PAINFUL FEET FROM THE PHYSICIAN'S POINT OF VIEW

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From the point of view of the physician, pain in the feet is often a valuable sign of more generalised disease. It will not, however, be possible within the scope of this short article to deal exhaustively with all those conditions other than purely surgical conditions which should be considered by the careful clinician when faced by such a case. Many fortunately can be detected easily if due attention is paid to the history and characteristics of the pain; and if the foot is carefully examined. In this way painful superficial lesions such as **callosities** or **plantar warts** may be easily detected. **Ingrowing toe nail** and **tinea** infection are also very common causes of painful feet.

Pain in the first joint of the big toe will lead immediately to a consideration of **gout** as the cause of the disturbance, and it must be remembered that the typical lesion may be preceded by pain in the ball of the toe, and that the tarsal joints may also be involved. Simple inspection will suffice in a patient with **rheumatoid arthritis**, and it is in any case rare for the joints of the foot to be involved without lesions of at least comparable severity in the joints of the fingers and hands.

It is however when we come to lesions of the nervous system and of the vascular tree that differential diagnosis becomes more difficult. Nevertheless the physician is in many respects more fortunate than the surgeon in that there are few conditions involving solely the foot, and a complete examination of the patient will practically always reveal some sign elsewhere in the body to correlate with the painful foot.

Pain in the lower extremity is experienced in several organic lesions of the nervous system. In many, however, as in *sciatica*, whether due to interstitial neuritis, or referred from a local lesion at the same segmental level as that from which the sciatic nerve arises, the pain mainly affects the upper part of the limb. In **multiple neuritis**, however, painful paraesthesiae may be experienced in the feet early in the illness. The two commonest causes of painful multiple neuritis are alcoholism and diabetes mellitus. In both there is a tendency to painful cramp of the muscles of the feet and of the calves, and severe aching pains as well as paraesthesiae may occur. The muscles are tender, and often the soles of the feet are painful and tender. Motor weakness and sensory loss are also present. In alcoholic neuritis foot drop occurs early and the tendon reflexes become weaker and finally disappear. In diabetic neuritis there is often a superficial resemblance to *tabes dorsalis*. Recognition of the etiological factor in multiple neuritis renders diagnosis comparatively easy.

Pain in the feet may occur in **tabes dorsalis**. Here, again, the lightning pains so characteristic of the condition rarely affect the feet alone, but they may on occasion be confined to this region in the early stages. All too commonly they are regarded as rheumatic in origin both by the patient and by the physician, but careful analysis will usually reveal their true nature. The paraesthesiae which occur in *tabes* are occasionally described as painful by sensitive patients.

Pain is not a conspicuous complaint in **subacute combined degeneration of the cord**, but here again the paraesthesiae which so are commonly experienced are frequently described as painful and often burning in quality. They are usually first felt in the toes, and later spread to the rest of the foot and up the leg.

Syringomyelia is usually associated in the physician's mind with loss of pain sensation, but there exists a rare variety which has been termed **Morvan's disease**, in which the extremities become painful until sensory loss is complete. Cyanosis of the feet with trophic changes are accompanying features of the condition.

It is, however, when we come to the lesions affecting the peripheral vessels that pain in the feet becomes a relatively common presenting symptom of serious disease which may easily be overlooked if due significance is not attached to it.

The conditions with which we shall deal depend essentially on reduction in the blood flow through the limb. It is necessary, however, to divide the cases into two main groups, those in which the reduction in blood supply is due to changes in the calibre of the arteries and arterioles, and those in which the main feature is recurrent spasm in vessels at first relatively healthy. The first group can be subdivided; there are cases in which the reduction in blood supply occurs

comparatively slowly, as in the relatively common arteriosclerosis obliterans, and the less common thromboangiitis obliterans, and secondly those cases in which sudden stoppage occurs due to the settling down of an embolus in an artery. When an intermittent spasm occurs, the vessels usually affected in the first instance are the smaller digital arteries, and changes occur in the digits which have been termed "Raynaud's phenomenon." It is proposed first of all to deal with the occlusive arterial diseases which are particularly prone to affect the lower limbs, and to mention more briefly the characteristics of Raynaud's disease which frequently involves the hands to a greater extent than the feet. The symptoms of a restriction of blood supply to the extremities are variable, and do not always correlate accurately with the degree of severity of the pathological process. It is consequently necessary to carry out special tests to confirm the nature of the disorder and to discover the extent to which it has advanced.

Pain arising from occlusive arterial disease is of two main types which should be clearly distinguished. These are firstly the highly characteristic pain of intermittent claudication which arises when muscle is exercised in the absence of an adequate oxygen supply, and secondly a more persistent pain associated with redness and tenderness to which Lewis has given the name erythralgia. The pain of **intermittent claudication** can easily be induced in the normal individual by placing a tourniquet round a limb and exercising a group of muscles thus deprived of their blood supply. It is a diffuse constant ache, and is often described by patients as "cramp-like," although in fact the muscles may be flaccid at the time. If exercise is continued the pain finally becomes intolerable, but when the circulation is restored it disappears rapidly in a few seconds in an individual with normal arteries. Lewis and his colleagues have produced good evidence that the pain is due to the accumulation of metabolites in the tissue spaces. In patients in whom the arteries are diseased, intermittent claudication arises when exercise is taken, and although the calf muscles are commonly the site of the pain, a considerable number of individuals complain of pain in the feet. The degree of ischaemia can to some extent be deduced from the amount of exercise required to produce the symptom, and from the duration of the pain after exercise has ceased. It is rare for complaint to be made of pain in both feet, but this does not mean that one limb is normal for the pain in the worse limb restricts walking and so spares that which is less severely diseased. Separate exercise of this leg will usually unmask a similar type of pain. A clear history of intermittent claudication is of the greatest assistance in making a diagnosis, and any pain in the foot arising only on exertion and disappearing after a period of rest should be attributed to muscular ischaemia. The type of arterial disease giving rise to the ischaemia will of course require further investigation; arteriosclerosis obliterans is the most likely cause in the elderly or diabetic, and thromboangiitis obliterans in younger subjects. An occasional cause of intermittent claudication, which is not sufficiently widely appreciated, is severe anaemia. Here the total blood flow to muscle is adequate, but an anaemic anoxia exists and allows metabolites to accumulate in the tissue spaces and to give rise to pain.

The more constant type of pain which occurs in occlusive vascular disease is worthy of special attention, since it affects the feet to a greater extent than any other part of the body. Lewis uses the term "erythralgia" to designate a redness of the skin accompanied by a peculiar form of tenderness. The erythralgic state is by no means confined to skin suffering from a defective blood supply, but occurs after a variety of forms of injury. Thus scratching, burning, freezing, or exposure to ultraviolet light can all be used to study the condition experimentally, while clinically it occurs in acute inflammatory conditions, in chilblains and in erythrocyanosis. The mechanism is the release into the skin of an unknown substance which lowers the threshold of the pain nerve endings to a variety of stimuli. Skin in this hyperalgesic state is unduly sensitive to friction, and becomes painful at temperatures which are easily tolerated by the normal individual. Increased tension in the tissues, as by simple dependency of the foot, also excites pain; it is usually described as burning or smarting. Clinically the picture is highly characteristic. If, for example, the toes are affected the skin, though red, is usually cold and is very tender to the touch. When their temperature rises, whether as the result of the external application of heat or due to a general rise of body temperature, the pain becomes severe. Hanging the leg over the side of the bed may also give great discomfort; walking, which both warms the feet and rubs the skin, may become so painful that the patient refuses to attempt it.

These two types of pain, intermittent claudication and erythralgia, have been described in some detail, since they are so often the presenting symptoms of arterial disease. Less commonly, indolent ulceration or small areas of necrosis may be the first symptom for which advice

is sought, and these lesions, too, are painful. A very common initial lesion is a small necrotic area round the nail bed of the big toe, and all too frequently this is regarded as an ingrowing toe nail.

When it is suspected that occlusive vascular disease exists, attention should be paid to differences in colour and temperature of the two limbs, and to alteration in the strength of pulsation of the vessels at the ankle. Various special tests are of great value, for example, the reactive hyperaemia test and oscillometry, but a description of them is rather outside the scope of the present article. Though syphilitic disease of the arteries is a possible cause of occlusive vascular disease, in practice the differential diagnosis rests between **arteriosclerosis obliterans** and **thromboangiitis obliterans**. Briefly the former occurs in the older age groups, affects the sexes equally, and is often associated with diabetes. The latter disease is rarer, is almost entirely confined to young males, and a history of cigarette smoking is extremely common. The veins are also often affected in this disease, and a history of venous thrombosis is of great help in confirming a diagnosis.

Pain in the feet may occur as the result of **arterial embolism**, and, in fact, pain is the commonest initial complaint in this condition. Much discussion has ranged round its causation. By some it is held to be due to a spasmodic contraction of the vessel which is said to be induced when the clot settles in it. Lewis has, however, marshalled a formidable body of evidence to show that the pain is practically always due to loss of blood supply to the muscles, and is in fact identical in type with that of intermittent claudication. It is thus a delayed symptom and indicates that the arterial impaction has occurred a little earlier. Other symptoms are pallor, coldness, loss of pulsation of the main vessels, weakness of the muscles and sensory changes. There is usually an easily identifiable heart lesion such as mitral stenosis, auricular fibrillation or bacterial endocarditis; the clot may also rise from intracardiac thrombosis secondary to coronary infarction.

Pain in the foot is experienced in occlusion of the abdominal aorta at its bifurcation, of the common femoral artery, and of the popliteal artery. Occlusion of the anterior or posterior tibial arteries rarely gives rise to symptoms. Palpation of the arteries and a consideration of the extent of the ischaemic area will usually reveal the site of the infarction. It should be remembered that an identical picture may be produced by primary arterial thrombosis.

Spasmodic arterial obstruction of the digital arteries gives rise to Raynaud's phenomenon which Lewis has defined as "any state in which loss of circulation to the digits occurs spasmodically, displaying itself in transient attacks of discoloration." Individuals displaying this phenomenon may have some definite underlying primary disease such as thromboangiitis obliterans or acute thrombosis. Such conditions must be eliminated before a diagnosis of Raynaud's disease is made. In **Raynaud's disease** there is a recurrent spasm of the digital arteries without such primary cause. All grades of severity occur, but it is only in the severer forms that the feet are affected. The disease is practically confined to women, and Raynaud's phenomenon occurring in a man should lead one to suspect some underlying cause such as thromboangiitis. A typical attack is brought on by exposure to cold, and in the milder cases this is the only effective stimulus. In severe cases, when the extremities are cool, mental emotion such as excitement or fright may precipitate an attack. The toes first become grey and pale and in a few minutes blanched and waxy. In some cases the capillaries relax and blood flows back from the veins; these cases exhibit cyanosis. After about half-an-hour the affected toes become numb, and it is this phenomenon which usually attracts the patient's attention; a little later an aching pain is experienced. It is brought about by the sudden discharge of warm blood into a cold toe, and may leave the toe tender for hours. In many cases of Raynaud's disease small areas of necrosis appear, and these are permanently tender, the tenderness increasing greatly when spasm is superadded.

Pain in the feet may also occur in other types of vascular disorders, but these are usually obvious and require only brief mention. In **acrocyanosis** and in **erythrocyanosis** of the leg, chilblains and indurated nodules occur which exhibit the type of pain already described as erythralgia. It is highly dubious if any such clinical entity as "erythromelalgia" exists; the term was originally applied to attacks of redness and pain in the limbs of vasomotor origin, but most cases on analysis prove to be examples of erythralgia occurring in the course of some other disorder. Thrombosis of the superficial veins of the feet will also give rise to local pain, the course of which is usually evident. Interest has recently been aroused in the symptoms which follow exposure of the limbs to prolonged immersion in water or to prolonged cold. In

the hyperaemic stage of recovery pain is common and may continue as a late sequel. Those interested are referred to excellent recent accounts of the condition (Ungley *et al.*).

One further cause of pain in the feet should perhaps be briefly mentioned; it is difficult to classify, but probably lies within the personal experience of most individuals. This is the common type of **cramp** which may affect the muscles of the feet. It occurs in states of dehydration such as cholera, in states of salt deficiency as "Stoker's cramp," and is common during pregnancy. It is not uncommonly experienced by normal individuals in bed at night, especially after an unusual degree of physical exertion. The cause is unknown, although in some cases it can be relieved by the administration of common salt. Quinine is also alleged to prevent attacks, but it is not permissible to use this drug at present for any purpose other than the treatment of malaria.

In this article greater attention has been paid to the types of pain which arise from peripheral vascular disease than from other causes. This has been done because pain is so commonly a presenting symptom in such conditions, and because differential diagnosis affords greater difficulty to most physicians; more is also known about the mechanism of the pains which may occur. Even so, many important vascular conditions have been but briefly discussed, and unfortunately it has proved impossible to deal with the treatment of such a large number of diseases. For those whose interest has been aroused the following books and articles can be recommended.

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BOOK REVIEWS

PRINCIPLES AND PRACTICE OF WAR SURGERY

By J. TRUETA, M.D. Wm. Heinemann, Ltd., London, 1943. Price 42s.

A good monograph is always a pleasure to read, for it introduces the reader to the author in a way that no omnibus book can. One is impressed by the apparent enthusiasm and energy of the author, as well as by the width of his study and research. It is a book that every surgeon undertaking war surgery ought to read. It is not written from the recollections of any previous campaign, but is right up-to-date. The author's experience is probably greater in this respect than any other living surgeon. He thinks clearly, and takes the greatest care to found his practice on sound principles. The young surgeon especially, who is going to do forward work in the field, should make a most careful study of these principles as set out so clearly in this book if he is going to do the best he can for the wounded. One can imagine Trueta as a man of boundless energy and enthusiasm. One wonders whether he has an irrepressible sense of humour, and wrote with his tongue in his cheek when he drew attention to "sessile histiocytes of the lymphatic glands." At any rate, the reviewer had not the slightest idea what this meant.

The first part of the book deals with the pathology of wounds and the treatment of the wounded

patient, and it is upon a proper appreciation of this that the technique of wound surgery in a five-point programme set out in part two is founded.

In the pathology, a new conception of shock is outlined which must come as a surprise to many surgeons. According to Trueta, shocks starts with a rise in blood pressure, though this may be very transient. There is a tendency for pathologists to agree with this conception of shock, and it certainly explains some of the phenomena.

The book deals almost entirely with injuries to the limbs, and it does not deal with wounds of the head, chest and abdomen, but these three regions as far as the war surgeon is concerned are apt to be dealt with in special centres; moreover, wounds in these regions form a very small proportion of the casualties admitted to hospitals, since so many of them are immediately fatal. Trueta's book will therefore cover at least 90 per cent of all casualties admitted to any hospital after an air-raid or from the battlefield.

Dealing with any small points of criticism; penile, aortic and sternal marrow transfusions are, in this country at any rate, unlikely to have many advocates, and most surgeons would prefer to dissect out a vein rather than rely on such methods.

The sterilisation of plaster shears before removing a plaster is so obviously good that one wonders that it has not been more generally employed. Trueta's notes on plaster of Paris technique will prove very helpful to any surgeon undertaking war surgery. His method of dealing with wounds has sometimes been held to be that of Winnett-Orr, but Trueta, while giving full credit to Winnett-Orr,