My Patient Has Resistant Hypertension: Now what?

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I have the following financial relationships to report with ACCME defined ineligible companies:

<table>
<thead>
<tr>
<th>Name of Company</th>
<th>Nature of Relationship</th>
<th>Current Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Medtronic</td>
<td>Site PI – SPYRAL AFFIRM</td>
<td>Ongoing</td>
</tr>
</tbody>
</table>
Overview and Objective

Problem of hypertension

Case Presentation

*Logic for role of renal denervation*
Association of Hypertension with Adverse Events

Meta-analysis

61 prospective observational studies

1 million adults with no history vascular disease

*Lancet* 2002; **360**: 1903–13
Linear relationship of increase in risk with increase in blood pressure

Association of Hypertension with Adverse Events

*Lancet* 2002; *360*: 1903–13
Estimated Prevalence of Hypertension in United States

<table>
<thead>
<tr>
<th>TABLE 7</th>
<th>Prevalence of Hypertension Based on 2 SBP/DBP Thresholds*†</th>
<th>SBP/DBP ≥130/80 mm Hg or Self-Reported Antihypertensive Medication†</th>
<th>SBP/DBP ≥140/90 mm Hg or Self-Reported Antihypertensive Medication‡</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall, crude</td>
<td>46%</td>
<td>32%</td>
<td></td>
</tr>
<tr>
<td>Men (n=4717)</td>
<td>46% (or 48%)</td>
<td>43%</td>
<td>31%</td>
</tr>
<tr>
<td>Women (n=4906)</td>
<td></td>
<td></td>
<td>32%</td>
</tr>
<tr>
<td>Overall, age-sex adjusted</td>
<td>48%</td>
<td>43%</td>
<td>31%</td>
</tr>
</tbody>
</table>

*†‡ Source: Whelton et al. 2017 High Blood Pressure Clinical Practice Guideline
Successful Treatment of Hypertension Improves Outcomes

Meta-analysis of 30 trials comparing BP-lowering meds (n=220,000+)

Outcome = MI / stroke / CV death +/- HF

Journal of Hypertension. 28(7):1356-1365, July 2010.
Successful treatment of Hypertension Improves Outcomes

Meta-analysis of 123 BP-lowering trials 1966-2015 (n=613,815)

A reduction of 10 mm Hg in SBP reduced major cardiovascular events by 20%

Figure 2: Meta-regression plot
Plot shows the percentage risk reduction in major cardiovascular events regressed against the difference in achieved systolic blood pressure between study treatment groups.
Resistant Hypertension is Prevalent

### Table 1. Classification of Adults With Hypertension in the United States

<table>
<thead>
<tr>
<th>Classification</th>
<th>No. of Participants</th>
<th>Among All Hypertensive Adults, % (SE)</th>
<th>Among Drug-Treated Hypertensive Adults, % (SE)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Uncontrolled, no drug treatment</td>
<td>1520</td>
<td>30.7 (1.2)</td>
<td></td>
</tr>
<tr>
<td>Controlled hypertension, ≤3 drugs</td>
<td>2035</td>
<td>40.8 (1.1)</td>
<td>58.9 (1.2)</td>
</tr>
<tr>
<td>Uncontrolled hypertension, ≤2 drugs</td>
<td>1136</td>
<td>19.6 (0.8)</td>
<td>28.3 (1.1)</td>
</tr>
<tr>
<td>Resistant hypertension, uncontrolled, ≥3 drugs or controlled ≥4 drugs</td>
<td>539</td>
<td>8.9 (0.6)</td>
<td>12.8 (0.9)</td>
</tr>
</tbody>
</table>

Uncontrolled indicates a mean systolic pressure of >140 or diastolic ≥90 mm Hg.

NHANES 2003-2008
Medication Non-adherence is Prevalent

747 patients from 9 trials across 5 countries in patients with difficult to control hypertension

Urine / plasma testing for drug adherence

23-68% had partial or total non-adherence

The Problem of Hypertension

- Hypertension is associated with adverse cardiovascular outcomes
- Hypertension is prevalent
- Improving blood pressure reduces cardiovascular events
- Hypertension is difficult to treat successfully
- Medication non-adherence is an obstacle to successfully treating hypertension

Now what?
Case Presentation

32 year-old female referred for uncontrolled hypertension

History of Greig cephalopolysyndactyly syndrome, migraines, 3-mm ACA aneurysm

Hypertension was diagnosed at 19 years of age

Catheter-based angiogram 2 years ago – no renal fibromuscular dysplasia

Other secondary hypertension workup – negative

- Urine vanillylmandelic acid, catecholamines, metanephrines, 5-hydroxyindoleacetate
- Plasma catecholamines, aldo:renin

Renal function is normal
Followed closely in Renal Hypertension Clinic since 2019

11 ED presentations and 4 admissions over 2020-2023 for headaches, neurologic symptoms, chest pain in the setting of uncontrolled hypertension

Meds currently prescribed:
- lisinopril 10 mg daily
- labetalol 200 mg twice daily
- prazosin 1 mg twice daily
- spironolactone 50 mg daily

Medications previously prescribed but not tolerated and / or discontinued:
- clonidine, losartan, amlodipine, hydralazine, hctz, Lasix, minoxidil
Case Presentation

- 200 mm Hg
- 150 mm Hg
- 100 mm Hg
Case Presentation

Enrolled in SPYRAL-AFFIRM with BP 146/88 mm Hg
Right Renal Denervation

14 treatments

2 segmental and main renal arteries
Left Renal Denervation

15 treatments

2 segmental and main renal arteries
Example of Data during RDN
Follow-up

131/86 mm Hg office-based BP at 3 months on same meds (4)

(Baseline was office BP 146/88 mm hg)

Renal function remained normal

Renal duplex - normal
Conclusion

Hypertension is a problem due to its association with adverse events, prevalence, and difficulties in effectively treating, leading to uncontrolled hypertension in many individuals.

A challenge in treatment is medication non-adherence.

Renal denervation offers an option for those with uncontrolled hypertension.