Current Practice

JOINTS AND THEIR DISEASES

Painful Feet

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Pain in the foot is a common complaint, especially in women ; but, unlike the hands, the feet usually excite little interest or sympathy in friends or doctors alike. The patient may have put up with pain and discomfort for a long time before seeking medical advice. This may be due to the insidious nature of the onset of the pain, but sometimes the patient assumes that there is little that can be done to help, and that the pain or aching is something they must come to accept, there being a vain search for comfortable shoes. Even if surgery is suggested for a remediable lesion, the patient may have to spend months—and often several years—on the orthopaedic waiting-list, while more urgent and interesting cases get priority. As with the ankle, the causes of pain are many and varied, ranging from simple lesions such as verrucas and ingrowing toe-nails to the severely deformed foot seen in some patients with rheumatoid arthritis. Some of the pain and disability arising from disorders of the foot is undoubtedly due in part to unsuitable footwear dictated by fashion, but this is too facile an explanation for all the problems encountered. In this review some of the more common conditions will be discussed rather than attempting to list all the rarities.

Pes Valgus

Pes valgus, or flat feet, is a good place to begin, but it is so common a condition that it is important to remember that it may not be the cause of the patient's pain. At the same time one must stress that most flat feet are not painful and do not require treatment. Parental anxiety is often the main reason for hospital referral in children, in whom mobile flat feet are common, but rare causes such as obliquity of the tibial epiphyses, internal torsion of the tibia, shortening of the tendo Achillis, and congenital vertical talus should be excluded. An inner raise to the heels and valgus stiffening of the shoes may be helpful, but formal exercises are not likely to be of value in the child. In the adolescent the pes valgus is frequently part of a general postural defect, and it is most important to examine the patient's spine and posture as well as paying attention to his feet. Foot exercises and exercises to correct posture and strengthen the hip extensors are often effective in relieving symptoms, but arch supports are not to be encouraged. Spasmodic flat feet or peroneo-extensor spasm is another less common type of valgus foot encountered during adolescence. The patient is usually a young boy who may have recently started work, and he presents with a painful, rigid foot, which is held in eversion and dorsiflexion by spasm of the peroneal muscles and the long extensors of the toes. The symptoms are made worse by standing and walking, and the muscles go into spasm when they are passively stretched. In many of these cases there is a calcaneo-navicular or talo-

calcaneal bar, though such anomalies can occur without causing symptoms. Treatment is with a non-weight-bearing plaster after the foot has been manipulated into a neutral position, for which an anaesthetic may be necessary. For the occasional case resistant to such treatment excision of the bar or an arthrodesis may be required.

In the adult the flat foot may become rigid and the seat of arthritic changes. Exercise alone may here not be sufficient to relieve pain, and arch supports or manipulation of the foot may be indicated.

Pes Cavus

Pes cavus, or accentuation of the longitudinal arch, is associated with clawing of the toes. Minor degrees cause no symptoms, but it can lead to severe disability in early adult life. These patients may develop painful callosities under the metatarsal heads, corns on the toes, and secondary arthritic changes in the tarsal joints. It has long been recognized that some cases are secondary to disorders such as peroneal muscular atrophy, Friedreich's ataxia, spina bifida, or poliomyelitis. Recent studies have demonstrated that most of the so-called idiopathic cases have evidence of denervation of the small muscles of the feet. Many cases do not require treatment or only need metatarsal supports, but in the cases that progress a number of different surgical procedures are available. These include operations on the toes—arthrodesis of the interphalangeal joints, or transplantation of the long flexor tendons into the extensor expansion. Muscle slide operations can also be carried out on the soft tissue of the sole, and in the more advanced cases a triple arthrodesis may be the treatment of choice.

Metatarsus Primus Varus and Hallux Valgus

This is not the place to debate the cause of this condition, which is so common in females, but heredity and incorrect footwear are probably both aetiological factors. It is customary here to recite the features of the sensible shoe which does not constrict and is able adequately to support the foot, but such repetition is vain if the shoe described does not conform to fashion. If a high heel is worn it is important that there is a platform for the heel to rest on, and that the foot does not slide forward and so accentuate the deformity.

These patients with a hallux valgus deformity may get symptoms from an overlying bunion, but the altered mechanics of the foot frequently cause dropping of the transverse arch with callosities under the metatarsal heads and hammer-toe deformities. Patients then present with anterior metatarsalgia rather than pain in the big-toe joint. Such a rigid foot often has poor intrinsic muscle function, and considerable relief of symptoms may be obtained from a course of faradic foot baths and foot exercises. This may have to be combined with strict

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weight reduction, and in some cases the use of metatarsal supports. These measures, however, may not be sufficient in themselves so long as the basic cause remains, and athroplasty of the metatarsophalangeal joint should then be advised. This is usually a Keller's operation, in which the proximal two-thirds of the proximal phalanx is removed and the metatarsal head trimmed. This can give excellent results, though it has a bad reputation with the public.

Hallux Rigidus

This is another name for osteoarthritis of the first metatarsophalangeal joint, which occurs more often in men than women and is frequently bilateral. Prominent and tender osteophytes develop and dorsiflexion of the joint is restricted. Stiffness of the joint occurs insidiously and does not necessarily cause symptoms, but such a joint is prone to injury and walking can become very painful. This is because at the point of take-off this joint is normally fully dorsiflexed. Local heat treatment to the joint, whether with short-wave diathermy or as wax baths, offers only temporary relief, but the patient may be helped by a metatarsal bar or by stiffening the sole of the shoe by inserting a thin metal plate. A metatarsal or rocker bar should be three-quarters of an inch broad and should lie obliquely across the width of the shoe at the rear of the sole. It is important that it should lie behind and not under the metatarsal heads. Unfortunately, such bars often damage the shoe unless the shoe is very strongly made, and they also quickly wear down. When pain persists a Keller's arthroplasty should be advised, although in some cases an arthrodesis may be the right operation.

Inflammatory Arthritis

Rheumatoid arthritis frequently affects the metatarsophalangeal, tarsal, subtaloid, and ankle joints, and even when a rheumatoid patient is not complaining of pain in the feet radiographs may reveal erosions of the metatarsophalangeal joints. At the same time the disease can present as anterior metatarsalgia due to involvement of the metatarsophalangeal joints, even before other joints elsewhere have become affected. A careful examination of the patient with early rheumatoid arthritis may show soft tissue swelling and tenderness of these joints, and osteoporosis and periosteal reaction may be found before erosion of the articular surface can be demonstrated radiographically. Apart from general and specific treatment of the disease, a period of rest from weight-bearing will be helpful if the pain is severe, and metatarsal supports may be of value. They must be measured accurately and have an insole that fits the shoe, and not simply be fastened to the foot with an elastic strap. Later in the disease, when the joints are severely damaged and subluxed, with tender callosities under the metatarsal heads, a forefoot arthroplasty, such as the type described by Fowler, gives an excellent result, and the patient is always grateful. Should surgery not be possible owing to the general condition of the patient, then surgical shoes may be necessary. Up to now these have often not fitted properly and as a result they have frequently remained unworn, but the recent introduction of seamless or space shoes could well prove an important advance in treatment. These shoes are moulded to fit the foot. A cast of the complete foot is made with the patient weight-bearing in wet plaster, which has been laid on a piece of plastic foam. A model of the foot can then be cast, from which the shoe is constructed. The completed shoe therefore has an imprint on the sole, which avoids undue pressure on painful bony prominences.

Other inflammatory arthritides such as ankylosing spondylitis and Reiter's syndrome can also affect the toes, tarsal joints, and heels. In ulcerative colitis the interphalangeal joints of the toes are sometimes involved. In psoriatic arthropathy destructive changes can occur in the metatarsophalangeal joints, and

radiographs may show "penciling" of the metatarsals, the heads having appeared to melt away. Another characteristic radiological feature sometimes seen in psoriasis is irregularity of the tuft of the terminal phalanges, which have a chewed appearance.

Gout

Though gout is nowadays often incorrectly or over diagnosed, a classical attack of gout, with marked redness, swelling, tenderness, and exquisite pain in the first metatarsophalangeal joint is not easily confused with other conditions. Such an attack is often followed by peeling of the skin. One must not forget that occasionally rheumatic fever or rheumatoid arthritis can start in the big toe, and an infective arthritis or a sesamoiditis can lead rarely to difficulty in diagnosis. Pseudo-gout or pyrophosphate arthropathy usually affects the larger joints such as the knees, ankles, elbows, or wrists, and only rarely occurs in the small joints of the hands or feet. Phenylbutazone has now largely replaced colchicine in the treatment of acute gout, and should be given in a dose of 200 mg. three times a day. Indomethacin is equally effective, and is considered the drug of choice by some, though in the dosage needed to suppress the acute attack of gout headache and other side-effects can sometimes be troublesome.

Plantar Digital Neuritis

This condition is frequently known as Morton's metatarsalgia to distinguish it from the more common anterior metatarsalgia. It has a very characteristic symptomatology, the patient presenting with attacks of sharp lancinating pain in the forefoot. These usually come on when wearing shoes, and the patient has to stop and take off his shoe to get relief. The pain shoots to the tips of two adjacent toes, usually the third and fourth, but other toes can be the site of pain. The pain is due to compression of the digital nerve, and there is thickening of the nerve just before it divides into its two terminal branches. The swelling is due to interstitial fibrosis, the cause of which is uncertain, but similar changes have been found in the digital nerves of a number of animals, including the giraffe. The metatarsophalangeal joints of these patients are not tender, but pain may sometimes be produced by compression of the forefoot, and always by direct pressure over the "neuroma" which is lying between the metatarsal heads. Treatment by conservative measures is not usually successful, but excision of the swollen portion of the nerve invariably gives good results.

March Fracture

A not uncommon cause of pain in the forefoot is a stress fracture of the shaft of one of the metatarsal bones, usually the second or the third. There is no preceding injury, and one does not always elicit a history of excessive standing or walking, though sometimes this can be obtained. The foot aches, and pain is present on walking. Frequently slight oedema is found on the dorsum of the foot and one is able to demonstrate local tenderness over the metatarsal at the site of the fracture. If a radiograph of the foot is taken within a few days of the fracture the bone may look normal or only a faint hairline crack may be seen, but usually by the time the patient reaches hospital there is an obvious fusiform swelling on the metatarsal, due to callus formation at the site of the fracture. Often no treatment is required other than explaining to the patient the cause of his pain, and telling him to avoid excessive walking, and that the pain will subside over the course of the next few weeks. In other cases strapping, or rarely a walking plaster, may be necessary for a few weeks.

Osteochondritis

There are two sites at which osteochondritis may occur in the foot, to both of which well-known eponyms are attached. The first is Köhler's disease, affecting the navicular bone, and here the patient is a child, usually between the ages of 3 and 6 years, who develops pain in the foot and who begins to walk with a limp. On examination there is tenderness to firm pressure on the medial side of the mid-foot over the navicular, and sometimes there is slight overlying swelling. When radiographs are taken the centre of the navicular appears dense and the bone has a squashed appearance from before backwards. These changes gradually revert to normal over the course of the next two years. Treatment is again by strapping or by using a walking plaster for three or four weeks. Fortunately, the condition does not give rise to permanent disability.

Freiberg's disease is the name given to osteochondritis of the head of the second metatarsal, which affects teenagers between the ages of 14 and 18. It is thought by some to be similar to osteochondritis dissecans rather than to other types of juvenile osteochondritis, as in some cases a fragment of bone separates and appears on the radiographs as a loose body. Sometimes the early lesion does not appear to cause symptoms and the condition is diagnosed only when osteoarthritic changes

develop as a result of the deformed metatarsal head. More usually the patient complains of pain in the forefoot and there is tenderness over the affected metatarsal head. Here again conservative measures are usually sufficient to give relief, but occasionally when osteoarthritis of the joint has supervened the metatarsal head may have to be excised.

Plantar fasciitis, nerve root compression from a disc prolapse, Sudek's atrophy, and the less common tarsal tunnel syndrome have all been covered in a previous article in this series, but more must be said of the painful ischaemic foot. This is often found in the diabetic, but many diabetics with peripheral neuropathy have ulcerated and gangrenous feet, and the striking feature is their relative freedom from pain. The patient with ischaemic pain often presents with a continuous rest pain in the toes, which is worse at night, when he may find he has to hang the leg out of bed to try to get relief. The affected toes may be red, shiny, and tender, and the peripheral pulses are absent. Such patients present a characteristic clinical picture, and will obviously be in need of further investigation, which is beyond the scope of this review.

The causes of pain in the foot are many and varied, but they are usually amenable to treatment, and, even where physiotherapy or surgery has a limited role to play, careful attention to footwear may earn the gratitude of your patient.

TODAY'S DRUGS

With the help of expert contributors we print in this section notes on drugs in current use.

Progestational Agents

The secretory change of the endometrium in the luteal phase of the menstrual cycle is caused by progesterone. The capacity to cause a secretory transformation in the endometrium of a castrated rabbit, primed by pretreatment with oestrogen, is an accepted biological test for progestational activity. A comparison with the natural hormone, progesterone, in this test is a yardstick often applied to new progestational agents. All mammals need progesterone to maintain pregnancy. Some, like man, are able to make this hormone in the placenta from a very early stage of pregnancy. Others, like the rabbit, have to rely on an ovarian source until late pregnancy. If they are castrated in early pregnancy they abort unless given progesterone from an outside source. Though we understand very little about how progesterone maintains pregnancy this effect has become an important reason for its therapeutic use. A second biological test very frequently applied to progestational agents is their capacity to maintain pregnancy in animals spayed soon after fertilization. Paradoxically these two useful tests have tended to restrict the therapeutic use of progestational agents. Because these two biological activities are accepted criteria of progestational activity there has been a tendency to restrict the use of these compounds to situations where it is intended to cause secretory change in the endometrium or to maintain pregnancy. Progesterone has many other metabolic effects—for example, on the respiratory system, on the renal handling of sodium, and on urea excretion. It would be interesting to explore the therapeutic possibilities of these activities.

Progesterone is rapidly converted in the liver to inactive metabolites such as pregnanediol. Progesterone is therefore inactive if taken orally unless given in massive doses. It is almost completely insoluble in water, and for parenteral administration it is injected as a microcrystalline suspension or in oily solution, or implanted as a solid pellet. By any of these means it is hardly possible to exceed a dose of 100 mg. per day of the

natural hormone. Though such doses are presumed to be well in the physiological range their therapeutic efficacy is open to doubt. For some acute indications it might well be desirable to maintain high blood progesterone levels for short periods by constant intravenous drip, but, owing to its insolubility, there is no intravenous progesterone preparation. In experimental situations the hormone has been given intravenously by adsorption on albumin, but this is hardly practicable as a clinical routine.

Synthetic Substitute

These problems of the therapeutic use of the natural hormone soon led a search for synthetic substitutes which would not be rapidly metabolized by the liver and might therefore be orally active. Though progesterone was first isolated in 1934 and Inhoffen and Holweg¹ introduced the first orally active synthetic progestin in 1938, it was not until 20 years later that the present flood of orally active progestogens began. The compound introduced by Inhoffen and Holweg did not in fact resemble progesterone very closely in chemical structure. Though it was also a steroid, it did not have the 21 carbon atoms characteristic of progesterone and its metabolites. It was named ethisterone, and in fact was ethinyl testosterone and therefore chemically related to quite a different hormone—one whose biological properties are not always desirable in the female.

The chemical nature of the first orally active progestogen, ethisterone, gave a clue to what was to follow. Its relationship to testosterone indicated that there were progestational properties in that molecule. Another modification of the testosterone structure opened the floodgates. This was the removal of the methyl group at C19, giving rise to the *nortestosterone* skeleton. Various modifications of *nortestosterone* are the basis of most orally active synthetic gestogens today.

Other possibilities for the production of compounds with progestational activity have been explored. Progesterone itself is not very amenable to modification in a way which recommends itself to the commercial pharmacologist. The two most