Current Practice

DISEASES OF THE HEART AND BLOOD-VESSELS

Ischaemia of the Lower Limbs

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Ischaemia of the lower limbs is almost always due to enlarging plaques of atheroma in the major abdominal or limb vessels. Other causes of ischaemia such as Buerger's disease, the small vessel blocks associated with diabetes, and permanent arterial damage secondary to vasospastic disease (Raynaud's phenomenon in the feet) are rare and will not be discussed.

Atheroma, the aetiology of which is still not understood, is a disease of arteries, not arterioles, and has a particular affinity for bifurcations. Thus the common sites of atheromatous stenosis or block are the bifurcations of the abdominal aorta, the common iliac artery, and the common femoral artery. One possible reason for this distribution is the presence of turbulent flow at these sites. The superficial femoral artery at the adductor hiatus is another site that is frequently grossly diseased. However, the vessels between these points also are always abnormal, for atherosclerosis is a disease which affects all arteries.

Complete occlusion of an artery is usually due to thrombosis at the site of a pre-existing irregular stenosis. The symptoms that follow total occlusion may be so acute as to be identical with those of an arterial embolism, but the occlusion may produce no more than an exacerbation of those signs of chronic ischaemia that are already present. The severity of the symptoms depends in each case on the balance between the progression of the disease and the growth of the collateral circulation.

Symptoms of Arterial Occlusion

Atheromatous occlusions of the lower limb vessels may present with symptoms of acute or chronic arterial insufficiency.

Acute arterial insufficiency usually results from thrombosis in a stenosed segment. The patient complains of the sudden onset of pain, coldness, discoloration, loss of power, and loss of sensation in the affected limb. The outcome is either gangrene or slow recovery.

Chronic Arterial Insufficiency

Chronic arterial insufficiency may present as pain, sepsis, pre-gangrene, or gangrene.

Pain may take the form of intermittent claudication, a cramp-like pain in muscle induced by exercise. It can occur in plantar, thigh, and buttock muscles, as well as those of the calf, and is thought to be due to anoxia and an inadequate washout of the breakdown products of the metabolism of muscle contraction.

Pain may also occur at rest, when it is of a continuous "gnawing" nature in the toes, the foot, or rarely the whole leg. This pain is often particularly disturbing at night. It is

often exacerbated by lying down, and many afflicted with this symptom prefer to sleep sitting in a chair. The source of the pain is thought to be ischaemia of nerve endings.

Sepsis.—Ischaemic tissues are vulnerable to infection. A paronychia following minor trauma, such as might occur while the patient is cutting his toe-nails, may be the first sign of arterial insufficiency. Tinea pedis may also appear if there are deep clefts between the toes.

Diabetics are particularly susceptible both to minor skin infections and to atherosclerosis, so that diabetes must always be excluded in any patient with arterial disease. In spite of this common association sepsis in diabetics is not always due to ischaemia, and control of the diabetes, thus lowering the tissue sugar content, together with eradication of the infecting organisms with antibiotics, will cure many patients with infected feet, even in the presence of a mild degree of ischaemia.

Pregangrene.—This term covers a host of symptoms, ranging from coldness, discoloration, and paraesthesia to loss of sensation and superficial ulceration, all of which, in the presence of other evidence of arterial obstruction such as absent pulses, are signs of a serious reduction of blood flow and foretell the imminence of gangrene.

Gangrene.—Dead tissue may be either black, hard, and shrivelled, or oedematous, friable, wet, and infected.

In broad terms patients either complain of claudication, which is due to muscle ischaemia, or of one of the many other symptoms which are indicative of skin ischaemia. The natural history, and so the role of surgery, of these two groups is different.

Management of Pregangrene

This is the most serious form in which ischaemic disease may present and every effort must be made to improve the circulation. There are three lines of approach, all surgical: complete restoration of the blood flow by direct arterial surgery; partial restoration of flow by dilating both the collateral and the distal vessels by division of the appropriate sympathetic nerves; and non-specific surgery to relieve symptoms. Pregangrene untreated will ultimately lead to loss of the limb, and so the three forms of treatment should be considered by the doctor in the order in which they have been listed.

Direct Arterial Surgery

The "teething" stage of peripheral vascular surgery has passed. One can predict the chances of success with a fair degree of certainty—for example, a femoro-popliteal vein bypass graft on a patient with normal vessels below the popliteal artery

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will have an 80–90% chance of being patent one year later. This means that direct surgery is the treatment of choice for all patients who are in danger of losing a limb, and all such patients should be admitted to hospital for aortography and assessment. A fair proportion will be suitable for surgery, but this may have to be extensive, involving aorto-iliac disobliteration as well as femoral artery disobliteration or bypassing. For those unfortunate patients who cannot be helped by direct surgery, either because of the extent and severity of the local disease or because of atherosclerosis in other areas such as the coronary or cerebral vessels, vasodilatation and symptomatic treatment are all that can be offered.

Vasodilatation

There are many ways of dilating blood vessels. These include drugs which interfere with sympathetic vasoconstrictor tone by preventing transmission of the nerve impulse at the vessel wall or in the sympathetic ganglia, others which act by blocking the action of circulating adrenaline, and some which have a direct relaxing action on the smooth muscle of the arterial wall. In addition vasodilatation may be achieved by surgical division of the sympathetic nerves.

Vasodilator drugs and surgical sympathectomy will increase foot blood flow in the normal person because the total inflow of blood to the limb can increase to meet the new requirements. *The situation is completely different in a diseased limb.* Any-one who has looked at an atheromatous artery will appreciate that it is incapable of dilating, and thus the inflow of blood to a leg through major vessels which are atheromatous is almost fixed. Any increase in inflow must come via the collateral vessels, and, though there is some evidence to suggest these vessels are subject to a certain degree of sympathetic constrictor tone, they must in many cases be maximally dilated.

To benefit from vasodilatation one must dilate the collateral and peripheral vessels in the diseased limb while maintaining the limb perfusion pressure—that is, the systemic blood-pressure. Surgical sympathectomy can achieve both these aims, for it selectively dilates all the blood-vessels of the diseased limb without affecting the rest of the circulation. The operation is therefore indicated in those patients with skin ischaemia for whom direct surgery is not possible. It has one rare but serious ill effect. If the arterial inflow is already on the borderline of total rather than partial inadequacy and the collaterals do not dilate after dividing the sympathetic chain the flow of blood through the dilated peripheral vessels gets slower, and this may precipitate gangrene. It is difficult to predict when this will happen. It is most common in cases of subacute obstruction and in those in whom the foot is already very blue and cold owing to a slow blood flow.

This rare complication excepted, most patients with skin ischaemia benefit from sympathectomy and it may often save the limb.

Vasodilator drugs are of no value in the treatment of limb ischaemia. Although these drugs will dilate the small peripheral vessels of the affected limb, they have two other effects which are deleterious. First, they affect the whole body, dilating the normal vessels more than the diseased ones, which results in a greater reduction of resistance in the relatively normal parts—for example, the upper limbs and intestines—so that blood is shunted to them away from the diseased limb. Secondly, these drugs tend to reduce the systemic blood-pressure, especially when the patient is erect, again because of their general effect. These changes—the reduction of vascular resistance in the normal tissues and the lowering of systemic blood-pressure—usually cause a reduction of flow in the diseased limb. Vasodilator drugs are therefore not only useless but on many occasions—some estimates are as high as 75%—actually harmful. These conclusions apply to all systemically administered vasodilator drugs when used for vaso-obliterative disease

whatever their mode of action and whatever the manufacturers may claim.

Symptomatic Treatments

Amputation.—Untreated pre-gangrene will become gangrene. Before the onset of gangrene there may be a period of severe rest pain. If direct arterial surgery or sympathectomy fails to relieve these symptoms then amputation is inevitable. In most cases amputation will be at the level of the knee-joint or at mid-thigh. Only rarely is a below-knee amputation successful. If direct vascular surgery is successful then a local amputation of the dead tissue only may be feasible.

Neurectomy.—Occasionally severe rest pain occurs when the other signs of ischaemia are only mild or moderate. In such cases division of the sensory nerves around the ankle may enable the patient to keep his foot and yet be pain-free. The foot will become numb and it must be treated with great care, as minor trauma and sepsis will not be noticed by the patient.

Prophylaxis Against Gangrene.—Many patients come to the surgery with very early signs of ischaemia such as cold feet and scaly skin. These patients can often live for many years without getting further trouble provided they take care of their feet. Sepsis is the main danger, and they should be warned of the damage that may be done to the skin when cutting the toenails. Many have thick nails and sometimes onychogryphosis; such patients are better cared for by a chiropodist, provided he also is aware of the danger of minor trauma.

Patients should be advised to keep their feet warm—not hot—by wearing thick socks, and to avoid too much walking outdoors in very cold weather. Warming the feet in front of the fire can be harmful. Thick socks and strong shoes will also protect the feet from trauma.

Management of Claudication

It has often been said that patients with claudication should not complain, they are lucky not to have gangrene. The point of the aphorism is found in the fact that a large proportion of patients with claudication survive for many years without getting signs of skin ischaemia. This fairly hopeful prognosis makes the approach to claudication much more conservative.

Not only do many claudicants never get gangrene, their claudication often gets better. About one-third of those who present with claudication improve, one-third remain unchanged, and one-third get worse. Thus there is every reason for watching and waiting, and for approaching direct arterial surgery with caution.

Symptomatic Treatment

All that the patient wants is to walk farther without pain. This can be achieved by reducing the amount of exercise performed by the affected muscles. Many patients improve if they use a walking-stick, and most can be trained to walk in such a manner that the bulk of weight-bearing and propulsion is transferred to the good leg. Raising the heel of the shoe by $\frac{1}{4}$ -in. sometimes helps. An increase in the walking distance of 50 yards often makes a great difference to a patient's life.

Vasodilator drugs are of no value. They not only shunt blood from the diseased to the normal areas, but, as they have more effect on skin than muscle blood-vessels, they may shunt the blood within the affected limb away from the muscle to the overlying skin. Such actions make them harmful. Most of the dramatic improvements that have been reported following the use of vasodilators can be attributed to spontaneous remissions.

Direct Surgery

Patients are only considered for direct arterial surgery if their claudication is causing economic hardship or extreme incapacity. In these cases, after aortography to determine the extent of the lesion, endarterectomy or an autogenous vein bypass procedure will result in long-term cures, provided the inflow and outflow tracts are good.

Palliative Surgery

Sympathectomy is of little value. There is a rapid return of tone in muscle blood-vessels after sympathectomy, so that muscle blood flow is not permanently increased. By contrast skin blood flow is permanently increased, so that the operation may cause a *reduction* of muscle blood flow. Occasionally a claudicant does improve after sympathectomy. We do not know why. It is not due to an increase in blood flow but may be due to the interruption of afferent pain fibres running in the sympathetic chain. As such improvements are uncommon, sympathectomy is no longer recommended for claudication.

Other operations are entirely palliative. Achilles tenotomy or neurectomy of the calf muscles may both relieve pain by reducing the activity of the calf muscles. Sometimes claudication can be so severe that amputation is the only solution, though one would attempt some form of reconstructive surgery, however difficult, before resorting to such a step.

Management of Sepsis

Infected areas in a limb with a poor blood supply must be treated vigorously. The toes and heels are most commonly affected. Rest in bed increases the rate of healing—probably because elevating the foot reduces the inflammatory oedema. Careful cleansing, removal of sloughs and dead skin, and the systemic administration of the appropriate antibiotic (determined from swab culture) are essential. Local antibiotics are not only of unproved and doubtful value but harmful if they result in the appearance of resistant strains. Diabetes, if present, should be strictly controlled. If a septic area is neglected it will spread to become wet gangrene.

Care After Direct Arterial Surgery

More and more patients are having obstructions in their limb arteries rebored or bypassed. They present the general practitioner with a new and important group of patients with a number of new symptoms. Regular follow-up examinations in which particular attention is paid to the peripheral pulses to determine if the arteries are still patent are essential. These examinations are done by the surgeon, but additional examinations by the general practitioner are of value, for the earlier that a new occlusion is discovered the more likely it is that something can be done about it.

The surgeon hopes to send the patient out of hospital with both pulses, or at least one, present in the foot, unless of course there is gross disease of the popliteal run-off. The danger period is the first three months after operation. Most arteries will stay patent for at least a year once this period has passed.

The dissection and removal of the long saphenous vein is often accompanied by damage to the saphenous nerve. Many patients develop areas of numbness and paraesthesiae down the inside of the leg and across the knee-cap. Paraesthesiae fade and the numb area gets smaller over a six- to nine-months period.

Stiffness of the thigh muscles is common and quickly passes. The edges of the wound often get slightly infected and are slow to heal.

Occasionally there is oedema of the thigh due to damage to the inguinal lymphatics produced while dissecting the common femoral artery. This may take a few months to resolve.

Dissection of the femoral and popliteal arteries inevitably involves some interference with the corresponding veins, especially in the lower popliteal fossa. Deep-vein thrombosis and ankle oedema are very common complications. Patients so affected may need to wear an elastic stocking for three or four months.

Though all these are minor symptoms, they are worrying to patients, who, after the operation, often become acutely aware of their legs; frequent reassurance is valuable.

Finally, successful surgery in one leg often unmasks symptoms on the other side. This must be treated on its merits, but there is no contraindication to bilateral arterial surgery.

ANY QUESTIONS?

We publish below a selection of questions and answers of general interest.

Sequels to Therapeutic Abortion

Q.—Is it true that wanted pregnancies occurring after an abortion has been previously induced are apt to be complicated by miscarriage, premature labour, ruptured uterus, and other serious accidents?

A.—Before answering this question it must be pointed out that, despite antibiotics, and however good the conditions, therapeutic abortion is associated with a real risk of infection, and a sequel of this in some instances is secondary infertility. The failure to achieve a wanted pregnancy afterwards must be regarded as a serious complication of therapeutic abortion.

Termination of pregnancy by dilatation of the cervix and evacuation of the uterine contents may be complicated by splitting of the internal cervical os, and this may be the

cause of abortion or premature delivery in a subsequent pregnancy. Another complication of vaginal termination of pregnancy is perforation of the uterus, and abdominal hysterotomy involves an incision into the uterine muscle. With both operations the uterus may be potentially weakened and there is an increased risk of rupture in a subsequent pregnancy. Apparently one woman who had previously had a hysterotomy died of this complication in the period 1961–3.¹

It is impossible to assess the actual mortality rate associated with termination of pregnancy in this country, because the number of operations is unknown. Still less is it possible to assess the morbidity and the number of complications that arise as a consequence in a future pregnancy. However, some statistics are available from countries where abortion has been legalized and takes

place on a large scale.² For instance, in Czechoslovakia there were nine deaths in 120,000 terminations, the incidence of infection varied from 7 to 15%, and in 1 to 2% of women there was a permanent upset of the menstrual cycle or amenorrhoea. In Hungary the incidence of perforation of the uterus in 145,641 abortions was 0.17% (250 cases).

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Contamination of Tenderized Meat

Q.—Is “tenderized” meat more liable to bacterial contamination than untreated meat?

A.—Yes, it is. There is some recent evidence that salmonellae and other bacteria