shows

By Deanna Jacob, Updated at 10:49 PM ET

October 23, 2018

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Surgery

Kidney Transplantation
Kidney Transplant Operation

Knowledge and Compassion Focused on You

MedStar Georgetown Transplant Institute
Types of Kidney Donors

- Living - related donors
- Living - unrelated donors
  - Spouse, friend, non-directed
- Deceased donors
  - KDPI
  - Allocation System
  - 2 Types:
    - Brain dead donors
    - Donation after cardiac death (DCD)
Kidney Transplants in Washington DC
2000 - 2013

OPTN/UNOS REGIONAL MAP
### VITAL SIGNS

<table>
<thead>
<tr>
<th>Date</th>
<th>Time</th>
<th>Value</th>
<th>Date</th>
<th>Time</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>10/23/2018</td>
<td>05:45</td>
<td>101/70</td>
<td>10/23/2018</td>
<td>08:00</td>
<td>105/70</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(Systolic / Diastolic)</td>
<td></td>
<td></td>
<td>(Systolic / Diastolic)</td>
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<tr>
<td></td>
<td></td>
<td>80 - 110</td>
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<td></td>
<td>105 - 113</td>
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<td></td>
<td></td>
<td>(BPM)</td>
<td></td>
<td></td>
<td>(BPM)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>171 / 79</td>
<td></td>
<td></td>
<td>184 / 72</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Duration of High (minutes)</td>
<td></td>
<td></td>
<td>Duration of High (minutes)</td>
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<td></td>
<td></td>
<td>15</td>
<td></td>
<td></td>
<td>45</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Duration of Low (minutes)</td>
<td></td>
<td></td>
<td>60</td>
</tr>
<tr>
<td></td>
<td></td>
<td>60</td>
<td></td>
<td></td>
<td>60</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Core Body Temp.</td>
<td></td>
<td></td>
<td>Core Body Temp.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>97.0 - 101.1 °F</td>
<td></td>
<td></td>
<td>275 - 281.1 °F</td>
</tr>
<tr>
<td></td>
<td></td>
<td>CVP (mm/Hg)</td>
<td></td>
<td></td>
<td>CVP (mm/Hg)</td>
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<tr>
<td></td>
<td></td>
<td>221</td>
<td></td>
<td></td>
<td>140</td>
</tr>
<tr>
<td></td>
<td></td>
<td>PA Pressure (Sys./Dias.)</td>
<td></td>
<td></td>
<td>PA Pressure (Sys./Dias.)</td>
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<tr>
<td></td>
<td></td>
<td>258</td>
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<td>258</td>
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### COMPLETE BLOOD COUNT (CBC)

<table>
<thead>
<tr>
<th>Date</th>
<th>WBC (x10^3/cu.mm)</th>
<th>HGB (g/dL)</th>
<th>HCT (%)</th>
<th>MCV (fl)</th>
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<tbody>
<tr>
<td>10/14/2013</td>
<td>8.1</td>
<td>12.9</td>
<td>41.4</td>
<td>77.4</td>
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<tr>
<td>10/15/2013</td>
<td>8.9</td>
<td>12.2</td>
<td>40.8</td>
<td>76.5</td>
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<tr>
<td>10/16/2013</td>
<td>8.6</td>
<td>11.9</td>
<td>39.9</td>
<td>74.1</td>
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<tr>
<td>10/17/2013</td>
<td>8.4</td>
<td>11.7</td>
<td>38.7</td>
<td>74.1</td>
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### LAB PANEL

<table>
<thead>
<tr>
<th>Date</th>
<th>Time</th>
<th>Na (mEq/L)</th>
<th>K+ (mEq/L)</th>
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<tbody>
<tr>
<td>10/19/2013</td>
<td>04:47</td>
<td>145</td>
<td>5.1</td>
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<tr>
<td>10/20/2013</td>
<td>08:58</td>
<td>143</td>
<td>3.6</td>
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<td>10/21/2013</td>
<td>11:42</td>
<td>143</td>
<td>3.6</td>
</tr>
<tr>
<td>10/22/2013</td>
<td>04:27</td>
<td>149</td>
<td>3.5</td>
</tr>
</tbody>
</table>

### Kidney Biopsy

- **A**
- **B**
**Pulsatile Perfusion Pump**

**Living Kidney Donation**

*“Works Faster, Lasts Longer”*

- First successful human living donor transplant was done in 1954 by Dr. Joseph E. Murray
- The recipient (left) Richard Herrick received a kidney from his twin brother Ronald Herrick
- Richard Herrick survived for 8 years following the transplant
Advantages of Living Donor Transplantation

- Start working faster, last longer
- Recipient will spend less time on the waiting list
- Recipient can be transplanted pre-dialysis
- Scheduled surgery at both donor and recipient’s convenience
- Can organize swaps or exchanges

Pediatric kidney transplants from living donors
Graft Survival in Pediatric Recipients

Living Donors at MGTI

- Living Donor Questionnaire – medical and surgical history, family history, relationship and motivation, consents
- Laboratory Tests, Blood Typing, HLA Testing
- Clinic Evaluation – surgeon, nephrologist, social worker, coordinator, independent donor advocate (Out of state & International donors)
- CXR, KUB, MRI, EKG, Echo
- Completion of evaluation is donor driven: usually 2-3 months
Rigorous Evaluation

- Of the 417 potential donors over last 2 years:
  - 144 (34.5%) are in the middle of active evaluation
  - 116 (27.8%) chose to opt out of the donation process
  - 107 (25.7%) were rejected
  - 50 (12.0%) completed donation

Evaluation, surgery, and hospitalizations paid for by the recipient’s insurance. However, we encourage all donors to have their own medical insurance.

Follow-up at 1 week, 6 months, 1 year, and 2 years postop
Donor Myths

After I donate . . .
• Do I have to take medication?
• Will I have to change my diet?
• Can I drink alcohol?
• Can I play contact sports?
• Can I have a healthy pregnancy?
• Will my blood pressure be ok?

No age limit to living donors
Left nephrectomy is most common.

MRI helps determine number of arteries and veins and any other aberrant anatomy.

Straight lap – Pfannenstiel incision

Hand Assisted Lap - midline incision
Possible Risks to Donors

- **Early**
  - DVT/PE
  - Wound or urine infections
  - Nausea/Vomiting
  - Injury to other organs
  - SBO

- **Late**
  - Higher Blood Pressure
  - Proteinuria
  - ESRD

- Death 3/10,000

Long-term Effects on Donors

- Past studies
  - Risk of ESRD:
    - 180/1,000,000 in donors vs
    - 268/1,000,000 in general population
2 Recent High Profile Articles

Long-term risks for kidney donors

JAMA
The Journal of the American Medical Association

Risk of End-Stage Renal Disease Following Live Kidney Donation

All-cause mortality

Knowledge and Con:
Conclusions

• “Our findings will not change our opinion in promoting live-kidney donation. However, potential donors should be informed of increased risks, although small, associated with donation in short-term and long-term perspective.”
• “Compared with a matched cohort of healthy non-donors, kidney donors had an increased risk of ESRD; however, the magnitude of the absolute risk was small. These findings may help inform discussions with persons considering live kidney donation.”
What are the implications of these new observations?

a. Informed consent

Should the data be presented to living donor candidates as:

i. Relative risk?
   A donor has 8–10 times ↑ risk of developing ESRD?
   
   OR

ii. Absolute risk?¹
   There is increased lifetime risk of ESRD in donors
   
   Mjøen G, et al.:² 5/1,000
   
   Muzaale AD, et al.:³ 9/1,000 (varies by subgroup)

How does this affect us?

• Notion that donors must accept some risk is not new.
• Advance and refine our understanding of medical risk for donors
• Payers and regulators must understand that this is a work in progress
• Appropriate informed consent – amplifies our ability to educate donors
AA had a donation rate of 9.8%, compared to 18.9% in other ethnicities.

Types of Living Donor Transplants

- Direct – ABO- or HLA-Compatible Transplants
- ABO- or HLA- incompatible Transplants
- Positive X-match/Highly Sensitized transplant with desensitization
- Paired Kidney Exchange
  Compatible Pairs
ABO- or HLA-Incompatible Transplants

- Check ABO titers
- HLA testing – patients with high PRA and/or DSA present with low MFIs
- Can desensitize patients (Plasmapheresis and IVIG) if low titers
- Transplants possible in pairs that have been refused in the past

Higher PRA decreases the possibilities of kidney transplantation

Kaplan Meier curve depicting the percentage of patients without a KT among the different % PRA groups adjusted for time on the waiting list (years).

Bostock et al. Transplant Immunology
Sensitization in Kidney Transplantation

Previous Kidney Transplant

Pregnancy

Blood Transfusion

- The time interval of the latest transfusion remains the most significant risk factor.

Paired Kidney Exchange

- Can combine exchange with desensitization
- MGTI participates in regional and national exchange programs (NKR, UNOS)
Paired Kidney Exchange

**Conventional** - only ABOi pairs A/B or B/A
(< 3% of donor/recipient pairs eligible)

Donor | Recipient
---|---
A | B
B | A

---

Paired Kidney Exchange

**Unconventional**
(all ABOi and + XM donor/recipient pairs eligible)

Donor | Recipient
---|---
A | B  (ABO I)
B | O  (ABO I)
O | A  (+) XM

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**Paired Kidney Exchange**

**Optimizing Living Donation**

**One living donor**

**Two placed on deceased donor list**

<table>
<thead>
<tr>
<th>Donor</th>
<th>Recipient</th>
</tr>
</thead>
<tbody>
<tr>
<td>O</td>
<td>A</td>
</tr>
<tr>
<td>B</td>
<td>O</td>
</tr>
<tr>
<td>A</td>
<td>B</td>
</tr>
</tbody>
</table>

*ABO compatible*

*ABO incompatible*

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**Paired Kidney Exchange**

**Optimizing Living Donation**

**Three living donors!**

<table>
<thead>
<tr>
<th>Donor</th>
<th>Recipient</th>
</tr>
</thead>
<tbody>
<tr>
<td>O</td>
<td>A</td>
</tr>
<tr>
<td>B</td>
<td>O</td>
</tr>
<tr>
<td>A</td>
<td>B</td>
</tr>
</tbody>
</table>

*ABO compatible*

*ABO I*

*(+) XM*

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Knowledge and Compassion *Focused on You*

MedStar Georgetown Transplant Institute
National Kidney Registry (NKR)

Transplants Facilitated

NKR Programs:
- Compatible Pairs
- Advanced Donation Program
- Donor Protection Program/Donor Shield
- DASH
- Donor Care Network
- Remote Donation
Ethical Issues in Living Donation

• Perfectly healthy AA 24 year old with extensive family history of HTN and DM
• High risk recipient
• HLA testing shows donor is not actually father of recipient
• Son with low IQ would like to donate to his mother, shows very little understanding of process or risks
• Non-directed donor – unemployed because he wants to be able to donate
April 5, 2018

Dear Joan,

It's my two-month anniversary! So exciting to be alive again!

My mom and I always talk about you to anyone who will listen. None of it is exaggerated, though. I don’t have words for how grateful I am to you for everything you've done for me and for my mom, so I’ll keep it simple... thank you, thank you, thank you.

Not only do I not mind being saved from cancer, I don’t mind having the honor of being a small part of my daughter’s recovery. I mind my daughter’s new chance to not just live, but to live a real life again.

You are an irreplaceable part of my heart, Jack’s heart, and, most importantly, Lisa’s heart.

Thank you beyond words.

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