FIRST SESSION

The Sixth and Seventh Ages of Man

WELCOME

Dr S. Cole, M.R.C.S., L.R.C.P., D.Obst.R.C.O.G., M.R.C.G.P. (*Provost of the South-east England Faculty*)

MAY I welcome you all to what promises to be a most interesting and stimulating symposium.

It is most fitting and a great honour for us that the chairman for the first session is Lord Amulree, president of the British Geriatric Society and honorary fellow of our College. He has done more than anyone else to make the study of geriatrics a speciality in its own right, and in so doing has made an enormous contribution to the care and understanding of the aged and infirm.

OPENING REMARKS

The Right Honourable Lord Amulree, M.A., M.D., M.B., B.Chir., F.R.C.P., M.R.C.S., L.R.C.P., F.R.C.G.P. (*Chairman*)

I am very gratified at the way interest in the problems of the elderly continues to increase, because it is one of the great difficulties that the National Health Service has to face today. The psychiatric aspect of the problem is particularly attractive because the number of elderly folk who become mentally confused and whose minds deteriorate seems also to be increasing. Establishment of geriatric departments is something of great importance; with a properly staffed, efficiently run department there should be practically no waiting list at all, and therefore this should be of great assistance to general practitioners.

High blood pressure and low blood pressure in the elderly

Dr L. Wollner, M.B., M.R.C.P. (*consultant physician*)

It is well known that high blood pressure can be harmful, but what is the significance of high and low blood pressure in the elderly, and when is treatment indicated?

Factors which determine the systemic arterial pressure

The mean systemic arterial pressure is determined by the cardiac output and the peripheral resistance. The cardiac output is dependent on the force and the rate of

cardiac contraction, the blood volume and the capacity of circulation, that is the venous system. Peripheral resistance is dependent on the arterioles and capillaries and to a small extent on the blood viscosity.

The control of systemic arterial pressure

The blood pressure in the normal subject is mainly controlled by the baroreceptor reflexes: pressure receptors arising mainly in the aorta and the carotid arteries. A fall in blood pressure is followed almost immediately by reflex vasoconstriction of arterioles which increases the peripheral resistance, and also vasoconstriction of veins and a tachycardia which increase the cardiac output; in this way the blood pressure is maintained within normal limits. The opposite also applies, so that a rise in blood pressure is again corrected by the baroreceptor reflexes towards normality. There are also other vascular reflexes and hormonal mechanisms which are concerned in the control of systemic arterial pressure.

It follows that a sustained rise in blood pressure must be due either to an increase in cardiac output or an increase in peripheral resistance which over-rule the control mechanisms and particularly the baroreceptor reflexes.

Rise of blood pressure with age

Both systolic and diastolic blood pressures rise with age and there has been a great deal of controversy as to the cause of this. Platt (1963, 1964) maintains that there is a disease entity, essential hypertension, which is genetically determined and due to two or three dominant genes becoming effective in middle age; this is shown by a bi-modal effect in a population with one group of people suffering from high blood pressure and a second group who are normal. Pickering (1961, 1965, 1968) takes a different view. He maintains that essential hypertension is multifactorial in aetiology and that what in fact is inherited is a tendency towards higher blood pressure at all ages as a function of normal variation similar to height or blue eyes; other factors superimposed in later life produce a more rapid rise, in other words an accelerated hypertension. Now Miall and Lovell (1967) have recently made an important contribution in showing that the rate of rise in blood pressure is related to the original level of blood pressure and not to age; this means that if, for instance, one starts off with a systolic blood pressure of 110 mm Hg one is less likely to develop a rise of blood pressure in later years than if one starts off with a blood pressure of 150 mm Hg. It is the initial height of blood pressure (not age) which determines future increases.

The important point is (and the evidence favours Pickering's view) that it is the height of the blood pressure at any time, irrespective of its cause, which produces harm. This is applicable to all age groups including the elderly (Dollery 1966).

Three main pathological conditions have now been shown to be associated with hypertension: fibrinoid necrosis of the malignant phase; miliary aneurysms of the cerebral arteries, the commonest cause of cerebral haemorrhage; and atheroma or nodular arteriosclerosis where however it is only one of several risk factors.

Reduction of high blood pressure, irrespective of its cause, is effective in lowering both the morbidity and mortality of malignant hypertension and of cerebral haemorrhage; its value in the prevention of atheroma is as yet uncertain.

Systolic hypertension

The commonest cause of systolic hypertension in old age is increased rigidity of the aorta and great vessels. There are other causes resulting from an increased stroke volume, such as a bradycardia whether due to sinus bradycardia or heart block; aortic regurgitation; the high-output states such as anaemia, thyrotoxicosis, hepatic disease, beri-beri, arteriovenous fistula or fever. In our present state of knowledge, hypotensive

therapy is not indicated for systolic hypertension alone, that is when the diastolic blood pressure is not raised.

Systolic and diastolic hypertension

In most conditions both systolic and diastolic blood pressure are raised. Essential hypertension has already been discussed. Secondary hypertension may be due to a number of conditions: (1) Diffuse renal disease including acute and chronic glomerulonephritis, diabetic nephrosclerosis, chronic pyelonephritis, polycystic kidneys, polyarteritis nodosa, disseminated lupus erythematosus, amyloid disease, or radiation nephritis; (2) Unilateral renal disease: an important group which includes congenital hypoplasia or malformation, renal injury, unilateral chronic pyelonephritis, renal artery stenosis, thrombosis, or embolism; (3) Endocrine disorder including Cushing's syndrome, sometimes from cortisone therapy; phaeochromocytoma; primary hyperaldosteronism; (4) Coarctation of the aorta; (5) Post-toxaemic hypertension (which may be first recognized in old age); (6) Neurogenic hypertension, an interesting group, where it is thought that brain disease itself may be the cause of secondary hypertension; this has been described in head injuries, in polioencephalitis, in tubercular meningitis; it has recently been suggested that basilar and vertebral artery ischaemia may be a common cause of secondary hypertension (Dickinson 1965). Certainly the systolic blood pressure may rise acutely following acute cerebral ischaemia.

Investigation of hypertension in the elderly

With regard to investigation, if an elderly patient has paroxysmal hypertension or malignant hypertension a phaeochromocytoma should be excluded by the estimation of the urinary excretion of catechol amines.

Any elderly patient with accelerated hypertension and a sustained blood pressure of more than 120 mm Hg should have an intravenous pyelogram done. This is particularly important when there is a sudden rapid rise in blood pressure. In some cases of unilateral renal disease and renal artery stenosis surgery may be indicated.

We have recently had a man of 76 who was known to have a mild hypertension and developed a very rapid rise in blood pressure; he was found to have a renal artery stenosis, and after nephrectomy his blood pressure returned to and has remained at normal levels. Thus old age does not entirely exclude the possibility of surgery, but patients need most careful selection. Secondary hypertension due to unilateral renal disease or renal artery stenosis can usually be treated satisfactorily by ordinary hypotensive agents. Alpha-methyl-para-tyrosine or phenoxybenzamine may be effective in a phaeochromocytoma when there is a contra-indication to surgery.

The effect of hypotensive therapy in elderly patients

There is now considerable evidence that a sustained reduction of blood pressure is associated with a reduction in mortality and morbidity (Leishman 1963, Hamilton *et al.* 1964).

Unfortunately, a fall in blood pressure, and particularly an abrupt fall, in a patient with ischaemic brain disease may produce symptoms of cerebral anoxia and can probably cause permanent damage; similarly angina or cardiac infarction may be precipitated. It is particularly important to appreciate that after an acute ischaemic stroke the blood pressure often rises and may not return to the previous level for six to eight weeks (Adams 1965). If one attempts to lower the blood pressure at this stage one may be doing harm.

The indications for hypotensive therapy

Malignant hypertension with papilloedema or premalignant hypertension with retinal haemorrhages without papilloedema require urgent treatment and so does hyper-

tensive encephalopathy. Cardiac failure and renal failure are an indication for hypotensive therapy. Renal failure requires particularly careful management as deterioration in renal function may occur when the blood pressure is lowered. The decision when to treat asymptomatic mild hypertension is particularly difficult. In younger patients we would consider a sustained diastolic blood pressure of 95 mm Hg or more as an indication for hypotensive therapy. In the elderly we would take a level of diastolic pressure of 110 mm Hg or over as an indication for treatment unless it had occurred within six weeks of a stroke.

Hypotensive drugs

All hypotensive drugs have side effects (table I). The choice of hypotensive agents in the elderly will largely be determined by their likelihood of precipitating abrupt falls in blood pressure and particularly postural or exercise hypotension.

TABLE I
HYPOTENSIVE DRUGS

Drug	*Initial dose mg.*	*Side effects*
Hydrochlorothiazide (with potassium supplements)	25 daily	Hypokylaemia. Hyperuricaedemia. Hyperglycaemia. Skin rashes. Pancytopenia
Reserpine ('Serpasil')	0.25 daily	Depression. Parkinsonism. Nasal obstruction
Methyldopa ('Aldomet')	250 b.d.	Drowsiness. Dry mouth. Gastrointestinal. Fluid retention. Gynaecomastia. Depression. Fever. Haemolytic anaemia. (Postural hypotension less common). Interferes with urinary catecholamine estimation
Bethanidine ('Esbatal') Guanethidine ('Ismelin') Pentolinium ('Ansolysen') in emergency	5 b.d. 10 daily 2.5 subcut.	Postural hypotension. Exercise hypotension Diarrhoea. Nasal obstruction. Fluid retention. Parotid pain. Depression. Impotence
Mecamylamine ('Inversine') Pempidine ('Perolysen') ('Tenormal')	2.5 b.d. 2.0 b.d.	Postural hypotension. Exercise hypotension. Retention of urine. Constipation. Dry mouth. Blurred vision. Impotence
Propranolol ('Inderal')	10 b.d.	Bradycardia. Exacerbates asthma and cardiac failure

In the case of malignant hypertension (which is uncommon in the elderly), of premalignant hypertension, methyldopa ('aldomet') and bethanidine ('esbatal') will be the drugs of first choice. In urgent cases intravenous frusemide ('lasix') and in hypertensive encephalopathy intramuscular reserpine may be required. Sometimes pentolinium ('ansolysen') may be necessary, but it is not well tolerated in the elderly.

In less severe cases a small dose of chlordiazepoxide ('librium') and bendrofluazide ('neonaclex') with potassium supplements will often prove adequate, and in the elderly one would aim for a diastolic pressure of 90–100 mm Hg. Where necessary reserpine ('serpasil') 0.25 mg. t.d.s. can be added, but this dose should not be exceeded and one has to observe carefully for the development of depression and Parkinsonism.

Our next choice would be the addition of methyldopa ('aldomet'). Propranolol ('inderal') can sometimes be useful but is contra-indicated in cardiac failure and asthma. We tend to avoid other hypotensive drugs in the elderly, if possible; we also avoid

barbiturates altogether as they so frequently give rise to confusional states.

Low blood pressure in the elderly

The function of any tissue depends on adequate perfusion, and the most vulnerable area is the brain. In the normal subject a fall in systemic arterial pressure is compensated by reflex vasodilatation of the cerebral vessels so that the cerebral blood flow does not fall. Kendall and Marshall (1967) have shown that this can apply also to some patients with carotid stenosis who have transient ischaemic attacks and in those he studied a reduction of systolic pressure to as low as 40 mm Hg had not produced any focal symptoms or signs.

This facility of the cerebral circulation is impaired in many elderly patients. If the systemic blood pressure falls cerebral blood flow may also fall and cerebral anoxia may occur.

Causes of low blood pressure

A low systemic arterial pressure may be caused by a low cardiac output or decreased peripheral resistance (tables II and III). Important causes in the elderly include cardiac

TABLE II
INADEQUATE CARDIAC OUTPUT

Diminished cardiac emptying
Myocardial injury
Extreme bradycardia
Aortic stenosis
Diminished cardiac filling
Central circulatory obstruction:
Mitral stenosis, Pulmonary emboli
Pericardial effusion or constriction
Extreme tachycardia
Diminished venous return
Raised intrathoracic pressure
Deficient muscle pump
Reduced venous tone
Inadequate effective blood volume

TABLE III
INADEQUATE PERIPHERAL RESISTANCE

Heat
Hyperventilation
Reflex vagal disturbances
Anoxia
Endotoxin
Anaphylaxis
Drugs
Blocked baroreceptor reflexes

or pulmonary infarction, dehydration, extreme bradycardia and dysrhythmias from digitalis intoxication, and the hypotensive effect of drugs.

Postural hypotension is of particular interest because it is far more common in elderly patients than is generally realized (Wollner 1965). Even when the effect of drug therapy was excluded postural hypotension was found in nine per cent of consecutive admissions to the Acute Geriatric Unit at Oxford (Johnson *et al.* 1965). The commonest cause of postural hypotension is a block of baroreceptor reflexes due to disease of the nervous system. This has been demonstrated in diabetic neuropathy, tabes dorsalis, encephalitis, spinal cord lesions and peripheral neuropathy. In the elderly the lesion may be due to cerebrovascular disease or degeneration. Any fall in arterial blood pressure may precipitate postural hypotension in these patients, and drugs with a potentially hypotensive action, such as chlorpromazine ('largactil') or imipramine ('tofranil'), may produce profound postural hypotension, even in very small doses (Barraclough and Sharpey-Schafer 1963).

Clinical manifestations of postural hypotension

These patients can usually be recognized because when an attempt is made to stand them up or walk them their legs give way and they collapse on to the ground. In more

severe cases even sitting them out of bed or sitting up in bed will produce drowsiness and they look pale, grey and feel cold. During this period they may become confused or they may be found in a collapsed condition on the commode or in the lavatory. The diagnosis can be established by a demonstration of a fall in systolic blood pressure of 20 mm Hg or more together with a fall in diastolic blood pressure of 10 mm Hg or more on change from the recumbent to the standing positions.

We take the blood pressure in all elderly patients in lying and standing positions. These measurements are facilitated by the use of a tilting table. With experience palpation at the wrist on change from the recumbent to the standing position will allow the diagnosis to be made in nearly all cases. Care has to be taken that the upper arm is not compressed on the side where the pulse is taken.

Management of patients with postural hypotension

The most important approach to the management of these patients is the prevention of any factor which will give rise to a fall in arterial pressure and the correction of any underlying causes as rapidly as possible. We always start with small doses of drugs and observe the blood pressure. Frequent changes in posture such as getting the patient in and out of bed for short periods appears to stimulate the baroreceptor reflexes. There is some evidence that vitamin B complex may correct the basic neurological abnormality in some cases, and we give parentrovite routinely to these patients.

With severe acute hypotension the use of intravenous 'dextran', plasma or blood may prove helpful, and in some cases the long-term use of plasma expanders such as 9-alpha-fluorohydrocortisone can be useful. In cases of doubt Addison's disease should first be excluded as this is a rare cause of postural hypotension.

Venous occlusive measures are of value: either elastic stockings or 'tubigrip' bandages. It is important to ensure that these are not suddenly removed in the sitting or standing positions as sudden profound postural hypotension may occur in these circumstances. Bandages which can readily be taken off are best avoided, and the same applies to corsets.

Vasoconstrictor agents would be the obvious choice. Unfortunately, no really satisfactory drugs are as yet available. Ephedrine and 'vasopressin' have too many side effects in doses which are effective. Adrenalin is of value but it also produces arterial vasoconstriction with consequent dangers of ischaemia and may produce cardiac side effects. Although a safe, long-acting vasoconstrictor drug has yet to be found for the treatment of postural hypotension, much can be done to prevent this unpleasant and potentially dangerous condition.

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