Hypertensive Crisis

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Overview

- Case
- Definition
- Urgency/ Emergency and others
- Evaluation, diagnosis and approach –

1. How quickly to reduce blood pressure
2. Is there any BP target
3. How should this goal be achieved

- Treatment with intravenous anti-hypertensive and conditions

Question 1

30 years old gentleman, presented to emergency for hypertensive urgency with severe chest pain.

He was diagnosed to have aortic dissection. Which is the first line of treatment for this patient ?

- Intravenous Nitroglycerine
- Intravenous Labetelol
- Intravenous Nitroprusside
- Intravenous Phentolamine
- Oral Captopril

Question 2

What should be his target blood pressure and within how much time this should be achieved:

- Lower BP to 100-120 mm Hg within 20 minutes
- Lower BP to 120-140 mm Hg within 40 minutes
- Lower BP to 140-160 mm Hg within 20 minutes
- Lower BP to 140-160 mm Hg within 40 minutes

Question 3

45 years old gentleman, known case of hypertension presented with sudden loss of consciousness.

O/E- BP 200/120 mm Hg, patient was drowsy.

CT brain showed evidence of cerebellar bleed.

Which is the ideal choice of anti-hypertensive ?

- IV nitroprusside
- IV Nitroglycerine
- IV Nicardipine
- IV Phentolamine
- Oral captopril

Question 4

In the same patient : what target of systolic BP should be achieved

- <140 mm Hg
- <160 mm Hg
- <180 mm Hg
- <200 mm Hg
- None of the above

GRR

71 years female
Indian,
ADL independent
community ambulant

Past Medical History

1. Resistant Hypertension secondary to right renal stenosis
- s/p Right artery stenting 22/3/16
2. DM
3. HTN
4. Dyslipidemia
5. Rheumatoid arthritis
- on Sulfasalazine

History and Examination

Admitted from GM clinic for
Hypertensive urgency

BP Right arm: 190/120 mm Hg,
Left arm : 200/120 mm Hg
HR 70/min, Spo2 98% RA
Afebrile, alert, comfortable

Systemic examination was normal

Medications

Nifedipine LA 60 mg BD
Hydralazine 100 mg TDS
Prazocin 3 mg TDS
Valsartan 120 mg BD
Atenolol 75 mg OM
Spironolactone 12.5 mg OM

Sulfasalazine 500 mg OM
Plavix 75 mg OM
SC Insulatard 8 units ON
Metformin 850 mg TDS
Glipizide 2.5 mg BD
Simvastatin 5 mg ON
Omeprazole 40 mg OM
Vitamin C 100 mg BD
Vitamin B forte 1 tab OM
Ferrous fumarate 400 mg TDS
Calcium carbonate + Vit D 2 tab OM

Progress

Renal artery Doppler scan 13/4/18:
Renal artery > 50% stenosis with stent hyperplasia throughout length of the stented renal artery – Stent thrombosis

REPEAT Right renal angioplasty 18/4/18

POST ANGIOPLASTY
-**Angiogram showed severely calcified, atheromatous abdominal aorta, shelf like concentric plaque at the ostium of L renal artery with ~90% focal stenosis. Largo aortic plaque noted along R aorta wall opposite of L renal ostium. R renal artery stent patent.**

Post – stenting (Hypertensive Emergency)

Post-angioplasty right -- FLASH PULMONARY EDEMA, BP - 210/120 →200/120 mm Hg

Creatinine jumped from 97 →440 umol/L

Hypertensive encephalopathy – MRI brain no acute stroke or bleed (other causes ruled out)

Other medications continued except ACE inhibitors.

Underwent left renal artery stenting – on 30th April 2018.

On Discharge

1 week post – angiolplasty on left side ---No flash edema,

- Creatinine normalized,
- Dramatic improvement in blood pressure, BP 122/58 mm Hg- →151/69 mm Hg

~~Nifedipine LA 60 mg BD~~

Hydralazine 100 mg TDS

Prazocin ~~3 mg TDS~~ 1 mg TDS

Valsartan 120 mg BD

~~Atenolol 75 mg OM~~

~~Spironolactone 12.5 mg OM~~

Amlodipine 10 mg OM

Bisoprolol 10 mg OM

Hypertension urgency

- More common
- Relatively asymptomatic or completely asymptomatic patient with a BP in the "severe" range (ie, ≥180/≥120 mmHg)
- Often a mild headache
- No signs or symptoms of acute end-organ damage.

Hypertensive emergency

Severe hypertension in adults BP in the "severe" range (ie, ≥180/≥120 mmHg)

Associated with a variety of acute, life-threatening complications. eg

-**hypertensive encephalopathy**
-retinal hemorrhages
-papilledema
-acute and subacute kidney injury.

Hypertensive emergencies

Grades III to IV hypertensive retinopathy with severely elevated blood pressures
Cerebrovascular
Hypertensive encephalopathy
Atherothrombotic brain infarction with severe hypertension
Intracerebral hemorrhage
Subarachnoid hemorrhage
Cardiac
Acute aortic dissection
Acute left ventricular failure
Acute or impending myocardial infarction
After coronary bypass surgery
Renal
Acute glomerulonephritis
Renal crises from collagen vascular diseases
Severe hypertension after kidney transplantation
Microangiopathic hemolytic anemia
Excessive circulating catecholamines
Pheochromocytoma crisis
Food or drug interactions with monoamine-oxidase inhibitors
Sympathomimetic drug use (cocaine)
Rebound hypertension after sudden cessation of antihypertensive drugs
Eclampsia
Surgical
Severe hypertension in patients requiring immediate surgery
Postoperative hypertension
Postoperative bleeding from vascular suture lines
Severe body burns
Severe epistaxis

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Malignant hypertension

Most patients with significantly elevated blood pressure (systolic pressure ≥180 and/or diastolic pressure ≥120 mmHg)

- Reversible microangiopathic hemolytic anemia
- Thrombocytopenia
- Renal insufficiency
- Retinal hemorrhages, exudates, and papilledema

Term is now considered outdated and used primarily by billing and coding personnel

Hypertensive encephalopathy

- Signs and/or symptoms of cerebral edema caused by severe and/or sudden rises in BP
- It is **primarily a diagnosis of exclusion** after other causes of central nervous system dysfunction are ruled out
- It characteristically responds dramatically to acute lowering of the mean arterial pressure, sometimes by as little as 10 to 15%

Moderate to severe hypertensive retinopathy

Retinal hemorrhages, exudates, and papilledema

Severe hypertensive retinopathy (Malignant hypertension)

Moderate hypertensive retinopathy (accelerated hypertension)

Patients with moderate to severe hypertensive retinopathy frequently have acute hypertensive nephrosclerosis (formerly called "malignant nephrosclerosis)

Historically, papilledema was the hallmark of a more advanced condition (ie, "malignant hypertension") associated with a higher mortality

EVALUATION AND DIAGNOSIS

The history and physical examination

- Acute head injury or trauma
- Generalized neurologic symptoms, such as agitation, delirium, stupor, seizures, or visual disturbances
- Focal neurologic symptoms that could be due to an ischemic or hemorrhagic stroke
- Fresh flame hemorrhages, exudates (cotton-wool spots), or papilledema when direct funduscopy is performed, as these are consistent with grade III or IV hypertensive retinopathy and can rarely be associated with hypertensive encephalopathy

EVALUATION AND DIAGNOSIS

- Nausea and vomiting, which may be a sign of increased intracranial pressure
- Chest discomfort, which may be due to myocardial ischemia or aortic dissection
- Acute, severe back pain, which might be due to aortic dissection
- Dyspnea, which may be due to pulmonary edema
- Pregnancy, as such patients with severe hypertension could have preeclampsia or develop eclampsia
- Use of drugs that can produce a hyperadrenergic state, such as cocaine, amphetamine(s), phencyclidine, or monoamine oxidase inhibitors, or recent discontinuation of clonidine or other sympatholytic agents

EVALUATION AND DIAGNOSIS

In addition, the following tests should be performed to evaluate the presence of target-organ damage in association with targeted clinical symptoms or signs:

- ECG
- Chest Xray
- Urinalysis

EVALUATION AND DIAGNOSIS

- Serum electrolytes and serum creatinine
- Cardiac biomarkers (if an acute coronary syndrome is suspected)
- Computed tomography (CT) or magnetic resonance imaging (MRI) of the brain – To rule out stroke /encephalopathy
- Contrast-enhanced CT or MRI of the chest or transesophageal echocardiography (if aortic dissection is suspected)

Overall approach

How quickly should the blood pressure be reduced?

- The blood pressure should be reduced over a **period of hours to days**

- Slower reductions may be needed in **older adult** patients at high risk for cerebral or myocardial ischemia resulting from excessively rapid reduction of blood pressure.

- Am Heart J. 2009 Oct;158(4):599-606.e1
- Arch Intern Med. 1989;149(10):2186.
- Ann Intern Med. 1987;107(2):185.

What is the blood pressure target during this time period?

- Rapidly lower the mean arterial pressure by **about 10 to 15 % in the first hour**. Mean arterial pressure **should not be lowered by more than 25 to 30%** over the first two to four hours

- **Short-term** blood pressure target, during the first several hours, may need to be **above 160/100 mmHg**

- **Long-term**, the blood pressure should usually be reduced further **(<140/<90 mmHg or <130/<80 mmHg).**

- Moving patients to a quiet room to rest can lead to a fall in systolic pressure of 10 to 20 mmHg or more.

How should this goal be achieved?

In general,

- the treatment is resumption of antihypertensive therapy (in nonadherent patients)

- initiation of antihypertensive therapy (if patients are treatment naïve)

- or the addition of another antihypertensive drug (in patients who are currently treated)

Parenteral drugs for treatment of hypertensive emergencies in adults*

Drug	Dose range	Onset of action (minutes)	Duration of action (minutes)	Adverse effects¶	Role△
Vasodilators					
Clevidipine	Initially 1 to 2 mg/hour as IV infusion with rapid titration. Most patients respond to 4 to 6 mg/hour and are treated with maximum doses of 16 mg/hour or less. NOTE: Delivered in lipid emulsion. 1000 mL maximum per 24 hours (equivalent to 21 mg/hour) due to lipid load.	2 to 4	5 to 15	Atrial fibrillation, nausea, lipid formulation contains potential allergens (eg, soy, egg)	Hypertensive emergencies including postoperative hypertension.
Enalaprilat	1.25 to 5 mg every six hours IV	15 to 30	approximately 6 to >12 hours	Precipitous fall in pressure in high-renin states; variable response, headache, dizziness	Acute left ventricular failure. Due to slow onset and long duration of effect, rarely used. Avoid use in AMI, renal impairment, or pregnancy.
Fenoldopam	Initially 0.1 mcg/kg per minute◇ as IV infusion titrated to a maximum of 1.6 mcg/kg per minute	5 to 10	30 to 60	Tachycardia, headache, nausea, flushing	Most hypertensive emergencies. Use caution or avoid with glaucoma or increased intracranial pressure.
Hydralazine	10 to 20 mg IV	10 to 20 IV	1 to ≥4 hours IV	Sudden precipitous drop in blood pressure, tachycardia, flushing, headache, vomiting, aggravation of angina	In general, hydralazine should be avoided due to its prolonged and unpredictable hypotensive effect. Labetalol and nicardipine are generally preferred choices for treatment of eclampsia.
	10 to 40 mg IM	20 to 30 IM	4 to 6 hours IM		

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Nicardipine	5 to 15 mg/hour as IV infusion. Some patients may require up to 30 mg/hour.	5 to 15	approximately 1.5 to ≥4 hours	Tachycardia, headache, dizziness, nausea, flushing, local phlebitis, edema	Most hypertensive emergencies, including pregnancy induced. Avoid use in acute heart failure. Caution with coronary ischemia.
Nitroglycerin (glyceryl trinitrate)	5 to 100 mcg/minute as IV infusion	2 to 5	5 to 10	Hypoxemia, tachycardia (reflex sympathetic activation), headache, vomiting, flushing, methemoglobinemia, tolerance with prolonged use	Potential adjunct to other IV antihypertensive therapy in patients with coronary ischemia (ACS) or acute pulmonary edema.
Nitroprusside	0.25 to 10 mcg/kg per minute as IV infusion. To minimize risk of cyanide toxicity, infusion duration should be as short as possible and not exceed 2 mcg/kg per minute. Patients who receive higher doses (ie, >500 mcg/kg at a rate exceeding 2 mcg/kg per minute) should receive sodium thiosulfate infusion to avoid cyanide toxicity.	0.5 to 1	1 to 10	Elevated intracranial pressure, decreased cerebral blood flow, reduced coronary blood flow in CAD, cyanide and thiocyanate toxicity, nausea, vomiting, muscle spasm, flushing, sweating	In general, nitroprusside should be avoided due to its toxicity. Nitroprusside should be avoided in patients with AMI, CAD, CVA, elevated intracranial pressure, renal impairment, or hepatic impairment.

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Adrenergic inhibitors					
Esmolol	250 to 500 mcg/kg loading dose over one minute; then initiate IV infusion at 25 to 50 mcg/kg per minute; titrate incrementally up to maximum of 300 mcg/kg per minute	1 to 2	10 to 30	Nausea, flushing, bronchospasm, first-degree heart block, infusion-site pain; half-life prolonged in setting of anemia	Perioperative hypertension. Avoid use in acute decompensated heart failure.
Labetalol	Initial bolus of 20 mg IV followed by 20 to 80 mg IV bolus every 10 minutes (maximum 300 mg) **or** 0.5 to 2 mg/minute as IV loading infusion following an initial 20 mg IV bolus (maximum 300 mg)	5 to 10	2 to 4 hours	Nausea/vomiting, paresthesias (eg, scalp tingling), bronchospasm, dizziness, nausea, heart block	Most hypertensive emergencies including myocardial ischemia, hypertensive encephalopathy, pregnancy, and postoperative hypertension. Avoid use in acute decompensated heart failure. Use cautiously in obstructive or reactive airway.
Metoprolol	Initially 1.25 to 5 mg IV followed by 2.5 to 15 mg IV every three to six hours	20	5 to 8 hours	Refer to labetalol	Myocardial ischemia, perioperative hypertension. Avoid use in acute decompensated heart failure.
Phentolamine	5 to 15 mg IV bolus every 5 to 15 minutes	1 to 2	10 to 30	Tachycardia, flushing, headache, nausea/vomiting	Alternative option for catecholamine excess (eg, adrenergic crisis secondary to pheochromocytoma or cocaine overdose).

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Acute aortic dissection

- Goal is rapid reduction of the BP to a goal

---approximately 20 minutes of diagnosis

- Maintain heart rate <60/min and systolic blood pressure between 100 and 120 mmHg.

- IV Esmolol (250 to 500 mcg/kg IV loading dose, then infuse at 25 to 50 mcg/kg/minute; titrate to maximum dose of 300 mcg/kg/minute)

- Or IV labetalol (20 mg IV initially, followed by either 20 to 80 mg IV boluses every 10 minutes to a maximal dose of 300 mg, or an infusion of 0.5 to 2 mg/minute IV).

Aortic dissection

- Once heart rate is consistently <60 BPM, and systolic blood pressure remains above 120 mmHg
- Initiate nitroprusside infusion (0.25 to 0.5 mcg/kg/minute titrated to a maximum of 10 mcg/kg/minute)
- or nicardipine infusion (2.5 to 5 mg/hour titrated to a maximum of 15 mg/hour).
- Vasodilator therapy (eg, nitroprusside, nicardipine) should not be used without first controlling heart rate with beta blockade

Severe hypertension in patients with recent vascular surgery

Severe elevations of blood pressure can threaten suture lines and, therefore, such patients are often treated with rapidly acting IV antihypertensive agents in an intensive care unit setting

No studies to specify clear goals of blood pressure targets but similar lines of management as treatment of aortic dissection

Acute ischemic stroke for thrombolysis

Treat BP if >185/110 mm Hg to target BP <185/110 mm Hg

- IV Labetalol 10 to 20 mg intravenously over 1 to 2 minutes, may repeat one time; or
- IV Nicardipine 5 mg/hour intravenously, titrate up by 2.5 mg/hour every 5 to 15 minutes, maximum 15 mg/hour; when desired blood pressure reached
- IV Clevidipine 1 to 2 mg/hour intravenously, titrate by doubling the dose every 2 to 5 minutes, maximum 21 mg/hour, until desired blood pressure reached

Management to maintain blood pressure at or below 180/105 mmHg during and after acute reperfusion therapy*

Hypertensive bleed in the brain

- 2012 American Stroke Association guidelines suggest that a decrease in systolic blood pressure to <160mm Hg is reasonable

- When blood pressure control is necessary, the use of vasodilators such as **nitroprusside or nitroglycerin should be avoided** because of their propensity to increase cerebral blood volume and therefore intracranial pressure.

- IV Labetalol, IV nicardipine – dose as mentioned

- IV enalaprilat dose 1.25 mg to 5 mg 6 hourly

Acute coronary syndrome with severe hypertension

Severe hypertension associated with an acute coronary syndrome

Intravenous nitroglycerin is useful in patients with persistent chest pain after three sublingual nitroglycerin tablets

Dose - 5 mcg/minute, increase by 5 mcg/minute every 3 to 5 minutes to 20 mcg/minute. If no response at 20 mcg/minute, may increase by 10 to 20 mcg/minute every 3 to 5 minutes (generally accepted maximum dose: 400 mcg/minute)

Conditions and recommended intravenous anti-hypertensive

Condition	Choice of intravenous antihypertensive
Aortic dissection	IV Labetalol/Esmolol If HR<60/min and BP >120 mm Hg- IV Nitroprusside or IV Nicardipine
Severe hypertension with recent vascular surgery	IV Labetalol/Esmolol
Acute ishaemic stroke with thrombolysis	IV Labetalol/IV Nicardipine/IV Clevadipine
Acute haemorrhagic stroke	IV Labetalol/IV Nicardipine/IV Enalprilat
Acute coronary syndrome with severe hypertension	IV Nitroglycerine

Question 1

30 years old gentleman, presented to emergency for hypertensive urgency with severe chest pain.

He was diagnosed to have aortic dissection. Which is the first line of treatment for this patient ?

- Intravenous Nitroglycerine
- Intravenous Labetelol
- Intravenous Nitroprusside
- Intravenous Phentolamine
- Oral Captopril

Intravenous Labetelol

Question 2

What should be his target blood pressure and within how much time this should be achieved:

- Lower BP to 100-120 mm Hg within 20 minutes
- Lower BP to 120-140 mm Hg within 40 minutes
- Lower BP to 140-160 mm Hg within 20 minutes
- Lower BP to 140-160 mm Hg within 40 minutes

Lower BP to 100-120 mm Hg within 20 minutes

Question 3

45 years old gentleman, known case of hypertension presented with sudden loss of consciousness.

O/E- BP 200/120 mm Hg, patient was drowsy.

CT brain showed evidence of cerebellar bleed.

Which is the ideal choice of anti-hypertensive ?

- IV nitroprusside
- IV Nitroglycerine
- IV Nicardipine
- IV Phentolamine
- Oral captopril

IV Nicardipine

Question 4

In the same patient : what target of systolic BP should be achieved

- <140 mm Hg
- <160 mm Hg
- <180 mm Hg
- <200 mm Hg
- None of the above

<160 mm Hg

Summarise

- Challenges in managing case of hypertensive crisis
- How quickly to lower blood pressure in hypertensive crisis
- Work up for patients with hypertensive crisis
- Management of hypertensive crisis in different condtions and intravenous strategies

THANK YOU FOR YOUR ATTENTION