The Struggle to Manage Stroke, Aneurysm and PAD

In this article, Dr. Salvian examines the management of peripheral arterial disease, aortic aneurysmal disease and cerebrovascular disease from symptomatology to diagnosis and treatment.

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Peripheral arterial disease

The accurate diagnosis and screening for peripheral arterial disease (PAD) is important, not only to be able to treat the patient’s symptoms but to manage their risk factors in order to decrease their morbidity, not only from PAD itself, but also from coronary artery disease (CAD) and cerebrovascular disease.

The prevalence of PAD in men < 50 years of age is about 1% to 2%. The prevalence increases to 5% in men > 50 years. It is twice as common in men as in women but this equalizes when both sexes reach about age 70.

Population studies have shown that about 30% of men and 25% of women with PAD also have associated CAD and cerebrovascular disease. In the CAPRIE Study, about 3.5% of patients had all three vascular beds involved. These include the:

- cerebrovascular bed,
- coronary artery bed and
- peripheral vascular bed.1

About 30% of men and 25% of women with PAD also have associated coronary artery disease and cerebrovascular disease.

The risk factors of PAD

Similar to atherosclerosis, the risk factors for PAD are:

- smoking,
- systemic hypertension,
- elevated plasma cholesterol, particularly LDL-cholesterol (LDL-C),
- diabetes,
- a family history of PAD and
- advanced age.

Natural history of patients

The natural history of patients with PAD needs to be considered with respect to their general health and survival, along with intermittent claudication.

General health and survival

Patients with PAD tend to have a much poorer outcome than age matched patients without PAD. In fact, the 10 year survival rate for a 60-year-old patient:

- without PAD is about 80%,
- with asymptomatic PAD is about 55% and
- with severe symptomatic PAD is about 25%, because of the associated cardiac cerebrovascular comorbidities.

These survival rates emphasize the need to manage the risk factors and make the diagnosis of the asymptomatic or minimally symptomatic PAD patient.
Intermittent claudication

Intermittent claudication has an estimated prevalence of about 4.2 million people in the US, but the actual prevalence is underestimated by two times to seven times. Intermittent claudication is not only seriously limiting to patients but it is a significant marker for CAD and cerebrovascular disease.

Intermittent claudication itself usually has a benign course based on how symptomatic the patient is initially. This can be graded according to symptomatology and ankle brachial index.

A patient with a short walking distance, significant rest pain or ulceration usually has an ankle brachial index of < 0.3 or 0.4. This is also a strong predictor of severe cardiovascular mortality. Patients with an ankle brachial index of around 0.5 to 0.6 generally are half-to-one block claudicators, whereas those with an ankle brachial index of 0.8 to 0.9 are in the one-to-two block claudication distance.

One-to-two block claudicators tend to have a benign course. Most can be medically managed. Those with < a half-block claudication or rest pain tend to require intervention.

Symptomatology and diagnosis

The symptomatology of PAD is related to the lack of collateralization to the distal vessels. Patients with an iliac artery obstruction develop pain in the thigh. Patients with a superficial femoral artery obstruction develop pain in the calf. Those with tibial peroneal occlusive disease (diabetics) tend to develop foot pain. This is related to resultant anaerobic metabolism and the build-up of lactic acidosis.

The diagnosis of PAD can usually be made by:
- an accurate history,
- evaluation of the pulses,
- an ankle brachial index and
- pre- and post- exercise testing on the treadmill.

Treatment of PAD

Medical management

The most important form of treatment for PAD is lifestyle modification. This would include:
- a graduated exercise program,
- absolute cessation of smoking,
- instructions on foot care and
- lipid control (total cholesterol < 5.2 mM, LDL-C < 2.5 mM and HDL-cholesterol > 1.0 mM),
- antiplatelet therapy with acetylsalicylic acid or copidogrel bisulfate and
- control of hypertension.

Sixty per cent to 70% of patients with intermittent claudication can be managed conservatively, with a significant increase in their walking distance. About 30% have some progression of their symptoms. Amputation is uncommon, particularly if the patient quits smoking.

About the author...

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Interventional therapy

Angioplasty and surgery are reserved for patients who have either severe ischemic rest symptoms, or who have failed medical management and are severely limited by intermittent claudication.

Angioplasty is generally the first-line of treatment and is beneficial in the iliac segments. It is less beneficial in the superficial femoral artery, popliteal and tibial vessels where restenosis is common and failure has significant complications. In general, a segment of artery which has a relatively short stenosis or occlusion (< 15 cm) and that is accessible, can be treated by angioplasty with or without a stent.

Surgical bypass is considered in patients who usually are at-risk of limb loss and who have very severe limiting claudication. Surgical success rates in the aortofemoral segment are very high, being in the range of 90% patency for an aortofemoral graft at five years and then falling to about 60% to 80% for a femoropopliteal bypass or femoral-tibial bypass graft at five years. Considering that these patients have multiple risks, operative mortalities can range from 2% to 4%.

When to refer

Patients with intermittent claudication should initially be medically managed, with control of risk factors. They should be referred to a vascular surgeon for definitive diagnosis and treatment when symptoms become limiting and certainly if there are any findings consistent with rest pain or ulceration. Early referral in the diabetic is beneficial.

Ankle brachial index is helpful in the diagnosis, but stress testing with treadmill ankle brachial index is more definitive

Summary

In summary, PAD is very common and is often associated with concomitant CAD and cerebrovascular disease. In fact, PAD may be the first presenting finding of atherosclerosis in an individual. Diagnosis is straight forward and treatment, most importantly, is aimed at controlling risk factors for atherosclerosis such as:

- quitting smoking,
- controlling cholesterol levels and
- controlling hypertension.

Most patients respond to conservative therapy and those that do not have severe limitations, and will generally have a good outcome, either with angioplasty or surgical treatment as indicated.

Success rates of surgery in the aortofemoral segment are very high, being in the range of 90% patency for an aortofemoral graft at five years.
Aortic aneurysmal disease

Aortic aneurysmal disease occurs in > 5% of the population above the age of 60 and seems to be increasing in incidence. These patients have similar risk factors as patients presenting with symptomatic PAD, although patients with aneurysms tend to be a little older (75% are > 60-years-old). They are more commonly hypertensive and have a higher incidence of CAD.

Aneurysms are most often due to degenerative atherosclerotic disease and are probably related to the breakdown of elastin and collagen elements in the media of the arterial wall. It is accepted that there is some hereditary tendency to the development of aneurysm that is related to the abnormalities in elastin and collagen metabolism.

Most abdominal aortic aneurysms arise below the renal arteries, but about 2% extend proximal to the renal arteries and other visceral branches (Table 1).

Clinical presentation

About 75% of aneurysms are asymptomatic but some patients have back pain or back ache that may even mimic lumbar spine pain.

About 10% to 30% of aneurysms present as ruptured abdominal aortic aneurysms and about 10% to 15% present as “symptomatic” abdominal aortic aneurysms with rapidly increasing back pain and tender aneurysms.

Diagnosis

The diagnosis of aneurysms is made by physical examination and in a lean individual, this is very accurate. In an overweight individual, ultrasound is the most cost effective method of diagnosis, but a CT scan is the most accurate. A CT scan provides the most information with respect to size and relationship to the renal arteries and run-off vessels. Screening studies in Britain have been shown to be extremely cost-effective in the early diagnosis of abdominal aortic aneurysm and in the prevention of rupture in the community.

Table 1

<table>
<thead>
<tr>
<th>Recommendations for aortic aneurysmal disease</th>
</tr>
</thead>
<tbody>
<tr>
<td>• All patients, particularly men who are 55 years of age, need yearly physical abdominal examinations. If they are overweight and difficult to examine, they should have yearly ultrasounds.</td>
</tr>
<tr>
<td>• Any aneurysm &gt; 3 cm to 5 cm in diameter should be reviewed by a vascular surgeon and should probably be confirmed initially with a CT scan. It should then be followed up yearly with either ultrasound or CT scan. (Ultrasound is probably adequate at this size). Once the aneurysm reaches 4 cm in diameter, follow-up needs to be more frequent, generally once every six months until the aneurysm is approximately 5 cm in women or 5.5 cm in men.</td>
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<tr>
<td>• Intervention for abdominal aortic aneurysm needs to be considered when there is either a rapid expansion of &gt; 1 cm per year, or the aneurysm approaches 5 cm to 5.5 cm in diameter.</td>
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<td>• Very careful consideration needs to be given to comorbidities. If a patient has significant cardiac risk factors and an aneurysm &gt; 5 cm to 5.5 cm in diameter, then they should be considered for endovascular aneurysm repair. This cuts the mortality from 4.5% to 1.5%. Patients must be suitable, however, anatomically (i.e., they must have an adequate neck and adequate access through the iliac vessels). If the patient is a reasonable operative candidate, then they are better to have a standard “open” aneurysm repair. The procedure is curative and has few late complications.</td>
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</table>
Complications of aortic aneurysm

Complications of abdominal aortic aneurysm can include:

- thrombosis (2% to 3%),
- emboli (2% to 3%), or
- rupture.

The risk of rupture of an aneurysm < 4.5 cm in diameter is well < 5% per year, whereas an aneurysm > 5 cm in diameter has a risk of rupture of around 5% and a risk of rupture in three years to five years of 40% to 50%. Aneurysms generally expand at about 4 mm to 5 mm per year.

Operative mortality

The operative mortality for a standard “open” abdominal aortic aneurysm repair depends on the risk factors. A patient with no cardiac history has an operative mortality of about 3%, whereas a patient who has had a previous MI or stroke has an operative mortality in the 5% to 6% range. The risk is higher if they have significant symptomatic CAD.

EVAR

Endovascular treatment of abdominal aortic aneurysm (endovascular aneurysm repair [EVAR]) is a new noninvasive procedure where a graft packed inside a catheter is passed from the femoral artery into the aneurysm and ejected inside the aorta, thus stenting the aneurysm from the inside. It is held in place by multiple stents, both proximally and distally.

This procedure takes about the same length of time as an open aortic aneurysm repair, but has an operative mortality of about 1.6% in a high risk group of patients and a shorter hospital stay. Patients do not require an abdominal incision and generally rehabilitate more rapidly. However, they have increased late complications and more graft-related procedures following surgery. There is still a small risk of rupture of about 1% per year and there may be endoleaks. However, as the technology improves, the long-term success rate with EVAR is becoming more optimistic.

### Table 2

Risk of stroke comparison - Medical therapy vs. surgical group

<table>
<thead>
<tr>
<th>Patient</th>
<th>Stenosis*</th>
<th>Risk of stroke</th>
</tr>
</thead>
<tbody>
<tr>
<td>Symptomatic</td>
<td>&gt; 70%</td>
<td>Medical therapy: 26%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Surgical group: 6% to 8%</td>
</tr>
<tr>
<td></td>
<td>50% to 70%</td>
<td>Medical therapy: 25%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Surgical group: 5%</td>
</tr>
<tr>
<td></td>
<td>&lt; 50%</td>
<td>No benefit to surgery unless artery severely ulcerated</td>
</tr>
<tr>
<td>Asymptomatic**</td>
<td></td>
<td>Medical therapy: 11.5%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Surgical group: 4.5%</td>
</tr>
</tbody>
</table>

* ipsilateral to a significant symptom

** women did not see as significant a benefit from surgery as did men in the asymptomatic case


**Cerebrovascular disease**

Stroke is a devastating event, both for the patient and for their family, as well as for the health care system. The prevention of stroke is extremely important.

**Managing extracranial carotid occlusive disease**

About 30% to 40% of embolic stroke is related to extracranial carotid occlusive disease. The presence of both asymptomatic and symptomatic extracranial carotid occlusive disease requires immediate and aggressive management of the atherosclerotic risk factors previously outlined. These patients need antiplatelet therapy and strict control of:

- hypertension,
- lipids,
- diabetes and
- homocysteine.

Unfortunately, despite aggressive medical management, stroke is still very common in the asymptomatic and symptomatic patient who has extracranial carotid occlusive disease.

The management of these conditions has been guided largely by the results of the randomized trials of the early 1990s, including the North American Symptomatic Carotid Endarterectomy Trial (NASCET), the European Symptomatic Carotid Endarterectomy Trial (ECST), Asymptomatic Carotid Artery Study (ACAS) and the European Asymptomatic Carotid Artery Study (Table 2).

**The presence of both asymptomatic and symptomatic extracranial carotid occlusive disease requires immediate and aggressive management of the atherosclerotic risk factors.**

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**Table 3**

**Recommendations for cerebrovascular disease**

- Patients > 60 years of age with risk factors of atherosclerosis should have a careful history to delineate cerebrovascular symptoms. They should have a physical examination to listen for carotid bruits. If there are any significant risk factors (i.e., peripheral vascular disease, coronary artery disease, a family history of stroke or carotid bruit) then a noninvasive carotid duplex scan should be done.

- Many patients with carotid occlusive disease and plaque in the area of the carotids require aggressive medical management of the atherosclerosis, including statin anti-platelet therapy, control of hypertension and likely, an angiotensin-converting enzyme inhibitor along with control of diabetes.

- Low risk asymptomatic patients with a > 80% stenosis of the carotid artery should be considered for carotid endarterectomy.

- Stenosis < 80% in an asymptomatic individual should be observed with serial ultrasound and surgery should be considered if the stenosis becomes > 80%, or if the patient becomes symptomatic.

- All patients presenting with a transient ischemic attack or stroke should have a carotid duplex scan and probably a CT angiography, echocardiogram and CT scan of the head. If the noninvasive testing shows a stenosis of > 50% and if the patient is a reasonable operative candidate, they should be considered for urgent carotid endarterectomy.

- Carotid angioplasty and stenting should be considered for patients with a stenosis > 50% who are symptomatic and are poor operative candidates because of:
  - severe cardiopulmonary disease,
  - radiation induced injury of the carotid and perhaps because of
  - recurrent carotid stenosis after carotid endarterectomy.

- Patients > 80 years of age may be candidates for surgery, although they must be assessed very carefully.
Carotid angioplasty

In recent years, carotid angioplasty with stenting has been shown to be of benefit, if a protection device (to prevent distal emboli) is used and if the patient is deemed to be at high-risk for surgery from a cardiopulmonary standpoint. The Carotid Revascularization Endarterectomy vs. Stenting Trial (CREST), a prospective randomized trial, is presently enrolling patients to compare the benefits of carotid angioplasty to carotid endarterectomy. The drawbacks for carotid angioplasty are the possibility of inciting a stroke with the initial catheter manipulation and the risk of recurrent in-stent stenosis. Patients > 80 years of age have been shown to be poor candidates for angioplasty (Table 3).

Reference

Resources