"FLAT FEET."

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To the lay mind the merit of a foot depends on the height of its arch. This idea is drilled into the public by advertisements depicting "fallen arches" restored by arch supports. Yet it is often the high-arched foot which is painful, whereas flat feet may be comfortable and efficient. The foot of the ballet dancer is usually quite flat when standing relaxed, and yet so supple and under such good muscle control that it can be arched or flattened at will and is strong and highly efficient. Flexibility, muscle control and correct weight-bearing are the true standards, and the degree of arch development is of quite secondary importance.

Disorders involving the longitudinal arches of the feet may be considered according to age incidence.

Infancy.

Young children are often brought for advice, with the story that they were rather slow in starting to walk; turn their toes out; are clumsy and bad at running and games; wear shoes over on the inner sides, and are easily tired and disinclined to walk far. On examination, the child is seen to stand with the feet everted; weight over on the inner borders, producing talipes valgus and "knock-ankles"; flat longitudinal arches and prominent scaphoid bones. Usually there is some degree of "knock-knee." When the feet are handled, they will be found to have an undue upward and outward range of movement. If the child is very young it is often possible to press the tops of the feet against the legs. This gives the clue to the congenital origin of the trouble. Before birth the feet were lying in the calcaneo-valgus position, and the subsequent signs and symptoms follow from mechanical causes. The flexor and invertor groups of muscles are overstretched and weak, the extensors and evertors shortened and strong. In infancy, before walking commences, the child may be observed to favour the upward and outward movements of the feet, instead of the downward thrusting which later on is required for standing and walking. Hence he is often slow to start walking. If untreated, the feet remain flat and everted and the gait lacks spring, as the important tibial muscles which control the arches are inefficient and weak. As the weight of the body is borne over on the inner sides of the feet talipes valgus, or "knock-ankles," are the rule, and this in time leads to "knock-knee." A congenital type of "flat foot" results, which, although not a painful condition, is associated with inefficiency and some deformity.

Treatment is well worth while. If the condition is recognized in infancy, little plaster of Paris or aluminium splints should be worn at night-time, and while the child is sleeping during the day. These splints are set to hold the feet in the reverse position to the deformity, namely, downwards and inwards. As soon as the time comes for the child to stand and walk, boots—in severe cases—or laced shoes should be worn. Light cork and leather "valgus insoles" are added to these, and wedges fixed to the inner sides of the soles and heels. By these means the ankles are supported and the child's weight deflected towards the outer borders of the feet, thereby relieving the weak group of muscles from overstrain. As these muscles become strong they will gradually assume their proper function of supporting the arches of the feet, and impart a normal "spring" in walking. These mechanical measures should be continued for some years, and later, when the child is old enough to co-operate, remedial exercises will help. A

few stereotyped exercises done for a short time each day are of no value. The treatment consists of educating the child in proper methods of standing and walking, weight distribution, and muscle control. Games and dancing which develop co-ordination and balance are to be encouraged.

Adolescence.

During this period of rapid growth and increasing weight the muscle support of the feet and their arches may fail, and lead to serious consequences. The condition, known as "spasmodic flat foot," has its own very definite characteristics. It occurs more often in boys than in girls, and rarely in the class of child who is at school and leading a regulated life at this age. The typical case is that of an overgrown lad of fifteen or so, who on leaving school finds employment as a messenger or odd-job boy. He is kept on his feet for many hours a day, carrying parcels or standing about. There may be some foot defect, such as "knock-ankles," to contribute towards over-strain, but often the arches are well developed and the foot of normal appearance. After a time, and often quite suddenly, the leg muscles become fatigued, lose their postural tone, and the body weight falls straight on to the structures of the arches, which have now lost their normal support. The ligaments binding the tarsal bones together are not designed to sustain this weight, nor have they the strength to do so. Stretching therefore occurs, and this is accompanied by severe pain and irritation of the tarsal joints. From reflex action the peroneal muscles go into spasm, and the feet become locked in the everted, or valgus, position. The arches, although acutely strained, may still show a normal contour at this stage, but flattening occurs later in untreated cases. Walking becomes increasingly laboured and difficult, and advice is usually sought.

On manipulating the feet with a steady inverting pressure the spasm of the peroneal muscles may sometimes be overcome. This is a painful proceeding, but if successful the prognosis is good. The boy must not work for at least three months. Rest is essential, combined with careful physical treatment to strengthen and re-educate the muscles. Mechanical support is afforded by boots fitted with valgus insoles, inside wedges, outside irons and inside ankle-straps. The amount of support can be reduced gradually, as improvement occurs, but the wedges to the boots should be continued during the period of growth.

In the more severe cases, where the muscle spasm cannot be overcome, the outlook as regards cure is poor. More drastic treatment by manipulation under an anæsthetic, followed by temporary fixation in plaster will be necessary, but only too often the valgus deformity persists, the arches flatten, and the tarsal joints become rigid. Fortunately, most such cases reach a stage of comfort, but the inefficiency of the feet remains.

In Adults.

Painful feet developing in adult life is often due to acute or chronic over-strain of the arches. The term "foot strain" is better than "flat foot," as some of the worst cases occur in people whose arches are well developed. It is the flattening, not the flat foot, which is painful. Many factors predispose to over-strain, such as occupations which necessitate many hours of standing; increase in body weight—so often the cause in middle-age; muscle weakness following illness or recumbency; and ill-health generally. *Acute* foot strain is most often seen in people who have recently changed their mode of life for one which requires an unaccustomed amount of standing and walking. Nurses, in their first few months of training, are frequent sufferers.

Pain is usually severe, and referred chiefly below the insteps, in the region of the spring ligaments, also on the dorsum of the feet and beneath the external malleoli. Some swelling and even oedema may be present, and may simulate some inflammatory disorder. Cramping pain up the calves of the legs is a frequent symptom, and there may be spasm of the peronei and extensor muscles of the toes.

A period of rest is essential. The feet should be coaxed into the inverted position and then strapped. After a few days, when the pain has begun to subside, physical treatment should be commenced, consisting of heat, gentle active and passive movements, and faradic foot-baths. It is probable that the patient has developed faulty methods of walking and standing, and re-education in these is an important part of the treatment. Advice must also be given as to the best type and shape of shoes. As a temporary measure, inside wedges and light flexible moulded leather insoles will help to deflect the weight away from the sensitive arches.

Chronic strain is the commonest cause of tired, aching feet, for which sufferers so often buy the much-advertised arch-supports, but without gaining the relief which they seek. The condition may follow an acute attack, or may come on insidiously. Predisposing factors are much the same as for "acute foot strain," and follow illness or debility, occupational fatigue, and anatomical and functional defect of the feet.

The ligaments become stretched, peri-articular adhesions form, and the normal movement of the tarsal joints is lost. In the late stages the longitudinal arches may become flattened. The essence of treatment is to restore free mobility, regain muscle control and correct defects of posture and weight-bearing. Arch-supports, especially of the rigid metal variety, will not put matters right. Temporary relief may be experienced by their use, but appliances of this description will only tend to promote further stiffness and deterioration of the foot mechanism.

On examination, the appearance of the feet should be studied first with the patient standing in shoes, then barefoot, then tip-toe and lastly with the feet inverted, and the weight over the outer borders. From this inspection a good estimate can be made of any defects of shoes or their wear, also of the anatomical peculiarities of the feet, and especially of their range of movement and muscle control. The patient should then sit, and the feet be examined manually. Mobility of the toes and tarsal joints is tested by passive stretching. If these movements, particularly those of plantar flexion and inversion, are limited and painful, then the cause of the stiffness must be determined. Should there be any suggestion of arthritis or other pathological condition of the bones or joints, an X-ray examination must be made. In the absence of definite X-ray findings it is most likely that the condition is one of chronic foot strain, and the pain and stiffness are due to stretched and sensitive ligaments and adhesions around the tarsal joints.

In such cases—and they are very common—manipulation under gas is the right course. The immediate relief of symptoms may be remarkable, and in any case it is the correct prelude to further treatment. Whatever the anæsthetic used, a few moments of good muscular relaxation is essential. The feet are then forcibly stretched through a maximum range of movement in all directions. No attempt

is made to restore the arches, if these have dropped, but only to regain full mobility. Adhesions will be felt and heard to give way, but as a rule very little pain is complained of afterwards, and more often the patient experiences relief forthwith. After-care is most necessary. Physical treatment from an experienced masseuse should be carried out for a week or two, and this treatment consists not only of massage, active and passive stretching and exercises, but also of re-education in correct methods of walking and standing. In most cases some adjustment to shoes will be required. No fixed rules can be laid down, as so much depends on the type of foot, mobility and so on. Some light insoles, of cork and leather, made from plaster casts of the feet, may aid in distributing the weight correctly; also the inner borders of the soles and heels of the shoes may need raising by means of wedges. With care and good judgment most over-strained feet can be made comfortable and efficient.

In Old Age.

Chronic strained feet in old age are likely to become "flat" in the literal sense. With the breaking down of the arches secondary changes are apt to occur in the bones and joints, and osteo-arthritis becomes established. Quite often in this late stage, where the ligaments have become completely stretched, very little complaint is made of serious pain. Often the patient seeks advice on account of troublesome callosities which have developed beneath the stiff, broken down feet. In such cases shoes made to fit the deformity are more likely to bring relief than any form of corrective appliance.