Percutaneous recanalization of occluded renal arteries in patient with resistant hypertension and high rennin activity

Assoc. Prof. Ivo Petrov MD, FESC, FACC; D-r Iskren Garvanski; D-r Mihail Marzyanov;
City Clinic University Hospital
Sofia, Bulgaria
DISCLOSURES

- I do not have any potential conflict of interest regarding this presentation
BACKGROUND (1-2)

• Hypertension affects more than 25% of the worldwide adult population. (1) Although the vast majority have essential hypertension, it is important to identify patients with secondary treatable causes of hypertension, especially atherosclerotic RAS, the most common cause of renovascular hypertension. (2) The DRASTIC, CORAL study showed that renal stenting resulted in improvement of blood pressure and reduce the number of antihypertensive medications. (3) The ASTRAL study showed that is no significant difference between the group with renal stenting and group medical therapy.

BACKGROUND (2-2)

- In SCAI Expert Consensus Statement for Renal Artery Stenting Appropriate Use - PTA in unilateral, solitary, or bilateral renal artery chronic total occlusion is considered to be rarely appropriate (1).

- We want to prove that in patients with totally occluded renal arteries, but preserved microcirculation by collateral filling and high rennin activity recanalization of the renal occlusion leads to significant reduction of blood pressure and reduced need for antihypertensive medications.

Between 2009 - 2015 we have done 57 renal artery PTA and stenting. Among them 6 patients (10%) with total renal artery occlusions. Percutaneous recanalization was attempted in 7 cases, success was achieved in 6 (85%).

All patients were hypertensive, before the procedure with mean values of BP 161/90 mmHg under systematic antihypertensive treatment with at least 3 antihypertensive agents. In all patients plasma renin activity (PRA) was more than 2.76 ng/ml/h) before the procedure. The patients had duplex signs of occluded renal artery and partially preserved subsegmental blood flow by collaterals.
MATERIALS AND METHODS (2-2)

- Two of the patients were with normal serum creatinine level; one was with end stage kidney disease (EKD) and was receiving chroniodialysis. The other three patients had slightly increased creatinine levels and in two of them those levels normalized and in one there was no significant change after the procedure.

- For recanalization of the occlusions of the renal arteries we used coronary CTO techniques (hydrophilic wires, low profile OTW balloons) and 6Fr GC with preferred radial approach (in 5 out of 7 (71%).
## Renal CTO recanalization

| n | Initials | gender | age | renal | etiology | IR* | PRA** | Average BP (mmHg) | Guide wire 0.014” | Balloon (mm) | Stent (mm) | succes
|---|----------|--------|-----|-------|----------|-----|-------|------------------|------------------|--------------|-----------|---------|
| 1 | TKT      | female | 39  | left  | FMD      | 0.65| 3.50  | 163              | Asahi Grand Slam | Ryujin       | Dynamic Renal 5x19 | yes
| 2 | RIN      | female | 31  | left  | FMD      | 0.55| 2.98  | 181              | Miracle 6.0    | Ryujin 1.25x15 | Xience V 4.0x28 | yes
| 3 | IIM      | male   | 61  | left  | Athero   | 0.63| 3.02  | 167              | Miracle 6.0    | NA           | NA        | no      
| 4 | STN      | male   | 72  | right | Athero   | 0.70| 3.11  | 158              | Miracle 6.0    | NA           | NA        | yes     
| 5 | VNP      | male   | 36  | right | FMD      | 0.62| 2.86  | 170              | Miracle 3.0    | Ryujin 1.25x15 | Infinium 3.25 x29 | yes
| 6 | TKP      | female | 51  | left  | Takayasu | 0.67| 2.57  | 159              | Miracle 6.0    | Sprinter     | Hypocamp | yes
| 7 | FMF      | male   | 15  | left  | Dissection | 0.63| 3.45  | 172              | Whisper        | Sprinter     | Racer     | yes

*IR*: Incorporation ratio, *PRA*: Pressure ratio after angioplasty.
## Follow-up

<table>
<thead>
<tr>
<th></th>
<th>PRA (30d.)</th>
<th>BP(30d.)</th>
<th>Restenosis 6m</th>
<th>Reintervention</th>
<th>Secondary patency</th>
<th>Survival 1 y</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>TKT</td>
<td>0.37</td>
<td>1.5</td>
<td>137/85</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>2</td>
<td>RIN</td>
<td>1.1</td>
<td>yes</td>
<td>98/59</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>3</td>
<td>IIM</td>
<td>4.7</td>
<td>no</td>
<td>157/97</td>
<td>no</td>
<td>yes</td>
</tr>
<tr>
<td>4</td>
<td>STN</td>
<td>0.9</td>
<td>no</td>
<td>189/113</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>5</td>
<td>VNP</td>
<td>1.4</td>
<td>no</td>
<td>143/99</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>6</td>
<td>TKP</td>
<td>1.9</td>
<td>yes</td>
<td>110/68</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>7</td>
<td>FMF</td>
<td>0.76</td>
<td>no</td>
<td>115/70</td>
<td>yes</td>
<td>yes</td>
</tr>
</tbody>
</table>
Example - recanalization of left renal CTO in a 42 y old patient with extremely resistant AH with BP values reaching 240/1200mmHg on 5 medications treatment
Dynamic Renal (Biotronik) 5.0/18mm implantation after recanalization
Final result after recanalization and stenting
53 y old female before and after recanalization and stenting of left renal
Recanalization of renal CTO is rarely done and not indicated as a standard procedure. Published several case reports - it is probably feasible using coronary CTO techniques. In case of chronic renal artery occlusion renin production is preserved in case there is collateral flow sufficient to maintain juxtaglomerular apparatus even in kidney with no excretion. These patients with preserved vascular microcirculation are the most probable candidates for recanalization and stenting as part of the BP control treatment. In some cases of young patients with high PRA levels, recanalization of renal CTO is curative.

CONCLUSION

• Renal artery CTO with preserved parenchymal flow is a rare but potentially unfavorable anatomical situation related to renovasal hypertension

• Recanalization and stenting of renal artery CTO is feasible and safe using protocols close to coronary CTO techniques

• In case of renal occlusion and resistant AH, the most probable mechanism of AH is the preserved vascular microcirculation allowing juxtaglomerular survival and renin production.

• On the same time the preserved microcircular perfusion is predictor for PRA lowering and blood pressure control success after opening a renal CTO.

• There is evidence of direct relationship between preserved parenchymal flow and the expected post interventional result regarding the BP control, confirmed in our cases.
thank you