

Assessing and managing postural hypotension



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Nonpharmacological measures alone may be sufficient to manage postural hypotension once underlying causes have been identified and treated and, if possible, contributing medications discontinued.

The occurrence of symptoms with a change in position from lying or sitting to standing suggests postural (orthostatic) hypotension, although often this condition is asymptomatic. Postural hypotension is defined as a drop in blood pressure on standing of at least 20 mmHg systolic and/or 10 mmHg diastolic. It is a common problem in older people, with prevalence rates of up to 30% in those aged over 75 years and even higher in frail elderly nursing home residents. Ageing itself attenuates the cardiovascular response to standing. Postural hypotension may be associated with an increased risk of falling and may be an independent risk factor for mortality (studies are conflicting). The condition is common in patients with diabetes, cardiovascular disease or Parkinson's disease, and a high index of suspicion is required in patients taking medications that lower blood pressure.

This article reviews the assessment and management of postural hypotension in general practice and briefly describes some of the more specialised approaches used in severe or difficult cases.

Diagnosis

Diagnosis of postural hypotension according to the definition above requires measurement of a patient's blood pressure and heart rate after at least five minutes (preferably 10 minutes) in the supine position, followed by measurement one, two and three minutes after standing up. In some people, however, the fall in blood pressure may not occur until after this time.

A neurogenic cause of postural hypotension is suggested by a drop in blood pressure associated with symptoms of lightheadedness without an

IN SUMMARY

- Postural hypotension (i.e. a drop in blood pressure on standing of at least 20 mmHg systolic and/or 10 mmHg diastolic) is common in older people but often asymptomatic.
- Common causes include hypovolaemia, medication (including diuretics, vasodilators, levodopa, tricyclic antidepressants and major tranquillisers), neuropathy (often due to diabetes) and other neurological conditions, and cardiac disease. Ageing itself affects the cardiovascular response to standing.
- A fall in blood pressure without an increase in heart rate suggests a neurological cause.
- Treatment is aimed at reducing symptoms rather than achieving and maintaining a specific blood pressure.
- Patient education is vital and nonpharmacological measures such as ensuring adequate fluid and salt intakes and elevating the head of the bed can be beneficial.
- If pharmacological therapy is required, fludrocortisone is the usual first line agent but is likely to exacerbate heart failure and hypokalaemia. Other agents may also be used, particularly in specialist centres and for severe cases of neurogenic postural hypotension.

continued



Figure 1. Tilt table testing allows precise and safe assessment of patients with severe symptoms of orthostatic intolerance.

increase in heart rate. Repeated measurements may be needed, as they can be variable, the condition tending to be worse in the mornings and after eating. Associated supine hypertension is common.

Patients with severe symptoms such as syncope related to changing position should be referred for a tilt table test that allows more precise and safe assessment; this should be performed in the morning (Figure 1). Beat to beat blood pressure and heart rate monitoring improves patient comfort and diagnostic yield.

Differential diagnoses

Postural tachycardia

In some patients, symptoms of orthostatic intolerance are not associated with postural hypotension but with postural

Table. Causes of postural hypotension

Non-neurogenic causes

Medications

Diuretics
Vasodilators
Alpha blockers
Other antihypertensives
Levodopa
Opiates
Barbiturates
Tricyclic antidepressants
Antipsychotic agents

Reduced intravascular volume

Haemorrhage
Post-dialysis
Burns
Diuretic treatment
Salt-losing nephropathy
Endocrine causes – such as Addison’s disease, diabetes insipidus, hypoadosteronism
Other causes of fluid loss

Vasodilatation

Drugs and alcohol
Fever, sepsis
Heat, exercise, postprandial state
Prolonged recumbency or bedrest

Cardiac dysfunction

Myocardial, valvular, pericardial diseases
Arrhythmia

Neurogenic causes

Primary

Multisystem atrophy (Shy-Drager syndrome)
Autonomic failure associated with
Parkinson’s disease
Lewy body dementia
Dysautonomia
Pure autonomic failure

Secondary

Central nervous system – stroke, tumour, spinal cord lesions
Peripheral nervous system – neuropathies due to diabetes, alcohol intake, Guillain-Barré syndrome, amyloidosis, paraneoplastic, porphyria, human immunodeficiency virus infection, other causes

Other causes

Ageing-related
Rare hereditary disorders, such as dopamine beta hydroxylase deficiency
Connective tissue disorders
Vitamin B₁₂ deficiency

tachycardia. Postural tachycardia syndrome (POTS) is defined as the development of orthostatic symptoms associated with a heart rate increase of 30 beats per minute or to more than 120 beats per minute within five minutes of standing or tilt up. This syndrome is most common in patients between 15 and 50 years of age. It is important to recognise POTS because its treatment is different from that of postural hypotension.

Tachycardia related to changing posture may also be a sign of dehydration.

Other conditions

Other conditions that may cause symptoms with a change in posture but that are not due to a fall in blood pressure include benign positional vertigo, primary

orthostatic tremor and low CSF pressure syndrome. Postural hypotension should also be differentiated from other causes of syncope or presyncope, particularly neurocardiogenic (vasovagal) syncope and carotid sinus hypersensitivity.

Medical history

The diagnostic process should begin with a detailed medical history. The history should gain information about the patient’s orthostatic symptoms and help to identify potential causal cardiac, endocrine, neurological or other conditions and medication (Table). Symptoms of postural hypotension include lightheadedness, visual disturbance, sweating, pallor, weakness, pain in the suboccipital and paracervical regions (‘coat-hanger

distribution') and even loss of consciousness. Any relationship between symptoms and meals or the time of day should be sought.

Careful assessment of past and current medical conditions, medications, alcohol intake and autonomic symptoms (dry mouth, bladder or bowel difficulties, sexual dysfunction, inability to sweat) is necessary.

Numerous medical conditions may be associated with postural hypotension. Any acute medical problem causing dehydration or blood loss, and even prolonged bedrest, can produce orthostatic intolerance. Chronic medical conditions include diabetes mellitus, other causes of neuropathy, cardiac dysfunction, Parkinson's disease, multisystem atrophy, Lewy body dementia and a history of strokes. Postural hypotension may be age-related. Less common conditions such as salt-losing nephropathy, Addison's disease, diabetes insipidus, primary and secondary hypoaldosteronism, diseases of the spinal cord and Guillain-Barré syndrome should be considered in some cases. Rare causes include pure autonomic failure and familial dopamine beta hydroxylase deficiency.

Medications associated with postural hypotension include primarily alpha blockers, diuretics, nitrates, antidepressants (including tricyclics and, rarely, selective serotonin reuptake inhibitors), antiparkinsonian medications and phenothiazines.

Investigations

Medical examination requires careful blood pressure and heart rate measurement as outlined above, followed by detailed cardiovascular and neurological examinations.

Laboratory tests should be guided by medical history and examination findings. Most patients require a complete blood count and determination of electrolyte, urea, creatinine, blood glucose, vitamin B₁₂ and folic acid levels. Severe autonomic

failure may be associated with anaemia. In some cases, a short synacthen test (a test of adrenal reserve) or a 24-hour urine collection for sodium and/or protein excretion should be performed. In patients with unexplained peripheral neuropathy, chest x-ray and nerve conduction studies may be necessary. Twenty-four-hour blood pressure monitoring may be helpful, particularly in patients with supine hypertension or a history suggesting postprandial hypotension. Echocardiography may be appropriate where there is evidence to suggest heart disease.

Referral for more specialised autonomic function tests may be indicated where the underlying cause is not clear or

other tests are inconclusive. Autonomic function tests are best performed in specialised units with appropriate equipment for precise measurement of heart rate and blood pressure. Heart rate tests include responses to the Valsalva manoeuvre, standing after being supine and deep breathing, and blood pressure tests include responses to immersing a hand in ice-cold water (the cold pressor test) and sustained handgrip. These are discussed in more detail in the box on this page. Occasionally, specialist centres may measure noradrenaline levels (supine and standing), particularly if a neurogenic cause is suspected, although results can be inconsistent and difficult to interpret.

Autonomic function tests for postural hypotension

Heart rate tests

Heart rate response to Valsalva manoeuvre (Valsalva ratio)

The subject holds an expiration against a closed glottis to a pressure of 40 mmHg for 15 seconds in a sitting position. The ratio of the longest R-R interval shortly after the manoeuvre (within 20 heart beats) to the shortest R-R interval during the manoeuvre is measured. In patients under 60 years, a normal Valsalva ratio is ≥ 1.21 ; abnormal, ≤ 1.10 ; and borderline, 1.11 to 1.20. In patients over 60 years, an abnormal ratio is ≤ 1.11 .

Heart rate response to standing up (30:15 postural ratio)

The subject lies for 20 minutes and then stands up. Normally there is an immediate increase in heart rate that is maximal at about the 15th beat after starting to stand up, followed by a bradycardia maximal at around the 30th beat. This can be quantified as the 30:15 ratio, i.e. the ratio of the longest R-R interval around the 30th beat to the shortest R-R interval around the 15th beat. Normal values are ≥ 1.04 ; borderline, 1.01 to 1.03; abnormal, ≤ 1.00 .

Heart rate response to deep breathing

The subject breathes deeply and evenly at six breaths per minute (five seconds in and five seconds out). The difference in maximum and minimum heart rates during each cycle are measured. Abnormal response is below 10 beats per minute.

Blood pressure tests

Cold pressor test

One of the subject's hands is placed in ice-cold water for 60 seconds. The increase in diastolic blood pressure is assessed. An abnormal response is an increase of ≤ 10 mmHg.

Blood pressure response to sustained handgrip

Handgrip is sustained for up to five minutes at 30% of the maximum voluntary contraction (using a handgrip dynamometer). The difference in diastolic blood pressure just before release of the handgrip and before starting is assessed. An abnormal response is a difference of ≤ 10 mmHg.

Postural hypotension

What is postural hypotension?

Postural hypotension is a fall in blood pressure related to standing from the lying or sitting position – a fall of more than 20 mmHg systolic (the top number in a blood pressure reading) or more than 10 mmHg diastolic (the bottom number) is considered abnormal. Postural hypotension is a common problem, especially in older people.

What are the symptoms?

A person with postural hypotension may experience symptoms of lightheadedness, dizziness or faintness (including blackouts in more severe cases) on standing. Visual blurring or neck and shoulder discomfort may also occur. Symptoms are often worse in the mornings, after meals, after exercise and in hot environments.

Often, however, a person with postural hypotension is unaware of any symptoms.

What causes postural hypotension?

There are many different causes, the most usual being ageing, diabetes, dehydration, heart disease and disorders of the nervous system. Some medications cause or exacerbate the problem, particularly certain blood pressure and heart medications (such as nitrates or diuretics), certain antidepressants and sedatives, and medication for Parkinson's disease.

What can be done to help?

The aim of treatment is to improve symptoms rather than achieve and maintain specific blood pressures. Your doctor will measure your blood pressure and examine you, and may organise some tests to exclude underlying illness. The medications you are taking should be reviewed with your doctor, and you should consult your doctor before using any over the counter medications.

It is usually possible to improve symptoms by measures other than taking drugs. Suggestions that may be helpful for you are listed below.

- Rise slowly from bed or chairs, especially if you have been

sitting or lying for a long time. This is especially the case in the mornings – sit on the side of the bed for several minutes, or longer if necessary, before standing.

- Using a urine bottle or bedside commode will avoid the need for you to get out of bed at night to walk to the bathroom.
- Symptoms are usually worse in the mornings so, where possible, schedule your activities for the afternoons. If you feel lightheaded, sit down, stoop or rest one leg in an elevated position. Crossing the legs and contracting the leg muscles can also be useful. It may be helpful to take a portable low chair with you when you go out. Having a drink of water (240 mL or more) may also help you to boost your blood pressure.
- Avoid warm environments, hot baths, alcohol and large carbohydrate-rich meals. Avoid straining and heavy lifting; discuss exercise with your doctor.
- Adequate fluid and salt intakes are important, but these should be discussed with your doctor if you have heart problems. Adding extra salt to your food may be helpful.
- The head of your bed should be elevated 5 to 20° (10 to 15 cm) as tolerated, using blocks to raise the bed frame or a wedge under the mattress. A footboard may be needed to stop you sliding when in the bed.
- Custom fitted support stockings and other garments may be used but they can be uncomfortable in hot weather and difficult to put on. Combined abdominal and leg compression is the most effective.
- Drinking coffee (two cups) in the morning may be helpful.

Will I need to take any medication?

Should you need drugs to treat your postural hypotension, you are most likely to be prescribed fludrocortisone (Florinef). This drug will take a few days to have an effect. Common side effects include swelling of the ankles, exacerbation of heart failure and low blood potassium (which will require monitoring with a blood test). Other medications may be used if symptoms persist.

Management

The goal of treatment in postural hypotension is improvement of a patient's symptoms and function rather than achievement and maintenance of a specific blood pressure. Identification and treatment of any underlying cause is critical, and any contributing medications should be discontinued if it is possible to do so safely.

Nonpharmacological measures

Treatment by patient education and other nonpharmacological measures should be attempted before beginning pharmacological treatment. An information sheet for patients is given on this page, and the points covered are discussed below.

Patients should be advised to rise slowly from beds or chairs, especially if they have been sitting or supine for a

prolonged period. This is especially the case in the mornings – patients should sit on the side of the bed for a while (the time needed will depend on the severity of the symptoms but should be at least three minutes). The use of a urine bottle or bedside commode will minimise the need for a patient to get out of bed at night. As symptoms are usually worse in the mornings, patients should schedule activities

continued

for the afternoons when possible.

Warm environments and hot baths may exacerbate postural hypotension, as can large meals and alcohol; patients should be warned of this. Advise them to have more frequent small meals with reduced carbohydrate and increased protein content, particularly if postprandial hypotension is a problem.

Patients should avoid straining and heavy lifting. Care should be taken with exercise, which induces vasodilatation, and advice on exercise should be tailored to the individual. Maintaining muscle strength is important.

Explain to patients that if their symptoms become more severe at any time, adopting positions such as crossing legs with leg muscle contraction, squatting, stooping forward while upright, or resting one leg in an elevated position can improve blood pressure. The use of small portable chairs with a low sitting height can be helpful.

An adequate intake of fluid is vital. Extra salt intake (dietary or salt tablets

[Salt Tablets, Slow Sodium]) can be very helpful (dose tailored to the individual), although care should be taken to avoid cardiac failure in susceptible individuals.

Drinking water (as little as 240 mL in some patients) can elicit an acute pressor response in a large subgroup of patients with severe postural hypotension due to autonomic failure. This effect is particularly useful in the mornings when symptoms can be more severe.

Elevation of the head of the bed activates both the renin-angiotensin system and vasopressin secretion, and may improve associated supine hypertension and nocturnal diuresis. It also encourages adaptation of cerebral autoregulation. Elevation by 5 to 20° (10 to 15 cm) may be achieved using blocks to raise the bed frame or a wedge under the mattress – a footboard may be needed to prevent the patient from sliding down the bed (Figure 2). Patients who have been bed-bound for a period may need reconditioning, and prolonged bed rest during the day should be avoided.

Custom fitted support stockings or garments may be useful but they need to be full-length and can be uncomfortable in hot weather and difficult to put on. Combined abdominal and leg compression is the most effective.

Drinking coffee (two cups) in the morning may also help patients.

Pharmacological treatment

Fludrocortisone

If nonpharmacological measures alone are inadequate to improve patients' symptoms, the usual first choice of medication is fludrocortisone (Florinef). This potent mineralocorticoid promotes renal tubular sodium reabsorption and hence expands plasma volume over a week or so. It also enhances alpha adrenoreceptor sensitivity to noradrenaline, and it is probably this effect that is responsible for improvement in blood pressure in the longer term. The starting dose is 0.1 mg taken at night. The effect is not maximal until after one to two weeks, and doses should be increased only once or twice a week.

Fludrocortisone is very likely to exacerbate heart failure, and side effects include headache, fluid retention, supine hypertension, hypokalaemia (in 50% of cases) and hypomagnesaemia.

Where symptoms persist despite the use of fludrocortisone, combination therapy may be necessary. Specialist advice should be sought.

Adrenoreceptor agonists - ephedrine, pseudoephedrine, midodrine

Adrenoreceptor agonists may be prescribed, often in combination with fludrocortisone. In many patients with postural hypotension, sensitivity to alpha adrenoreceptor agonists is increased, so caution is required with their use.

Oral ephedrine is used in Australia. This has direct and indirect effects and is a moderate alpha agonist but strong beta-1 and beta-2 agonist. It is taken three times daily (avoiding nocturnal dosing) and side effects include tremor, tachycardia,



Figure 2. Elevating the head of the bed by 10 to 15 cm may improve supine hypertension and nocturnal diuresis associated with postural hypotension.

Case study: a typical case of postural hypotension

An 81-year-old man presented with falls, syncope, and faintness. He had noticed more severe symptoms after eating, and gave a history of hypertension and transient cerebral ischaemic event. He had had symptoms and signs of Parkinson's disease for four years.

Orthostatic hypotension was confirmed by a blood pressure of 175/111 mmHg supine falling to 100/68 mmHg after standing for two minutes. Treatment with fludrocortisone 0.2 mg and salt supplements gave good response and resolution of symptoms but supine hypertension were noted at 10 days – 190/80 mmHg supine falling to 150/60 mmHg on standing. This was controlled with 10% of head up bed elevation.

At clinic review two months later he was well, with a blood pressure of 140/70 mmHg sitting and 130/70 mmHg on standing.

supine hypertension, appetite reduction and, in men, urinary retention. Extended relief pseudoephedrine (Sudafed 12 Hour Relief) is also used.

Midodrine (ProAmatine), a selective alpha agonist, is also used for postural hypotension, particularly in patients with

peripheral autonomic dysfunction. It has proven efficacy in improving both standing blood pressure and symptoms in neurogenic postural hypotension. It is best avoided in patients with coronary disease, arrhythmia or peripheral vascular disease, and night-time dosing should be

avoided because of nocturnal supine hypertension. Midodrine is available in Australia only through the Special Access Scheme.

Other medications

Other medications that may occasionally be initiated by specialist centres include:

- the serotonin and noradrenaline reuptake inhibitor venlafaxine (Efexor) and selective serotonin reuptake inhibitors such as fluoxetine
- NSAIDs – in selected patients
- clonidine – in patients with CNS causes of autonomic insufficiency
- caffeine (No Doz)
- dihydroergotamine (Dihydergot); use of the combination formulation caffeine plus ergotamine tartrate (Cafergot) is appropriate in some cases.

Yohimbine has also been used overseas but is prohibited in Australia.

Drugs with potential application for treatment of postural hypotension include:

- erythropoietin (epoetin alfa rch [Eprex], darbepoetin alfa rch [Aranesp]) – in patients who have anaemia
- octreotide (Sandostatin) – in patients with postprandial hypotension
- ambulatory noradrenaline (Levophed) – has shown promise in the treatment of refractory patients with primary autonomic failure
- oral L-DOPS (L-threo-3,4-dihydroxy-phenylserine, a synthetic amino acid that is a noradrenaline precursor) – improves orthostatic tolerance and increases blood pressure in patients with neurogenic postural hypotension
- pyridostigmine (Mestinon) – has been trialled with some success in neurogenic cases.

Camphor–crataegus berry extract combination is an alternative medicine

that is used for postural hypotension. It has been shown to reduce tilt-induced fall in blood pressure in a dose-dependent manner in patients with this condition. *Ruscus aculeatus* (Butcher's Broom), which has alpha adrenergic agonist activity, has been proposed as another alternative treatment as it may be effective in alleviating the adverse effects of hot conditions on postural hypotension.

Conclusion

Postural hypotension is common, particularly in elderly people, although it is often asymptomatic. It may be associated with supine hypertension and may present as such.

The goal of treatment is to improve symptoms. Underlying conditions and medications that exacerbate the fall in blood pressure should be sought and treatment adjusted if possible. Patient

education is vital and nonpharmacological measures such as ensuring adequate fluid and salt intakes and elevating the head of the bed can be very beneficial. If medication is required, fludrocortisone is the usual first line agent but patients need to be monitored for hypokalaemia and fluid overload. Several other agents are used in difficult or severe cases by specialist centres. **MT**

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A list of further reading is available on request to the editorial office.

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