Hypertension and its management

Indranil Dasgupta
Consultant Nephrologist, Heartlands Hospital
Honorary Senior Lecturer, University of Birmingham, UK
Differing influence of hypertension on absolute and relative risk of stroke and MI

## BHS Classification of BP Levels

<table>
<thead>
<tr>
<th>Category</th>
<th>Systolic BP (mmHg)</th>
<th>Diastolic BP (mmHg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Optimal BP</td>
<td>&lt;120</td>
<td>&lt;80</td>
</tr>
<tr>
<td>Normal BP</td>
<td>&lt;130</td>
<td>&lt;85</td>
</tr>
<tr>
<td>High Normal BP</td>
<td>130-139</td>
<td>85-89</td>
</tr>
<tr>
<td>Grade 1 Hypertension (mild)</td>
<td>140-159</td>
<td>90-99</td>
</tr>
<tr>
<td>Subgroup: Borderline</td>
<td>140-149</td>
<td>90-94</td>
</tr>
<tr>
<td>Grade 2 Hypertension (moderate)</td>
<td>160-179</td>
<td>100-109</td>
</tr>
<tr>
<td>Grade 3 Hypertension (severe)</td>
<td>≥180</td>
<td>≥110</td>
</tr>
<tr>
<td>Isolated Systolic Hypertension</td>
<td>≥140</td>
<td>&lt;90</td>
</tr>
<tr>
<td>Subgroup: Borderline</td>
<td>140-149</td>
<td>&lt;90</td>
</tr>
</tbody>
</table>
Threshold levels of BP for the diagnosis of Hypertension according to measurement method

<table>
<thead>
<tr>
<th></th>
<th>SBP (mmHg)</th>
<th>DBP (mmHg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Office</td>
<td>&gt;140</td>
<td>&gt;90</td>
</tr>
<tr>
<td>Self/home BP Monitoring</td>
<td>&gt;135</td>
<td>&gt;85</td>
</tr>
<tr>
<td>Ambulatory BP Monitoring Day</td>
<td>&gt;135</td>
<td>&gt;85</td>
</tr>
<tr>
<td>Ambulatory BP Monitoring Night</td>
<td>&gt;120</td>
<td>&gt;75</td>
</tr>
<tr>
<td>Ambulatory 24 hr BP Monitoring</td>
<td>&gt;130</td>
<td>&gt;80</td>
</tr>
</tbody>
</table>

Cut off 5/5 mmHg lower by ABP and HBP
Prevalence of hypertension and its impact

• The global prevalence of hypertension in adults was 26% in 2000 and is projected to go up to 29% in 2025 (1-5% in children)
• 36% in the UK
• It is estimated to contribute to
  – 62% of all strokes,
  – 49% of heart disease
  – 7.1 million or 13% of all deaths annually.
  – 57 million disability adjusted life years (DALYs).

The risk

• Hypertension is a major risk factor for
  – Stroke 33%
  – MI 25%
  – Heart failure
  – Kidney failure (cost of dialysis £30k/patient/yr)
  – Premature death
  – Cognitive impairment

• 2 mmHg rise in BP increases stroke mortality by 10% and from MI by 7%
Risk reduction by treatment

Systolic blood pressure (SBP)$^1$
- 10 mmHg reduction in SBP
- 40-50% reduced risk of stroke in those under 60

Diastolic blood pressure (DBP)$^2$
- 10 mmHg reduction in DBP
- 37% reduced risk of CHD
- 56% reduced risk of stroke

References
Summary of antihypertensive drug treatment

Key
A – ACE inhibitor or angiotensin II receptor blocker (ARB)¹
C – Calcium-channel blocker (CCB)
D – Thiazide-like diuretic

Step 1
Aged under 55 years
A

Step 2
Aged over 55 years or black person of African or Caribbean family origin of any age
C²
A + C²

Step 3
A + C + D

Step 4
Resistant hypertension
A + C + D + consider further diuretic³,⁴ or alpha- or beta-blocker⁵
Consider seeking expert advice

See slide notes for details of footnotes 1-5
NICE hypertension update 2011

• If high BP identified in GP surgery – patient should be referred for 24 hour ambulatory BP monitoring to rule out white-coat hypertension

• WCH is present in 15-30% of general population and 50% of treated hypertensives

• If patient does not tolerate ABPM – patients should be asked to monitor BP at home (HBPM) using a validated machine – 2 readings am and pm for 7 days
A case history

- 46 year old, African Caribbean, male
- Referred with BP 180/106
- On amlodipine 10 mg, Lisinopril 20 mg, Bendrofluomethiazide 2.5 mg, Doxazosin 16 mg
- ABPM: daytime mean BP 170/100, echo LVH
- Change BFZ to furosemide 40 mg
- 3/12 - BP 176/104, add Spironolactone 25 mg
- 3/12 – BP 172/102, add moxonidine 400 mg
- 3/12 – BP 170/102 ............
Resistant Hypertension

• 36% of the UK population have hypertension
• Resistant hypertension = uncontrolled BP (>140/90) despite taking > 3 agents
• Health Survey of England 2008 – 30% men and 35% of women hypertensives have resistant hypertension
• True resistance 10 – 15%
Current management pathway for resistant hypertension

- 24 hr ambulatory BP to confirm resistance
- Exclude secondary hypertension
- Add further medication

Aged under 55 years

Aged over 55 years or black person of African or Caribbean family origin of any age

Add further med/device based treatment

Non-compliance

True drug resistance

Drug efficacy clinic/ admit for 2 days
Supervised administration of drugs
24 hr BP
• Trial in RH patients
• Spironolactone most effective
• 8.7 mmHg drop Vs. Placebo
• 4.26 mmHg drop Vs. mean of bisoprolol and doxazosin
• Implicates primary role of sodium retention in patient with RH.

Lancet October 2015
Causes of resistance to anti-hypertensive treatment

• White coat effect (apparent resistance)
  – Often superimposed on essential hypertension
• Non-adherence to medication
  – Unintentional – multiple AH drug intolerance
  – Intentional – overt or covert
• High salt intake
• Use of concomitant medication, e.g. NSAID
• Secondary hypertension
  – Renal disease, Conn’s, Cushing’s, Pheochromocytoma
• Truly resistant hypertension
Prevalence and determinants of white coat effect in a large UK hypertension clinic population.
J Hum Hypertens. 2015 Sep 17

- >50% treated hypertensive patients have WCE
- Mean difference 18/6 mmHg between clinic and ABP

N=2056, F = 53%, Caucasian 76%, 85% on treatment
Secondary hypertension

• Renal (>95%)
  – Renal parenchymal disease
  – Reno-vascular disease – fibromuscular dysplasia, atherosclerotic (commoner, in patients with PVD)

• Adrenal
  – Conn’s syndrome
  – Cushing’s syndrome
  – pheochromocytoma

• Others
  – Acromegaly
  – Coarctation of aorta
DEVICE-BASED TREATMENTS
Renal sympathetic denervation

• Catheter based
• Radio frequency ablation
Experience of RDN in Birmingham

Real-life experience

Report on the safety and efficacy outcomes

34 patients in total across the 2 sites

Mean BP >180/100 mmHg

>5 drugs on average
50% patients responded

FIGURE. Change in clinic blood pressure (BP) (left) and day ambulatory BP (right) according to responder status. The two graphs show the mean BP changes in responders and non-responders based on the reduction achieved in either clinic BP (responder defined as BP drop ≥10 mm Hg and nonresponder as BP drop <10 mm Hg) or daytime ambulatory BP (responder defined as BP drop ≥5 mm Hg and nonresponder as BP drop <5 mm Hg). The I bars indicate standard error of the mean. *Indicates statistically significant change (P<.05). SBP indicates systolic blood pressure; DBP, diastolic blood pressure.
Ultrasound Renal Denervation

• KONA WAVE IV clinical trial in progress cross Europe and Australia
• Sham-controlled
• Non-invasive
• High Frequency US based ablation of renal nerves
• Completed first round of treatment at BHH
Central arteriovenous anastomosis for the treatment of patients with uncontrolled hypertension (the ROX CONTROL HTN study): a randomised controlled trial

Melvin D Lobo, Paul A Sobotka, Alice Stanton, John R Cockcroft, Neil Sulke, Eamon Dolan, Markus van der Giet, Joachim Hoyer, Stephen S Furniss, John P Foran, Adam Witkowski, Andrzej Januszewicz, Danny Schoors, Konstantinos Tsioufis, Benno J Rensing, Benjamin Scott, G André Ng, Christian Ott, Roland E Schmieder, for the ROX CONTROL HTN Investigators*

- A-V fistula between artery and vein
- Iliac Vessels
Summary

- Hypertension: BP >140/90 (clinic), >135/85 (ABP)
- Prevalence 36% in the UK
- Commonest CV risk factor – contributes to 62% all strokes, 49% of heart dis, and 13% of all deaths
- Minor reduction in BP lowers CV death significantly
- WCH common – ABP or Home BP before start of Tx
- Life style advice should be offered first
- Start treatment with RAAS blocker for <55 years
- Spironolactone – probably best 4th line agent
- Device based treatment available for true resistance
- Target BP 140/90 but 130/80 for high risk patients