Hypertensive Crises: Emergencies and Urgencies

Hypertensive Crises

- Acute and marked elevation of arterial pressure, arteriolar spasm, necrotizing arteriolitis, and secondary organ damage
  - hypertensive emergency: DBP ≥ 120 mm Hg or SBP ≥ 180 mm Hg, concomitant acute and progressing end-organ damage
  - hypertensive urgency: DBP ≥ 120 mm Hg or SBP ≥ 180 mm Hg; not immediately life-threatening; no symptoms or progressing TOD

Hypertensive Crises

- Prevalence
  - 2.4-5.2% of hypertensive patients
  - men >> women
  - African Americans, Indian-Asians > whites
  - can occur in all ages
    - peak incidence in age 40-60
    - suspect 2° causes if patient < 30 yrs old
  - associated with comorbid conditions
    - cerebral injury, severe burns, eclampsia, MAOI interaction

Risk Factors

- pheochromocytoma
- renal vascular disease
- poorly-controlled accelerated essential hypertension
- noncompliance with antihypertensive therapy

Signs and Symptoms

- CNS
  - headache (severe), dizziness, nausea, vomiting, anorexia, confusion, nystagmus, slurred speech, motor paralysis
- Heart
  - acute CHF, angina, MI, acute aortic dissection, acute pulmonary edema
- Eyes
  - blurred vision, loss of eyesight, funduscopic findings (hemorrhages, exudates, papilledema)
- Kidneys
  - hematuria, proteinuria, pyelonephritis, elevated BUN and SCr

Urgency vs. Emergency

- Emergency
  - eyes (ocular hemorrhage or funduscopic changes)
  - renal failure/insufficiency
  - eclampsia
  - drug-induced (MAOI-tyramine, PCP, cocaine, LSD)
  - life-threatening!
  - requires immediate pressure reduction
  - IV
- Urgency
  - not life-threatening
  - treated over several hours to days
  - oral therapy or slow-acting parenteral drugs preferred

Pharmacologic Therapy

- Oral vs. Parenteral?
  - urgencies are usually treated with oral antihypertensives, unless:
    - perioperative hypertension
    - intractable epistaxis
    - sympathomimetic drug overdose
    - increased circulating catecholamines
    - MAOI-tyramine interaction
  - emergencies require immediate BP reduction with IV agents

Goals of Therapy

- Emergency
  - reduce mean arterial BP by no more than 25% (within minutes to 2 hrs), then toward 160/100 within 2-6 hrs
    - ↓ 5-10 mm Hg q 5-10 min to diastolic of 100 or a 25% ↓
    - avoid excessive falls in pressure - may cause renal, cerebral, or coronary ischemia
    - caution in patients at high risk for hypotensive complications - esp. elderly
    - patients with chronically elevated BP are less likely to tolerate abrupt reductions in BP
    - Need to bring down BP immediately in acute aortic dissection, ischemic stroke, and intracerebral hemhorrage

Goals of Therapy

- Urgency
  - reduction in blood pressure with relief of symptoms
  - over several hours to days
  - Treat the patient not the numbers

Oral Agents

- Nifedipine - AVOID using this drug!!
  - short-acting CCB
  - 10-20 mg, traditionally given “bite and swallow”
  - rapid onset (5-15 min)
  - vasodilatory effect
  - BP ↓ directly correlated with pretreatment pressure
  - SE: flushing, headache, reflex tachycardia, DEATH!

Oral Agents

- Nifedipine - AVOID using this drug!!
  - CVA, MI, death have been reported with short-acting CCB (JAMA 1996;276:1328-31)
  - profound hypotensive response
  - precipitates cerebral and coronary ischemia

Oral Agents

- Clonidine
  - centrally-acting α_2-agonist
  - inhibits sympathetic outflow from CNS
  - reduces MAP, CO, SV, HR
  - 0.2 mg initially, then 0.1 mg q hr (max 0.5-0.8 mg)
  - 25% reduction in BP in first hr
  - safe and effective
  - SE: sedation, dry mouth, orthostatic hypotension

Oral Agents

- Captopril
  - ACEI
  - 6.5-50 mg at 1-2 hr intervals
  - 15-30 min onset; peak at 30-90 min
  - useful in presence of chronic kidney disease, SLE, renal vascular hypertension, renin-secreting tumors
  - Caution: can induce renal failure in patients with bilateral RAS
  - SE: $\uparrow K^+$, angioedema, first-dose hypotension

Oral Agents

- Labetalol
  - non-selective β-blocker, α-adrenergic properties
  - reduces PVR without reflex sympathetic stimulation
  - 100-300 mg initial; 200 mg q 2-3 hr to max 1200 mg
  - SE: orthostatic hypotension, nausea, vomiting, dizziness, flushing, headaches
  - avoid in asthma, bradycardia, CHF

Oral Agents

- Prazosin
  - α_1 adrenergic blocker
  - limited use
  - 5 mg initial
  - SE: severe first-dose hypotension

Parenteral Agents

- Nitroprusside
  - direct-acting arterial and venous vasodilator
  - does not affect CO (may improve in CHF)
  - reflex sympathetic activation and ↑ myocardial contractility and HR in patients without CHF
  - agent of choice for minute-minute control
    - requires continuous BP monitoring
    - $t_{1/2}$ = 2 minutes
    - 0.5-8.0 mcg/kg/min
  - rapidly reversible (2-5 min)

Parenteral Agents

- Nitroprusside
  - metabolized to cyanide, then thiocyanate
    - must monitor thiocyanate levels if infusion > 72 hrs
    - d/c if levels > 12 mg/dl
    - increased risk in renal dysfunction or doses > 2mcg/kg/min!
    - Advantages: rapid action; fast on and off, can adjust infusion to achieve desired BP, no sedation
  - SE: fatigue, nausea, anorexia, disorientation, psychotic behavior, muscle spasms

Parenteral Agents

- Nitrogylcerin
  - arterial and venous vasodilator
  - ↓ preload, afterload, myocardial oxygen demand
  - useful in presence of MI, angina
  - Not indicated for hypertensive encephalopathy
    - (↑ intracranial pressure)
  - rapid onset of action, easily titratable
    - 5-100 mcg/min
    - continuous monitoring
  - tachyphylaxis with prolonged use (>24-48 hrs)

Parenteral Agents

- Hydralazine
  - arteriolar vasodilator - ↓ TPR
  - rapid onset (10-30 min)
  - reduces diastolic > systolic
  - Disadvantages: increases intracranial pressure, increases dP/dT (pressure wave) so avoid in aortic dissection
  - marked reflex tachycardia, ↑ oxygen demand
    - may precipitate chest pain in patients with CAD
  - Drug of choice for pregnant women with eclampsia or preeclampsia
    - also in renal insufficiency

Parenteral Agents

- Labetalol
  - non-selective β-blocker, α-adrenergic properties
  - decreases PVR
  - 5 min onset of action
  - 20 mg bolus or 0.5-2 mg/min infusion
  - useful in patients with CAD or MI - reduces myocardial oxygen demand
  - SE: orthostatic hypotension, N & V, headaches
  - avoid in asthma, bradycardia, CHF

Parenteral Agents

- Esmolol
  - Fast-acting cardioselective beta blocker for IV use
  - Used for a variety of indications, including supraventricular tachycardias, postoperative hypertension, and hypertensive crises
  - Advantages
    - easilly titratable; rapid onset and cessation
    - Metabolized by RBC's so that active drug eliminated without need for hepatic or renal involvement
  - Disadvantages
    - Reported side effects include diaphoresis, dizziness, nausea

Parenteral Agents

- Fenoldopam
  - selective post-synaptic dopaminergic receptor agonist
  - peripheral vasodilator
  - causes diuresis and natriuresis, ↑ renal blood flow
  - immediate onset of action
  - 0.1-0.3 mcg/kg/min
  - similar efficacy to nitroprusside; better tolerated?
  - SE: HA, N & V, flushing, ↑ IOP – avoid in glaucoma

Clevidipine

- Intravenous Dihydropyridine calcium channel blocker
- Dose: 1-2 mg/hr initial, titrate up at 90 second intervals. 1-2 mg/hr = 2-4 mmHg reduction in SBP
- Avoid in patients with:
  - Allergy to soy or egg products
  - Defective lipid metabolism
  - Aortic stenosis
- Adverse effects – afib, N/V, Headache, acute renal failure

Parenteral Agents

- Phentolamine
  - nonselective alpha-adrenergic blocker
  - most effective in catecholamine excess
    - pheochromocytoma, cocaine, amphetamine ODs, MAOI crisis

Parenteral Agents

- Others
  - trimethaphan
  - nicardipine
  - enalaprilat
  - diazoxide

Comorbidity	Preferred Treatments	Comments
Acute pulmonary edema	Clevidipine, Nitroglycerin, or Nitroprusside	Beta-blockers contraindicated
Acute Coronary Syndromes	Labetalol or esmolol in combo with nitroglycerin	Esmolol/Nitro preferred
Hypertensive Encephalopathy	Labetalol, nicardipine or fenoldopam	
Acute aortic dissection	Esmolol or Labetalol	Beta-blockade should precede vasodilator if extra agents needed
Eclampsia/Preeclampsia	Hydralazine, Labetalol, or nicardipine	Nitroprusside, ACE-I contraindicated
Acute renal failure	Clevidipine, fenoldopam, or nicardipine	N/A
Pheochromocytoma	Phentolamine	Requires rapid lowering of BP

Test Tips

- Doses - only if emphasized (e.g. HCTZ, chlorthalidone)
- Drugs – recognize which class a drug is in
  - losartan – A-II blocker
  - amlodipine – dihydropyridine CCB
  - captopril - ACE inhibitor
  - metoprolol - BB
  - prazosin - alpha blocker
  - Aliskiren – renin inhibitor
- Focus on effects of classes of drugs – side effects, drug intx
- Consider comorbid diseases when selecting drugs
- Follow process for medication selection (review session)