Surgical complications in Live-donor Pediatric and adolescent Renal Transplantation: Study of Risk Factors

By

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Introduction

- Surgical complications represent the most common complication after pediatric renal transplantation and may be associated with significant morbidity.
Topics

- Introduction.

- Aim of the Work.

- Patients.

- Results.

- Conclusion.
Aim of the Work

- To report the surgical complications among our pediatric and adolescent renal transplants and to analyze the different factors that may influence the occurrence of such complications.
Topics

- Introduction.
- Aim of the Work.
- Patients.
- Results.
- Conclusion.
Patients

Demographics

- 500 children and adolescent.
- 308 boys, 192 girls.
- Mean age: 15.4 ± 3.7 yrs (5-20 yrs).
- Mean weight: 38 ± 13 kg (12-82 kg).
- 10 patients: Retransplant.
- 112 patients: pre-empetive.
# Patients

## Causes of original Kidney Disease

<table>
<thead>
<tr>
<th>Cause</th>
<th>No. of patients</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aplastic, hypoplastic, dysplastic kidney</td>
<td>64</td>
<td>12.8</td>
</tr>
<tr>
<td>Nephrotic syndrome</td>
<td>56</td>
<td>11.2</td>
</tr>
<tr>
<td>Obstructive uropathy</td>
<td>48</td>
<td>9.6</td>
</tr>
<tr>
<td>Hereditary nephritis</td>
<td>40</td>
<td>8</td>
</tr>
<tr>
<td>Chronic glomerulonephritis</td>
<td>30</td>
<td>6</td>
</tr>
<tr>
<td>Chronic pyelonephritis</td>
<td>20</td>
<td>4</td>
</tr>
<tr>
<td>Familial focal segmental glomerulosclerosis</td>
<td>20</td>
<td>4</td>
</tr>
<tr>
<td>Oxalosis</td>
<td>18</td>
<td>3.6</td>
</tr>
<tr>
<td>Reflux nephropathy</td>
<td>18</td>
<td>3.6</td>
</tr>
<tr>
<td>Interstitial nephritis</td>
<td>18</td>
<td>3.6</td>
</tr>
<tr>
<td>Cr Crescentic glomerulonephritis</td>
<td>12</td>
<td>2.4</td>
</tr>
<tr>
<td>Neurogenic bladder</td>
<td>8</td>
<td>1.6</td>
</tr>
<tr>
<td>Polycystic kidney diseases</td>
<td>8</td>
<td>1.6</td>
</tr>
<tr>
<td>Renal amyloidosis (secondary to familial Mediterranean fever)</td>
<td>6</td>
<td>1.2</td>
</tr>
<tr>
<td>Unknown</td>
<td>134</td>
<td>26.8</td>
</tr>
</tbody>
</table>
Patients

Surgical Technique

- **Incision:**
  - Right pararectal incision, extraperitoneal approach

- **Vascular anastomosis:**
  - Aorta, IVC
  - Common iliac artery and vein
  - Internal iliac artery
  - External iliac artery and vein

- **Ureteral anastomosis:**
  - Ureterovesical
    * Politano-leadbetter: 25
    * Lich-Gregior: 448
  - Others
    * Uretero-ureteral: 20
    * Pyelo-ureteral: 3
    * Continent cutaneous: 4
Patients

Immunosuppression

Cyclosporine-based

Tacrolimus-bases

Serolimus-bases

Methyl prednisolone

+ Azathioprine

Mycophenolate mofetil
Patients

Early post-operative assessment I

- **Every day:**
  - Clinical.
  - S. creat/ creat. clearance.
  - Grey scale/Doppler US.

- **Perirenal collection:**
  - US.
  - Diagnostic aspiration.
  - MRU.
Patients
Early post-operative assessment II

- Suspected urinary extravasation:
  - Cystography.
  - PCN/Antegrade pyelography.

- Suspected ureteric obstruction:
  - US.
  - Diuretic renography.
  - MRU.
  - PCN/antegrade pyelography.
Statistical Analysis

- Continuous variables: Student’s t test.
- Categorical variables: Chi square test.
- Multivariable analysis: Cox proportional hazards
- Graft and patients survival: Kaplan-Maier technique/Log-Rank test.
Topics

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- Patients.
- Results.
- Conclusion.
Results

Frequency of surgical complications

Among the 500 patients, 70 surgical complications occurred in 66 patients (14%).

<table>
<thead>
<tr>
<th>Complication</th>
<th>No. pts</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Urinary leakage</td>
<td>20</td>
<td>4</td>
</tr>
<tr>
<td>Ureteral obstruction</td>
<td>22</td>
<td>4.4</td>
</tr>
<tr>
<td>Stone of the graft ureter</td>
<td>2</td>
<td>0.2</td>
</tr>
<tr>
<td>Complicated lymphocele</td>
<td>16</td>
<td>3.2</td>
</tr>
<tr>
<td>Renal artery stenosis</td>
<td>2</td>
<td>0.2</td>
</tr>
<tr>
<td>Renal vein thrombosis</td>
<td>2</td>
<td>0.2</td>
</tr>
<tr>
<td>Hematoma</td>
<td>6</td>
<td>1.2</td>
</tr>
</tbody>
</table>
Results

Urinary Leakage

- No. pts: 20 (4%)
- Interval to diagnosis: <1 wk in 8 and 1-4 wk in 12 pts.
- Diagnosis:
  - Suspected
    - Sudden oliguria or anuria.
    - ↑ S. Creat.
    - ± Leakage of urine in the drain.
    - ± Graft or abdominal tenderness or distension.
  - Confirmed:
    - US, MRU and graft PCN.
Results

Urinary Leakage

Treatment

- Fixation of graft PCN in all patients:
  - Antegrade ureteric stent 13
  - Repeat ureteroneocystostomy 3
  - Uretero-ureterostomy 2
  - Pyelovesicostomy 1
Urine Leak
Results

Ureteric Obstruction

- No. pts: 22 (4.4%)
- Interval to diagnosis: <1 month in 6 and as long as 4 yrs in 16.
- Diagnosis:
  - Suspected: ↑S. creat Dilatation by US
  - Confirmed: Renogram MRU Graft PCN
Results

Ureteric Obstruction Treatment

- Endourological (6 pts):
  - Early/mild and distal obstruction.
  - Antegrade balloon dilatation.

- Surgery (16 pts):
  - Late, severe obstruction.
  - Ureteroneocystostomy,
  - Uretero-ureterostomy
  - Pyeloureterostomy
  - Ileal ureter.
Clot Anuria
Ureteric Obstruction
Ureteric Obstruction
Results

Graft Ureteric Stone

- Successful treatment by antegrade URS in 2 patient.
Results

Figure. a, An antegrade study showing a filling defect caused by a stone in the ureter; b, treatment by antegrade ureteroscopy.
Results
Symptomatic Lymphocele

- No. pts: 16 (3.2%)
- The Interval to diagnosis: 2d- 3 wk.
- Diagnosis:
  - Suspected:
    * Obstruction of the graft ureter
    * Edema of lower limb
    * Localized abdominal distension
  - Confirmation:
    * MRU
    * Needle aspiration and creat. content.
Results

Symptomatic Lymphocele Treatment

- Percutaneous aspiration + sclerotherapy: 12
- Marsupalization:
  - Laparoscopy: 2
  - Open surgery: 2
Lympholcele
Results

Vascular and Haemorrhagic Complications

- Renal artery stenosis (2 pts)
  - Angioplasty 1
  - Open surgery 1

- Renal vein Thrombosis (2 pts)
  - Thrombectomy 1
  - Graft nephrectomy 1

- Haematoma (6 pts):
  - Exploration/control of bleeder.
Renal Artery Stenosis
Results

- We studied factors affecting surgical complications by both:
  - Univariable analysis.
  - Multivariable analysis.
## Results

### Factors affecting surgical complications

#### Univariable analysis

- **Pretransplant variables**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Number</th>
<th>Comp. No (%)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Age</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;10 yr</td>
<td>58</td>
<td>10 (27.6)</td>
<td>0.02</td>
</tr>
<tr>
<td>≥ 10 yr</td>
<td>442</td>
<td>50 (11.3)</td>
<td></td>
</tr>
<tr>
<td><strong>Sex</strong></td>
<td></td>
<td></td>
<td>0.52</td>
</tr>
<tr>
<td>Male</td>
<td>308</td>
<td>40 (12.9)</td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>192</td>
<td>26 (13.5)</td>
<td></td>
</tr>
<tr>
<td><strong>Lower UT abnormalities</strong></td>
<td></td>
<td></td>
<td>0.04</td>
</tr>
<tr>
<td>No</td>
<td>468</td>
<td>56 (11.9)</td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>32</td>
<td>10 (31.3)</td>
<td></td>
</tr>
<tr>
<td><strong>Pre-Tx dialysis</strong></td>
<td></td>
<td></td>
<td>0.47</td>
</tr>
<tr>
<td>No</td>
<td>112</td>
<td>16 (14.3)</td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>388</td>
<td>50 (12.9)</td>
<td></td>
</tr>
</tbody>
</table>
## Results

Factors affecting surgical complications

**Univariable Analysis**

### Operative variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Number</th>
<th>Comp. No (%)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cold ischemia time (min)</td>
<td></td>
<td></td>
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<tr>
<td>&lt; 30</td>
<td>64</td>
<td>6 (9.4)</td>
<td>0.82</td>
</tr>
<tr>
<td>30-60</td>
<td>396</td>
<td>54 (13.6)</td>
<td></td>
</tr>
<tr>
<td>&gt; 60</td>
<td>40</td>
<td>6 (15)</td>
<td></td>
</tr>
<tr>
<td>No. renal arteries</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>One</td>
<td>444</td>
<td>56 (12.6)</td>
<td>0.64</td>
</tr>
<tr>
<td>≥ 2</td>
<td>56</td>
<td>10 (17.9)</td>
<td></td>
</tr>
<tr>
<td>Primary urinary continuity</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Politano-leadbetter</td>
<td>25</td>
<td>5 (20)</td>
<td>0.01</td>
</tr>
<tr>
<td>Lich-Gregoir</td>
<td>448</td>
<td>46 (10.3)</td>
<td></td>
</tr>
<tr>
<td>Others</td>
<td>27</td>
<td>12 (44.4)</td>
<td></td>
</tr>
<tr>
<td>Time to diuresis</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Immediate</td>
<td>420</td>
<td>46 (10.9)</td>
<td>0.02</td>
</tr>
<tr>
<td>Delayed</td>
<td>80</td>
<td>20 (25)</td>
<td></td>
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</table>
## Results

### Factors affecting surgical complications

#### Univariable Analysis

<table>
<thead>
<tr>
<th>Variable</th>
<th>Number</th>
<th>Comp. No (%)</th>
<th>P value</th>
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</thead>
<tbody>
<tr>
<td><strong>Postoperative variables</strong></td>
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<td></td>
</tr>
<tr>
<td>ATN</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>466</td>
<td>62 (13.3)</td>
<td>0.61</td>
</tr>
<tr>
<td>Yes</td>
<td>34</td>
<td>4 (11.8)</td>
<td></td>
</tr>
<tr>
<td>Primary immunosuppression</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Steroid + Aza</td>
<td>36</td>
<td>7 (19.4)</td>
<td>0.29</td>
</tr>
<tr>
<td>Steroid + Cysl</td>
<td>39</td>
<td>7 (17.9)</td>
<td></td>
</tr>
<tr>
<td>St+ cycle + Aza</td>
<td>159</td>
<td>16 (10.1)</td>
<td></td>
</tr>
<tr>
<td>Others</td>
<td>266</td>
<td>50 (18.8)</td>
<td></td>
</tr>
<tr>
<td>Acute Rejection</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>214</td>
<td>14 (11.2)</td>
<td>0.26</td>
</tr>
<tr>
<td>Yes</td>
<td>284</td>
<td>42 (14.8)</td>
<td></td>
</tr>
<tr>
<td>Total dose of st in 1st 3 m</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>≤ 5 g</td>
<td>256</td>
<td>30 (11.7)</td>
<td>0.30</td>
</tr>
<tr>
<td>&gt; 5 g</td>
<td>244</td>
<td>36 (14.8)</td>
<td></td>
</tr>
</tbody>
</table>
Results
Factors affecting surgical complications
Summary of Univariable Analysis

- Significant factors:
  - Age <10 yrs.
  - Lower urinary tract abnormalities.
  - Delayed diuresis.
Results

Factors Affecting Surgical Complications
Multivariable Analysis

- Cox proportional hazards analysis:
  - Only the type of primary urinary recontinuity is the significant independent variable.
  - Lich-Gregoir giving the best results.
Results
Impact of surgical complications
On patient survival

Patient survival in renal transplant children with and without surgical complications

A.A. Shokeir
Results

Impact of surgical complications on graft survival

Graft survival in renal transplant children with and without surgical complications

$p = 0.84$
Topics

- Introduction.
- Aim of the Work.
- Patients.
- Results.
- Conclusion.
Conclusions (I)

- Primary urinary anastomosis is the only risk factor that affects the incidence of surgical complications among pediatric and adolescent live-donor renal transplants with the technique of Lich-Grgoir giving the best results.
Conclusions (II)

- Surgical complications in pediatric and adolescent renal transplants can be minimized if basic principles of careful transplant techniques are used.
Conclusions (III)

- Prompt identification and treatment of any complication is paramount to graft and patient survival.
Thank you