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Review Article

A Review Article on Hypertension

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ABSTRACT

The most common modifiable risk factor for death and disability is hypertension, which include stroke accelerated coronary disease and systemic atherosclerosis, heart failure chronic kidney disease, lowering blood pressure with antihypertensive drugs and reducing target organ damage and the prevalence of the occurrence of cardiovascular disease. Reducing dietary sodium intake, losing weight if the patient is overweight, getting regular exercise, drinking moderately, and eating more potassium rich foods were all recommended lifestyle changes. The first hypertensive medication should be chosen from one of the four types known to minimize cardiovascular events; thiazide diuretics, ACE inhibitors, ARB's and calcium channel blockers. In clinical practice two interventional approaches renal denervation and baro-reflex activation therapy are employed to treat variety of treatment resistant hypertension.

INTRODUCTION

Hypertension is defined as persistently elevated arterial blood pressure. It is also known as high blood pressure .According to the World Health Organization (WHO), hypertension is responsible for approximately 10.4 million deaths globally each year. It is often asymptomatic, earning each the name "silent killer" and frequently goes undiagnosed until complication arise. Early

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identification and effective management are crucial for reducing morbidity and mortality.

Blood Pressure Ranges:

Blood Pressure Category	Systolic (mm Hg)	Diastolic (mm Hg)
Healthy	Less than 120	Less than 80
Elevated	120-129	less than 80
Stage 1 hypertension	130-139	80-89
Stage 2 hypertension	140 or higher	90 higher
Hypertension crisis	Over 180	Over 120

Epidemiology:

- Global prevalence: 30-45% of the adult population.
- Increased incidence: with age, obesity, sedentary lifestyle, and high Sodium intake.
- Disparities: More prevalent in low-and middle-income countries due to limited healthcare access and awareness.

Pathophysiology:

These include genetic predisposition, environmental factors, and alterations in the body's systems that control blood pressure, such as the nervous, endocrine, and renal systems. Essential hypertension, which has no identifiable cause, is thought to involve disruptions in these regulatory systems, leading to elevated blood pressure.

Here's a breakdown of the key pathophysiological aspects:

1. Genetic and Environmental Influences:

Genetic Predisposition:

Family history of hypertension increases the risk of developing the condition.

Environmental Factors:

Diet (excess salt intake), obesity, lack of physical activity, alcohol consumption, and stress all contribute to the development of hypertension.

2. Disrupted Blood Pressure Regulation:

Sympathetic Nervous System:

The sympathetic nervous system plays a crucial role in regulating blood pressure. Over activity of this system can lead to vasoconstriction (narrowing of blood vessels), increased heart rate, and ultimately, elevated blood pressure.

Renal Dysfunction:

The kidneys play a vital role in regulating blood pressure by controlling sodium and water balance. Impaired renal function can lead to fluid retention and increased blood pressure.

Endocrine System:

Hormones like aldosterone and cortisol, produced by the adrenal glands, influence blood pressure. Imbalances in these hormones can contribute to hypertension.

Renin-Angiotensin-Aldosterone System (RAAS):

This system regulates blood pressure through a cascade of hormones. Dysregulation of the RAAS, particularly excessive production of angiotensin II (a potent vasoconstrictor), can elevate blood pressure.

Vascular Changes:

Changes in the structure and function of blood vessels, such asstiffening of the arteries (arteriosclerosis) or damage to the endothelium

(lining of blood vessels), can contribute to increased peripheral resistance and hypertension.

Inflammation:

Immune cells and inflammatory processes can contribute to vascular damage and worsen hypertension.

Types of Hypertension

Essential (Primary) Hypertension:

It's believed to result from a combination of genetic and environmental factors that disrupt the body's blood pressure regulation mechanisms.

Secondary Hypertension:

This type of hypertension is caused by an identifiable underlying medical condition, such as kidney disease, endocrine disorders, or sleep apnea.

Clinical Evaluation and Diagnosis:

History and Physical Examination:

- Assess for symptoms (headache, blurred vision, chest pain, dizziness)
- Evaluate lifestyle, diet, medication use.
- Screen for secondary causes

BP Measurement

- Control with multiple readings over several visits.
- Ambulatory BP monitoring (ABPM) or home BP.

Classification of Anti-hypertensive Agents:

ACE inhibitors (Angiotensin converting enzyme inhibitor)	Enalapril, Lisinopril, Ramipril,Captopril
ARBs(Angiotensin receptor blockers)	Telmisartan, Olmesartan, Losartan, Candesaratan,Valsartan
Calcium channel blockers	Amlodipine,Felodipine,Nimodipine,Nifedipine,Isradipine,Verpamil,Diltiazem
Beta blockers	Atenolol, Metoprolol, Bisoprolol, Labetolol, Propranolol
Diuretics	Hydrochlorthiazide, Chlorthiazide, Chlorthalidone, Spironolactone, Furosemide.
Direct Vasodilators	Hydralazine, Minoxidil, Sodium Nitropruside, Diazoxide
Alpha blockers	Terazozin, Doxazosin, Prazosin
Centre Alpha 2 Agonists	Clonidine, Methyldopa

There are more groups of antihypertensive agents which are not in much use. They include:

- Adrenergic neuron blockers : Guathidine
- Catecholamine depleters: Reserpine
- Ganglion blockers: Trimethaphan, Mecamylamine
- 5 HT antagonists: Ketanserin

Management:

Pharmacologic Treatment:

First-line agents:

- Thiazide diuretics(e.g.,chlorthalidone,indapamide)
- ACE inhibitors(e.g.,lisinopril)
- ARBs(e.g.,losartan)
- Calcium channel blockers(e.g.,amlodipine)

Combination therapy often needed:

- Single –pill combinations improve adherence

- Tailored based on comorbidities (e.g.,beta-blockers in CAD,ACE inhibitors in CKD)

Special populations

- Elderly: start low,go slow.consider frailty
- Diabetes/CKD: ACE inhibitors or ARBs preferred
- Pregnancy: Labetalol,methyldopa,nifedipine are safe options.

Recent advances and future directions

- SGLT2 inhibitor show antihypertension and cardioprotective effects.
- Device-based therapies (renal denervation) being explored.
- Artificial intelligence and digital health tools(e.g.,smart BP monitors telemedicine aid in early detection and adherence.

Life style modifications

- Limiting alcohol and quiting smoking
- Sodium restriction(<2.3 g/day)
- Weight reduction
- DASH diet(rich in fruits,vegetables,low-fat dairy)
- Physical activity

Complications

- Cardiac: Left ventricular hypertrophy, heart failure, ischemic heart disease
- Cerebrovascular: Stroke, transient ischemic attacks
- Renal: Chronic kidney disease
- Ophthalamic: Hypetensive retinopathy

Risk Factors

- Age
- Family history
- Obesity
- Smoking
- Stress
- Excessive salt and alcohol intake

CONCLUSION

Hypertension remains a global health challenge despite being preventable and treatable .Amultifaceted approach including lifestyle changes, pharmacotherapy, and regular monitoring is key to controlling blood pressure and preventing complications. Future innovations in diagnostics and personalized medicine promise to enhance outcomes.

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