

South African Medical Journal Suid-Afrikaanse Tydskrif vir Geneeskunde

P.O. Box 643, Cape Town

Posbus 643, Kaapstad

Cape Town, 25 June 1955

Weekly 2s. 6d.

Vol. 29 No. 26

Kaapstad, 25 Junie 1955

Weekliks 2s. 6d.

REVISION SERIES

XII. COMMON DISABILITIES OF THE FEET

ARTHUR J. HELFET, B.Sc., M.D., M.Ch.Orth., F.R.C.S.(Eng.)

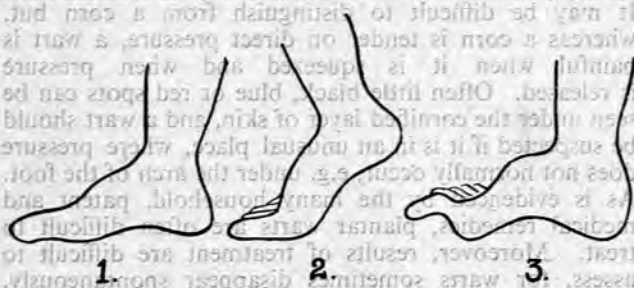
Cape Town

Napoleon may have declared that an army marches on its stomach, but in more recent wars we have realized that a soldier marches with more agility on good feet. Moreover—in time of peace—vigour, good nature and good temper depend on pedal comfort. Osler, with due authority, wrote, 'A man is as old as his arteries', but we may endorse Lewin's addendum, 'but he acts as old as his feet and legs'. It is also permissible to generalize that either the shoe must be made to fit the foot, or the foot must be made to fit the shoe. With that proviso a strong and supple foot is a good foot even if it is flat or unshapely. In other words, if the foot has an abnormality of shape we must either make a shoe that accommodates the abnormality or, by surgery, we must trim the shape to fit an ordinary shoe. If the patient has a shoe which fits the foot or if he walks barefoot, he will be comfortable as long as the foot is strong and supple, whatever its shape.

The Action of the Foot in Standing and Walking

When standing on the normal foot, weight is borne on the heel and on the heads of the 1st and 5th metatarsals. This 3-point weight-bearing is converted into a tripod by longitudinal and transverse arches (Fig. 1).

When walking, weight is borne alternately on this tripod and on a platform formed by the heads of the metatarsals and the 5 toes in front of them (Fig. 2).



Figs. 1, 2 and 3

In order to stand and walk comfortably, it is essential that the toes should be held straight so that weight is distributed evenly on a broad surface. The toes are straightened by the short muscles of the feet, chiefly the lumbricals and interossei. The arches are supported by the short muscles and also by the long calf muscles.

FOOT STRAIN

In our well-shod and motor-car age the short muscles of the feet are not always sufficiently exercised and tend to weaken. They then fatigue on standing or walking and the toes, instead of remaining a straight platform, claw in the shoes. Weight is borne unevenly on the heads of the metatarsals and the tips of the toes, and the clawed toes crowd the shoes. The consequence is metatarsal callosities, corns on the toes and metatarsalgia (Fig. 3). This process is accelerated and exaggerated if the short muscles are injured or are paralysed by poliomyelitis, spina bifida or other nerve lesion.

When fatigue is excessive or repeated, the feet swell towards the evening. After a night's rest the swelling subsides, but if this process is not checked, in due course oedema persists overnight and later chronic oedema organizes. Fibrin is formed, which in turn is converted into fibroblasts and fibrous tissue, and so gradually chronic strain produces increasing stiffness of the joints of the foot and the patient feels discomfort on forced passive movements.

Sometimes, though rarely, the arches of the foot collapse acutely and dramatically. More usually, the arch drops slowly and the fall is accompanied by the formation of osteophytes on the dorsum of the tarsal joints. The most common site is in the neighbourhood of the long extensor tendon to the big toe. When the arch flattens, these osteophytes are squeezed out on the dorsal edges of the mid-tarsal joints. This phase is denoted by tenderness of the spring ligament and by pain under the longitudinal arch. As the short muscles fatigue, the long muscles of the calf try to compensate.

When they tire, aching in the calf becomes the predominant symptom.

Treatment

The treatment of foot strain includes the treatment of symptoms which frequently follow in sequence, viz.: aching on fatigue, metatarsalgia, corns, aching under the longitudinal arches of the feet, and aching in the calves on walking. All are finally aggravated when the feet swell and become stiff. The approach to treatment depends on the stage of strain which has been reached and particularly on whether the feet are supple, are mildly stiff with pain on passive movements, or are very rigid.

(a) *Supple feet* can be restored to comfort and vigour by correct proportions of rest and exercise. In severe foot-strain rest should consist of a few days in bed. In less severe instances it may be achieved by limiting activity with or without foot supports. In the early stages the usual longitudinal arch-supports are rarely required. All that the patient needs is a metatarsal pad or platform. This relieves the heads of the metatarsals from full weight-bearing and helps to straighten the toes. When unnecessary, longitudinal arch-supports would weaken the foot and in many instances the patient cannot again do without them.

Exercise should initially be non-weight-bearing and directed to strengthening the short muscles of the feet, the muscles that straighten and separate the toes. The patient is instructed to do the exercises for short periods, 2 or 3 times a day when seated. The traditional direction to walk on the outer borders of the feet serves no purpose, as only the muscles of the calf are so exercised. When the patient can actively straighten and separate the toes good progress has been made. Longitudinal arch-supports are prescribed for cases of long standing and of marked weakness or wasting only. They should be made to measure of resilient, not rigid, material.

(b) *Rigid Feet.* In comfortable shoes, rigid feet, though weak, are often painless. If not, the prime requisite is a pair of firm and custom built supports. The supports must be made from a plaster-of-paris cast, for it is seldom that stock sizes are adequate. If standard shoes do not fit, special shoes must be made or surgery will be necessary to reshape the foot. Physiotherapy should aim only at reducing swelling and maintaining the circulation.

(c) *The Semi-rigid Foot.* When the patient complains of pain on forced passive movements, a clinical decision must be made. Either the feet must be mobilized by physiotherapy and manipulation and then treated as supple strained feet as in (a), or we must accept the disability and treat as a rigid foot as in (b). The largest group of 'foot sufferers' fall into this category, but most of them can be completely relieved by the judicious use of manipulation under general anaesthesia, adequate rehabilitation and appropriate supports.

CORNS AND CALLOSITIES

Corns are caused by intermittent pressure over a limited area of skin where there is firm resistance underneath. They occur chiefly on the toes, and under the heads of

the metatarsals. It is said that no other minor condition causes as much discomfort, pain and disability as a corn. The frequency with which great writers comment on them is evidence of their prevalence, and Jonathan Swift's line, 'A coming shower your shooting corns presage', describe their association with weather prophecy.

Callosities follow intermittent pressure over a wider area where the underlying resistance is not as firm. They are found chiefly on the soles of the feet, the palms of the hands and the backs of the heels. Callosities may or may not be painful and are often protective.

The conditions which provide the medium conducive to the formation of corns and callosities are: (1) badly fitting shoes, (2) foot strain with its incident wasting of muscle and clawing of toes and (3) deformities of the feet and toes.

Treatment

Prevention of these 3 conditions is the best treatment. Today shoes are manufactured in many sizes with a wide range of fittings and it is easier to find well-fitting shoes. Symptoms of foot strain need early attention and occasionally bony deformities such as clawed toes, hammer-toes, overlapping 5th toes, exostoses and prominent heels, must be corrected surgically.

Once the corn is established, treatment is virtually in the province of the chiropodist, who treats them by pressure-relieving pads, by paring or by removal. Various applications help to soften corns so that they shed themselves. The best of these is a paint of salicylic acid in collodian. It is applied daily until the corn peels off with the 'sticky skin' formed by the repeated applications.

Allied to chiropody we must see that the feet are strengthened, that friction points are eliminated, and that the toes are kept straight, even if to do so manipulation, tenotomies, or surgery are required.

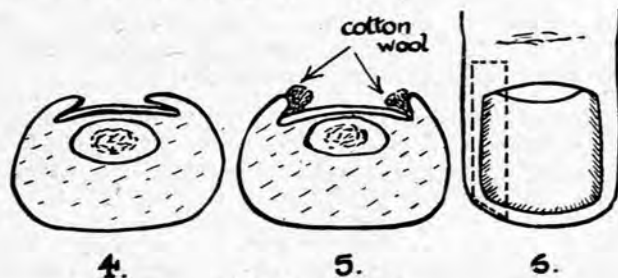
PLANTAR WARTS

A plantar wart is an infective papilloma on the sole of the foot. It does not usually protrude beyond the surface and tends instead to burrow into the soft tissues of the sole because it is covered by a thick layer of cornified skin. It is generally thought to be due to infection by a virus and to be contagious, spreading to the feet of others. It causes disability, not only by the pain it produces but because it is apt to multiply on the foot. It may be difficult to distinguish from a corn but, whereas a corn is tender on direct pressure, a wart is painful when it is squeezed and when pressure is released. Often little black, blue or red spots can be seen under the cornified layer of skin, and a wart should be suspected if it is in an unusual place, where pressure does not normally occur, e.g. under the arch of the foot. As is evidenced by the many household, patent and medical remedies, plantar warts are often difficult to treat. Moreover, results of treatment are difficult to assess, for warts sometimes disappear spontaneously. One can achieve success in many cases by applications of formalin or acetic acid. Surgical methods include coagulation with cutting diathermy. This is relatively

painless afterwards, although the craters heal slowly. Adequate curettage under local anaesthesia followed by packing with permanganate crystals or Friar's balsam is another measure which may be recommended. Deep X-ray therapy should be prescribed only rarely and very cautiously. It does harvest its percentage of cures but, when deep X-ray fails, treatment becomes so much more difficult because of the avascular scar with which it surrounds the wart. Surgery then becomes protracted because the resultant wound is indolent in healing.

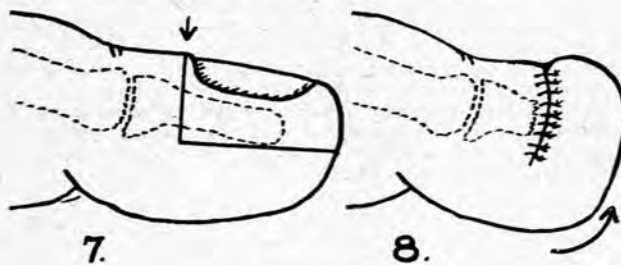
INGROWN TOENAILS

Lewin defines an ingrown toenail as 'one in which one or both lateral margins are embedded in the soft tissues of the nail-groove, producing inflammation'. Usually the big toe is involved and most frequently the cause is cutting the nail too short. Sometimes the shape of the nail is responsible (Fig. 4).



Figs. 4, 5 and 6

In the early stages wisps of cotton wool dipped in Friar's balsam packed between the nail and the nail-fold are all that is necessary (Fig. 5). They open up the groove and relieve the inflammation and pain. Granulating areas should be cauterized with sticks of silver nitrate or copper sulphate. If the condition is more established the affected quarter of the nail with its nail-bed and overlapping flap of skin should be excised



Figs. 7 and 8

(Fig. 6). If the big toe is longer than the 2nd, amputation of half the terminal phalanx and the whole nail-bed, using a planter flap to cover the stump, may be confidently recommended. The only disadvantage is the cosmetic effect of the loss of the nail (Figs. 7 and 8).

METATARSALGIA

This term is used to describe all aches and pains associated with the ball of the foot. The common forms are due to foot strain, clawing of the toes, and pes cavus.

Treatment of the causal factor plus metatarsal platforms or metatarsal bars is often successful in bringing relief.

A severe type, also known as Morton's metatarsalgia, is due to a neuritis of the plantar interdigital plexus of nerves. The plexus is formed at the junction of the medial and lateral plantar nerves and is usually situated at the distal end of the third inter-metatarsal space. Occurring most often in women, the classical description is of acute shooting pains or cramps extending into the 3rd and 4th toes, which make her stop walking, remove her shoe and squeeze her foot. After a rest she can continue walking. On examination the plexus is tender, and clicks on squeezing the metatarsals. After a time sensory changes can be detected in the affected toes.

In the early stages the attacks may be relieved by wider shoes, metatarsal platforms and physiotherapy, but excision of the nerve plexus brings a dramatic cure.

HALLUX VALGUS

This is the commonest deformity of the feet to cause disability (Fig. 9). In children it is associated with metatarsus primus varus or adduction of the 1st metatarsal. Osteotomies and muscle transfers are necessary to correct and maintain correction of the deformity, and should be undertaken to prevent increasing discomfort and unsightliness.

In adult life the deformity develops mainly in women



Fig. 9

and is associated with splaying of the foot and flat-foot. The condition may also be complicated by foot strain, by metatarsalgia, by clawing of the toes and corns, by overlapping 2nd toe and, most commonly and almost universally, by an exostosis with bunions on the head of the metatarsal. The bunion becomes inflamed and even infected. Later osteo-arthritis develops in the metatarsophalangeal joints. Pain which is felt later is due mainly to the bunion or to the osteo-arthritic joint.

Treatment

Some patients make walking tolerable by wearing open sandals or cutting a hole in the shoe over the bunion. In early cases, and especially in young people, corrective appliances and exercises to strengthen and tighten up the feet are helpful. When deformity is established these measures are useless, but surgical correction may be recommended confidently. In my experience a modification of the Kellars operation in which the base of the proximal phalanx and the exostosis on the head of the metatarsal are excised gives very satisfactory results. Thirty degrees of movement with active control should be achieved. This result depends on careful and systematic post-operative care. The Mayo operation, in which the head of the metatarsal is excised, tends to weaken the tread, and simple excision of the exostosis and bursa, though temporarily comfortable, usually leads to a recurrence of pain and the need for the more radical operation a few years later. When present, complications such as foot strain, clawed toes, hammer-toes, etc., must be dealt with at the same time.

HALLUX RIGIDUS

Hallux rigidus is due to arthritis of the metatarsophalangeal joint of the big toe, which in these cases is often abnormally long. The frequency with which arthritis occurs in this joint is associated with the fact that it takes more strain than any other in the body—with every step. The patient suffers increasing pain and stiffness and tries to reduce discomfort by walking on the outer border of the foot, which may in turn become painful. And often the presenting symptom when the patient consults his doctor is pain on the outer side of the foot.

The conservative approach to treatment is to protect the joint from movement. This is achieved by wearing shoes with a thick sole and inserting a 'roller bar' between the layers of the sole at the level of the metatarsophalangeal joints, thereby trying to imitate the effect of wearing a wooden sabot. Where there is much pain the sole is made more rigid by a thin strip of light metal.

Treatment by operation is simpler and should be advised for all fit patients. Again the modified Kellars seems to give the most consistent results.

Most of these disabilities of the feet are preventable if proper attention is given to shoe fitting and to Lewin's 'pedigram', 'Fatigue is a warning; pain is a danger signal; swelling may be serious'.

REFERENCES

- Lewin, P. (1947): *The Foot and the Ankle*. Philadelphia: Lea and Febiger.
 Lake, N. C. (1945): *The Foot*. London: Baillière, Tindall and Cox.
 Helfet, A. J. (1941): *J. Roy. Army Med. Cps.*, 76, 282.