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HYPERTENSIVE EMERGENCIES AND URGENCIES: A REVIEW OF PATHOPHYSIOLOGY, DIAGNOSIS, AND ACUTE CARE

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Abstract:
Hypertensive emergencies and urgencies are critical conditions characterized by severe elevations in blood pressure (BP), with hypertensive emergencies involving acute target organ damage and requiring immediate medical intervention. These conditions are significant due to their potential to cause life-threatening complications if not promptly and appropriately managed. The distinction between hypertensive emergencies and urgencies is crucial for determining the appropriate treatment strategy, which varies significantly between the two conditions. The distinction is essential for effective patient care, while hypertensive emergencies require immediate treatment due to acute organ damage, urgencies permit a more measured approach. The history and examination for these conditions should focus on detecting organ damage and assessing the severity of hypertension to guide management. Hypertension's pathophysiology involves complex interactions among various systems and damage mechanisms. Understanding these is vital for effective treatment and positive patient outcomes. Emergencies require quick IV medication intervention, while urgencies allow for oral medications and monitoring. Recognizing these differences is crucial for emergency management.
Keywords: Hypertension, Blood Pressure, Urgency, Emergency, Pathophysiology

INTRODUCTION

Hypertensive emergencies and urgencies are two critical conditions characterized by elevated blood pressure, but they differ significantly in their clinical implications and management strategies. A hypertensive emergency is defined as a situation where blood pressure readings exceed 180/120 mmHg and are accompanied by acute specific target organ damage, necessitating immediate medical intervention to prevent further complications. [1] This condition can manifest through various symptoms, including severe headache, chest pain, shortness of

breath, and neurological deficits, all indicating potential organ damage. The presence of end-organ damage, such as acute myocardial infarction or stroke, distinguishes hypertensive emergencies from urgencies. In these cases, treatment must be initiated without delay, often within minutes, to mitigate the risk of extensive damage to vital organs. [2,3]

Conversely, hypertensive urgency is characterized by a significant elevation in blood pressure without the presence of acute organ damage. Patients may exhibit mild symptoms such as palpitations or headache, but they do not show evidence of vascular damage. The blood pressure levels in hypertensive urgency are similarly high, yet the absence of acute target organ damage allows for a more gradual approach to treatment, it involves the initiation of therapy and careful follow-up over a period of 24 to 48 hours. Management typically involves the initiation of oral medications rather than immediate hospitalization, as the condition does not require urgent normalization of blood pressure. [4] This distinction is crucial, as the management strategies must align with the severity of the patient's condition. Risk factors for both hypertensive emergencies and urgencies include poorly controlled hypertension, medication noncompliance, and lifestyle factors such as obesity and lack of exercise. [1]

The 2017 American College of Cardiology (ACC) and American Heart Association (AHA) guidelines introduced a comprehensive classification of hypertension (HTN) into four distinct stages, which are crucial for effective diagnosis and management [Table 1]. The 2017 guidelines also emphasize the importance of tailoring treatment not only to blood pressure levels but also to the estimated 10-year risk of atherosclerotic cardiovascular disease (ASCVD). Moreover, the guidelines highlight the necessity of accurate blood pressure measurement, recommending multiple readings over time and the use of out-of-office monitoring methods, such as ambulatory blood pressure monitoring (ABPM) or home blood pressure monitoring (HBPM), to confirm diagnoses. [5] Understanding these differences is vital for healthcare providers to ensure appropriate and timely interventions, ultimately improving patient outcomes in hypertensive crises.

TABLE [1]: STAGES AND CLASSIFICATION OF HYPERTENSION

Category	Blood Pressure Ranges
Normal blood pressure (BP)	Systolic BP is less than 120, and diastolic BP is less than 80.
Elevated BP	Systolic BP is 120 to 130, and diastolic BP is less than 80.
Stage 1 Hypertension	Systolic BP 130 to 139 or diastolic BP 80 to 89.
Stage 2 Hypertension	Systolic BP at least 140 or diastolic at least 90.
Hypertensive crises	Systolic BP over 180 and/or diastolic BP over 120.

PATHOPHYSIOLOGY

The exact underlying mechanisms of a hypertensive crisis remain not entirely understood. Nevertheless, it is widely accepted that two interrelated processes may play a crucial role in the overall pathophysiology of a hypertensive crisis, which merits further investigation and understanding [Figure 1]. The first of these mechanisms is the failure of the autoregulatory system, which is responsible for blood perfusion and is critically important in maintaining normal physiological function. Autoregulation can be defined as the remarkable ability of essential organs, such as the brain, heart, and kidneys, to sustain a consistent blood flow, regardless of fluctuations in perfusion pressure that may occur due to various factors. In instances where perfusion pressure declines, the associated blood flow may momentarily decrease, but it typically returns to normal levels within a few minutes due to the autoregulatory mechanisms at play. However, when there is a malfunction in this autoregulation process, a drop in perfusion pressure can lead to a significant decrease in blood flow along with an accompanying increase in vascular resistance.

During a hypertensive crisis, the absence of effective autoregulation within the vascular bed can lead to an abrupt and alarming rise in blood pressure along with an increase in systemic vascular resistance, which frequently results in mechanical stress on the vascular system and potential injury to the endothelium. The second mechanism that plays a critical role in this scenario is the activation of the renin-angiotensin system (RAS), which leads to further vasoconstriction and creates a vicious cycle of ongoing injury and resultant ischemia. The RAS is plays a significant role in regulating blood pressure and renal function. In cases of malignant hypertension, particularly those associated with essential hypertension (EHT). In addition to these two primary mechanisms, it is also worth noting that a prothrombotic state could significantly contribute to the pathophysiology of a hypertensive crisis; a recent study, although limited in size, demonstrated that levels of sP-selectin were markedly elevated in individuals experiencing a hypertensive crisis when compared to those with normal blood pressure, irrespective of whether retinopathy was present. This finding suggests that platelet activation may emerge as an early indicator of the pathophysiological consequences associated with a hypertensive crisis, emphasizing the need for further research in this area to understand better the underlying processes involved.

In elderly hypertensives, several hemodynamic changes contribute to the condition. These include decreased aortic compliance, increased peripheral resistance, reduced cardiac output, and diminished renal blood flow. The decrease in aortic compliance, for instance, exacerbates aortic pressure due to wave reflection, which is particularly pronounced in older adults. Additionally, increased peripheral resistance and reduced cardiac output further complicate the hemodynamic profile, leading to sustained hypertension. End-organ damage is a significant consequence of chronic hypertension, with left ventricular hypertrophy being a primary indicator of such damage. This hypertrophy can occur alongside other conditions, such as coronary heart disease and cerebrovascular disease, which are prevalent in elderly hypertensives. The presence of silent cerebrovascular disease is particularly concerning, as it can lead to depressed neurobehavioral function, further complicating the clinical picture. [2,6,7]

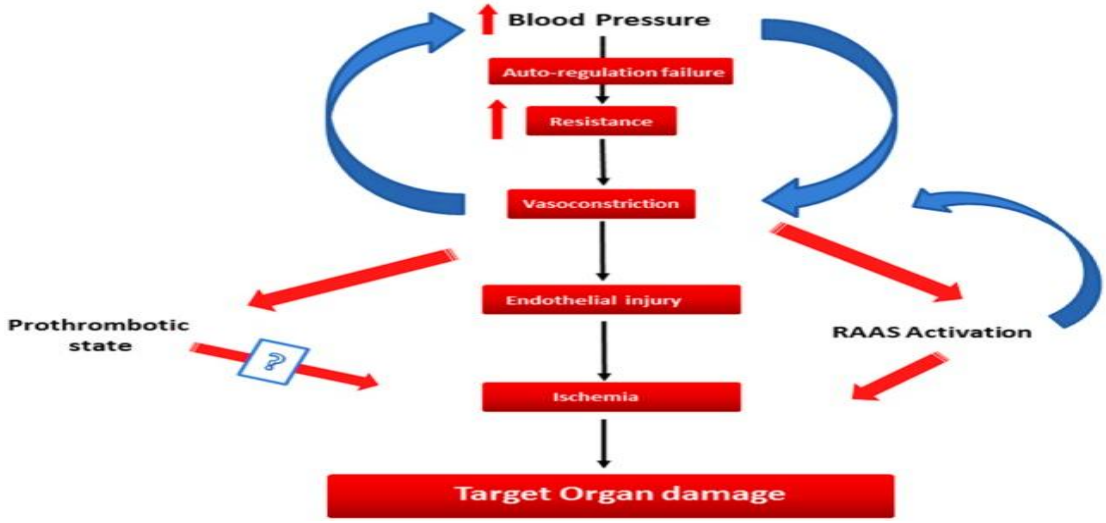

FIGURE [1]: THE PATHOPHYSIOLOGY OF HYPERTENSIVE.

DIAGNOSIS

The diagnosis of hypertensive emergencies and urgencies is critical for effective management and prevention of severe complications. According to the American Heart Association (AHA), a hypertensive is characterized by severely elevated blood pressure (≥180/120 mmHg). To accurately diagnose these conditions, clinicians must assess for target organ damage (TOD), which includes complications affecting the brain, heart, kidneys, and eyes. The presence of TOD is a key differentiator between hypertensive emergencies and urgencies, as it dictates the urgency and intensity of treatment. For instance, signs of hypertensive encephalopathy, such as neurological symptoms, can indicate a hypertensive emergency requiring urgent treatment. The 2025 guidelines emphasize the importance of precise blood pressure measurement standards to confirm hypertension. This includes using validated automated devices to ensure accuracy. Clinicians are encouraged to follow established protocols for blood pressure assessment, which should be performed in a calm environment to minimize the risk of white-coat syndrome, a common phenomenon that can lead to misdiagnosis. [4,8]

When evaluating a patient with suspected hypertensive crisis, a thorough history and physical examination are essential. Key components of the history should include the onset and duration of hypertension, any previous episodes of hypertensive crises, and associated symptoms such as chest pain, shortness of breath, headache, or neurological deficits. [9] During the physical examination, vital signs should be meticulously recorded, focusing on blood pressure measurements in both arms to assess for discrepancies that may indicate underlying vascular issues. Specific attention should be paid to symptoms indicative of target organ damage, such as acute pulmonary edema, stroke, or acute myocardial infarction, which are common complications of hypertensive emergencies. The anticipated examination results differ based on the particular organ primarily impacted. In cases of cardiac dysfunction, auscultation of the lungs may reveal rales, while jugular venous distension or peripheral swelling could be observed, and additional heart sounds might be detected. In situations where hypertension develops rapidly, often associated with sympathomimetic substance abuse, significant shortness of breath may occur without peripheral swelling, indicating flash pulmonary edema. Neurological impairment can lead to changes in mental status, blurred vision, ataxia or other issues related to cerebellar function, aphasia, or one-sided numbness or weakness. A thorough neurological assessment should include an evaluation of cranial nerves, strength, and sensory perception, along with tests for cerebellar function and gait. An eye examination might show signs of papilledema, as well as exudates and flame-shaped hemorrhages. Acute kidney failure may also present with symptoms of pulmonary edema or peripheral swelling. [8,10]

Laboratory tests and imaging studies may be warranted based on the clinical presentation. These can include complete blood counts, renal function tests, and imaging to evaluate for signs of acute organ damage. Once it

has been established that a hypertensive emergency is either present or probable, tests such as metabolic panels, urinalysis, B-natriuretic peptide, and cardiac enzymes can be beneficial. An ECG is advised for any patient suspected of experiencing cardiac ischemia. Head computed tomography (CT) is suggested for patients with acute neurological symptoms or findings on examination. A chest x-ray may be valuable for those experiencing shortness of breath. Additionally, a chest x-ray might reveal mediastinal widening in cases of aortic dissection; however, this is a relatively poor indicator, and CT angiography of the chest and abdomen should be performed to either exclude or confirm a dissection and to assess the extent of the intimal tear. [8,9]

ACUTE CARE AND TREATMENT

Emergency department protocols play a crucial role in managing both conditions, ensuring that patients receive timely and effective care tailored to their specific needs through various classes of antihypertensive agents, which can be categorized into several groups, each with distinct mechanisms of action and therapeutic benefits [Figure 2]. [5] For hypertensive emergencies with potential for acute target organ damage, the American Heart Association recommends a rapid reduction of mean arterial pressure by no more than 25% within the first hour, followed by a gradual decrease to approximately 160/100 mmHg over the next 2 to 6 hours. [1,10] Several types of pharmacological agents can be employed for treatment purposes, but the common features that they all share are their ability to act quickly in response to the clinical situation and their ease of titration to achieve the desired therapeutic effect. Among the various agents available, urapidil has emerged as a first-choice treatment due to its high response rate of 96% in hypertensive crises. oral medications that include clonidine and nifedipine do not have any significant role to play in the immediate and urgent management of a hypertensive emergency, where swift intervention is critical. Sodium nitroprusside remains the traditional drug of choice for hypertensive emergencies, providing rapid blood pressure reduction. However, it requires careful monitoring due to potential adverse effects. In contrast, intravenous vasoactive infusions, which consist of medications such as labetalol, esmolol, diazoxide, hydralazine, nicardipine, and nitroglycerin, are generally recognized as effective and reliable options for addressing such medical emergencies. [8,11,12] The goal in these situations is to stabilize the patient quickly, as failure to do so can lead to severe outcomes such as stroke or acute renal failure.

In contrast, hypertensive urgencies do not exhibit evidence of vascular damage, allowing for a more gradual approach to treatment over 24 to 48 hours. patients are typically asymptomatic and do not require immediate blood pressure normalization. Instead, treatment can begin with oral medications, and careful follow-up is essential. The focus here is on initiating therapy to manage blood pressure over a longer period, as the absolute level of blood pressure is less critical than the rate of increase. [13] the treatment may involve monitoring and adjusting medications based on the patient's response. [10] Oral or sublingual agents are typically preferred for managing hypertensive urgencies due to their rapid onset of action and ease of administration. Among the most effective agents are clonidine and nifedipine, both of which have demonstrated efficacy in quickly reducing blood pressure. Clonidine, in particular, is noted for its rapid onset and has largely replaced older medications like reserpine and methyldopa, which have slower effects. Nifedipine, similarly, is recognized for its desirable pharmacologic characteristics and rapid action, making it a suitable choice for urgent treatment. Minoxidil is another option that has been used with some success, although it is less commonly employed than the aforementioned agents.[14,15] In cases where immediate treatment is necessary, intravenous agents may be considered as mentioned earlier. The management strategy should be tailored to the individual patient, taking into account their overall health status and any underlying conditions.

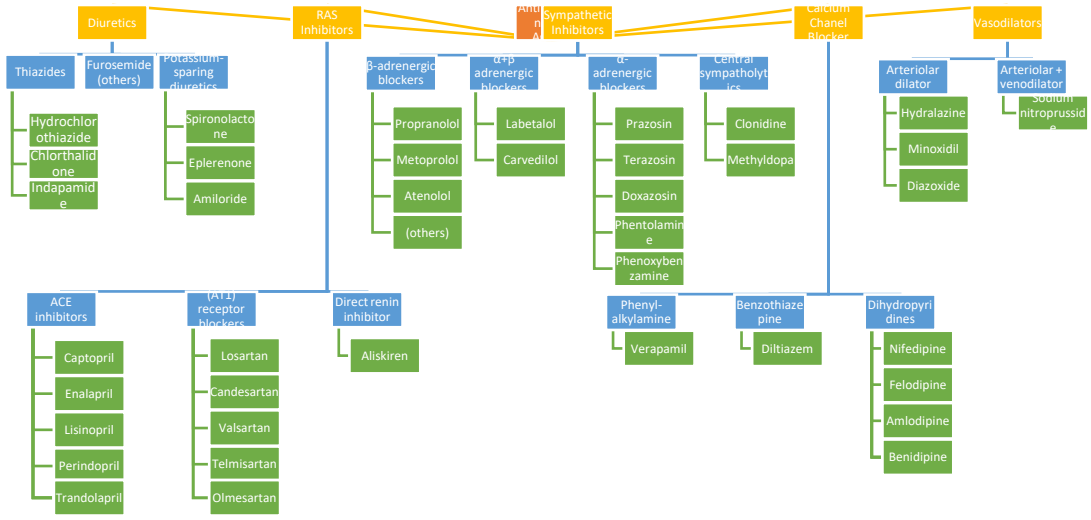

FIGURE [2]: CLASSIFICATION OF ANTIHYPERTENSIVES AGENT

CONCLUSION

The distinction is essential for effective patient care, while hypertensive emergencies require immediate treatment due to acute organ damage, urgencies permit a more measured approach. The history and examination for these conditions should focus on detecting organ damage and assessing the severity of hypertension to guide management. Hypertension's pathophysiology involves complex interactions among various systems and damage mechanisms. Understanding these is vital for effective treatment and positive patient outcomes. Emergencies require quick IV medication intervention, while urgencies allow for oral medications and monitoring. Recognizing these differences is crucial for emergency management.

CONFLICT OF INTEREST

Authors declare they don't have any conflict of interest.

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AUTHOR CONTRIBUTIONS

Although all authors made substantial contributions through data collection and literature searches, the original author created the text. Each author took full responsibility for the work, participated in the manuscript's critical review, and approved the final draft.

ETHICAL APPROVAL

Not Applicable

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