The Latest in Caring for Your Hypertensive Patients

Dr. Beth Steele

Disclosures – Dr. Beth Steele

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<th>Company</th>
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<td>Advisory Board</td>
<td>Honorarium</td>
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<td>Consultant</td>
<td>Honorarium</td>
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Prevalence of Hypertension

Hypertension in adults ≥20 1999-2014


CDC.gov
Number of deaths and age-adjusted death rates for hypertension-related and all other causes of death combined: United States, 2000–2013

Blood Pressure Classifications and Referral Guidelines
(adapted from the Joint National Committee on Detection, Evaluation, and Treatment of High Blood Pressure – JNC 7, 2003)

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Refer within 2 months
Refer within 1 month
Evaluate or refer immediately or within 1 week

JNC 8 – What’s New?

- Threshold for treatment of BP in ages ≥60
  - 150/90 vs. 140/90
  - NOW 130/80 mm Hg

- Recommendations for initial therapy
  - Thiazide diuretics
  - ACE inh, ARBs, Ca²⁺ channel blockers
  - NOT: β-blockers, α-blockers, loop diuretics
**Clinical Practice Guideline**


A Report of the American College of Cardiology/American Heart Association Task Force on Clinical Practice Guidelines

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<th>BP Category</th>
<th>SBP</th>
<th>DBP</th>
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<tr>
<td>Normal</td>
<td>&lt;120 mm Hg and &lt;80 mm Hg</td>
<td></td>
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<tr>
<td>Elevated</td>
<td>120–129 mm Hg and &lt;80 mm Hg</td>
<td></td>
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<tr>
<td>Hypertension</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stage 1</td>
<td>130–139 mm Hg or 80–89 mm Hg</td>
<td></td>
</tr>
<tr>
<td>Stage 2</td>
<td>≥140 mm Hg or ≥90 mm Hg</td>
<td></td>
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All values ~10mmHg lower than JNC

"Hypertensive Crisis”

- URGENT vs. EMERGENT
- JNC 7
  “Evaluate and treat immediately or within 1 week depending on clinical situations and complications."
- Systemic symptoms
- Ocular findings

Hypertensive Crisis Emergencies – indicated end organ damage

- 1-year death rate is >79%
- median survival is 10.4 months if the emergency is left untreated
- actual BP level may not be as important as the rate of BP rise
Same BP – 2 different situations

BP 190/112
- Feeling “fine”
- Forgot his medicine today
- Denies H/A, etc
- DFE: crossing changes

BP 190/112
- (+) “migraine” since yesterday
- DFE: disc edema, flame heme

Causes of Hypertensive Crisis

- Most have known Hx HTN
  - Compliance
  - Recent medication changes
  - Drug interactions
- Pregnancy
- Recreational Drug Use (cocaine, amphetamines)
- Head Trauma

The breaking point of autoregulation

- Autoregulation helps control retinal blood flow
- Operates within a certain range
- Critical point: breaks down → vessels no longer protected
  - Too high=Malignant hypertension / hypertensive crisis
  - Too low=Arteriolar hypertension

Subjects retina to ischemic damage

Significance of Headache in HTN

- Classic warning symptom, but prognostic value??
- Classification by of headache for this cohort:
  - Migraine
  - Daily H/A
  - Other H/A
- Daily H/A: increased prevalence of all grades of retinopathy
  - 64% mild, moderate retinopathy
  - 16% severe retinopathy
- H/A not associated with worse outcome

Other potential considerations

• Interpretation
  • Medication compliance
  • Patient’s reaction

• Recommendations
  • Use of topical 2.5% PE ± NLO
  • Post-dilation BP
  • Aggressive but SLOW lowering of BP

Most common antihypertensives

<table>
<thead>
<tr>
<th>Drug Class</th>
<th>Onset</th>
<th>Peak Reduction</th>
<th>Rapid I/C BP with acute withdrawal?</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACE inhibitors (lisinopril, ramipril, accupril)</td>
<td>1 hour</td>
<td>6 hours</td>
<td>no</td>
</tr>
<tr>
<td>ARBs (olmesartan ‘Benicar’; valsartan ‘Diovan’; losartan ‘Cozaar’)</td>
<td>2 hours</td>
<td>6 hours</td>
<td>no</td>
</tr>
<tr>
<td>Diuretics (HCTZ)</td>
<td>2 hours</td>
<td>4 hours</td>
<td>Lasts 6-12 hours</td>
</tr>
<tr>
<td>Calcium Channel Blockers (amlodipine ‘Norvasc’; nifedipine ‘Procardia’; diltiazem ‘Cardizem’)</td>
<td>Peak Norvasc reached in 6-12 hours</td>
<td>Nifedipine will act faster...30 minutes to an hour</td>
<td></td>
</tr>
</tbody>
</table>

Best Practices and Avoiding Sources of Error....

Is routine blood pressure part of your daily routine in patient care?

• Hypertension
  • Millions are undiagnosed
  • ”silent killer”
  • Stroke, heart disease, kidney failure

• Hypotension
  • Risk of fainting, falls
  • Ischemia to brain, heart

• Patients more likely to visit eye doctor
  • Vision problems cause symptoms
  • Disorders of blood pressure are often asymptomatic
ODs in Saudi Arabia screen for HTN

• 20% had elevated BP
• 70% were unaware
• 30% of those previously diagnosed were not well-controlled

• We need a multidisciplinary approach to tackle prevention!
  • Expanding role of ECPs??
  • Increasing global prevalence of HTN

Patient Preparation

• Patient seated and \textit{relaxed} (5-10 min)
• Unrestricted baring of upper arm
• Legs uncrossed
• Palm up, slightly bent arm, and midpoint of upper arm resting at heart level

Upper arm at heart level

• No exertion present!
• Arm rest may suffice, depending on patient height

• Radial pulse is used to judge how high to initially pump cuff

• Inflate to at least 30 mmHg above the level at which the radial pulse disappears
Körotkoff Sounds

- Phase 1 – appearance of clear tapping sounds (systolic)
- Phase 2 – swishing of sounds
- Phase 3 –↑ clear sounds, ↑ intensity
- Phase 4 – abrupt muffling of sounds (diastolic I)
- Phase 5 – complete disappearance of sounds (diastolic II)

Auscultatory Gap

- Early, temporary disappearance of sounds between phase II and III
- No sounds for ~20mmHg
- Can cause underestimate systolic

- Roughly 20% of patients
  - Arterial wall stiffness

Automated BP Monitors – the low down...

- Easy for technicians to use
- At home monitoring is crucial for HTN patients
- Proceed with caution...
  - Underestimates (?) systolic by ~10, and diastolic by ~5mm
  - Less accurate (?) in extreme high/low ranges

Threshold for diagnosing hypertension by automated office blood pressure using systolic sample population data.

J Hypertens. 2016 Aug 10. [Epub ahead of print]
A better option for at-home monitoring?

- Accutension App
- Can use with any BP cuff and smartphone

Patient education: Can Lifestyle Really Make a Difference?

<table>
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<tr>
<th>Modification</th>
<th>Approximated Systolic BP Reduction</th>
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<tr>
<td>Weight Loss (maintain BMI under 24)</td>
<td>5-20mmHg/10kg weight loss</td>
</tr>
<tr>
<td>DASH eating plan (fruits, veggies, low sodium, low saturated fats)</td>
<td>8-14mmHg</td>
</tr>
<tr>
<td>Dietary Sodium reduction</td>
<td>2-8mmHg</td>
</tr>
<tr>
<td>Physical Activity (30 min/day)</td>
<td>4-9mmHg</td>
</tr>
<tr>
<td>Moderate alcohol consumption (1-2/day)</td>
<td>2-4mmHg</td>
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Ocular Manifestations

Review of Findings and Terminology

HTN Retinopathy

- 2nd most common to diabetic retinopathy
- Most common physical manifestation of HTN
- Mod-severe: predictive of cardiovascular disease and stroke
- Include BP reading in report to PCP
  - far more effective – stronger diagnostic sign
HTN Retinopathy in Diabetics

- Beaver Dam Eye Study 1997
  - 8% non-diabetics with mod-severe HTN retinopathy
  - 33% diabetics with mod-severe HTN retinopathy

- Better control of BP = decreased retinopathy
- HTN associated with VEGF in retina = increased risk for PDR, macular edema
- Activation of Renal renin-angiotensin system (RAAS) in diabetes = leads to HTN

Historic Grading of HTN Retinopathy
Keith-Wagener-Barker (KWB)

<table>
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<tr>
<th>Grade</th>
<th>Findings</th>
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</table>
| 1     | Arteriolar narrowing  
      | Increased ALR       |
| 2     | AV “nicking” (i.e. crossing changes)  
      | Increase in arteriolar narrowing |
| 3     | Flame hemes  
      | CWS  
      | Further Increased ALR – “copper wiring” |
| 4     | Further increased ALR – “silver wiring”  
      | Optic disc swelling |

Chronic changes (KWB grading system)

Grades 1-3 Not always accurately predictive of HTN severity

Vs. Acute changes – Grade (3-) 4

- Arteriolar occlusion → CWS, capillary drop out
- Increased capillary permeability → retinal deposits (transudates), macular edema
- Disc edema
### Simplified Classification System: Mitchell-Wong

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<tr>
<td>1</td>
<td>Mild</td>
<td>AV changes, ALR, Arteriolar narrowing</td>
<td>Modest association with CVD</td>
</tr>
<tr>
<td>2</td>
<td>Moderate</td>
<td>Above plus CWS, homas, MA</td>
<td>Strongly associated with stroke, CVD</td>
</tr>
<tr>
<td>3</td>
<td>Severe</td>
<td>Above plus papilledema</td>
<td>Strongly associated with mortality</td>
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Cuspidi C. J of Hypertension, Nov 2015
Downie. J of Hypertension May, 2013

### Fundus Images and Fluorescent Angiography

- **A**: Large fibrovascular frond obscuring the optic nerve and creating a shallow retinal detachment.
- **B**: Poor early filling in both choroidal and retinal circulation.
- **C**: Marked late leakage.
- **D**: Marked late leakage.

In Your DFE: response to high BP

- Retina
- Vs Optic nerve
- Vs Choroid
  - Vascular sclerosis
  - RPE ischemia
Hypertensive Choroidopathy

- Young patients
- Acute HTN
- Elschnig Spots
  - Focal choroidal infarctions
  - Sign of past acute HTN episodes
- Siegrist Streaks
  - Linear areas of infarction and subsequent necrosis

32 year old with Hx kidney transplant

Fundus photograph of the left eye shows optic nerve head edema, neovascularization of the disc, macular edema, scattered exudates, and hemorrhages. Elschnig spots (white arrowhead), and Siegrist streaks (black arrowhead).

Fundus Autofluorescence can also be useful in diagnosing choroidopathy.
And Indirect Manifestations...

85 WM, HTN, Smoker

- Black circle over vision x 2 days
- FB vision
- Pupils normal

NAION

- Reduced flow in both retinal papillary capillaries and deeper peripapillary choriocapillaris
- Good agreement with VF loss
NAION

Normal Optic Nerve

Hypotension

- Low Blood Pressure
  - Systolic < 90
  - Diastolic < 60

- Poor perfusion of oxygen and nutrients to vital organs

- Common symptoms = blurred vision, fatigue, dizziness, fainting, confusion

- Risk of ocular manifestations

Retinal Vein Occlusions

- Location
- Risk for neo: Ischemic vs. non-ischemic

- Subtle microvascular abnormalities – collaterals, telangiectasia, early neo

- Collaterals vs. neo – vein occlusion
  - Neo arises from venous circulation and penetrates ILM
  - Collaterals are thin, loopy vessels in RPC layer

- Macular ischemia

63 AAM
Post Avastin Injection – prediction of acuity based on blood flow
Winegarner et al. Retina 2018

- Location
- Determine risk for neo: Ischemic vs. nonischemic
- Subtle microvascular abnormalities – collaterals, telangiectasia, early neo
- Macular ischemia

BRVO with PDR

Closing Thoughts – Impact of the OD

- Early detection is key
  - Screening for disease is crucial

- ODs can impact patient overall health and well-being
  - Conduct appropriate referrals
  - Seize opportunities to communicate with patients
    - Encourage medication compliance
    - Reinforce positive health behaviors
    - Encourage self-monitoring
    - Reinforce importance of follow-up with PCP

Helpful Resources

- American Heart Association http://americanheart.org
- American Society of Hypertension http://www.ash-us.org/index.html
- Centers for Disease Control http://www.cdc.gov/bloodpressure/
Using the Referral Guidelines – Optometry Case Examples

**case1**
- 38 year old BM, Police officer
- Family Hx of HTN
- Took HTN medication 3 or 4 years ago, but stopped
- BP readings – 158/98, 160/96
- Says it’s just because he’s “stressed”
- Asymptomatic

When should you refer?
(adapted from the Joint National Committee on Detection, Evaluation, and Treatment of High Blood Pressure – JNC 7, 2003)

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- Refer to PCP within 2 months
- Refer to PCP within 1 month

**case2**
- BP around 165/85 at every visit, but denies any problems and doctor says “all is ok”
**When should you refer?**
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<td>80-89</td>
<td>≥100</td>
<td>&gt;110</td>
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Refer immediately or within 1 week

**case3**
- 25 year old WM
- Here for annual exam
- Reports worsening headache over past hour
- +Hx HTN taking verapamil but recent change in meds
- BP 208/115

**case4**
- 70 year old WF
- Here for annual exam
- Has been taking lisinopril for 10+ years
- BP readings – 144/94, 146/92
- Saw her PCP 4 months ago and thinks her BP was “around mid 130s over high 80s” – supposed to see PCP again in 2 months
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Refer to PCP within 2 weeks