Salvageability of renal function following renal revascularization in children with Takayasu arteritis-induced renal artery stenosis

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Introduction

• Takayasu’s arteritis (TA) is a chronic granulomatous periarteritis affecting mainly the aorta and it’s large vessel branches.

• Renal arteries involvement 78%-86%
  – malignant hypertension and chronic kidney disease.

• Revascularization option to control hypertension and preserve renal function.

• Literature mainly in adults and only limited to a few case series in children.
Objective

• To evaluate the impact of renal artery revascularization on renal function of children with renal artery stenosis (RAS) secondary to TA in our centre
Materials and Methods: Study centre and population

• A 22 year retrospective study of all children diagnosed with Takayasu’s arteritis at the Red Cross

• TA was diagnosed based on the EULAR/PReS endorsed consensus criteria

• Renal artery stenosis (RAS), confirmed by angiography was considered significant if >50% of the lumen was occluded.
Medical therapy

• Antituberculous medications
• Steroids
• Immunosuppressive agents – cyclophosphamide, methotrexate
• Antihypertensives
Indications for revascularization procedures

- Refractory hypertension
- Deterioration in renal function
Revascularization Procedures

• Percutaneous transluminal angioplasty (PTA),

• Kidney auto-transplantation

• Arterial bypass surgery (ABP) either using
  – autologous or prosthetic vascular grafts
  – revascularizations using splenic, hepatic and other vessels.
Criteria for success of renal preservation following revascularization

- **American Heart Association guidelines** for Reporting of Renal Artery Revascularization in Clinical Trials (2002):

  Outcome assessed at:
  2 weeks –
  3 months,
  3 – 6 months and
  6 – 12 months

  Creatinine was measured and GFR calculated using Schwartz formula

  1) Improvement: greater than 20% increase in e-GFR from pre-surgery value
  2) Stabilization: e-GFR within 20% of pre-surgery value
  3) Failure: Greater than 20% deterioration in e-GFR from pre-surgery value

  **Benefit—improvement or stabilization.**

- Associations between outcome and variables were determined. Significance was set at p< 0.05.
Results: Baseline characteristics of 59 children diagnosed with Takayasu’s

<table>
<thead>
<tr>
<th></th>
<th>No(%)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sex</strong></td>
<td>Male</td>
<td>25 (42.4)</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>34 (57.6)</td>
</tr>
<tr>
<td><strong>Age (years)</strong></td>
<td></td>
<td>9.98 (range 1.10-14.65 )</td>
</tr>
<tr>
<td><strong>Race</strong></td>
<td>Black</td>
<td>31 (52.5)</td>
</tr>
<tr>
<td></td>
<td>Mixed race</td>
<td>27 (45.8)</td>
</tr>
<tr>
<td></td>
<td>White</td>
<td>1 (1.69)</td>
</tr>
<tr>
<td><strong>Mantoux test</strong></td>
<td>Positive</td>
<td>55 (93.2%)</td>
</tr>
<tr>
<td></td>
<td>Negative</td>
<td>4 (6.8%)</td>
</tr>
<tr>
<td><strong>Erythrocyte sedimentation rate</strong></td>
<td></td>
<td>52.9 (range 5-143mm/hr )</td>
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</tbody>
</table>
Results

• 59 children with TA during the study period
  – RAS in 45 patients (76.3.2%)
  – bilateral in 30 patients (50.8%).

• 20 children had renal artery revascularization

• The mean duration of follow up was 31.8 ± 34.1 months (range: 1 – 141 months)
Demographic and laboratory variables of 20 children who had revascularization surgeries for renal artery stenosis

<table>
<thead>
<tr>
<th>Variable</th>
<th>Value</th>
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</thead>
<tbody>
<tr>
<td><strong>Age (years)</strong></td>
<td></td>
</tr>
<tr>
<td>• Mean</td>
<td>9.1 ± 3.1</td>
</tr>
<tr>
<td>• Range</td>
<td>2 - 14</td>
</tr>
<tr>
<td><strong>Gender</strong></td>
<td></td>
</tr>
<tr>
<td>• Male (%)</td>
<td>9 (45)</td>
</tr>
<tr>
<td>• Female (%)</td>
<td>11 (55)</td>
</tr>
<tr>
<td><strong>Hypertension (%)</strong></td>
<td>20 (100)</td>
</tr>
<tr>
<td><strong>Baseline eGFR in µmol/L range, mean (SD)</strong></td>
<td>53 – 150, 88.6 (25.4)</td>
</tr>
<tr>
<td><strong>Side of renal artery stenosis</strong></td>
<td></td>
</tr>
<tr>
<td>• Right (%)</td>
<td>5 (25)</td>
</tr>
<tr>
<td>• Left (%)</td>
<td>2 (10)</td>
</tr>
<tr>
<td>• Bilateral (%)</td>
<td>13 (65)</td>
</tr>
</tbody>
</table>
Renal function outcomes

- 20 children had 27 revascularization procedures
- 6 children had bilateral revasc
- Most common procedure was PTA which was done singly or in combination with other procedures in 10 patients.
### Outcome

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Period 3 months</th>
<th>Period 6 months</th>
<th>Period 1 year</th>
<th>Period 2 years</th>
</tr>
</thead>
<tbody>
<tr>
<td>Improvement</td>
<td>8/17 (47%)</td>
<td>9/17 (53%)</td>
<td>6/14 (43%)</td>
<td>5/13 (38%)</td>
</tr>
<tr>
<td>Stabilization</td>
<td>9/17 (53%)</td>
<td>8/17 (47%)</td>
<td>8/14 (57%)</td>
<td>7/13 (54%)</td>
</tr>
<tr>
<td>Failure</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1/13 (8%)</td>
</tr>
</tbody>
</table>

92% of the patients had stable or improved renal function at the long term follow up (p< 0.05).
Outcome

• Association between renal outcome after revascularization and
  – Age \( p = 0.977 \)
  – Gender \( p = 0.257 \)
  – Type of revascularization \( p = 0.526 \)
  – Nephrectomy \( p = 0.452 \)
  at the various follow up periods.

• Bilateral revascularization significantly associated with an improvement in renal function in the early 3-month post-operative period (OR 0.03; 95% CI 0.001 – 0.851; \( p = 0.04 \)). This significance was not observed at further follow up periods.
Limitations

- Retrospective review over many years
- Small number of patients
- No control group
- Patients varied considerably in site and degree of stenosis
- Effect of collaterals
Conclusion

• Revascularization may have a beneficial effect on preservation of renal function in patients with RAS secondary to Takayasu’s Arteritis