Pediatric En-bloc Kidney Transplant in Pediatric Recipients
The Miami Experience

46th Miami Pediatric Nephrology Seminar
March 10, 2019
Disclaimer

• Nothing to disclose
Pediatric en-bloc kidney transplants

• 1) First report Meakins JL et al Surgery 1972;71:72

• 2) Pediatric en-bloc kidneys have potential to grow in size (hypertrophy) post-transplantation. DD Nghiem J Urol 1995;153:326
Introduction

• En-bloc kidney transplants (EBKT) have been performed in adults with good results

• Not commonly performed in the pediatric population because of thrombotic complications and poor outcomes

• There is limited, but supportive literature on this form of transplant in children. Winnicki E. J Pediatrics 2016;173:169
Methods

• Retrospective review over 10 year period (2004-2014)

• Total # of patients, n = 25

• 18 patients had combined kidney en-bloc transplants

• 7 patients had combined liver-kidney en-bloc transplants
## Results

### Recipient Demographics

<table>
<thead>
<tr>
<th>Male</th>
<th>Female</th>
</tr>
</thead>
<tbody>
<tr>
<td>13</td>
<td>12</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Race</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>White</td>
<td>6</td>
</tr>
<tr>
<td>African American</td>
<td>5</td>
</tr>
<tr>
<td>Asian</td>
<td>6</td>
</tr>
<tr>
<td>Hispanics</td>
<td>8</td>
</tr>
</tbody>
</table>
Results

• Etiology of ESRD

- FSGS
- Congenital Syndromes
- Hypoplastic/Dyplastic
- APKD
- VUR
- Vascular anomalies
- Hyperoxaluria
- Unknown
Results

Recipient Characteristics

• Median Recipient age 4.6 years (range 0.9-17)
• Median recipient weight 17.9 kg (range 5.8-21.1kg)
Recipient Age and Weight

**Recipient_Age**
- Mean = 6.90
- Std Dev. = 5.834
- N = 26

**Recipient_weight**
- Mean = 25.17
- Std Dev. = 18.122
- N = 24
Donor Characteristics

• Median donor age 22 months (2-108)
• Median donor weight 12.0kg (5.8-21.1)

• Mean Pedi En-bloc Kidney Weight 80g
Donor Characteristics - Donors after Brain death

- COD
Preservation Pump Parameters

<table>
<thead>
<tr>
<th>Flow</th>
<th>Pressure</th>
<th>Resistance</th>
</tr>
</thead>
<tbody>
<tr>
<td>56</td>
<td>30/20</td>
<td>0.35</td>
</tr>
</tbody>
</table>

- Mean duration on pump 18.9 hrs
- Mean CIT 20.5 hours
- Mean WIT 57 mins
Technique

- En-Bloc Kidney Transplant
- Aortic cap, iliac artery extension
- Vena cava oversew
- Divide internal iliac vein (if placed on external iliac vein)
- Position like peas in a pod
Technique

- LK enbloc
# Anastomosis site

<table>
<thead>
<tr>
<th>Vascular Anastomosis</th>
<th>Number of cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>CIA/CIV</td>
<td>8</td>
</tr>
<tr>
<td>EIA/EIV</td>
<td>6</td>
</tr>
<tr>
<td>CIA/IVC</td>
<td>5</td>
</tr>
<tr>
<td>Aorta/IVC</td>
<td>8</td>
</tr>
<tr>
<td>Common Iliacs</td>
<td>6</td>
</tr>
<tr>
<td>External Iliacs</td>
<td>5</td>
</tr>
<tr>
<td>Common / IVC</td>
<td>1</td>
</tr>
</tbody>
</table>
Induction ISP

- Thymoglobulin

- Zenapax (Anti-CD25), Thymoglobulin

- Thymo, Solumedrol, Simulect (Anti-CD25)
Maintenance

• FK + MMF
• Low dose Aspirin for thrombotic prophylaxis
Complications

<table>
<thead>
<tr>
<th>Complications</th>
<th>Treatment</th>
<th>Graft Loss</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Renal artery Stenosis/Urine Leak</td>
<td>Lower pole artery thrombectomy Ureteric Revision</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Allograft ischemia</td>
<td>Revision artery</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Kidney Rupture</td>
<td>Mesh wrap</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Urine Leak /Malposition</td>
<td>Ureteric Revision Tacked to mesentery</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Allograft Ischemia</td>
<td>Left Nephrectomy 5 months later</td>
<td>No</td>
</tr>
</tbody>
</table>

5/25 complications requiring reoperation; 2 graft losses
Results

• 1 mortality in this series – intraoperative cardiac arrest from L/K patient

• 1 year patient survival 96%

• 1 year graft survival 88%
Results

• Graft function—median creatinine

<table>
<thead>
<tr>
<th></th>
<th>Serum Cr</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 year</td>
<td>0.42</td>
</tr>
<tr>
<td>3 year</td>
<td>0.51</td>
</tr>
<tr>
<td>5 year</td>
<td>0.62</td>
</tr>
</tbody>
</table>
Discussion

• Technically challenging

• Not many centers perform pedi-en-bloc in pediatric recipients

• Results in adult recipients are comparable
Pediatric en-bloc kidneys on Pump
Bladder Patch Technique
Discussion

- Usage of Pedi enbloc grafts increases the donor pool.
- Our series adds to the literature that this form of transplant is acceptable in the pediatric population.
Deceased Pediatric Donor Issues

• 1) Technical complications including vascular thrombosis (multiple renal arteries)
• 2) Late events: hypertension/renal artery stenosis, proteinuria
Deceased Pediatric Donor Issues

• 1) Should en-bloc kidneys be split, or used en-bloc? What is the minimal size to justify use of single kidney?

• Transplantation in press (China) Zhu L et al. Single kidneys from: very small (1.7 years (.7-3 years); 6.5 cm (5-8cm); vs small (8 years (3.5-11 years); 8cm (6-9cm) donors. Results at 1 year comparable, ~90% graft survival. Recipients of very small kidneys were small, young Chinese women.
Pediatric Kidney Recipient Issues

• 1) Infants/small children receiving adult kidneys likely to experience hypoperfusion/possible hypotension. J Transplantation 2014 J. Donati-Bourne et al.

• 2) Children should receive size-matched kidneys. Pape L. Young for Young (editorial) Ped Neph2007;22(4):477

Although adult kidneys may serve an adult pop better, depriving children access will reduce the number of pediatric KT’s performed.
Pediatric Kidney Recipient Issues

• Infants, children, adolescents likely to need at least two KT’s during lifetime. Does order matter (DD vs LD)?

Segev, DL. Transplantation 2013;96(5):487
Living Pediatric Kidney Donor

- Rare instance of Twin kidney donation
- Judge/Court order necessary.
- Twenty years and counting!
Conclusion

• Optimal Allocation of Pediatric Deceased Donor Kidneys Needs Further Investigation/Study.

• Thank You