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Hypertensive Crisis

- **Definitions**
- **Epidemiology**
- **Pathophysiology**
- **Assessment**
- **Diagnosis**
- **Management**
- **Key Points**

Background Definitions:

Hypertensive crises refer to clinical situations in which the blood pressure is elevated and there is either acute(hypertensive emergencies)or impending end-organ damage hypertensive urgencie.Examples of impending end-organ damage include papilledema , shortness of breath, and pedal edema.Historically ,hypertensive urgencies have been defined as diastolic blood pressures 120 mm Hg. It is important to remember ,however ,that the absolute blood pressure is not as critical as the degree and rate of increase from baseline blood pressure.

Epidemiology

Although approximately 60 million Americans have hypertension ,only 1% develop hypertensive crises.The typical patient who presents with a hypertensive crisis is 40-50 years of age, male ,noncompliant with hypertensive therapy ,lacks primary care ,and uses illicit substances and/or alcohol. Any disorder that causes hypertension can give rise to a hypertensive crisis, but the most common cause is poorly controlled essential hypertension. Other etiologies include medications and antihypertensive withdrawal syndromes ,*illicit drugs, renal and pregnancy-related diseases,vasculitis ,postoperative hypertension , coarctation of the aorta, burns, and pheochromocytoma.

PATHOPHYSIOLOGY :

The pathophysiology of hypertensive crises is not. completely understood. With mild-to- moderate elevations in blood pressure, arterial and arteriola vasoconstriction initially maintains tissue perfusion while preventing increased pressure from being transmitted to more distal vessels . With severe elevations in blood pressure(i.e < 180 /110 mm Hg,) this autoregulation fails, and increased pressure in capillaries leads to endothelial damage of the vascular wall ,causing fibrinoid necrosis and perivascular edema. Fibrinoid necrosis obliterates the vascular lumen, resulting in organ damage.

History

A brief and focused history should address the presence of end organ damage ,the circumstances surrounding the hypertension ,and any identifiable etiology(Box 1-32 .One should address the duration as well as the severity of hypertension, all current medications including prescription and nonprescription drugs such as: Use of recreational drugs, and compliance with current antihypertensive therapy .A history of medical problems, specifically cardiovascular and renal disease, and date of last menstrual period in women is essential .Finally ,the presence and duration of current symptoms ,if any ,are important. Although common symptoms of hypertensive crises include headache ,blurry vision ,and chest pain ,the presence of any of these does not indicate a hypertensive crisis and can be seen with uncontrolled hypertension alone .In addition to asking about these common symptoms ,one should ask about other symptoms as dyspnea, back pain

Box 32-1 Targeted Historical Questions in Hypertensive Crises

- Presence of neurologic or cardiovascular symptoms
- Blurry vision
- Sensory paresthesias, motor weakness
- Confusion
- Somnolence
- Chest pain
- Dyspnea
- History of hypertension and antihypertensive therapies
- History of illicit drug use
- Any past medical history
- History of noncompliance
- Over-the-counter medication use
- Last menstrual period in women

PHYSICAL EXAMINATION:

The physical examination should focus on the presence of endorgan damage and help with identifying secondary causes of hypertension(Box 2- 32 It should begin with an assessment of blood pressure ,with an appropriate-size cuff in both upper extremities and in a lower extremity .It is critical to measure blood pressure accurately ,it is common to see recordings of falsely elevated blood pressures from using the wrong technique(i.e ,.inappropriate small size cuff artificially elevating blood pressure ,cuff over clothing, etc , It is helpful to use an organ system—based approach to identify signs of end-organ damage .The examination can aid in determining the degree of involvement of affected organs and provide clues to possible causes of secondary forms of hypertension .A careful cardiovascular , neurologic ,and funduscopic.

Box 32-2 Focused Physical Examination in Hypertensive Crises

- CNS
  - Focal neurologic findings
  - Seizures
  - Altered mental status
  - Papilledema, hemorrhages, exudates
- Cardiovascular
  - Evidence of congestive heart failure
    - Pulmonary edema
    - Extra heart sounds
    - Jugular venous distension
    - Peripheral edema
  - Equal and symmetric blood pressure and pulses bilaterally
  - Abdominal masses and bruits

Laboratory and Other Studies:

Initial studies should be limited and focused on assessing the presence of acute end- organ damage) 3-32). They should be performed in an expedited manner.

Laboratory studies should include a chemistry panel consisting of electrolytes and creatinine, a urinalysis with microscopic examination of sediment ,and a complete blood count with a peripheral smear .Additional laboratory studies including a toxicology screen and pregnancy test may be considered when appropriate.

An electrocardiogram should be performed to assess for **evidence of ischemia or infarction.** Further studies, including chest and brain imaging(chest x-ray ,head or chest CT ,)should be reserved for those in which the clinical examination suggests acute end - organ damage(i.e ,.asymmetric blood pressure and pulses, focal neurologic signs ,coma.)

Box 32-3 Initial Laboratory and Other Tests in Hypertensive Crises

- Chemistry panel with electrolytes and creatinine
- Urinalysis with microscopy
- Complete blood count with peripheral smear
- Electrocardiogram
- Chest radiography when indicated
- Head imaging when indicated
- Pregnancy test when indicated
- Toxicology screen when indicated

DIAGNOSIS

Hypertensive Emergency:

The diagnosis of hypertensive emergency is made when a patient presents with elevated blood pressure and acute end-organ Damage. Although commonly the diastolic blood pressure is› 12 mm Hg ,the degree of blood pressure elevation is not uniformly above a certain level ,nor should it be defined by it .It is more important to establish the presence of acute end-organ damage in the setting of elevated blood pressure. In determining the acuity of organ damage ,it becomes important to know historical data on patients before arriving at the diagnosis of hypertensive emergency .For example ,if a patient presents with a diastolic blood pressure of 14 mm Hg and a creatinine of 0.3mg/dL, but 6 months ago had a creatinine of 2.8 mg/dL ,this finding alone is not a hypertensive emergency ,but could rather be considered indicative of a hypertensive urgency or uncontrolled severe hypertension.

Hypertensive Urgency:

The diagnosis of hypertensive urgency is somewhat controversial. Although some use the diastolic blood pressure of120 mm Hg ,it is important to make the diagnosis of hypertensive urgency on a case-by-case basis. Many patients with a diastolic blood pressure of 120 mm Hg or greater do not have an urgent need to lower blood pressure. A large number of patients with severe hypertension do not have impending target organ damage ;rather ,they have chronic severe uncontrolled hypertension, and they should be classified as such. Making the diagnosis of hypertensive urgency is not as critical as hypertensive emergency ,because the management is not that different from chronic severe uncontrolled hypertension.

MANAGEMENT

The treatment of hypertensive crises must balance preventing further end-organ damage while maintaining tissue perfusion. **The initial goal for blood pressure reduction is not to obtain a normal blood pressure.** Rapid and aggressive reductions in blood pressure can actually induce cerebral ,myocardial ,or renal ischemia or infarction if the blood pressure falls below the range at which tissue perfusion can be maintained by autoregulation. Two questions that should be considered in all patients with hypertensive crises are **at what rate** and **to what extent** should the blood pressure be lowered. The answers depend on whether it is a hypertensive emergency or urgency.

HYPERTENSIVE EMERGENCIES

Hypertensive emergencies **require immediate lowering** of blood pressure .**All patients should be admitted to an ICU where** continuous arterial blood pressure monitoring can take place .**Intravenous medications should be used so** that predictable and controlled changes in blood pressure occur .**The initial reduction in mean arterial pressure should not exceed 20—25% below the pretreatment blood pressure**. **A more gradual decrease in blood pressure should be sought over the next 24 hours** .Excessively rapid reductions in blood pressure are dangerous and should be avoided. **As the signs and symptoms of acute end-organ damage are controlled** , **parenteral therapy can be gradually weaned ,while initiating oral medications** .

Typically ,the initial doses of oral medications should be given before the parenteral therapy is stopped.

Patients who present with an ischemic stroke and marked hypertension represent a notable exception to immediate lowering of blood pressure in a hypertensive emergency .Reductions in blood pressure may adversely affect cerebral autoregulation , causing an expansion of an otherwise small ischemic area .There is no clear evidence to support the use of antihypertensive treatment during an acute stroke in the absence of other concurrent acute end-organ damage. Usually ,hypertension associated with an acute stroke will spontaneously return to prestroke levels within several days. **Thus , these patients should be allowed to remain hypertensive during the Initial 48 – 72 hours after admission to optimize cerebral perfusion.**

antihypertensive drugs

Table 32-1 Commonly Used Antihypertensive Drugs in Hypertensive Emergencies

Medication	Initial Dose	Maximum Dose
Nitroprusside	0.25–0.5 mcg/kg/min	8–10 mcg/kg/min
Nitroglycerin	5 mcg/min	100 mcg/min
Esmolol	Bolus: 500 mcg/kg, that can be repeated after 5 min Infusion: 50–100 mcg/kg/min	300 mcg/kg/min
Labetalol	Bolus: 20 mg bolus, followed by 20–80 mg every 10 min Infusion: 0.5–2mg/min	300 mg
Enalaprilat	1.25 mg every 6 hr	
Fenoldopam	0.1 mcg/kg/min titrated every 15 min	
Hydralazine	10 mg every 20–30 min	20 mg
Nicardipine	5 mg/hr	15 mg/hr
Phentolamine	5–10 mg every 5–15 min	

Nitroprusside

Nitroprusside is an arteriolar and venous dilator that has an immediate onset (seconds) and disappears within minutes .It is generally safe and very effective ,working in a predictable manner. While nitroprusside has been the gold standard for many hypertensive emergencies ,there are limitations to its use ,including the need for constant monitoring ,hypotension ,and cyanide toxicity. This toxic risk is increased in patients with underlying renal insufficiency and with use for more than 24—48 hours. There is a potential risk in cases of cardiac ischemia that nitroprusside causes" coronary steal ",shunting blood away from ischemic areas .Thus ,nitroprusside should be avoided if possible in patients with cardiac ischemia. Nitroprusside should also be avoided in pregnant women ,because it is teratogenic

Nitroglycerin

Nitroglycerin is predominately a venodilator yielding arteriolar dilation with increased doses .It also has a quick onset ,with effects lasting only minutes .Nitroglycerin is perhaps most effective in those patients with acute coronary syndromes and in those

with hypertension following coronary bypass surgery .The main side effects of nitroglycerin include headache ,tachycardia, and tachyphylaxis—increasing dosages will be necessary over time to sustain the same effect.

Esmolol

Esmolol is a cardioselective beta-blocker with a short half-life(9 minutes) and a relatively short duration of action(30 minutes.)

It has almost immediate onset of action, decreasing heart rate in addition to blood pressure .The main potential side effects are hypotension and bronchospasm.

Labetalol

Labetalol is an alpha -and beta-adrenergic blocker with a rapid

onset(5 minutes .)It does not directly affect cerebral blood flow .The main side effects of labetalol include hypotension ,heart block, and bronchospasm.

Enalaprilat

Enalaprilat is an intravenous form of enalapril .Although it has few side effects ,the response to enalaprilat is unpredictable .Enalaprilat should be used with caution in patients who are hypovolemic and should be avoided in pregnant women.

Fenoldopam

Fenoldopam is a peripheral dopamine-1 receptor agonist .It causes peripheral vasodilatation while maintaining or increasing renal perfusion .It is most effective during the first 48 hours of treatment .It can be used safely in all

hypertensive emergencies and may be most beneficial in patients with renal insufficiency .Fenoldopam is contraindicated in patients with glaucoma.

Hydralazine

Hydralazine is an arterial vasodilator that causes unpredictable hypotension and reflex tachycardia .It has prolonged effects and should be primarily limited to pregnant women ,because it increases uterine blood flow.

Nicardipine

Nicardipine is a dihydropyridine calcium channel blocker that is

as effective as nitroprusside in lowering blood pressure .It may potentially have favorable effects in patients with cardiac and cerebral ischemia by relaxing coronary smooth muscle and increasing vasodilatation,respectively.

Phentolamine

Phentolamine is an alpha-adrenergic blocker that should be restricted to hypertensive emergencies induced by catecholamine excess(i.e ,.pheochromocytoma, tyramine ingestion in a patient on monoamine oxidase inhibitors .)Phentolamine can cause angina and arrhythmias.

Treatment of Specific Hypertensive Emergencies

Aortic Dissection

Optimal drugs to treat a dissection are those that decrease not only mean arterial blood pressure, but also the rate at which blood pressure increases. This is usually achieved by the combination of nitroprusside and an intravenous beta-blocker such as esmolol or labetalol .Nitroprusside should not be given alone.

Acute Coronary Syndromes

Cardiac ischemia or infarction commonly increases the systemic blood pressure . Intravenous parenteral vasodilators, such as nitroglycerin, are effective. Beta-blockers are also beneficial in hypertensive patients with acute coronary syndromes .One should be careful in using nitroglycerin and beta-blockers in those patients with posterior wall or right ventricle ischemia(e.g ,.inferior myocardial infarction ,)as these patients are preload and volume dependent .Drugs that increase cardiac work(hydralazine)should be avoided.

Acute Pulmonary Edema

Patients with acute pulmonary edema and hypertension should be treated with vasodilators (nitroprusside or nitroglycerin) and loop diuretics .Enalaprilat is an alternative treatment .Betablockers should be used with caution ,if at all.

AcuteRenal Failure

In patients with hypertension and acute renal failure, choices of therapy include fenoldopam, nicardipine, and beta-blockers .The use of nitroprusside should be limited to a brief period(i.e 24< ,.hours), because its toxic metabolite ,thiocyanate ,can accumulate.

IschemicStroke

Most patients presenting with this scenario have increased blood pressure that gradually returns toward baseline after the event .Therapy should be individualized and generally initiated only if other acute end-organ damage is present.

Intracerebral Hemorrhage

Since hypertension after intracerebral hemorrhage may be self -limiting ,delayed hypotension can occur with oral antihypertensive medications .Therefore ,if parenteral medications are used to lower pressure initially ,oral antihypertensives should be avoided until baseline blood pressure is determined posthemorrhage .Theoretically beta- blockers ,nicardipine, labetalol, and enalaprilat are ideal choices since they have little effect on intracranial pressure .Nitroprusside and nitroglycerin should be avoided, because they cause cerebral venodilation.

Pregnancy

In pregnant women with severe hypertension) preeclampsia ,eclampsia (, intravenous hydralazine is the treatment of choice because it increases uterine blood flow. Beta- blockers and nicardipine can also be used if hydralazine is contraindicated or if the blood pressure response is not optimal.

HYPERTENSIVE URGENCIES

There is no proven benefit ,however ,from a rapid reduction in asymptomatic patients who have no evidence of acute target end-organ damage .In fact ,a deleterious effect on cerebral, cardiac, and/or renal perfusion can occur with uncontrolled and unpredictable large blood pressure reductions. How quickly hypertensive urgencies need to be treated is debatable .Individualized decisions need to be made with each patient ,taking into consideration the patient's history ,degree of compliance, symptoms, and likelihood of target end-organ damage. Since most patients who present with hypertensive urgencies are those who have long-standing uncontrolled severe hypertension ,making adjustments to their antihypertensive regimen, or reinitiating therapy in a noncompliant patient, is usually all that is required. If the decision has been made to acutely decrease blood pressure, the initial goal should be **to reduce the blood pressure to a target of 160 \110 mm Hg over several hours to days with conventional oral therapy.** Most patients will require at least two antihypertensive medications. It is important to remember that the benefit seen with many oral medications will not be reflected in blood

pressures measured hours to days after beginning a new agent ;it will likely require 1 to 2 weeks. In general ,there is no need to hospitalize patients with hypertensive urgencies . Ongoing outpatient management of blood pressure is necessary ,however ,to gradually return blood pressure to a normal and safe level and to decrease complications.

DISCHARGE/FOLLOW-UP PLANS

A normal blood pressure should not be the discharge goal of patients admitted with hypertensive emergencies. Aiming for a diastolic blood pressure of 100 - 110 at discharge may be reasonable. Patient education is critical in helping to prevent future hypertensive crises and in managing blood pressure in general. Stressing compliance with diet ,weight reduction if necessary ,avoidance of illicit drugs and other substances (i.e ,.sympathomimetics ,)and adherence to antihypertensive therapy is important. Scheduling a 2-week follow up with a primary care physician should be coordinated at the time of discharge. Patients should be instructed to call their doctor or return to seek medical attention if any acute symptoms return or appear.

Key Points

The absolute blood pressure is not as critical as the degree and rate of increase from baseline blood pressure in determining what is or is not a hypertensive urgency.

Many patients with a diastolic blood pressure of 120 mm Hg or greater do not have an urgent need to lower blood pressure. A large number of patients with severe hypertension do not have impending target organ damage ;rather ,they have chronic severe uncontrolled hypertension, and they should be classified as such. The initial goal for blood pressure reduction is not to obtain a normal blood pressure; rapid and aggressive reductions in blood pressure can actually induce cerebral ,myocardial ,or renal ischemia or infarction.

Patients with hypertensive emergencies require ICU admission and immediate and predictable lowering of blood pressure with IV medications ,but the initial reduction in mean arterial pressure should not exceed 20-25 %below the pretreatment blood pressure. The choice of parenteral antihypertensive drugs varies with the clinical setting and also with the experience of the hospital and physician. There is no proven benefit from rapid reduction of blood pressure in patients with an acute ischemic stroke, and this may worsen outcomes. A normal blood pressure should not be the discharge goal of patients admitted with hypertensive emergencies. Aiming for a diastolic blood pressure of 100 - 110 at discharge is reasonable.