

HYPERTENSIVE EMERGENCY- A CARDIOVASCULAR CRISIS

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Abstract: Hypertension is a common problem throughout the world and the number of complications arising from uncontrolled hypertension is a matter of concern for physicians globally. Around 85 million people in the United States have high blood pressure. Blood pressure is the force exerted by the blood against the walls of the blood vessels. The recent guidelines changed the cut off of hypertension from 140/90 to 130/80. Lifestyle factors are the best way to address high blood pressure. Hypertensive emergencies encompass a spectrum of clinical presentations in which uncontrolled blood pressures (BPs) lead to progressive or impending end-organ dysfunction. There are two types of hypertension- primary or essential hypertension and secondary hypertension. Some other types are- Malignant hypertension, Pseudohypertension, Pulmonary hypertension, Isolated systolic hypertension and, White coat hypertension. Various risk factors include- Age, Sex, Family history, Personal history, etc. The hypertensive emergency can lead to a lot of complications like Stroke, Heart failure, Dementia, and End organ damage. The evaluation of a hypertensive crisis initially includes a detailed medical history and physical examination. Treatment goals for hypertensive crises depend on classification (e.g., emergency vs. urgency) and presenting condition.

Keywords: Hypertensive Emergency, Pulmonary hypertension, hypertensive crises, high blood pressure.

1. INTRODUCTION

Hypertension is another name for high blood pressure. Blood pressure is the force exerted by the blood against the walls of the blood vessels. The pressure depends on the work being done by the heart and the resistance of the blood vessels. The more blood your heart pumps and the narrower your arteries, the higher your blood pressure. Hypertension and heart disease are global health concerns [1].

The recently released guideline from the American College of Cardiology (ACC) and American Heart Association (AHA) on the prevention, detection, evaluation, and management of high blood pressure (BP) in adults lowers this cut off from 140/90 to 130/80 mm Hg [4].

BP is a dynamic—not static—measurement, and varies based on when, where, and how it is measured. The new ACC/AHA guideline appropriately addresses BP measurement. Properly obtained measurements have been the standard in clinical trials, but require about 10 minutes and are not routinely obtained in the office setting [4].

High blood pressure is a common condition in which the long-term force of the blood against your artery walls is high enough that it may eventually cause health problems, such as heart disease. You can have high blood pressure (hypertension) for years without any symptoms. Even without symptoms, damage to blood vessels and your heart continues and can be detected. Uncontrolled high blood pressure increases your risk of serious health problems, including heart attack and stroke. [2].

Hypertensive emergencies encompass a spectrum of clinical presentations in which uncontrolled blood pressures (BPs) lead to progressive or impending end-organ dysfunction. In these conditions, the BP should be lowered aggressively over minutes to hours [3].

Some key points about hypertension:

- Normal blood pressure is 120 over 80 mm of mercury (mmHg), but hypertension is higher than 130 over 80 mmHg.
- Around 85 million people in the United States have high blood pressure.
- Acute causes of high blood pressure include stress, but it can happen on its own, or it can result from an underlying condition, such as kidney disease.
- Unmanaged hypertension can lead to a heart attack, stroke, and other problems.
- Lifestyle factors are the best way to address high blood pressure [1].

Key Elements of Office Blood Pressure Assessment:

- Instruct the patient to avoid caffeine and smoking for at least 30 minutes before the visit.
- Have the patient relax, sitting in a chair (feet on the floor with back supported) for at least five minutes.
- Ensure that the patient has emptied his/her bladder.
- Refrain from talking during the rest period and measurement.
- Remove all clothing covering the area where the cuff will be placed.
- Use the correct cuff size.
- Support the patient's arm.
- Position the middle of the cuff on the patient's upper arm at the level of the right atrium (the midpoint of the sternum).
- Separate repeated measurements by one to two minutes.
- Take the average of at least two measurements [4].

Causes:

There are two types of high blood pressure.

Primary (essential) hypertension:

For most adults, there's no identifiable cause of high blood pressure. This type of high blood pressure, called primary (essential) hypertension, tends to develop gradually over many years.

Secondary hypertension:

Some people have high blood pressure caused by an underlying condition. This type of high blood pressure, called secondary hypertension, tends to appear suddenly and cause higher blood pressure than does primary hypertension. Various conditions and medications can lead to secondary hypertension, including:

- Obstructive sleep apnea
- Kidney problems
- Adrenal gland tumors
- Thyroid problems
- Certain defects you're born with (congenital) in blood vessels
- Certain medications, such as birth control pills, cold remedies, decongestants, over-the-counter pain relievers, and some prescription drugs
- Illegal drugs, such as cocaine and amphetamines [5].

Malignant Hypertension:

High blood pressure is usually called the "Silent Killer". It is called this because it does not always have obvious signs or symptoms. Unlike moderate high blood pressure, malignant hypertension has very noticeable symptoms such as:

- Changes in vision including blurry vision.
- Chest Pain.
- Anxiety.
- Nausea or vomiting.
- Numbness or weakness in the arms or legs.
- Shortness of breath.
- Headaches.
- Reduced urine output.

Resistant Hypertension:

Simply put, it means your high blood pressure is hard to treat and may also have an underlying secondary cause.

Resistant hypertension may have one or more underlying medical conditions. In addition to treating resistant hypertension with medications, doctors usually investigate secondary cause such as:

- Abnormalities in the hormones that balance and control blood pressure.
- The accumulation of artery-clogging plaque in blood vessels that nourish kidneys, a condition known as renal artery stenosis.
- Sleep issues such as a breath-holding type of snoring known as obstructive sleep apnea.
- Obesity or a heavy intake of alcohol or other substances that interfere with blood pressure.

Pulmonary Hypertension:

Some forms of pulmonary hypertension are serious conditions that progressively become worse and are sometimes fatal. Although some forms of pulmonary hypertension are not curable, treatment can help lessen symptoms and improve the quality of life.

There are several types of pulmonary hypertension and the treatment plan depends on the type. Symptoms can include but are not limited to:

- Shortness of breath during routine activity, such as climbing two flights of stairs.
- Fatigue.
- Chest pain.
- A racing heartbeat.
- Pain in the upper right quadrant of the abdomen near the liver.
- Decreased appetite.

Pseudo-Hypertension:

This type of blood pressure usually appears in senior citizens. Non-compressibility, and Osler's sign of pseudohypertension is a falsely elevated blood pressure reading obtained by the blood pressure machine. This is due to calcification of the blood vessels which cannot be compressed.

White coat hypertension:

This is a fairly common phenomenon whereby blood pressure is only elevated when a patient is in the doctor's surgery. People with white coat syndrome have normal readings at home, and only have high readings when their BP is taken by a doctor.

Isolated systolic hypertension:

It's not uncommon for patients to have either a systolic number that's elevated while the diastolic number remains normal.

It's less common to have an elevated diastolic number. This condition is known as isolated systolic hypertension, usually affects older people and tends to result from a clear and defined condition somewhere else in the body.

As a general rule of thumb, the systolic reading tends to be very high in these cases, often close to 200. If it isn't then general high blood pressure is usually diagnosed. This type of blood pressure needs urgent treatment too since recent research carried out at The Heart Disease Prevention Program, University of California uncovered evidence to suggest that the higher the systolic pressure the greater the risk of death from heart disease [6].

Risk factors:

High blood pressure has many risk factors, including:

- **Age.** The risk of high blood pressure increases as you age. Until about age 64, high blood pressure is more common in men. Women are more likely to develop high blood pressure after age 65.
- **Race.** High blood pressure is particularly common among people of African heritage, often developing at an earlier age than it does in whites. Serious complications, such as stroke, heart attack, and kidney failure, also are more common in people of African heritage.
- **Family history.** High blood pressure tends to run in families.
- **Being overweight or obese.** The more you weigh the more blood you need to supply oxygen and nutrients to your tissues. As the volume of blood circulated through your blood vessels increases, so does the pressure on your artery walls.
- **Not being physically active.** People who are inactive tend to have higher heart rates. The higher your heart rate, the harder your heart must work with each contraction and the stronger the force on your arteries. Lack of physical activity also increases the risk of being overweight.
- **Using tobacco.** Not only does smoking or chewing tobacco immediately raise your blood pressure temporarily, but the chemicals in tobacco can damage the lining of your artery walls. This can cause your arteries to narrow and increase your risk of heart disease. Second-hand smoke also can increase your heart disease risk.
- **Too much salt (sodium) in your diet.** Too much sodium in your diet can cause your body to retain fluid, which increases blood pressure.
- **Too little potassium in your diet.** Potassium helps balance the amount of sodium in your cells. If you don't get enough potassium in your diet or retain enough potassium, you may accumulate too much sodium in your blood.
- **Drinking too much alcohol.** Over time, heavy drinking can damage your heart. Having more than one drink a day for women and more than two drinks a day for men may affect your blood pressure.

If you drink alcohol, do so in moderation. For healthy adults, that means up to one drink a day for women and two drinks a day for men. One drink equals 12 ounces of beer, 5 ounces of wine or 1.5 ounces of 80-proof liquor.

- **Stress.** High levels of stress can lead to a temporary increase in blood pressure. If you try to relax by eating more, using tobacco or drinking alcohol, you may only increase problems with high blood pressure.
- **Certain chronic conditions.** Certain chronic conditions also may increase your risk of high blood pressure, such as kidney disease, diabetes and sleep apnea.

Sometimes pregnancy contributes to high blood pressure, as well [5].

Pathophysiology of uncontrolled hypertension

The factors that cause the acute severe increase in BP in subjects with hypertensive crises are partially understood.

Complications:

The excessive pressure on your artery walls caused by high blood pressure can damage your blood vessels, as well as organs in your body. The higher your blood pressure and the longer it goes uncontrolled, the greater the damage.

Uncontrolled high blood pressure can lead to complications including:

- **Heart attack or stroke.** High blood pressure can cause hardening and thickening of the arteries (atherosclerosis), which can lead to a heart attack, stroke or other complications.
- **Aneurysm.** Increased blood pressure can cause your blood vessels to weaken and bulge, forming an aneurysm. If an aneurysm ruptures, it can be life-threatening.

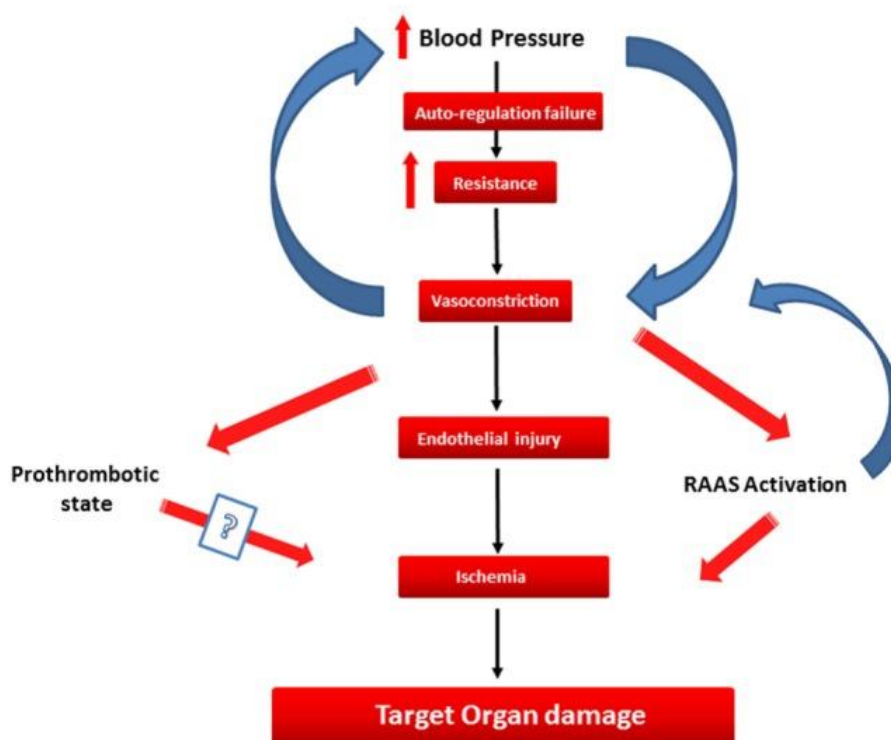
- **Heart failure.** To pump blood against the higher pressure in your vessels, the heart has to work harder. This causes the walls of the heart's pumping chamber to thicken (left ventricular hypertrophy). Eventually, the thickened muscle may have a hard time pumping enough blood to meet your body's needs, which can lead to heart failure.
- **Weakened and narrowed blood vessels in your kidneys.** This can prevent these organs from functioning normally.
- **Thickened, narrowed or torn blood vessels in the eyes.** This can result in vision loss.
- **Metabolic syndrome.** This syndrome is a cluster of disorders of your body's metabolism, including increased waist circumference; high triglycerides; low high-density lipoprotein (HDL) cholesterol, the "good" cholesterol; high blood pressure and high insulin levels. These conditions make you more likely to develop diabetes, heart disease, and stroke.
- **The trouble with memory or understanding.** Uncontrolled high blood pressure may also affect your ability to think, remember and learn. The trouble with memory or understanding concepts is more common in people with high blood pressure.

Dementia. Narrowed or blocked arteries can limit blood flow to the brain, leading to a certain type of dementia (vascular dementia). A stroke that interrupts blood flow to the brain also can cause vascular dementia. Prolonged and uncontrolled hypertension leads to cerebrovascular insult, accumulation of plaques and tangles and predisposing the person to Alzheimer's disease in long run [7].

Despite the high prevalence of hypertension (HTN), only a small proportion of the hypertensive patients will ultimately develop hypertensive crisis. The majority of the patients with hypertensive crisis often report non-specific symptoms. Hypertensive crises can be divided into hypertensive emergencies or hypertensive urgencies according to the presence or absence of acute target organ damage, respectively. In a recent large multicenter Italian study (6), 4.6/1,000 cases—out of 333,407 patients—consecutively admitted to the emergency department were diagnosed with hypertensive crises ($n = 1,546$). Out of 1,546 hypertensive cases, 25.3% of them ($n = 391$) being reported as hypertensive emergencies [8].

The precise pathophysiology of the hypertensive crisis remains unclear. However, two different but interrelated mechanisms may play a central role in the pathophysiology of the hypertensive crisis. The first is the failure in autoregulatory mechanism in the vascular bed. The second mechanism is the activation of renin-angiotensin system, leading to further vasoconstriction and thus generating a vicious cycle of continuous injury and subsequently ischemia [8].

Hypertensive crisis: pathophysiology



Diagnosis:

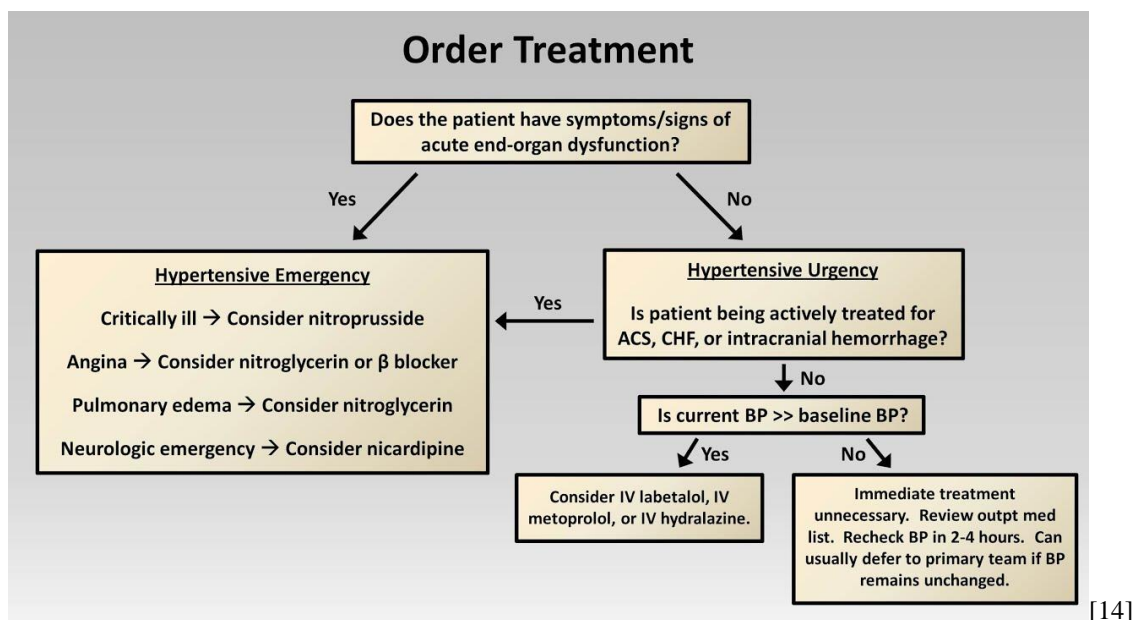
The evaluation of a hypertensive crisis initially includes a detailed medical history. Also, physical examination should include (i) auscultation of heart sounds/murmurs (aortic coarctation), neck arteries, and abdominal murmurs, (ii) neurological deficits, (iii) fundoscopy to assess for retinopathy, grade III (flame hemorrhages, dot and blot hemorrhages, hard and soft exudates), or grade IV (papilledema), (iv) absence, reduction, or asymmetry of pulses in the lower extremities, and (v) examination of the abdomen (aortic aneurysm). Initial laboratory analyses should be performed rapidly after initial evaluation of the patient [8].

These laboratory analyses include urinalysis (check for significant proteinuria, red blood cells, cellular casts, or analysis for metanephrines in case of high suspicion of pheochromocytoma), a chemistry panel (creatinine, blood urea nitrogen levels), electrocardiogram (to check for myocardial ischemia or infarction and/or signs of left ventricular hypertrophy), a plain chest radiograph (evaluation of cardiomegaly or pulmonary edema), brain computed tomography (CT) scan (evaluation of neurological deficits), and chest CT scan or transesophageal echocardiography (in suspicion of aortic dissection) [9].

Treatment:

Treatment goals for hypertensive crises depend on classification (e.g., emergency vs. urgency) and presenting condition. Hypertensive urgency often requires initiating, reinitiating, modifying, or titrating oral therapy and usually does not require ICU or hospital admission. The treatment target for hypertensive urgency is a gradual blood pressure reduction over 24–48 hours [13].

In the treatment of hypertensive emergency, patients who would fall into the general treatment goals should be identified and treated accordingly. For patients without exceptions, the goal of therapy is to reduce the mean arterial pressure (MAP) by 25% over the first hour of therapy. Greater reductions (by more than 25%) have been associated with the induction of cerebral ischemia. In addition, if neurologic deterioration is noted during the initial 25% MAP reduction (or during subsequent lowering), therapy should be. After the first hour, a more gradual blood pressure reduction is recommended [13].



Medications used in the treatment of hypertensive emergency are

- Vasodilators like Hydralazine, Nitroglycerine and Sodium Nitroprusside.
- Calcium channel blockers like Clevidipine and Nicardipine.
- Beta blockers like Metoprolol, Esmolol, and Labetalol.
- ACEI drugs like Enalaprilat.
- Others are Phentolamine and Fenoldopam.

2. METHODOLOGY

In this review article, the data is pooled from various kinds of literature referring the web to understand the existence, symptoms, diagnosis, management, and complications of hypertensive emergency.

To understand this medically relevant and fascinating association, we collected information from the studies done in the past throughout the world.

We can conclude that it is a severe and life-threatening condition which need immediate medical attention to avoid life-threatening complications and prevent mortality and morbidity associated with this fatal condition.

Although, approximate conclusions can be made from the pooling of the data from the past literature, a definitive plan of action on how to prevent this condition and adequately treating it to avoid damage to body organs needs further research and studies.

3. RESULTS & CONCLUSION

Hypertensive emergencies are a group of diseases that are related to acute hypertension caused by catecholamines, the sympathetic nervous system, the vascular endothelium, and acute stress. Hypertensive crisis has the potential of end-organ damage. The prognosis differs substantially whether the patient is presenting with hypertensive emergency or urgency.

Several regimens are effective to treat both hypertensive emergencies and urgencies, but the choice of the treatment is dependent on the clinical presentation of the patient.

It is very important for the attending physician to identify the hypertensive emergencies quickly and so to intervene with BP-lowering medications in order to avoid any further target organ damage and deterioration.

Studies should explore why the regulation systems are temporarily absent and are not able to adjust for hypertension.

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