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The Rheumatoid Foot

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Medical Aspects of the Rheumatoid Foot

Involvement of the foot is a major crippling problem in rheumatoid arthritis. The Leigh population survey for rheumatic diseases (Kellgren *et al.* 1953) suggested that about 2% of adults in this country have rheumatoid arthritis of a degree sufficient to take them to a doctor. About half of these have foot involvement. In another population survey, this time for foot complaints, Clarke (1969) found that 2% had foot troubles due to 'arthritis'. Thus both surveys suggested that upwards of 600,000 people in the country have foot troubles due to rheumatoid arthritis.

The problems of the rheumatoid foot can be divided into early, due only to synovial swelling, and late, when a wide variety of secondary deformities occur and are complicated by mechanical and shoe-fitting problems and by non-articular manifestations of rheumatoid disease and of its treatment.

Early disease: Fusiform swelling of the interphalangeal toe-joints is rare in rheumatoid and of importance only in differential diagnosis: it is rather more common in Reiter's syndrome. However, involvement of the lateral metatarsophalangeal joints is of major importance. It is a common mode of onset of rheumatoid arthritis, often first misdiagnosed as 'dropped arch' or 'metatarsalgia'. Tender thickening and puffiness about the base of the toes makes the foot broader as the joints are forced apart by swelling. This gives rise to the 'daylight sign'. In shoe-wearing people the lateral toes are normally packed tightly together and moulded one to another. There is no space between them. With early metatarsophalangeal involvement the toes become separated and rounded and one can 'see daylight' between them. The lateral metatarsal pressure sign is a good early screening test for rheumatoid at this stage.

Hallux valgus is very common. A surprising number of patients have had an operation for hallux valgus as their first joint trouble, the onset of the arthritis rather than the bent toe having been the real cause of pain, a point occasionally of medico-legal significance if a patient blames the surgeon for persistent pain or spread of arthritis after the operation.

The commonest early problem in the hindfoot is involvement of the subtaloid joint with danger of valgus deformity below the ankle. This calls for remedial exercises and plasters, since persistent valgus deformity is painful in its own right and may lead to damaging stresses in the knee.

Late disease: In late rheumatoid arthritis the deformities are numerous. Many are exaggerations of the corns, bunions and ingrowing toenails seen in nonarthritic feet. In older patients it is often difficult to say what is a rheumatoid deformity and what is a nonrheumatoid deformity. Fig 1 gives the accepted explanation of the mechanism of lateral toe deformity. Due to destruction and loosening of ligaments and tendon sheaths the toes are pressed dorsally during walking and there is secondary flexion of the interphalangeal joints. The normal fibro-fatty cushions under the toe tips and metatarsal heads are displaced and secondary pressure lesions occur

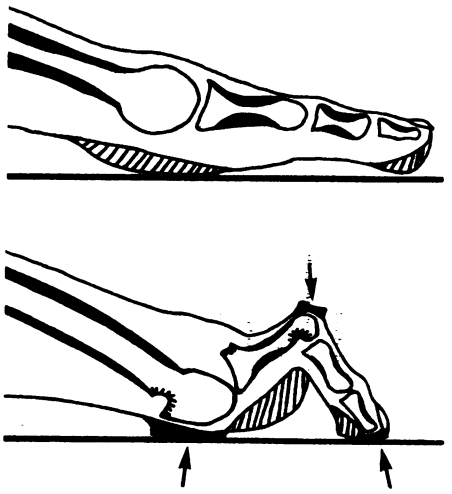

Fig 1 *Mechanism of deformity of lateral toes. The toe subluxes at the metatarsophalangeal joint and flexes distally. The normal fibro-fatty cushions are displaced. Callosities form at painful pressure points*

there and also on the projecting dorsum of the knuckles. Erosion of the metatarsal heads may lead to bony spikes which dig into the skin from inside. Fig 2 shows the characteristic so-called 'centre-forward' callosity under the second metatarsal head. Such callosities often cover an adventitious bursa or a breaking down rheumatoid nodule. When these are present an injection of steroid will sometimes produce local relief. The normal dynamic foot print shows that heel, ball of foot and toes all take weight during walking: in contrast, in the rheumatoid foot the highest concentrations of pressure are sharply localized under the metatarsal heads. The toes, except the hallux, take no weight. Even with no arthritis such pressure concentrations would be very painful. Small wonder, then, that the patient often says she feels as though she is 'walking on marbles'. Sinuses, at first sterile, may form and fistulæ, as one can feel by probing, may go down to the joint. Later, they become infected and intermittently discharge. Nearly all patients with fistulæ have required operation.

In practice an enormous variety of deformities of the toes are seen. Fifth toes may project straight downwards, straight upwards, tuck underneath the other toes or be displaced on top of them. The hallux valgus may be so severe as to cause overriding of the lateral toes or underriding. The bursa over the bunion may become inflamed, filled with fluid or infected. Occasionally one sees an unusual pattern of toe deformity in which there is hallux varus et flexus instead of the usual hallux valgus. The toes then follow into varus deviation. In one patient the rare and the common deformities were simultaneously present on opposite feet.

The midtarsal joints are seldom affected, except in late very severe widespread arthritis and then they usually ankylose. However, established deformity at the subtaloid joint is all too common. It may coexist with forefoot deformity or, more frequently, occur on its own. Subtaloid deformity is less amenable both to surgery and to surgical shoes. True ankle involvement is comparatively rare but tenosynovitis around the ankle can be troublesome and lead to periosteal reaction along the tibia or fibula. A stiff ankle should always be tested for in late rheumatoid arthritis when prescribing surgical shoes. If the patient cannot point her toes she will be unable to get the foot into a shoe with a normal length of opening.

Nodules on the Achilles tendon or under the heel sometimes cause trouble.

Other problems: In early rheumatoid arthritis excessive sweating is common and makes certain shoe materials unpleasant or intolerable. Œdema of the feet is common at all stages and is only partly controllable by diuretics or pressure bandages. It has a number of possible contributory mechanisms – we are still learning about these. They include dependency, high protein exudation from the capillaries, leakage of joint fluid into the tissues and obstruction to the veins and the lymphatics by cysts at the back of the knee. Up to 50% increase of foot volume can occur in some patients.

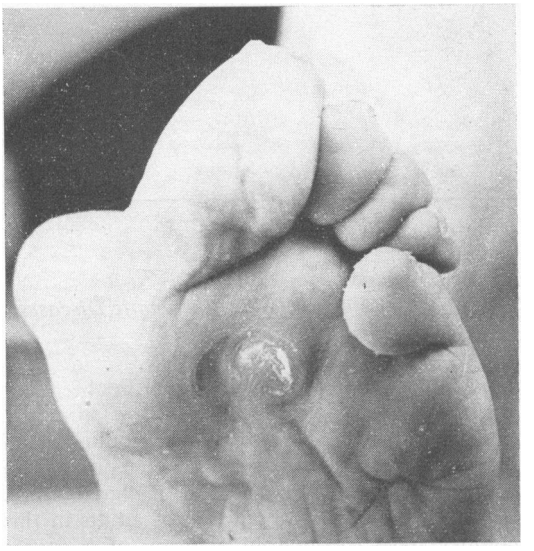

Fig 2 *The 'centre-forward' callosity of the rheumatoid foot*

Arteritis is not too uncommon in late rheumatoid arthritis. It may trap the unwary in that the main foot pulses can be beating strongly even though there is ischæmia of the toes. It is an obvious hazard in assessing a patient for surgery.

Tissue paper skin and easy bruising of chronic steroid poisoning can make wound closure difficult or pressure lesions due to ill-fitting shoes ulcerate rapidly.

Shoes for rheumatoid arthritis: Conventional surgical shoes as supplied by manufacturers in contract with the National Health Service are often disappointing for patients with rheumatoid arthritis. Such shoes are often heavy, weighing up to 1 lb (450 g) each, require numerous intermediate fittings and take up to six months for delivery. The wearability on final delivery was no more than 60% for all kinds of foot problems in a previous study (Dixon & Franklin 1968). For severe rheumatoid arthritis the wearability was less than 40%. Such shoes are often £20 worth of instant waste.

For some years we have been experimenting with the seamless shoe technique whereby a soft lightweight shoe is made by a moulding and

bonding process direct to a modified plaster of paris model of the patient's deformed foot (Fig 3).

It is a pleasure to note how manufacturers[1] have improved their products so that one can now buy a better seamless shoe in Britain than in America where the technique originated. The cost has also come down. The wearability of such shoes is now up to 90% for rheumatoid arthritis. Durability has not been as good as conventional leather shoes (possibly because they are worn more) but is improving. One hundred per cent immediate wearability is unlikely since a plaster model tells nothing about the consistency of a foot. A soft 'plastic' foot will always require a shoe which is a tighter fit than a hard rigid foot. Nevertheless the technique is already an improvement on pre-existing methods and promises to improve further. After a year of wearing accurately moulded shoes, spreading the pressure away from the callosities on to the whole of the weight-bearing area of the foot, the callosities disappear and the bottom of the foot is covered with a smooth, thin healthy skin. The deformities themselves do not seem to improve.

Fig 3 *Seamless shoes for rheumatoid arthritis.* Left, *a zip and ring closure for patients with disabled fingers.* Right, *corrective lace-up style*

Future trends: In 1968 the Ministry of Health provided 80,000 pairs of surgical shoes at a cost of £1,250,000. Ministry of Health statistics show that the country's stock of traditional surgical shoe craftsmen is rapidly diminishing. Their average age is 60 and no new apprentices are entering the trade. In about five years' time there will be a crisis. Hence, it is urgent for those who prescribe shoes for rheumatoid arthritis to experiment with and develop the seamless shoe technique whereby any competent hospital person, such as the plaster technician or physiotherapist, can take a plaster model of the patient's foot, post it off to the central factory, and have a high expectation of a comfortable shoe for the patient delivered in only a few weeks.

The 600,000 people in this country estimated to have rheumatoid foot problems are far too numerous for surgery, even if suitable. Consequently one will have to rely on containing the deformed foot rather than on correcting it.

[1]Manufacturers who have worked with us are Braywick Distributors, Maidenhead; Messrs Robinson, Northampton; Orthopædic Footline, Leicester; Messrs Clarks of Street

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Surgery of the Rheumatoid Foot

Patients with foot problems are seldom seen early in the disease and therefore surgery of the rheumatoid foot has tended to be of a salvage nature. The foot has been neglected and we still have a lot to learn about the value of surgery and in particular the value of early surgery.

The value of early synovectomy of joints of the foot is still not established and access to these joints is technically difficult. Fortunately surgery has much to offer in the more advanced cases.

There are fewer indications for surgery to the ankle and hindfoot than of the forefoot. During the period 1963-9, 72 forefoot operations were carried out at St Mary Abbots Hospital, and during this time only 9 were performed on the hindfoot and ankle in a total of 79 cases.

Arthrodesis of the ankle gives excellent results, although it must always be borne in mind that a fixed ankle-joint may in time affect the remainder of the foot. Rheumatoid changes occur in the subtalar and midtarsal joints in 67% of all cases (Vainio 1956).

The main indication for triple arthrodesis is pain. Pain due to subtalar arthritis may be severe, particularly on weight-bearing; the slightest lateral movement causing acute pain. Before performing a triple arthrodesis I try the effect of a below-knee walking plaster for 4–6 weeks and if this completely relieves the symptoms, which then return within weeks of removing the cast, operation is indicated. Pain on weight-bearing, unrelieved by using a stick, is also an absolute indication for triple arthrodesis. Pantalar arthrodesis (i.e. fusion of ankle and triple arthrodesis) is indicated if there are severe changes in the ankle and subtalar joints.