Hypertension

Heart

High BP places a pressure load on the heart and may lead to left ventricular hypertrophy. The excess cardiac mortality and morbidity associated with hypertension are largely due to a higher incidence of coronary artery disease.

Severe hypertension can cause left ventricular failure in the absence of coronary artery disease, particularly when renal function, and therefore sodium excretion, are impaired.

Kidneys

Long-standing hypertension may cause proteinuria and progressive renal failure by damaging the renal vasculature.

Malignant or 'accelerated' phase Hypertension

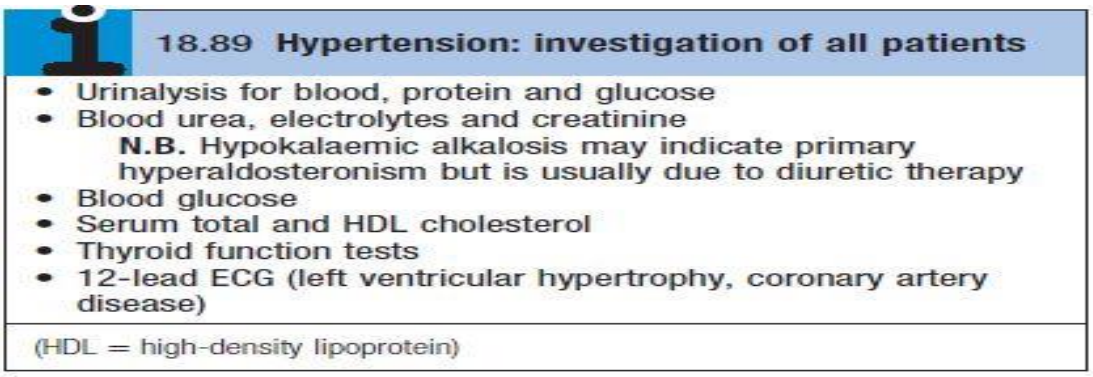
This rare condition is characterized by accelerated microvascular damage with necrosis in the walls of small arteries and arterioles ('fibrinoid necrosis') and by intravascular thrombosis.

The diagnosis is based on evidence of high BP and rapidly progressive end organ damage, such as:-

1- retinopathy (grade 3 or 4),
2- renal dysfunction (especially proteinuria)
3- and/or hypertensive encephalopathy
4- Left ventricular failure may occur
5- and, if this is untreated, death occurs within months

Investigations

All hypertensive patients should undergo a limited number of investigations.

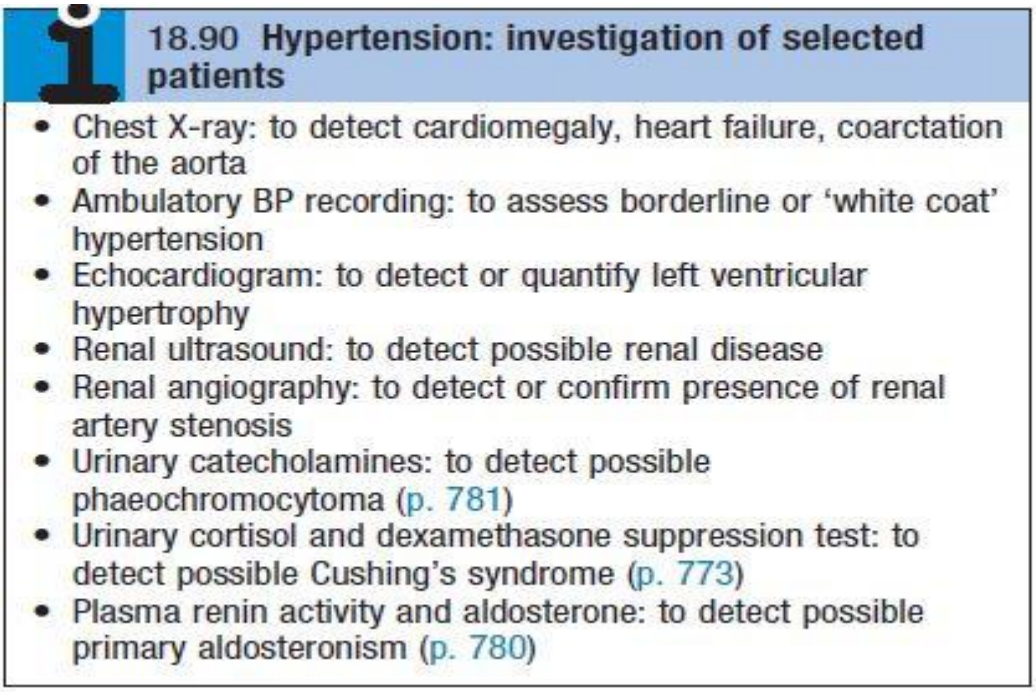


18.89 Hypertension: investigation of all patients

- Urinalysis for blood, protein and glucose
- Blood urea, electrolytes and creatinine
  N.B. 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)

(HDL = high-density lipoprotein)

Additional investigations are appropriate in selected patients



18.90 Hypertension: investigation of selected patients

- Chest X-ray: to detect cardiomegaly, heart failure, coarctation of the aorta
- Ambulatory BP recording: to assess borderline or 'white coat' hypertension
- Echocardiogram: to detect or quantify left ventricular hypertrophy
- Renal ultrasound: to detect possible renal disease
- Renal angiography: to detect or confirm presence of renal artery stenosis
- Urinary catecholamines: to detect possible phaeochromocytoma (p. 781)
- Urinary cortisol and dexamethasone suppression test: to detect possible Cushing's syndrome (p. 773)
- Plasma renin activity and aldosterone: to detect possible primary aldosteronism (p. 780)

Management

Quantification of cardiovascular risk

The sole objective of antihypertensive therapy is to reduce the incidence of adverse cardiovascular events, particularly:

a- coronary artery disease,
b- stroke and
c- heart failure

Threshold for intervention

Systolic BP and diastolic BP are both powerful predictors of cardiovascular risk.

Patients with diabetes or cardiovascular disease are at particularly high risk and the threshold for initiating antihypertensive therapy is therefore lower (≥ 140/90 mmHg) in these patient groups. The thresholds for treatment in the elderly are the same as for younger patients

Hypertension in old age:

• **Prevalence**: affects more than half of all people over the age of 60 yrs (including isolated systolic hypertension).
• **Risks**: hypertension is the most important risk factor for MI, heart failure and stroke in older people.
• **Benefit of treatment**: absolute benefit from therapy is greatest in older people (at least up to age 80 yrs).
• **Target BP**: similar to that for younger patients.
• **Tolerance of treatment**: antihypertensives are tolerated as well as in younger patients.
• **Drug of choice**: low-dose thiazides but, in the presence of coexistent disease (e.g. gout, diabetes), other agents may be more appropriate.

Treatment targets

The optimum BP for reduction of major cardiovascular events has been found to be ***139/83 mmHg***, & even lower in patients with diabetes mellitus. Moreover, reducing BP below this level causes no harm. Patients taking antihypertensive therapy require follow-up at 3-monthly intervals to:

- monitor BP,
- minimize side-effects and
- reinforce lifestyle advice.

Non-drug therapy

Appropriate lifestyle measures may obviate the need for drug therapy in patients with borderline hypertension.

- ✓ Correcting obesity,
- ✓ reducing alcohol intake,
- ✓ restricting salt intake,
- ✓ taking regular physical exercise and
- ✓ increasing consumption of fruit and vegetables can all lower BP.
- ✓ Moreover, quitting smoking,

- ✓ eating oily fish and
- ✓ adopting a diet that is low in saturated fat, ***may produce further reductions in cardiovascular risk***

Antihypertensive drugs

Thiazide and other diuretics; The mechanism of action of these drugs is incompletely understood and it may take up to a month for the maximum effect to be observed. An appropriate daily dose is 2.5 mg bendroflumethiazide or 0.5 mg cyclopenthiazide. More potent loop diuretics, such as furosemide (40 mg daily) or bumetanide (1 mg daily), have few advantages over thiazides in the treatment of hypertension, unless there is substantial renal impairment or they are used in conjunction with an ACE inhibitor.

ACE inhibitors; ACE inhibitors (e.g. enalapril 20 mg daily, ramipril 5–10 mg daily or lisinopril 10–40 mg daily) inhibit the conversion of angiotensin I to angiotensin II and are usually well tolerated.

They should be used with particular care in patients with impaired renal function or renal artery stenosis because they can reduce the filtration pressure in the glomeruli and precipitate renal failure.

Calcium channel antagonists; The dihydropyridines (e.g. amlodipine 5–10 mg daily, nifedipine 30–90 mg daily) are effective and usually well-tolerated antihypertensive drugs that are particularly useful in older people.

Side-effects include flushing, palpitations and fluid retention.

Beta-blockers; These are no longer used as first-line antihypertensive therapy, except in patients with another indication for the drug (e.g. angina). Metoprolol, atenolol, and bisoprolol preferentially block cardiac β-adrenoceptors, as opposed to the β2-adrenoceptors that mediate vasodilatation and bronchodilatation.

Labetalol and carvedilol; are combined β- and α-adrenoceptor antagonists which are sometimes more effective

than pure β-blockers. Labetalol can be used as an infusion in malignant phase hypertension.

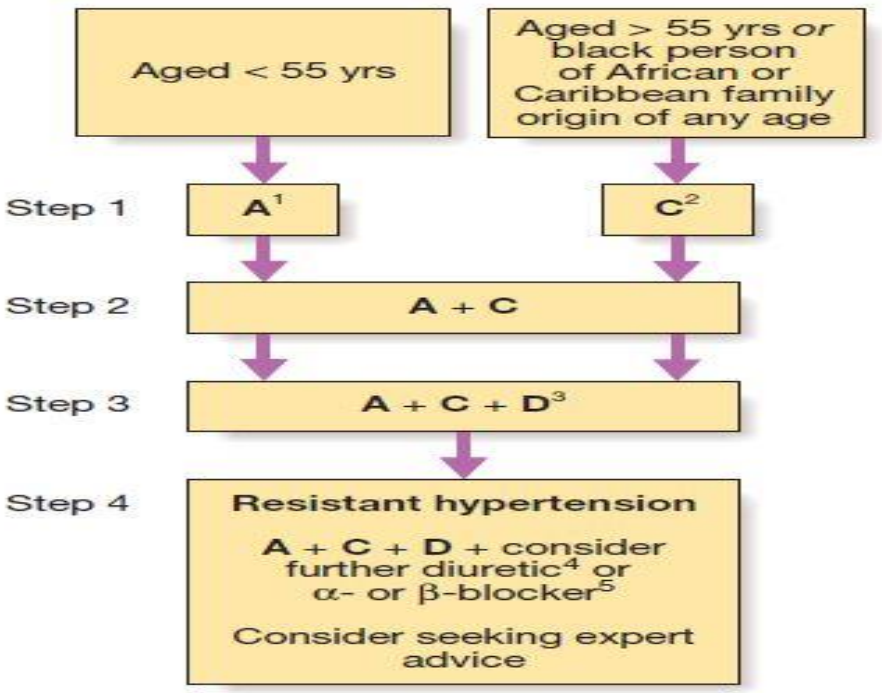
Other drugs. A variety of vasodilators may be used. These include the α1-adrenoceptor antagonists (α-blockers), such as:

- ✓ prazosin
- ✓ indoramin and
- ✓ doxazosin

and drugs that act directly on vascular smooth muscle, such as hydralazine and minoxidil.
Side-effects include first-dose and postural hypotension, headache, tachycardia and fluid retention. Minoxidil also causes increased facial hair and is therefore unsuitable for female patients.

Choice of antihypertensive drug

Trials that have compared thiazides, calcium antagonists, ACE inhibitors and angiotensin receptor blockers have not shown consistent differences in outcome, efficacy, side-effects or quality of life. Beta-blockers, which previously featured as first-line therapy in guidelines, have a weaker evidence base.
Although some patients can be treated with a single antihypertensive drug, a combination of drugs is often required to achieve optimal BP control.



1A = ACE inhibitor or consider angiotensin II receptor blocker (ARB)
2C = calcium channel blocker
3D = thiazide-type diuretic

Combination therapy may be desirable for other reasons; for example, low-dose therapy with two drugs may produce fewer unwanted effects than treatment with the maximum dose of a single drug. Some drug combinations have complementary or synergistic actions; for example, thiazides increase activity of the renin–angiotensin system, while ACE inhibitors block it.

Emergency treatment of accelerated phase or malignant hypertension

In accelerated phase hypertension, 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.
Bed rest and oral drug therapy, in most patients, can bring BP under control and avoid parenteral therapy.

Refractory hypertension

The common causes of treatment failure in hypertension are

1- non-adherence to drug therapy,
2- inadequate therapy, and
3- failure to recognize an underlying cause, such as renal artery stenosis or pheochromocytoma.

Adjuvant drug therapy

• *Aspirin*. Antiplatelet therapy is a powerful means of reducing cardiovascular risk but may cause bleeding, particularly intracerebral hemorrhage, in a small number of patients.
• *Statins*. Treating hyperlipidemia can produce a substantial reduction in cardiovascular risk.