

and severely crippling disease is accorded the attention that its importance merits.

If leprosy is diagnosed early enough and is treated properly, nerve damage can generally be prevented, social dislocation avoided, and the cycle of transmission interrupted. Every doctor working in the tropics should strive towards this ideal.

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Seamless Shoes in Rheumatoid Arthritis—Preliminary Trial

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In each foot there are approximately 30 joints or tendon sheaths which may be affected by rheumatoid arthritis, and patients often complain of pain on walking. In early disease pain is usually reduced by prescribing commercially obtainable shoes large enough to contain both the swelling of the foot and special insoles which redistribute the body weight from the painful metatarsophalangeal joints to relatively painless parts of the longitudinal arch.

As disease progresses numerous deformities develop. In typical late rheumatoid arthritis they include hallux valgus with broadening of the forefoot, dorsal subluxation or dislocation of the second to fifth toes at the metatarsophalangeal joints, valgus deformity at the subtaloid joint with collapse of the longitudinal arch, and, less often, involvement of the ankle joint itself with painful limitation of flexion and extension. Under the metatarsophalangeal joints the fibrofatty "cushion" moves forward, leaving the bones with little protection between them and the plantar skin. Painful callosities form beneath the metatarsal heads (and may break down to form sinuses) while shoe pressures cause similar callosities on the dorsum of the cocked-up proximal interphalangeal joints. Contractures of the hips and knees also affect the way in which the foot is used and hence the ability to obtain comfortable shoes.

In Great Britain the National Health Service provides surgical shoes, free of charge, on the prescription of a hospital consultant. This is a service of great value. Unfortunately, we noted that a proportion of shoes prescribed for patients with rheumatoid arthritis could not be worn. Delays of up to six months occurred between prescription and delivery, and shoes too often did not fit when delivered. Further alterations might take more months.

Retrospective Study

A retrospective pilot study looked at what happened to conventional surgical shoes prescribed at St. Mary Abbots and St. Stephen's Hospitals, London, from 1 to 30 January 1965 for 116 patients (all diagnoses). Of these, 29 were not traceable (inadequate records), 87 were written to, and of 70 who replied 30 had no complaints about the shoes and 40 had one or more complaints—that is, shoes uncomfortable (26), returned for adjustment because of misfit (14), too tight (10), too heavy (16),

too clumsy (14), some other reason (8). Thirty-one patients had difficulties in "breaking-in" the shoes.

Most of these shoes were prescribed for patients with rheumatoid arthritis. Those with the more severe rheumatoid foot deformities showed a higher proportion of misfits and of shoes sent back for adjustment.

This study provided evidence of waste in the provision of surgical shoes and that many months might elapse between prescription and delivery. One possible reason for misfits was that the patient's foot might change further during the waiting period. A long period sometimes necessary to break-in the shoes was also notable. There was no evidence that poor quality material or workmanship was used—rather the reverse. However, the all-leather, weather-proof construction made for a firm and relatively unyielding shoe. In rheumatoid arthritis with thin atrophic skin covering bony prominences, the breaking-in period could be an agonizing experience.

Trial of Seamless Shoes

Nineteen patients with difficult shoe-fitting problems were each provided with one pair of conventional surgical shoes and one pair of seamless shoes.¹ A systematic comparison was then made. Of the 19 patients, 18 had rheumatoid arthritis and one had psoriatic arthropathy.



Photograph of seamless shoe

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¹ The brand known as Imprints made by Messrs. Jack C. Rich, of New York, was used; shoes and cast-making kits are available through Braywick Distributors Ltd., Maidenhead, Berkshire.

Seamless shoes are made by a moulding and bonding process, a modified plaster-of-Paris cast of the patient's foot being used as a last. A special technique is used to ensure that the cast of the foot is taken in the "spread" weight-bearing position. By marking with an indelible pencil the pressure lesions and bony landmarks such as the malleoli on the skin, the precise location of these is transferred during the casting process to the replica. The plaster "negative" obtained in hospital is posted to the manufacturer together with a standard form which records the degree of spread of the foot on weight-bearing, the patient's weight, occupation, and associated deformities, etc. These details, together with the location of lesions transferred automatically from the foot, help the manufacturer to modify the replica to act as a satisfactory last on which to build the shoe. Sole contours are built up with a cork and rubber composition which thereby incorporates metatarsal and valgus supports and internal heels. The underside is finished with a sheet of microcellular rubber of the required density. The final result is a shoe (see Fig.) which can be very light or relatively heavy (according to whether lightness or durability is the more important) and which distributes the body weight over the widest possible area of the foot, thus avoiding local concentrations of pressure.

Results

Minimum follow-up time was six months. One patient died. Of the 18 survivors, 14 preferred the seamless shoes. Those of the remaining four pairs of seamless shoes could be worn but were not preferred, as they were "too heavy," "too hot," or "too unsightly," and one pair caused painful pressure on the skin over a dorsally protruding toe (this proved easy to adjust). Of the 14 who preferred the seamless shoes, the majority did so solely on the grounds of comfort. In eight patients these shoes alone could be worn, the conventional shoes being too uncomfortable to wear without a period of breaking-in—unacceptable when other comfortable shoes were available. The seamless shoes were a major factor in keeping two men of working age at their jobs, one a postman who walked at least seven miles (11 km.) a day, the other a nurse in a busy hospital.

In the majority of instances the seamless shoes were available to the patient at least a month before conventional shoes, though the casts had had to be sent to New York and the shoes returned thence. (But, of course, the seamless shoe manufacturer knew his product was under test, while the conventional shoe manufacturers were providing normal service only.)

Wear and Repair

Repair was easy and wear compared favourably with conventional shoes, though a systematic comparison was impossible

because comfortable shoes were worn more than uncomfortable ones and patients limited by painful knees and hips could not walk enough outdoors for the shoes to show much wear, even if comfortable. One patient has had his shoes resoled four times in two years.

Discussion

The average final cost of conventional shoes in this study was £17 a pair. The cost of seamless shoes, including freight charges for the casts and import duty, was about £30 a pair. In this country similar shoes are now being produced to retail at £12 to £14 a pair. The present annual cost to the National Health Service of providing conventional surgical shoes has been estimated at £1,200,000 by the Ministry of Health. However, the significance of this trial lies not so much in the potential saving of money as in the lower proportion of initial misfits. Owing to their construction the seamless shoes nearly always fit first time. Casting of the foot can be carried out by existing hospital personnel using existing hospital materials. Manufacture can be anywhere in the country. Expensive visits by or to the fitter are unnecessary. Skilled craftsmanship is still needed to modify the plaster replica to use it as a satisfactory last, and fully automatic processing of the casts is not possible. Nevertheless, the method permits some degree of production-line technique with a saving in cost.

The appearance of these shoes is unconventional. Many find them unsightly, and we anticipated that women patients would reject them on this account. For the patients with whom we have been dealing—namely, those with foot deformities such that they were grateful for any comfortable shoe—this was of only minor importance. One woman found she could tolerate her uncomfortable conventional surgical shoes for short periods when visiting friends if she had previously worn the seamless shoes at home for most of the day.

The shoes are impermeable to moisture because of the rubber-based bonding techniques used. Small ventilating holes punched in the sides are not very effective. We anticipated that this impermeability would prove unacceptable to some because of sweatiness, but this has not been so. The biggest problem, so far has been the time taken in making, packing, and posting the cast—half an hour or more—and a simplification of the casting process is being developed.

The present study has subsequently been extended to patients with foot deformities due to diabetic neuropathy, congenital abnormalities, and mutilations and to those with defects after trauma or surgery. The results are promising.

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