Management of Resistant Renal Artery Stenosis with Cutting Balloon Angioplasty in a Child


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29th June, 2008
Renovascular Hypertension

• **Systemic hypertension in children (2%)**:
  – Renal arteries anomalies 20%⁽¹⁾

• **Treatment depend on**:
  - location of the renal artery stenosis (RAS)
  - underlying abnormality

• **Options**:  
  – Medical management  
  – Surgical revascularization  
    autotransplant, nephrectomy  
  – Endovascular procedures  
    PTA, Stent, CBA

Renovascular Hypertension - Treatment

- Percutaneous Transluminal Angioplasty (PTA)
  - 93.1% beneficial effect on blood pressure \(^{(3)}\)
  - Low morbidity
  - 25.8% restenosis \(^{(3)}\)

- **Stent placement** → AVOID IN CHILDREN! \(^{(3)}\)
  - technical issues
  - may compromise arterial growth
  - complicate subsequent surgical revascularization
  - predispose to renal artery thrombosis

Renovascular Hypertension - Treatment

• Cutting Balloon Angioplasty (CBA)

- Therapeutic choice in renal artery stenosis resistant to dilatation by a conventional balloon
- Minimally invasive alternative to surgery
- Sustained normotensive state >6 months \(^{(4)}\)
  - Adverse events (14%, most are minor and access related):
    - recurrent stenosis
    - arterial oclusion
    - arterial rupture
    - pseudoaneurysm


CB: 3-4 metal blades mounted on the surface of the balloon catheter
Case Report

- ♂, 11 years old
- Previously healthy

- Sustained arterial hypertension:
  - 170/100 mmHg
  - 150/98 mmHg, despite 4 anti-hypertensive drugs:
    - Atenolol 50mg, bid
    - Hidroclorotiazida 50mg + amilorido 5mg, bid
    - Amlodipine 5mg, bid
    - Nifedipine 5mg, SOS

- Physical examination:
  - weight and height: 25-50th percentile
  - no alterations (no abdominal bruit)
**Analysis**

- **Hemogram:** normal
- **Renal function tests:**
  - Cr: 0.6mg/dl
  - U: 47mg/dl
- **K+:** 3.61mmol/L
- **Urinary findings:** negative
- **Fundoscopy:** no alterations
- **Peripheral renin activity:** 444.1pg/ml
- **Thyroid function:** normal
- **Serum cortisol:** normal

**Tests**

- **Abdominal US:** smaller left kidney
- **ECG and Ecocardiogram:** normal
- **Angio-TC:**
  - Assimetric dimensions
    - Left kidney: 76mm
    - Right kidney: 90mm
  - **Left renal artery stenosis >50%**

**PTA of left renal artery stenosis with progressive diameter ballons**
- 2.5, 3 and 4 mm
Case Report

- Maintained hypertension 150/98mmHg (4 anti-hypertensive drugs)

- Determination of the renal-vein renin:
  - Left renal vein: 76pg/ml
  - Right renal vein: 50pg/ml
  - VCI: 50.1pg/ml (above renal veins); 52pg/ml (below renal veins)
  - Renal vein renin ratio: 1.52 (abnormal if >1.48)
  - Renal systemic renin index: 0.82 (renin hipersecretion if > 0.48)

Hypertension likely to be improved or cured after revascularization
Endovascular Procedure - Angiography

- Left renal artery stenosis > 50%, tubular, 6mm of length;
- Post-stenotic dilatation
Endovascular Procedure

Heparin: 70 IU/Kg

Cutting balloon angioplasty: 2,5x10mm
Percutaneous transluminal angioplasty: 3x20mm
Endovascular Procedure

Cutting balloon angioplasty: 3.5x10mm
Percutaneous transluminal angioplasty: 4x20mm
Endovascular Procedure

Final control- BP: 137/85mmHg
Case Report – Follow-up

• BP registration under 2 antihypertensive drugs (mmHg):

<table>
<thead>
<tr>
<th>Min</th>
<th>Max</th>
<th>Period</th>
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<tbody>
<tr>
<td>120/53</td>
<td>130/85</td>
<td>1\textsuperscript{st} week</td>
</tr>
<tr>
<td>136/59</td>
<td>148/97</td>
<td>1\textsuperscript{st} month</td>
</tr>
<tr>
<td>140/62</td>
<td>163/100</td>
<td>Next 3 months</td>
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<table>
<thead>
<tr>
<th>Normal values</th>
<th>SBP</th>
<th>DBP</th>
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<tbody>
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<td>95th P</td>
<td>123.6</td>
<td>81.7</td>
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• Questions:
  – Can we consider that this procedure was a success?
  – Is this definitive or transitory?
  – A bridge to a future treatment: endovascular or classic surgery?
Angio-CT: 4 months after procedure

Is this fibromuscular dysplasia (FMD) evolution or a procedure complication?
Conclusions

- **CBA**: Promising and attractive treatment in FMD renal stenosis
- Reported to be effective in the treatment of balloon-resistant FMD
- Studies suggest using it in very selective cases and, most importantly, after PTA have failed