Renal Artery Stenting: One Year outcome on BP control and Antihypertensive Medication

I Sathyamurthy*, K Sudhakar**, K Jayanthi***, K Subramanyan***, P Ramachandran***, Robert Mao***, K Mathew Samuel***

Abstract

Aim: There is lot of controversy regarding the efficacy of renal artery stenting in atherosclerotic renal artery stenosis. The aim of this retrospective study is to evaluate blood pressure control and requirement of antihypertensive drugs after renal artery stenting.

Methods and Results: Eighty patients who have undergone renal artery stenting for atherosclerotic renal artery stenosis with hypertension were evaluated and followed up for one year. Those with procedural complications were excluded. The systolic and diastolic BP control, number of medications, their dosage and serum creatinine levels were assessed at 3 months and at one year. At the end of one year 3 patients had total cure (all 3 had bilateral renal artery stenting). In 30 patients, there was reduction in number of drugs and in 11 patients there was reduction in dosage of antihypertensive drugs. In 16 patients there was a need to change the class of drugs. In 16 patients same drugs and dosage were continued. In 4 patients, the dose was increased.

Conclusions: At the end of one year, 3 patients had cure, 44 patients improved and there was no change in 33 patients. Our results are comparable to other reported series. Renal artery stenting is a cost effective approach in properly selected patients of renal artery stenosis with hypertension.

Introduction

Atherosclerotic renal artery stenosis (ARAS) is associated with coronary artery disease. In our own series we reported an incidence of 7.6% in patients undergoing routine coronary angiography.1 ARAS may lead to hypertension, progressive loss of renal function and hypertension related morbidity.2 Percutaneous transluminal renal angioplasty (PTRA) has emerged as a preferred mode of nonsurgical therapy in these cases. Restoration of vessel patency may reduce the need for antihypertensive medications and may even retard the progression of renal failure.

There are no previous reports in Indian literature regarding blood pressure (BP) control and antihypertensive medication after renal artery stenting. The aim of the present study is to evaluate the BP control, number of antihypertensives required and their dosage after renal stenting during 1 year follow up.

Material and Methods

Eighty patients who underwent successful PTRA from Jan 2001 to Dec 2006 were included in the study. There were 57 men and 23 women and their ages ranged from 38 to 80 years (mean age-48.2 years) (Table 1). Majority (76%) were above the age of 50 years. All patients who had the luminal diameter stenosis of more than 50% were considered for intervention. Forty-seven patients had unilateral renal artery stenosis (RAS) and 33 patients had bilateral (RAS).

Inclusion Criteria: All patients with ARAS and hypertension, who were on
regular medication following PTRA with successful angiographic results, were included in the study. Anatomical success was defined as either total or near total elimination of stenosis after stenting without any procedure related complication resulting in renal flow limitation.

Exclusion criteria: Those patients who were on dialysis, those who were normotensive despite renal artery stenosis, those with single functioning kidney, serum creatinine more than 2.5 mg%, those with complications like thrombus and suboptimal results after PTRA were excluded. To maintain uniformity those in whom distal protection devices, or cutting balloons used were also excluded. Those who had restenosis of stent by doppler assessment were also excluded.

All patients were regularly followed up either at our centre or by the referring physicians and patients maintained weekly random systolic and diastolic BP recordings. Serum creatinine levels, (Table 2) number of antihypertensive drugs and their dosages were recorded before, after stenting and at three monthly intervals. Hypertension was defined as cured if BP was less than 140/90 mmHg. Number of patients who showed improvement by reduction in BP, reduction in number of drugs and dosages were assessed (Table 3). Of the 80 patients, 44 of them were on 4 drugs and the rest of them were on 3 drugs. None of the patients with bilateral RAS received either ACEI/ARBs. Thirtynine out of 47 patients with unilateral RAS received either ACEI/ARBs. Post stenting, 29 patients were continued on ACEI/ARBs. All of them had doppler assessment for patency of stent at three months and one year post procedure. The number of cases who showed improvement in BP, reduction of drugs and in whom the BP worsened were recorded. Statistical analysis was done using paired t-test.

### Results

All patients underwent PTRA through femoral route except 6 cases, three of whom underwent by radial route and the other 3 through brachial route. In all of them guiding catheter technique and 0.014” wire were used. Predilatation of the lesion was done wherever indicated.

The systolic and diastolic BP levels were found reduced at the end of 1 year; and the difference was statistically significant. The number of antihypertensives needed also was less at the end of 1 year (Table 2). As regards the serum creatinine levels, the difference was not statistically significant.

Only 3 patients (4%) showed complete cure at the end of 1 year without needing any antihypertensives and all of them had bilateral renal artery stenting. Fiftyfive percent of patients showed improvement in the BP control (16 patients needed same dosage of drugs and 41 patients needed either reduction in number of drugs or dosages of drugs). In 16 patients (20%), the BP was not controlled and the dose of medication was either increased or the drug was replaced with different classes of antihypertensives (Table 3).

### Discussion

Earlier studies have shown variable response to BP control after renal artery stenting for ARAS. The exact percentage of patients who showed improvement is difficult to establish due to different inclusion and exclusion criteria as some studies included patients with progressive renal dysfunction and some studies excluded patients who are likely to improve with stenting.

In DRASTIC study7 fifty six patients assigned to renal angioplasty were compared to 50 cases assigned to medical treatment. In this study only 2 patients received stents. Twenty two patients though initially assigned to drug treatment, subsequently needed angioplasty during 1 year follow up. Though BP levels were not significantly different between the two groups, the angioplasty treated group certainly required fewer drugs. Similar observations were made in two other studies.8,9 In the ASTRA trial10 403 patients of ARAS were treated by renal stenting.

### Table 1: Age of patients who have undergone PTRA

<table>
<thead>
<tr>
<th>Age Group</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 40</td>
<td>01</td>
</tr>
<tr>
<td>41 – 50</td>
<td>18</td>
</tr>
<tr>
<td>51 – 60</td>
<td>20</td>
</tr>
<tr>
<td>61 – 70</td>
<td>24</td>
</tr>
<tr>
<td>71 – 80</td>
<td>17</td>
</tr>
</tbody>
</table>

### Table 2: BP and serum creatinine values and number of drugs

<table>
<thead>
<tr>
<th>N</th>
<th>Baseline</th>
<th>1 year</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>80</td>
<td>147.82±14</td>
<td>124.20±14.66</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>80</td>
<td>89.75±7.79</td>
<td>78.70±8.08</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>80</td>
<td>1.9±0.78</td>
<td>1.2±0.60</td>
<td>0.015</td>
</tr>
<tr>
<td>80</td>
<td>3.6±1.2</td>
<td>2.4±0.9</td>
<td>&lt; 0.001</td>
</tr>
</tbody>
</table>

### Table 3: Effect of PTRA on Antihypertensive Drugs and Dosages

<table>
<thead>
<tr>
<th>Effect</th>
<th>Number</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Cure</td>
<td>3</td>
<td>3.75%</td>
</tr>
<tr>
<td>Reduction in no. of drugs</td>
<td>30</td>
<td>37.5%</td>
</tr>
<tr>
<td>Reduction in dosages of drugs</td>
<td>11</td>
<td>13.75%</td>
</tr>
<tr>
<td>Change of drugs</td>
<td>16</td>
<td>20%</td>
</tr>
<tr>
<td>Maintenance of same drugs</td>
<td>16</td>
<td>20%</td>
</tr>
<tr>
<td>Higher dosage of drugs</td>
<td>4</td>
<td>5%</td>
</tr>
</tbody>
</table>

© JAPI • MARCH 2014 • VOL. 62
in combination with medical treatment and 403 patients with medical treatment alone. No significant difference was noted in serum creatinine, systolic BP and overall vascular events between the two groups. The authors concluded that there was no meaningful clinical benefit by renal stenting. All these studies resulted in a controversy regarding the benefit of renal stenting in ARAS.

The aim of the present study was to evaluate whether carefully selected cases of ARAS showed reduction in BP, number of antihypertensives and their dosage after renal artery stenting, during 1 year follow up. Some of the previously reported studies have shown definite reduction in BP and improvement in renal function after renal stenting. Rundbach and Jacob\(^{11}\) placed 24 stents in 20 patients of ARAS. After 12 months follow up reduction in BP was noted in 67% cases and reduction in serum creatinine in 71% cases. Dorros et al\(^{12}\) successfully placed Palmaz Schatz stents in 1058 patients of ARAS. They found good control of BP and improvement in renal function during 4 year follow up with improved survival. At the end of 1 year 33% of patients with unilateral lesions and 38% with bilateral lesions improved. They stressed upon early detection, diagnosis and early intervention before renal impairment sets in.

In our study also, early intervention probably helped the 3 patients who were cured of hypertension. White et al\(^{13}\) reported renal stenting in 133 renal arteries in 100 patients and reported good reduction in systolic and diastolic blood pressures at 6 months. Rocha Singh\(^{14}\) reported renal stenting in 100 consecutive hypertensives with ARAS. Mean arterial pressure fell significantly. The number of antihypertensive drugs decreased from 2.9±1.2 to 1.9±1.1. In Aspire-II study\(^{15}\) renal stenting was done after unsuccessful balloon dilatation in ostial or restenotic lesions of ARAS. There was significant reduction of both systolic and diastolic blood pressures in 40% of cases at 24 month follow up.

The best way to assess improvement in BP is by identifying whether BP is completely cured, improved, unchanged or worsened. In the present study after renal stenting at the end of 12 month follow up 4% showed cure, 55% showed reduction in need for antihypertensive drugs. In 41% of cases, either there was no change or worsening in BP Control. Table 4 shows our results compared with 6 other reported\(^{16-21}\) series. Most of these series showed cure in less than 10% of cases. Surprisingly, Stefano Pinto\(^{21}\) reported cure in 35% of cases, but in this series there was only 58 cases and the follow up was 6 months. In the largest series reported by Rees et al\(^18\) there were 845 patients and showed cure rate of 6% at 24 months follow up. Our observations are in agreement with most of these studies.

The variability in the results in various series is due to lack of uniform selection criteria, inclusion of patients with ischaemic nephropathy; and in some studies even patients on dialysis were included. The variables like kidney size, information regarding split renal functions and assessment of renal resistance index by doppler will definitely give us better guidance regarding long term benefit of renal stenting.

### Limitations of the Present study

Present study is retrospective analysis and patients with serum creatinine > 2.5mg% were excluded. Multiple operators were involved in the procedure with resultant variability in the procedural techniques.

The results of the ongoing large randomised trial comparing PTRA with stenting with optimal medical treatment versus medical treatment alone (CORAL trial -Cardiovascular outcomes in renal atherosclerotic lesions) will certainly clarify some of the controversial issues regarding renal revascularisation therapy.

### Conclusions

There is wide acceptance that PTRA should be the treatment of choice for ARAS and hypertension with or without impaired renal function. We conclude from our study that renal stenting is the most cost effective approach for patients with ARAS and hypertension. If properly selected, the cure rates will go up and in the majority of them the number of antihypertensive drugs and their dosages can come down. There are no studies available on the long term benefit of renal stenting in preventing renal failure, adverse cardiovascular events and mortality.
References


21. Stefano Pinto, Elene Daghini, Fabririo Arzilli etal: Percutaneous Renal artery angioplasty (PTA) and stenting (PTAS) in hypertensive patients with renal artery stenosis (Abstract). *Am Journal Heart* 2002;15;No.4 Part 2 19A.