Treatment of specific hypertensive emergencies

Malignant hypertension and hypertensive encephalopathy: A modest reduction of the BP, by no more than 25 percent of the initial value within the first 24 hours, with a parenteral vasodilator (eg, nitroprusside) or labetalol is the initial strategy for management.

Ischemic stroke or subarachnoid or intracerebral hemorrhage. The benefit of reducing the BP in these disorders must be weighed against possible worsening of cerebral ischemia induced by the thrombotic lesion or by cerebral vasospasm. These cerebrovascular events are characterized by the abrupt onset of usually focal neurologic findings. This is in contrast to the typically insidious onset of headache, nausea, vomiting, and confusion seen in hypertensive encephalopathy, a disorder in which rapid lowering of the BP generally leads to resolution of the symptoms within 24 to 48 hours.

Angina pectoris or acute myocardial infarction: Beta adrenergic blockers should be administered to all patients without contraindications. Intravenous parenteral vasodilators, principally nitroprusside and nitroglycerin, are effective and may reduce mortality in patients with acute myocardial infarction, with or without hypertension. Drugs that increase cardiac work (hydralazine) are contraindicated.

Aortic dissection: An intravenous beta adrenergic blocker should be given to reduce the heart rate below 60 beats/min and maintain the systolic blood pressure between 100 to 120 mmHg or the lowest level that is tolerated. Nitroprusside can be added to further control blood pressure but should not be given without first controlling the heart rate with beta blockade.

Withdrawal of antihypertensive therapy: Abrupt discontinuation of a short-acting sympathetic blocker (such as clonidine or propranolol) can lead to severe hypertension and coronary ischemia due to upregulation of sympathetic receptors. Control of the BP can be achieved in this setting by readministration of the discontinued drug and, if necessary, phentolamine, nitroprusside, or labetalol.

Acute increase in sympathetic activity: In addition to drug withdrawal, increased adrenergic activity can lead to severe hypertension in a variety of other clinical settings. These include: (1) pheochromocytoma; (2) autonomic dysfunction, as in the Guillain-Barré syndrome or post-spinal cord injury; and (3) the use of sympathomimetic drugs, such as phenylpropanolamine, cocaine, amphetamines, phencyclidine, or the combination of an MAO (monoamine oxidase) inhibitor and the ingestion of tyramine-containing foods (such as most fermented cheeses, smoked or aged meats, Chianti, champagne, and avocados). The rise in BP seen in the last setting is due to an MAO inhibitor-induced decline in intestinal tyramine metabolism, followed by increased tyramine absorption and a subsequent tyramine-induced release of endogenous catecholamines. Control of the hypertension in these disorders can be achieved with phentolamine or nitroprusside. Administration of a beta blocker alone is contraindicated, since inhibition of beta-receptor-induced vasodilation results in unopposed alpha-adrenergic vasoconstriction and a further rise in BP.

Pregnancy: Intravenous labetalol and hydralazine have been widely used in pregnant women with severe hypertension, which is usually due to preeclampsia or exacerbation of preexistent hypertension.

References

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Table 1. Parenteral drugs for treatment of hypertensive emergencies in adults

Drug	Dose range	Onset of action (minutes), Duration of action (minutes)	Adverse effects	Role*
Clevidipine	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 restriction.	2 to 4, 5 to 15	Atrial fibrillation, nausea, lipid formulation contains potential allergens (eg, soy, egg)	Hypertensive emergencies including postoperative hypertension.
Fenoldopam	0.1 microgram/kg per minute as IV infusion titrated to a maximum of 1.6 microgram/kg per minute.	5 to 10 30 to 60	Tachycardia, headache, nausea, flushing	Most hypertensive emergencies, including aortic dissection. Use caution or avoid with glaucoma or intracranial hypertension.
Enalaprilat	1.25 to 5 mg every 6 hours IV.	15 to 30 ~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.
Hydralazine	10 to 20 mg IV 10 to 40 mg IM	10 to 20 IV 1 to ≥4 hours IV 20 to 30 IM 4 to 6 hours IM	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.
Nicardipine	5 to 15 mg/hour as IV infusion. Some patients may require up to 30 mg per hour.	5 to 15 ~1.5 to ≥4 hours	Tachycardia, headache, dizziness, nausea, flushing, local phlebitis, edema	Most hypertensive emergencies, including aortic dissection and pregnancy-induced. Avoid use in acute heart failure. Caution with coronary ischemia.
Nitroglycerin (glyceryl trinitrate)	5 to 100 micrograms/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 micrograms/kg per minute as IV infusion. To minimize risk of cyanide toxicity infusion duration should be as short as possible and not exceed 2 micrograms/kg per minute. Patients who receive higher doses (ie, >500 microgram/kg at a rate exceeding 2 microgram/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. If other appropriate agents (eg, nicardipine, fenoldopam) are unavailable, can be used for treating aortic dissection after control of heart rate with beta-blockade. Nitroprusside should be avoided in patients with AMI, CAD, CVA or elevated intracranial pressure, renal or hepatic impairment.
Adrenergic inhibitors				
Esmolol	250 to 500 microgram/kg loading dose over 1 minute; then initiate IV infusion at 25 to 50 microgram/kg per minute; titrate incrementally up to maximum of 300 microgram/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	Aortic dissection, 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 infusion following an initial 20 mg IV bolus (maximum 300 mg per 24 hours).	5 to 10 2 to 4 hours	Nausea/vomiting, paresthesias (eg, scalp tingling), bronchospasm, dizziness, nausea, heart block	Most hypertensive emergencies including myocardial ischemia, aortic dissection, 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 3 to 6 hours.	20 5 to 8 hours	Refer to labetalol	Aortic dissection, 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).