UNIT NO. 3

CEREBROVASCULAR AND PERIPHERAL VASCULAR COMPLICATIONS

Dr Chadachan Veerendra Melagireppa, Dr Tay Jam Chin

ABSTRACT

Hypertension is one of the most important global public health challenges and is among the most common conditions seen at the primary care office setting. Hypertensive patients are at increased risk of developing cerebrovascular diseases (CVD) and peripheral vascular diseases (PVD). Patients who have established CVD and PVD are not only associated with significant morbidity and mortality in short term from the disease itself, but also in long term from recurrent events and from associated cardiovascular disease. While in patients with CVD, the primary disease is by itself life-threatening, in patients with PVD, the major life threatening problems are more from associated cardiovascular disease and CVD. Hence primary care physicians are often faced not only with challenges of diagnosing and managing these complications in the short term, as well as with secondary prevention of recurrent events in the long term. In this article, we will present guidelines on diagnosis, clinical evaluation and management of these complications of hypertension at a primary care office testing. We will also present guidelines on when to refer patients with the complications to Specialist services.

Keywords: Cerebrovascular Complications, Peripheral Vascular Complications, Face Arm Speech Test, Transient ischaemic attack, ABCD2 score.

SFP2011; 37(4) (Supp 1): 15-21

CEREBROVASCULAR COMPLICATIONS OF HYPERTENSION

Background

Hypertension is the single most important modifiable risk factor for stroke [1]. There is a close linkage between hypertension and cerebrovascular disease. It has been estimated that about 54% of strokes worldwide are attributable to hypertension [2]. The degree of elevation of blood pressure (BP) is also tightly correlated with the risk of stroke. Detailed analysis of large cohort studies have shown that the relationship between BP and risk of stroke is continuous, consistent and independent of other risk factors [3].

It has also been shown that hypertension increases the risk of both ischemic as well as hemorrhagic strokes [4]. Among the ischemic strokes, although hypertension-related strokes are mainly lacunar infarcts from small-vessel disease, hypertension also plays a key role in the pathogenesis of large artery atherosclerosis, which in turn causes ischemic stroke due to thrombotic arterial occlusion, artery-to-artery embolism, or a combination of both these factors.

In this section of the article we will review the clinical evaluation and management of cerebrovascular disease in hypertensive patients at a primary care setting.

Clinical Evaluation

Most (95%) people will have their first symptoms of cerebrovascular accidents outside the hospital and may initially present to the primary care physician. Therefore it is vital that the primary care physicians can recognise stroke as accurately as possible to facilitate appropriate emergency care. It is also essential that they treat patients with symptoms suggestive of an acute stroke as an emergency and organise urgent transfer to a centre with specialised hyperacute stroke services such as a Stroke unit. This is especially true for those patients who are seen within the first three hours of the onset of stroke symptoms, who require to be transferred directly to a specialised hyperacute stroke unit for assessment for the need for thrombolysis.

Diagnosis Of Cerebrovascular Accidents (CVA)

Stroke is defined as an acute onset of neurological symptoms which result from impaired cerebral vascular perfusion and persist for more than 24 hours. Transient ischemic attack is defined as transient and acute onset of neurological symptoms which recover within 24 hours and most of the times within one hour [5].

Initial diagnosis of CVA is based mainly on the history and physical examination. At a primary care office setting, when a patient presents with a sudden onset of neurological symptoms, a validated tool, such as FAST (Face Arm Speech Test), should be used to screen for diagnosis of stroke or TIA (See Table 1) [6].

Of course it is important to exclude hypoglycemia in all patients who present with sudden onset of neurological symptoms. If a patient is suspected to have stroke, further management is determined by the type of stroke. Hence the process of diagnosis will need to establish whether or not the stroke is due to ischaemia (approximately 80% of all strokes) or due to intracerebral haemorrhage (approximately 20% of all strokes). Moreover, those with ischaemic strokes presenting within three hours of onset of symptoms should be assessed for thrombolysis in centres with staff and systems in place to deliverthis intervention. Therefor all patients with suspected stroke should be referred for admission to a specialised acute

CHADACHAN VEERENDRA MELAGIREPPA, Consultant, Department of General Medicine, Tan Tock Seng Hospital

TAY JAM CHIN, Senior Consultant, Department of General Medicine, Tan Tock Seng Hospital

stroke unit. There is also evidence that stroke patients have better long term outcomes if they are managed in a Stroke units rather than in a general ward or in the community [7].

Table 1. FAST screening tool for diagnosis of CVA

Facial weakness	Can the person smile? Has their mouth or eye drooped?
Arm weakness or numbness	Can the person raise both arms? Is there numbness in either arm?
Speech problems	Can the person speak clearly and understand what you say?
Time: Act FAST	Stroke is a medical emergency Call Ambulance – early treatment can prevent further brain damage

If a patient is diagnosed to have TIA symptoms, then he/she should be referred to the Specialist Neurology clinic as soon as possible. The urgency of referral depends upon the risk of recurrent TIA or stroke after the initial TIA event. This risk can be assessed using the ABCD2 score computation (See Table 2) [8].

Table 2. ABCD2 Score for estimation of Stroke Risk after TIA

Age	≥ 60 yrs	1 point
	< 60 yrs	0 points
Blood pressure	≥ 140/90	1 point
	< 140/90	0 points
Clinical Features	Speech impairment without weakness	1 point
	Unilateral weakness	2 points
Duration of symptoms	10-59 mins	1 point
	≥ 60 mins	2 points
Diabetes	Yes	1 point

ABCD2 algorithm predicts a patient's very early risk of stroke following a TIA. The corresponding 2- day risks for a subsequent stroke are shown in Table 3 [9].

Table 3. ABCD2 Score and Risk of subsequent stroke

ABCD2 score	Risk of stroke at 2 days	Urgency of Referral
0-3	1%	Within 7 days
4-5	4%	Within 24 hours
6-7	8%	Within 24 hours

High risk patients (ABCD2 score 4 and above) should be assessed at the Specialist Neurology clinic within 24 hours of first presentation to the primary care doctor.

Low risk patients (ABCD2 score 3 or lower) should be assessed at the Specialist clinic within 7 days of first presentation to the primary care doctor.

Management Of Cerebrovascular Complications

Role of primary care physicians in CVA is biphasic. First phase is management of stroke (or TIA) before admission to hospital (or before specialist consultation for TIA). Second phase is the long term management of stroke patients after they are discharged from the hospital.

Management In Pre-Admission Phase

Acute Stroke

All patients with suspected stroke should be referred for admission to a specialised acute stroke unit.

Brain imaging (CT scan or MRI/MRA) should be performed immediately, if available at the Family practice setting, for patients with acute stroke to determine the type of stroke.

All people presenting with acute stroke who have had a diagnosis of primary intracerebral haemorrhage excluded by brain imaging should, as soon as possible but certainly within 24 hours, be given aspirin 300 mg orally [10].

All patients with acute stroke should have their swallowing screened before being given any oral food, fluid or medication.

Management of hypertension in the acute stroke situation is a matter of debate. Most guidelines recommend antihyper tensive treatment in the acute setting of stroke in patients scheduled for thrombolysis if blood pressure is above 185/110 mmHg. If thrombolysis is not indicated antihypertensive treatment is recommended when blood pressure is above 220/110 mm Hg or if there is a hypertensive emergency.

Subsequent management of patients with acute stroke is carried out in-patient at the Specialised Stroke units.

Transient Ischemic Attacks (TIA)

Patients with suspected TIA who are at high risk of stroke (that is, with an ABCD2 score of 4 or above) should have aspirin (300 mg daily) started immediately and referred to Specialist assessment and investigation within 24 hours of onset of symptoms. Measures for secondary prevention introduced as soon as the diagnosis is confirmed, including modification of individual risk factors [11].

Patients with crescendo TIA (two or more TIAs in a week) should be treated as being at high risk of stroke, even though they may have an ABCD2 score of 3 or below [11].

Patients who have had a suspected TIA who are at lower risk of stroke (that is, an ABCD2 score of 3 or below) should have aspirin (300 mg daily) started immediately and referred to Specialist assessment and investigation as soon as possible, but definitely within 1 week of onset of symptoms. Measures for secondary prevention again should be introduced as soon as the diagnosis is confirmed, including modification of individual risk factors [11].

Patients who have had a TIA but who present late (more than 1 week after their last symptom has resolved) should be treated as though they are at lower risk of stroke [11].

Management In Post-Discharge Phase

Poststroke outpatient care largely focuses on rehabilitation and secondary prevention of recurrent stroke.

Rehabilitation

Rehabilitation planning and initiation begins within the first day of the acute stroke. Recent research has demonstrated the benefits of early and aggressive mobilization.

Secondary prevention of recurrent stroke or TIA

From the moment a person has an acute cerebrovascular event, that person is at an increased risk of further stroke and other vascular events. The risk of further stroke is highest early after stroke or TIA and may be as high as 10% within the first week, 20% within the first month, and between 30% and 43% over the next five years.

For each patient, an individualised and comprehensive long-term strategy for stroke prevention should be implemented as soon as possible following a TIA or stroke.

Life-style recommendations

1. All patients who smoke should be advised to stop smoking.
2. All patients should be advised to eat the optimum diet.
3. All patients should be advised to take regular exercise as far as they are able to.

Blood pressure recommendations

1. All patients should have their blood pressure checked, and should be treated in keeping with the recommended guidelines. An optimal target BP for patients with established cardiovascular disease is 130/80 mmHg.

2. In hypertensive patients aged 55 or older, the first choice for initial therapy should be either a calcium-channel blocker or a thiazide-type diuretic. In hypertensive patients younger than 55, the first choice for initial therapy should be an angiotensin-converting enzyme (ACE) inhibitor (or an angiotensin-II receptor antagonist if an ACE inhibitor is not tolerated). An ACE inhibitor, calcium-channel blocker or a thiazide-type diuretic should be added if target BP is not achieved with the initial choice

3. Beta blockers should not usually be initiated as first or second-line for the prevention of recurrent stroke (unless there are other specific clinical indications).

Lipid lowering therapy recommendations

All patients who have had an ischaemic stroke or a transient ischaemic attack should be treated with a statin drug unless contraindicated, if the total cholesterol is more than 3.5mmol/L, or LDL cholesterol is more than 2.6mmol/L

REFERRAL GUIDELINES

Stroke

1. All patients with suspected stroke should be referred to a hospital with a specialist acute stroke unit to allow medical stabilization and assessment of factors that may lead to complications. With the advent of thrombolysis, speed of admission is paramount.

2. The primary care physician is also responsible for the general medical care of people who have had a stroke and have been discharged from hospital. They should ensure that problems related to stroke are detected early and, when necessary, referred to the appropriate community health service, local social services, and specialists in secondary care, including an occupational therapist, a physiotherapist, and a speech therapist.

3. Remember to address psychosocial issues as depression is common, affecting up to half of all those who have suffered a stroke. If depression is detected then a prompt referral should be considered for psychiatric evaluation.

Transient Ischaemic Attack

1. If a patient presents with TIA symptoms they should be referred to the Specialist Neurology clinic as soon as possible. The risk of recurrent event is assessed using the ABCD2 score computation.

2. High risk patients (ABCD2 score 4 and above) should be assessed at the Specialist's clinic within 24 hours of first presentation to a primary care doctor.

3. Low risk patients (ABCD2 score 3 or lower) should be assessed at the Specialist's clinic within 7 days of first presentation to the primary care doctor.

PERIPHERAL VASCULAR COMPLICATIONS OF HYPERTENSION

Background

Hypertension is an important risk factor for the development of Peripheral vascular disease (PVD). There is a strong link between blood pressure and the risk of developing PVD in the future. In the Framingham Heart Study, the higher an individual's blood pressure, the more likely he/she was to develop PVD [12]. On the other hand, the patients with PVD also have higher prevalence of hypertension. About 70-80% of patients with PVD have hypertension. And finally, the presence of peripheral vascular disease carries an increased risk of developing cardiovascular events [13]. This risk is further shown to

be augmented by the presence of hypertension. Thus it is very important to look for PVD in patients with hypertension. Unfortunately, PVD remains under-diagnosed in primary care settings. Many a times, PVD remains asymptomatic with only a quarter of patients having symptoms. Secondly, most patients with PAD do not present with typical symptoms, which may contribute to less frequent diagnoses. Finally, ABI measurements are rarely performed at the primary care office settings. In this section of the article we will review clinical evaluation and management of PVD in hypertensive patients in a primary care setting.

CLINICAL EVALUATION FOR PERIPHERAL VASCULAR DISEASE (PVD)

Clinical evaluation for PVD in patients with hypertension should include accurate diagnosis of PVD and assessment of cardiovascular risk.

DIAGNOSIS OF PERIPHERAL VASCULAR DISEASE

Diagnosis of PVD is based mainly on the history and physical examination, with ankle brachial pressure index being used to confirm the diagnosis and assess the severity of the disease.

History Taking

A diagnosis of intermittent claudication can usually be made on the basis of the history. Intermittent claudication presents with a characteristic history of pain in the muscle, typically in the calf, thigh or buttock, which is elicited by exertion and relieved within a few minutes of rest. The Edinburgh claudication questionnaire is highly specific (91%) and sensitive (99%) for the condition (See Table 4) [14].

The location of pain helps to determine the level of PVD and the amount of exercise needed to elicit pain determines the severity of PVD. The distal lesions in the femoral, popliteal or tibial arteries produce a cramping pain in the calf muscles, while proximal or aorto-iliac lesions usually produce an aching discomfort in the hips, buttocks or thigh. And the more severe the disease, the lesser the amount of exercise is needed to produce pain. Development of rest pain or non-healing or delayed healing wounds or ulcers in the feet indicates a more severe or critical limb ischemia.

Table 4. Edinburgh Claudication Questionnaire

Questions	Correct Answer
1. Do you get pain or discomfort in your legs(s) when you walk? o Yes o No o Unable to walk If you answered "yes" to question 1, go to the following questions	Yes
2. Does the pain ever begin when you are standing or sitting still? o Yes o No	No
3. Do you get it when you walk fast or uphill? o Yes o No	Yes
4. Do you get it when you walk at an ordinary pace on the level? o Yes o No	Yes
5. Does the pain disappear if you stand still for up to 10 minutes? o Yes o No	Yes
Definition of positive classification requires all correct responses: "Yes" to (1), "No" to (2), "Yes" to (3), "Yes" to (4), "Yes" to (5). If these criteria are fulfilled go to question (6)	
6. Where do you get this pain or discomfort? Classic claudication - when the pain is in the calf. Atypical claudication - when the pain is in the thigh or buttock, in the absence of any calf pain.	

It is also important to differentiate intermittent claudication of PVD from venous claudication and neurogenic claudication (See Table 5).

Table 5. Differential diagnosis of Intermittent claudication

Type	Intermittent claudication	Venous claudication	Neurogenic claudication
Characteristic of pain	Cramping sensation	"Bursting" sensation	Electric shock-like sensation
Onset	Gradual, consistent	Gradual, can be immediate	Can be immediate, inconsistent
Relieved by	Standing still	Elevation of leg	Sitting down, bending forward
Location	Muscle groups (buttock, thigh, calf)	Whole leg	Poorly localised, can affect whole leg
Legs affected	Usually one	Usually one	Often both

Physical Examination

A detailed physical exam should be performed with emphasis on:

1. The quality of the femoral, popliteal, dorsalis pedis, and posterior tibial arterial pulses.

2. Signs of arterial insufficiency, e.g., coolness, scaling, paleness (especially with leg elevation), and ulceration.

3. Measurement of ankle-brachial index (ABI).

The ABI measurement is a simple, highly specific, noninvasive screening and diagnostic test for PAD. The actual performance time for an ABI in a primary care setting takes an average of 5 minutes. All physicians providing routine care to patients with hypertension should be able to measure the ABI. ABI is

measured by the higher of the systolic blood pressures in the pedal arteries (usually the dorsalis pedis or posterior tibial artery) divided by the higher of the systolic blood pressures in the brachial arteries of the two arms. The ABI cannot pinpoint the area of stenosis but it is a very accurate indicator of the presence of PVD. It is also a simple measure of the severity of lower extremity PVD (See Table 6) [15].

Table 6. Interpretation of ABI results

ABI	Interpretation	Clinical implications
>1.30	Non-compressible calcified vessels	PAD need to be evaluated with other tests.
0.90 to 1.30	Normal	No symptoms
0.40 to 0.89	Mild to moderate PVD	Patients usually present with intermittent claudication.
<0.40	Severe PVD	Patients may present with rest pain or non-healing ulcers.

ASSESSMENT OF CARDIOVASCULAR RISK

Peripheral vascular disease is a marker of systemic atherosclerosis; the risk to the limb in claudication is low, but the risk to life is high because of increased prevalence of cardiovascular events in patients with PVD [16]. Therefore, assessment of patients with PVD should also include evaluation for other cardiovascular risk factors (in addition to hypertension), evaluation for other target organ damages (in addition to PVD) and evaluation for presence of other cardiovascular diseases:

Evaluation for other Cardiovascular risk factors

1. Family history of coronary artery disease,

2. History of Smoking,

3. Fasting lipid profile

4. Presence of diabetes and status of its control

Evaluation for other Target organ damages associated with hypertension

1. Ask for any symptoms of vascular disease in other vascular territories – coronary artery disease, cerebrovascular disease, etc.

2. Test for the presence of protein in the urine by sending a urine sample for estimation of the albumin:creatinine ratio and test for haematuria using a reagent strip.

3. Measure plasma creatinine with electrolytes and estimate glomerular filtration rate (eGFR).

4. Examine the fundi for the presence of hypertensive retinopathy.

5. Arrange for a 12-lead electrocardiograph to be performed.

Evaluation for presence of other cardiovascular diseases

1. Coronary artery disease – history of angina, myocardial infarction, features of heart failure, ECG.

2. Cerebrovascular disease – history of TIAs, strokes, presence of carotid bruit.

3. Renovascular disease – presence of renal artery bruits, severe resistant hypertension, worsening renal failure with ACE inhibitors.

4. Abdominal aortic aneurysm – pulsatile abdominal masses.

MANAGEMENT OF PATIENTS WITH PVD

Management of patients with PVD includes risk factor modification, a regular exercise program, pharmacologic therapy and referral for revascularisation [17].

Risk factor modification

1. Hypertension control. Strict control of hypertension slows the progression of PVD and reduces cardiovascular events. There is no consensus about what type of antihypertensive drugs to use in patients with PVD. Beta-blockers used to be avoided, but most experts now believe that their benefits outweigh the risk. Based on the HOPE trial, angiotensin-converting enzyme (ACE) inhibitors would be the agents of choice [18].

2. Management of dyslipidemia. Angiographic studies have confirmed that lipid-lowering retards the progression of femoral atherosclerosis. All hypertensive patients with elevated lipid levels should be on lipid-lowering therapy, and the target LDL level should be less than 100 mg/dL. Statins have shown benefit in reduction of incidence of PVD as well as improvement of claudication symptoms [19].

3. Encourage patients to quit smoking. The progression of peripheral vascular atherosclerosis is significantly greater in patients who continue to smoke. Complete cessation of tobacco use should be the goal. Stopping smoking can reduce the 5-year amputation risk tenfold and decrease the mortality rate by 50% [20].

4. Control of diabetes mellitus. The combination of diabetes mellitus and PVD is ominous, because PVD rapidly progresses to ischemic pain at rest and ulceration in these patients. Optimal glycaemic control should be a consideration.

Exercise Program

A regular walking regimen is extremely helpful. It has been shown to increase the claudication distance by 180 to 400% [21]. Initially, patients should be enrolled in a supervised exercise regimen. In these programs, patients walk on a treadmill initially set to a speed and grade that bring on the pain of claudication within 3 to 5 minutes. They walk at this rate until they experience claudication of moderate severity, rest until the claudication abates, and then resume walking. The sessions typically last 60 minutes and are monitored by a skilled nurse or technician. Subsequently, patients are encouraged to continue walking at home. They should walk at least three times a week (preferably every day) for 30 to 45 minutes, and keep up this regimen for at least 6 months. They should walk as far as possible using near-maximal pain as a signal to stop, and resume walking when the pain goes away.

Pharmacologic therapy

1. Two agents have been approved by US FDA for the symptomatic treatment of intermittent claudication. The first agent shown to be useful was pentoxifylline. But unfortunately, only about 20% of patients benefit from pentoxifylline, but a trial of 2 to 3 months in most patients is reasonable. Cilostazol, a newer antiplatelet and vasodilating agent, may be more effective than pentoxifylline for patients with intermittent claudication [22]. However, cilastozol being a phosphodiesterase inhibitor is absolutely contraindicated in patients with congestive heart failure, because studies have shown increase mortality with the use of phosphodiesterase inhibitors in patients with congestive heart failure.

2. Antiplatelet agents reduce both the risk of limb loss and the need for surgical revascularization in patients with intermittent claudication. Antiplatelet therapy also substantially reduces the risk of myocardial infarction, stroke, or death in patients with PVD. Therefore all patients with PVD should be started on aspirin or other antiplatelet agents unless contraindicated [23].

Revascularization

PVD patients should be referred for revascularization (i.e., percutaneous angioplasty or surgery) if they have lifestyle-limiting claudication, rest pain, ischemic ulceration, and gangrene. In general, angioplasty is favored for shorter lesions, while surgery is reserved for chronic long-segment occlusions and after failure of angioplasty [24,25] .

REFERRAL GUIDELINES

Patients should be referred to a Vascular medicine/ Vascular surgery specialist for an assessment if they have any of the following:

1. Lifestyle-limiting claudication

2. Any sign of potential critical limb ischemia, such as foot or limb ulceration, skin changes (nail or skin atrophy, dependent rubor), or gangrene

3. An ABI less than 0.50 at rest

4. An incompressible ankle artery (systolic ankle pressure > 300 mm Hg); incompressible ankle arteries suggest significant medial wall calcification and likely reflect significant PVD

5. Blood pressure more than 75 mm Hg higher in the ankle than in the arm.

REFERENCES

1. Chobanian AV, Bakris GL, Black HR et al.Seventh Report of the Joint National Committee on prevention, detection, evaluation and treatment of high blood pressure. National High Blood Pressure Education Program Co-ordinating Committee. Hypertension.2003: 42:1206-52.
2. Lawes CMM, Van der Hoom S, Rodgers A. For the International Society of Hypertension. Global burden of blood pressure related disease, 2001. Lancet. 2008:371:1513-18.
3. Amery A, Birkenhager W, Brixko P, et al. Mortality and morbidity from the European working party on high blood pressure in the elderly trial. Lancet. 1985:1:1349-54.
4. Bogousslavsky J, Van Melle G, Regli F: The Lausanne Stroke Registry: Analysis of 1,000 consecutive patients with first stroke. Stroke 1988:19:1083–1092.
5. Hatano S (1976) Experience from a multicentre stroke register: a preliminary report. Bulletin of the World Health Organisation 54: 541–53.
6. Harbison, J., Hossain, O., Jenkinson, D. et al. Diagnostic accuracy of stroke referrals from primary care, emergency room physicians, and ambulance staff using the face arm speech test. Stroke 2003: 34(1):71-76.
7. Indredavik B, Slordahl A, Bakke F, et al. Stroke unit treatment – Long term effects. Stroke 1997:28:1861-66.
8. Bray, J.E., Coughlan, K. and Bladin, C. (2007) Can the ABCD Score be dichotomised to identify high-risk patients with transient ischaemic attack in the emergency department? Emergency Medicine Journal 2007:24(2): 92-95.
9. Johnston SC, Rothwell PM, Huynh-Huynh MN, et al. Validation and refinement of scores to predict very early stroke risk after transient ischemic attack, Lancet, 2007:369:283-292.
10. Intercollegiate Stroke Working Party. National clinical guideline for stroke: third edition. Royal College of Physicians. 2008.
11. National collaborating centre for chronic conditions. Stroke: diagnosis and initial management of acute stroke and transient ischaemic attack (TIA). National Institute for Health and Clinical Excellence guidelines 68, 2008.
12. Kannel WB, McGee DL. Update on some epidemiologic features of intermittent claudication: the Framingham Study. J Am Geriatr Soc. 1985:33:13-18.
13. Makin A, Lip GYH, Silverman S, et al. Peripheral vascular disease and hypertension: a forgotten association? J Hum Hypertens 2001:15:447-54.
14. Leng GC, Fowkes FG. The Edinburgh Claudication Questionnaire: an improved version of the WHO/Rose Questionnaire for use in epidemiological surveys. J Clin Epidemiol. 1992:45(10):1101-9.

15. Khan TH, Farooqui FA, Niazi K. Critical Review of the Ankle Brachial Index. Curr Cardiol Rev. 2008 May; 4(2): 101–106.
16. Reunanen A, Takkunen H, Aromaa A. Prevalence of intermittent claudication and its effect on mortality. Acta Med Scand.1982;211;249-256.
17. Hirsch AT, Haskal ZJ, Hertzer NR, et al. ACC/AHA 2005 Guidelines for the Management of Patients With Peripheral Arterial Disease (Lower Extremity, Renal, Mesenteric, and Abdominal Aortic): A Collaborative Report from the American Association for Vascular Surgery/Society for Vascular Surgery, Society for Cardiovascular Angiography and Interventions, Society for Vascular Medicine and Biology, Society of Interventional Radiology, and the ACC/AHA Task Force on Practice Guidelines (Writing Committee to Develop Guidelines for the Management of Patients With Peripheral Arterial Disease) J Am Coll Car. 2006;47:e1–192.
18. Heart Outcomes Prevention Evaluation Study Investigators. Effects of an angiotensin-converting-enzyme inhibitor, ramipril, on cardiovascular events in high-risk patients. N. Engl J Med 2000; 342: 145–53.
19. Heart Protection Study Collaborative Group. Randomised trial of the effects of cholesterol-lowering with simvastatin on peripheral vascular and other major vascular outcomes in 20,536 people with peripheral arterial disease and other high-risk conditions. J Vasc Surg 2007:45:645-54.
20. Jonason T, Bergstrom R. Cessation of smoking in patients with intermittent claudication: effects on the risk of peripheral vascular complications, myocardial infarction and mortality. Acta Med Scand. 1987;221:253-260.
21. Hamburg N, Balady G. Exercise Rehabilitation in Peripheral artery disease: Functional impact and mechanisms of benefits. Circulation. 2011; 123: 87-97.
22. Hiatt WR, Money SR, Brass EP. Long-term safety of cilostazol in patients with peripheral artery disease: the CASTLE study. J Vasc Surg. 2008:47(2):330-336.
23. Berger JS, et al. Aspirin's benefits unclear in PAD. JAMA 2009;301(18):1909-19.
24. White CJ, Gray WA. Endovascular therapies for PAD – An evidence based review. Circulation. 2007:116:2203-2215.
25. Radack K, Wyderski RJ. Conservative management of intermittent claudication. Ann Intern Med. 1990;113:135-146.

LEARNING POINTS

- **Hypertension is the single most important modifiable risk factor for stroke and about 54% of strokes worldwide is attributable to hypertension.**
- **At the primary care setting, when a patient presents with a sudden onset of neurological symptoms, a validated tool, such as FAST (Face Arm Speech Test) should be used to screen for diagnosis of stroke or TIA.**
- **Patient with crescendo TIA (two or more TIAs in a week) should be treated as being at high risk of stroke, even though they may have an ABCD2 score of 3 or below.**
- **Poststroke outpatient care focuses on rehabilitation and secondary prevention of recurrent stroke.**
- **All patients who have had an ischaemic stroke or a transient ischaemic attack should be treated with a statin drug unless contraindicated, if the total cholesterol is more than 3.5mmol/L, or LDL is more than 2.6mmol/L.**
- **High risk patients (ABCD2 score 4 and above) should be assessed at the specialist's clinic within 24 hours of first presentation to a primary care doctor.**
- **Diagnosis of peripheral vascular disease is based mainly on the history and physical examination, with ankle brachial pressure index being used to confirm the diagnosis and assess the severity of the disease.**
- **Management of patients with peripheral vascular disease includes risk factor modification, a regular exercise program, pharmacologic therapy and referral for revascularization.**