

Hypertension

Definition

Is persistent elevation of blood pressure more than 140/90 mmhg.

It is usually asymptomatic until the diagnosis is made at a routine physical examination or when a complication arises. (BP check is advisable every 5 years in adults over 40 years of age to pick up occult hypertension.)

-Sometimes clinical features may be observed that can give a clue to the underlying cause of hypertension. These include radio-femoral delay in patients with coarctation of the aorta , enlarged kidneys in patients with polycystic kidney disease, abdominal bruits that may suggest renal artery . stenosis and the characteristic of Cushing's syndrome

-The cardiovascular risks associated with hypertension depend on the combination of risk factors in an individual, such as age, sex, weight, physical activity, smoking, family history, serum cholesterol, diabetes mellitus and pre-existing vascular disease.



16.64 Definition of hypertension

| Category | Systolic blood pressure (mmHg) | Diastolic blood pressure (mmHg) |
|---------------------------------------|--------------------------------|---------------------------------|
| Blood pressure | | |
| Optimal | < 120 | < 80 |
| Normal | < 130 | 85 |
| High normal | 130–139 | 85–89 |
| Hypertension | | |
| Grade 1 (mild) | 140–159 | 90–99 |
| Grade 2 (moderate) | 160–179 | 100–109 |
| Grade 3 (severe) | ≥ 180 | > 110 |
| Isolated systolic hypertension | | |
| Grade 1 | 140–159 | < 90 |
| Grade 2 | ≥ 160 | < 90 |

Pathogenesis

Many factors may contribute to the regulation of BP and the development of hypertension, including renal dysfunction, peripheral resistance, vessel tone, endothelial dysfunction, autonomic tone, insulin resistance and neurohumoral factors.

-In more than 95% of cases, no specific underlying cause of hypertension can be found. Such patients are said to have essential hypertension.

Risk factors

1-Ethnicity ,hypertension is more common in some ethnic groups, particularly African Americans and Japanese, and approximately 40%–60% is explained by genetic factors.

2-Age is a strong risk factor in all ethnic groups.

3-Important environmental factors include a high salt intake, heavy consumption of alcohol, obesity and lack of exercise.

4-Impaired intrauterine growth and low birth weight are associated with an increased risk of hypertension later in life.

5- In about 5% of cases, hypertension is secondary to a specific disease



16.65 Causes of secondary hypertension

Alcohol

Obesity

Pregnancy

Renal disease

- Parenchymal renal disease, particularly glomerulonephritis
- Renal vascular disease
- Polycystic kidney disease

Endocrine disease

- Pheochromocytoma
- Cushing's syndrome
- Primary hyperaldosteronism (Conn syndrome)
- Glucocorticoid-suppressible hyperaldosteronism
- Hyperparathyroidism
- Acromegaly
- Primary hypothyroidism
- Thyrotoxicosis
- Congenital adrenal hyperplasia due to 11β -hydroxylase or 17α -hydroxylase deficiency
- Liddle syndrome
- 11β -hydroxysteroid dehydrogenase deficiency

Drugs

Coarctation of the aorta



How to measure BP

- Use a machine that has been validated, well maintained and properly calibrated .
- Measure sitting BP routinely, with additional standing BP in older and diabetic patients and those with possible postural hypotension; rest the patient for 2 minutes .
- Remove tight clothing from the arm -
- Support the arm at the level of the heart .
- Use a cuff of appropriate size (the bladder must encompass more than two-thirds of the arm)
- Lower the pressure slowly (2 mmHg per second) -
- Read the BP to the nearest 2 mmHg -
- Use phase V (disappearance of sounds) to measure diastolic BP -
- Take two measurements at each visit -

-Ambulatory blood pressure measurement:

A series of automated ambulatory BP measurements obtained over 24 hours or longer provide a better profile than a limited number of clinic readings and correlate more closely with evidence of target organ damage than casual BP measurements.

-Home blood pressure measurements :

Patients can measure their own BP at home using a range of commercially available semi-automatic devices. The value of such measurements is dependent on the environment and timing of the readings measured.

Home or ambulatory BP measurements are particularly helpful in patients with unusually labile BP, those with refractory hypertension, those who may have symptomatic hypotension, and those in whom white coat hypertension is suspected.

It has been estimated that up to 20% of patients with a raised BP at outpatient clinics have a normal BP when it is recorded by automated devices used at home (White coat syndrome). So home or ambulatory BP measurements are important to confirm the diagnosis.

History and examination

- Ask and look for hents to rule out secondary causes
- Ask and look for evidence of risk factors for hypertension, such as central obesity and hyperlipidaemia.
- Ask and look for symptoms and signs may be observed due to the complications of hypertension.

Complications of hypertension

1-Cardiovascular :severe hypertension can cause left ventricular failure in the absence of CAD, particularly when there is an impairment of renal function. AF is common also due to diastolic dysfunction. Aortic aneurysm and dissection, PAD or stroke

2-Retinopathy.

3- CKD

i**16.66 Hypertensive retinopathy****Grade 1**

- Arteriolar thickening, tortuosity and increased reflectiveness ('silver wiring')

Grade 2

- Grade 1 plus constriction of veins at arterial crossings ('arteriovenous nipping')

Grade 3

- Grade 2 plus evidence of retinal ischaemia (flame-shaped or blot haemorrhages and 'cotton wool' exudates)

Grade 4

- Grade 3 plus papilloedema

A**B**

Fig. 16.75 Retinal changes in hypertension. **A** Grade 4 hypertensive retinopathy showing swollen optic disc, retinal haemorrhages and multiple cotton wool spots (infarcts). **B** Central retinal vein thrombosis showing swollen optic disc and widespread fundal haemorrhage, commonly associated with systemic hypertension. (A and B) Courtesy of Dr B. Cullen.

Investigations

-Routine :

- Urinalysis for blood, protein and glucose
- Blood urea, electrolytes and creatinine
- Hypokalaemic alkalosis may indicate primary hyperaldosteronism but is usually due to diuretic therapy
- Blood glucose
- Serum total and HDL cholesterol
- Thyroid function tests
- 12-lead ECG (left ventricular hypertrophy, coronary artery disease)

Specific investigations to rule out secondary causes in patients younger than 40 years of age or those with resistant hypertension , Family history, sedentary lifestyle (exercise, salt intake, smoking habit):

- Chest X-ray, Echocardiogram: : to detect cardiomegaly, heart failure, coarctation of the aorta ,left ventricular hypertrophy
- Renal ultrasound/ Renal angiography : to detect possible renal disease /to detect or confirm the presence of renal artery stenosis
- Urinary catecholamines: to detect possible phaeochromocytoma (attacks of headaches, palpitation , sweating)
- Urinary cortisol and dexamethasone suppression test: to detect possible Cushing s syndrome
- Plasma renin activity and aldosterone: to detect possible primary aldosteronism

Management

-The benefit of antihypertensive therapy is to reduce the incidence of adverse cardiovascular events, particularly CAD, stroke and heart failure.

-According to studies the relative benefits (approximately 30% reduction in risk of stroke and 20% reduction in risk of CAD)

-Treatment targets: the optimum BP for reduction of major cardiovascular events has been found to be 139/83 mmHg, and even lower in patients with diabetes mellitus and chronic kidney disease .

-Treatment targets :

Patients <80 years < 140/90 / < 135/85, clinic /home, ambulatory retrospectively

Patients >80 years < 150/90 < 140/85 , clinic / home ambulatory retrospectively

Non drug therapy

Appropriate lifestyle measures may obviate the need for drug therapy in patients with borderline hypertension, reduce the dose or the number of drugs required in patients with established hypertension, and directly reduce cardiovascular risk.

- Correcting obesity , taking regular physical exercise
- Reducing alcohol intake
- Restricting salt intake
- stop smoking
- Eating oily fish and adopting a diet that is low in saturated fat may produce further reductions in cardiovascular risk that are independent of changes in BP

| Class of drug | Compelling indications | Possible indications | Caution | Compelling contraindications |
|---|--|--|---|--|
| α-blockers | Benign prostatic hypertrophy | – | Postural hypotension, heart failure ¹ | Urinary incontinence |
| ACE inhibitors | Heart failure Left ventricular dysfunction, post-MI or established CAD Type 1 diabetic nephropathy Secondary stroke prevention ⁴ | Chronic renal disease ² Type 2 diabetic nephropathy | Renal impairment ² PAD ³ | Pregnancy Renovascular disease ² |
| Angiotensin II receptor blockers | ACE inhibitor intolerance Type 2 diabetic nephropathy Hypertension with left ventricular hypertrophy Heart failure in ACE-intolerant patients, after MI | Left ventricular dysfunction after MI Intolerance of other antihypertensive drugs Proteinuric or chronic renal disease ² Heart failure | Renal impairment ² PAD ³ | Pregnancy |
| β-blockers | MI, angina Heart failure ⁵ | – | Heart failure ⁶ PAD Diabetes (except with CAD) | Asthma or chronic obstructive pulmonary disease Heart block |
| Calcium channel blockers (dihydropyridine) | Older patients, isolated systolic hypertension | Angina | – | – |
| Calcium channel blockers (rate-limiting) | Angina | Older patients | Combination with β -blockade | Atrioventricular block, heart failure |
| Thiazides or thiazide-like diuretics | Older patients, isolated systolic hypertension, heart failure, secondary stroke prevention | – | – | Gout ⁶ |

¹In heart failure when used as monotherapy. ²ACE inhibitors or ARBs may be beneficial in chronic renal failure and renovascular disease but should be used with caution, close supervision and specialist advice when there is established and significant renal impairment. ³Caution with ACE inhibitors and ARBs in PAD because of association with renovascular disease.

⁴In combination with a thiazide or thiazide-like diuretic. ⁵ β -blockers are used increasingly to treat stable heart failure but may worsen acute heart failure. ⁶Thiazides or thiazide-like diuretics may sometimes be necessary to control BP in people with a history of gout, ideally used in combination with allopurinol.

(ACE = angiotensin-converting enzyme; ARBs = angiotensin II receptor blockers; CAD = coronary artery disease; MI = myocardial infarction; PAD = peripheral arterial disease)

| Class of drug | Major adverse effects |
|--------------------------------------|--|
| ACE inhibitors | dry cough, renal dysfunction in patients with impaired renal function |
| ARBs | increase in hepatic enzyme levels |
| CCBs (dihydropyridines) | headache, palpitation, rash, gravitational oedema |
| Diuretics (thiazide-like) | dry mouth, thirst, muscle cramps, impotence, hyperglycaemia, hypercholesterolaemia, abnormality in electrolytes (hypokalaemia, hypomagnesaemia, hypercalcaemia, hyponatraemia), pancreatitis |
| Beta-blockers | high-degree atrioventricular block, bradycardia, heart failure, Raynaud phenomenon, impotence, fatigue, sleep disturbance including nightmares, depression, alteration of lipid profiles |
| Alpha-blockers | orthostatic hypotension, syncope, dizziness, headache, drowsiness |
| Central alpha-agonist | orthostatic hypotension, bradycardia, drowsiness, dry mouth, galactorrhoea, sexual dysfunction |
| Peripheral alpha-agonist (reserpine) | depression, sedation, nasal stuffiness |

^a Source: ref. 317.

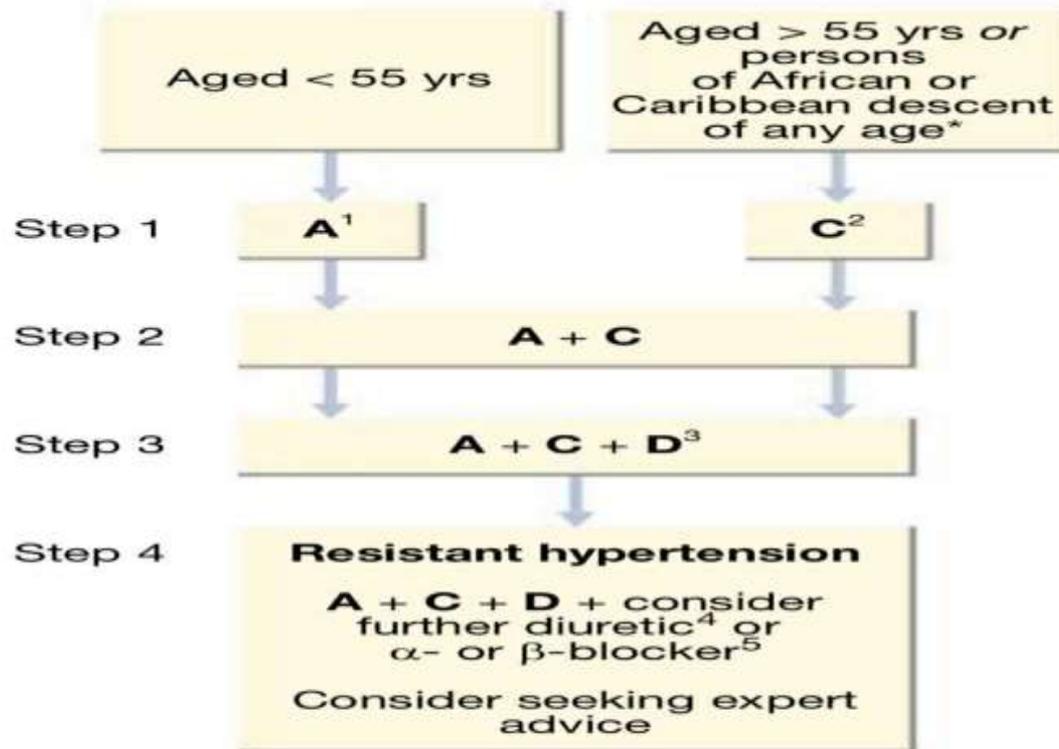


Fig. 16.77 Antihypertensive drug combinations. *Does not apply to those who are of mixed race. ¹A = Angiotensin-converting enzyme (ACE) inhibitor or consider angiotensin II receptor blocker (ARB); choose a low-cost ARB. ²C = calcium channel blocker (CCB); a CCB is preferred but consider a thiazide-like diuretic if a CCB is not tolerated or the person has oedema, evidence of heart failure or a high risk of heart failure. ³D = thiazide-type diuretic. ⁴Consider a low dose of spironolactone or higher doses of a thiazide-like diuretic. ⁵Consider an α- or β-blocker if further diuretic therapy is not tolerated, or is contraindicated or ineffective. *Adapted from 2020 International Society of Hypertension Global Hypertension Practice Guidelines.*

Refractory HTN

Refractory hypertension refers to the situation where multiple drug treatments do not give adequate control of BP. Although this may be due to common cause of treatment failure is non-adherence to drug therapy./ secondary cause

- Spironolactone is a particularly useful addition in patients with treatment-resistant hypertension

Antihypertensives & pregnancy

| Antihypertensives to be avoided during pregnancy | Antihypertensives found safer during pregnancy |
|--|---|
| ACE inhibitors, ARBs: Risk of foetal damage, growth retardation. | Hydralazine Methyldopa |
| Diuretics: increase risk of foetal wastage, placental infarcts, miscarriage, stillbirth. | Dihydropyridine CCBs: if used, they should be discontinued before labour as they weaken uterine contractions. |
| Nonselective β blockers: Propranolol cause low birth weight, decreased placental size, neonatal bradycardia and hypoglycaemia. | Cardioselective β blockers and those with ISA, e.g. atenolol, metoprolol, pindolol, acebutolol: may be used if no other choice. |
| Sod. nitroprusside: Contraindicated in eclampsia. | Prazosin and clonidine-provided that postural hypotension can be avoided. |

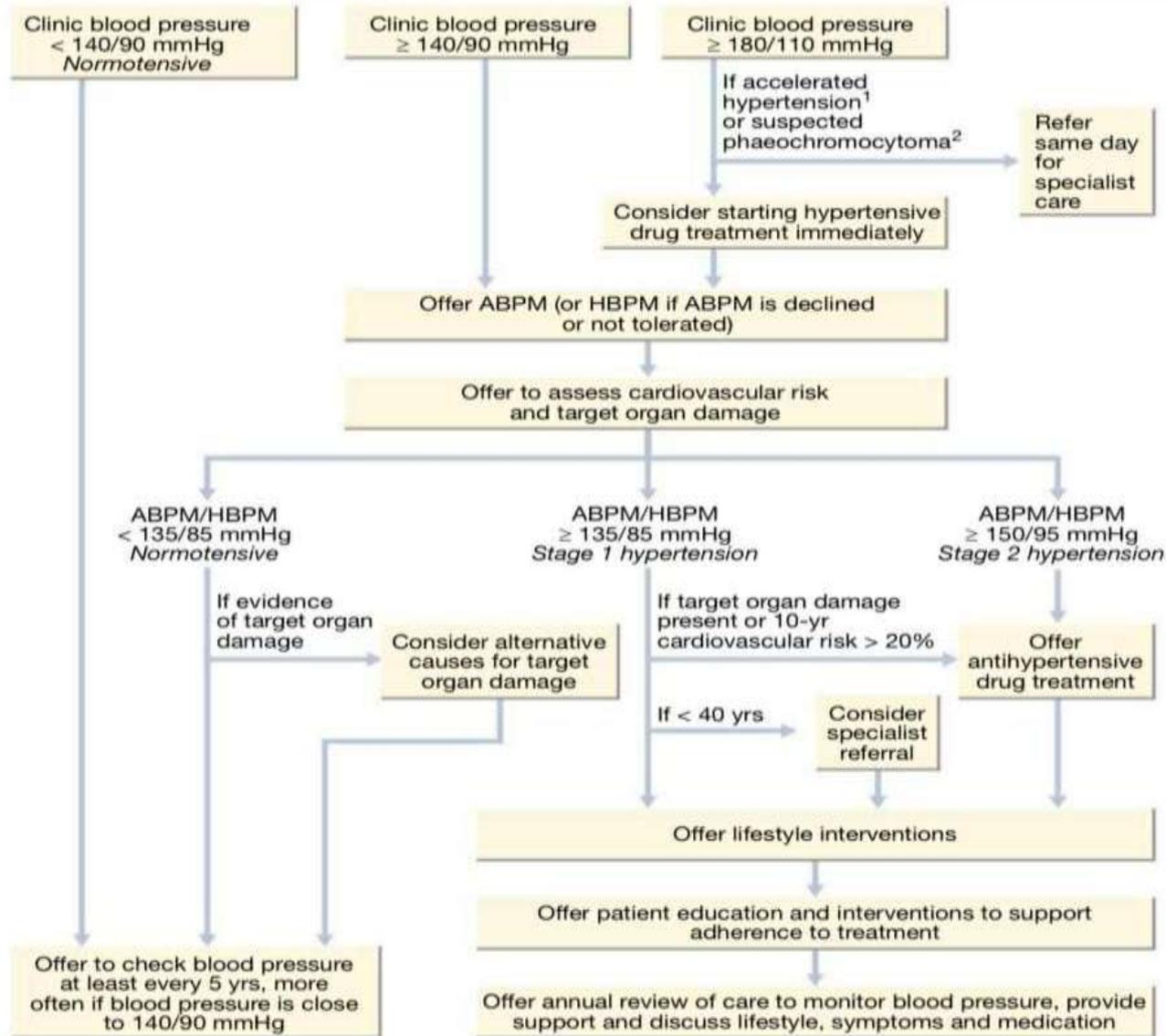


Fig. 16.76 Management of hypertension. ¹Signs of papilloedema or retinal haemorrhage. ²Labile or postural hypotension, headache, palpitations, pallor and diaphoresis. (ABPM = ambulatory blood pressure monitoring; HBPM = home blood pressure monitoring). Adapted from 2020 International Society of Hypertension Global Hypertension Practice Guidelines.

HYPERTENSION CRISES

EMERGENCY

BP >180/120

**Acute Target Organ
Damage**

Life threatening

GOAL: ↓ BP now

IV therapy

URGENCY

BP >180/120

**No Target Organ
Damage**

Not life-threatening

GOAL: ↓ BP over days

Oral therapy

Accelerated or malignant hypertension

Is a rare condition that can complicate hypertension of any aetiology. It is characterised by accelerated microvascular damage with necrosis in the walls of small arteries and arterioles (fibrinoid necrosis) and by intravascular thrombosis.

The diagnosis is based on evidence of high BP and rapidly progressive end-organ damage, such as retinopathy (grade 3 or 4), renal dysfunction (especially proteinuria) and hypertensive encephalopathy. Or Left ventricular failure may occur and death occurs within months if untreated.

Management: lowering BP too quickly may compromise tissue perfusion due to altered autoregulation and can cause cerebral damage, including occipital blindness, and precipitate coronary or renal insufficiency. Even in the presence of cardiac failure or hypertensive encephalopathy, a controlled reduction to a level of about 150/90 mmHg over a period of 24–48 hours is ideal.

Intravenous or intramuscular labetalol, intravenous GTN, intramuscular and intravenous sodium nitroprusside are all effective but require careful supervision, preferably in a high-dependency unit.

Dr Razan Alodat
Thank you