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Shoes and their application in medical treatment

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In medical treatment we know the following types of shoes :

1. The seamless shoe, or disposable shoe.
2. The commercial shoe that can be obtained from the ordinary shoe-shop.
3. The semi-orthopaedic shoe, of which there are three types :
 - a. the commercially available type, which may be modified orthopaedically by the orthopaedic shoemaker,
 - b. the slipper type,
 - c. the sultanino brand.
4. The orthopaedic footwear proper.
5. Orthoses or prostheses, which are worn inside orthopaedic shoes or commercial shoes.

These different types will now be discussed in further detail.

1. The disposable shoe may be used as a temporary provision, previous to providing semi-orthopaedic or orthopaedic footwear. Postoperatively or during treatment the patient may be wearing bandages and often the wound has not healed enough by then to provide orthopaedic footwear. By means of this type of shoe it has proved possible to mobilize quickly patients with severely vulnerable feet and open wounds, as are seen in diabetes mellitus and after amputations, and they may be discharged earlier

than they would have been in former days.

There are two types : first of all the type made of plastazote, which is usually perforated to permit a better perspiration and over which a felt shoe is worn. This type was introduced to us by Mr. Cooper, a shoe-manufacturer at Leicester, England (fig. 1).

Because this plastazote-type did not answer our needs in all circumstances we managed to develop a new type that is a bit stronger and that is made of the material "Prix", which can also be perforated if necessary (fig. 2).

In both types of seamless shoes the foot can be kept properly warm and in cases of a bad circulation we noted a faster healing of the wound. The advantage of plastazote as well as of prix is that it can be washed and even be sterilized.

2. Secondly we have the factory-made shoe with orthopaedic modifications. These shoes can be obtained from the ordinary shoe-shop. They have to be of such quality, however, that minor internal or external corrections can be made.

Now it is about time to tell you something about the anatomic features of the shoe (~~fig. 3~~).

Uppers and shaft are made of leather. When using leather the elastic properties of the material should be taken into account. Shoes with laces (~~3~~) usually offer greater possibilities for a proper shoe fit than other types, such as loafers or shoes with elasticized vamps. A snug grip of the counter about the heel is important for the roll-off. Soles and heels (~~4~~) are made of leather or rubber. Plastics are seldom used in orthopaedic shoes. A reinforced toe box protects the foot against influences from outside. The reinforcement is constructed of leather, celluloid or steel.

The inner side-lining stabilizes the shoe sideways and is made of leather. The counter is also made of leather. It should give maximum support, should fit the heel snugly but should not press against the calcaneocuboid joint or against the ankles.

These parts of the shoes may be modified in several ways. We are not going to describe the various removable foot or arch supports or all possible modifications of the innersole, counter, toe box or shaft, but will confine ourselves to the external shoe corrections of the outer sole and heel.

Outer sole corrections or modifications are prescribed to improve the function of the foot. By producing a more or less artificial roll-off, a lacking motion can be substituted. A rocker-bar is used in stiffened joints, but also when the joints must be spared, as in arthritis. The range of motion of a rocker-bar depends on its height in relation to its length. A narrow rocker-bar causes the tipp-off to be relatively abrupt, a gentle rockered sole gives a more smooth roll. The metatarsal rocker-bar is positioned closer to the heel than normally. They are used in cases of restricted motion in the ankle joint.

The long sole rocker is a rocker-bar that is positioned more towards the toes. This correction has a stabilizing effect on the knee.

The two-phase rocker is used in patients who have difficulty in plantar rolling-off, but who have to be held back shortly thereafter, for example because of knee instability. Occasionally we prescribe the two-phase rocker in poliomyelitis.

The direction removing rocker (~~fig. 4~~) is used in fixed contractures and external or internal rotation positions of the foot, as seen in, for example, hip contractures. By application of such rocker-bars the roll-off direction can be altered or accepted. Heel corrections include heel elevations, by which the toe spring comes a little more forward. External heel elevations exceeding half a cm require therefore the addition of an outer-sole forefoot shoe elevation. Conversely, lowering of the heel causes an increase in toe spring.

As a non-skid provision a sucker-like hole may be fraised in the heel or the heel may be provided with a profile.

According as the heel is made softer a greater shock-absorbing effect will be achieved. A heel of resilient material may be used for instance after a calcaneal fracture.

The back of the heel may be rounded off, as occasionally is done in case of a prosthesis.

A heel may be flanged in lateral instability or in valgus or varus feet. Heel flanges are positioned either medially or laterally to increase plantigrade heel stability, as in patients with co-ordination disorders, as we see in multiple sclerosis. The heel may also be flanged posteriorly, as may be applied in light degrees of genu recurvatum.

- 3a. We now come to the semi-orthopaedic shoes, of which there are three types.

First of all we have the commercial shoe that is furnished by the orthopaedic shoemaker. This type permits the addition of removable foot or arch supports, which is not always possible in normal factory-made shoes. In fact we are talking here in a way of orthopaedically fabricated shoes, which nevertheless can be manufactured as commercial shoes. These shoes also come in special lasts, which are wider and provide more space for abnormal feet.

- 3b. Then we have the slipper type of the semi-orthopaedic shoe (fig 3). The advantages of this type are that they can be supplied quickly because of the relatively short delivery-time, which is about three weeks, and that they can be produced at lower cost.

The main feature of this type lies in the supporting and weight-bearing distribution function of the plastazote footbed. It is a common fact that plastazote loses its elasticity after some time, but this disadvantage can be countered by furnishing more than one inlay together with the shoe. These shoes are not orthopaedic in the classical way, because corrections are hardly possible. Experience has demonstrated, however, that such additions are seldom indicated. The group of patients we have in view now, namely, do not roll-off any more, they just shuffle

round the house. We believe these shoes offer great opportunities for elderly patients with foot deformities who only have but a restricted walking-distance. Many of these patients we see in nursing-homes, homes for the elderly, etc. They are often coming to the consulting-hour wearing slippers, or shoes in which they have cut holes, because they cannot find anymore shoes that fit.

- 3c. The last type of semi-orthopaedic shoe is the Saltanino brand, which is very appropriate for correcting valgus or varus feet in children. That is because it is a firm boot with a reinforced counter round the heel. These sturdy high-top shoes can also easily be provided with braces and that is why they are frequently prescribed in spastic children. The shoes are supplied by the orthopaedic shoemaker and the braces by the orthotist (fig. 6).

4. Next we come to the genuine orthopaedic footwear, which is prescribed mainly in cases of foot deformation, or orthopaedic deformities.

In our opinion the orthopaedic shoe is used too little in neurological disorders. In these cases many orthopaedic shoemakers and also physicians will position the foot or the leg in a position that is orthopaedically justified. The plaster-of-paris mould is often made in a sitting position. In many cases too little is taken into account that during walking and standing the situation is totally different. Functional positions arise, for example an equinus position. The force of the spasticity may be such that if the positioning is carried out too far in the classical way, the ankle or the foot will wreck the fabricated footwear. Even it often occurs that braces break several times. Moreover, the positioning may produce even more spasticity, the so-called "shift"-phenomenon.

We have learned to look for the most functional position, next to accept it and then to fit-on the shoes in that position. An evaluation-programme we carried out in our department has

demonstrated the importance of the cosmetical aspect of the shoes. We would like to illustrate this by demonstrating a young man with a foot shortening as well as a paresis of the lower-limb musculature and a leg shortening as an after-effect of poliomyelitis. This boy made extremely high cosmetic demands, otherwise he would definitely refuse to wear the shoes. By means of the shoes shown in figure 5 we succeeded to improve his walking-pattern considerably. Also the patient showed his satisfaction about the cosmetical aspect of the shoes.

5. In the last place we mention the orthoses and prostheses (fig. 6) that can be worn inside orthopaedic or commercial footwear.

Finally we would point out the possibilities that exist to correct a central paresis of the peroneal nerve, (by which we mean a paresis caused by brain damage).

- A. The traditional solution is : the posterior bar or spring.
- B. Then we have the orthopaedic shoe with a socket round the malleoli. This appliance, which prevents the foot from flailing, can be constructed in a high-top shoe or boot.
Which choice will be made between these two possibilities depends among other factors upon the spasticity. If the spasticity is too strong, one will have to apply a peroneal bar , otherwise the patient may break right through the socket.
- C. The same applies to the third solution : the ankle orthosis to be worn under stockings. This device can be worn in practically normal orthopaedic footwear or commercial footwear.
- D. If the spasticity is not too severe, then in a central paresis also the peroneal stimulator may be used. During the swing phase the peroneal nerve of the affected leg is stimulated, which causes a dorsalflexion of the foot.

In the near future it will be possible to reduce the spasticity of too spastic patients by phenolizing the motor units of the too spastic musculature, so that they will be able to wear shoes, a socket, or to use a stimulator. We are busy developing these techniques and the first results look promising and encouraging.

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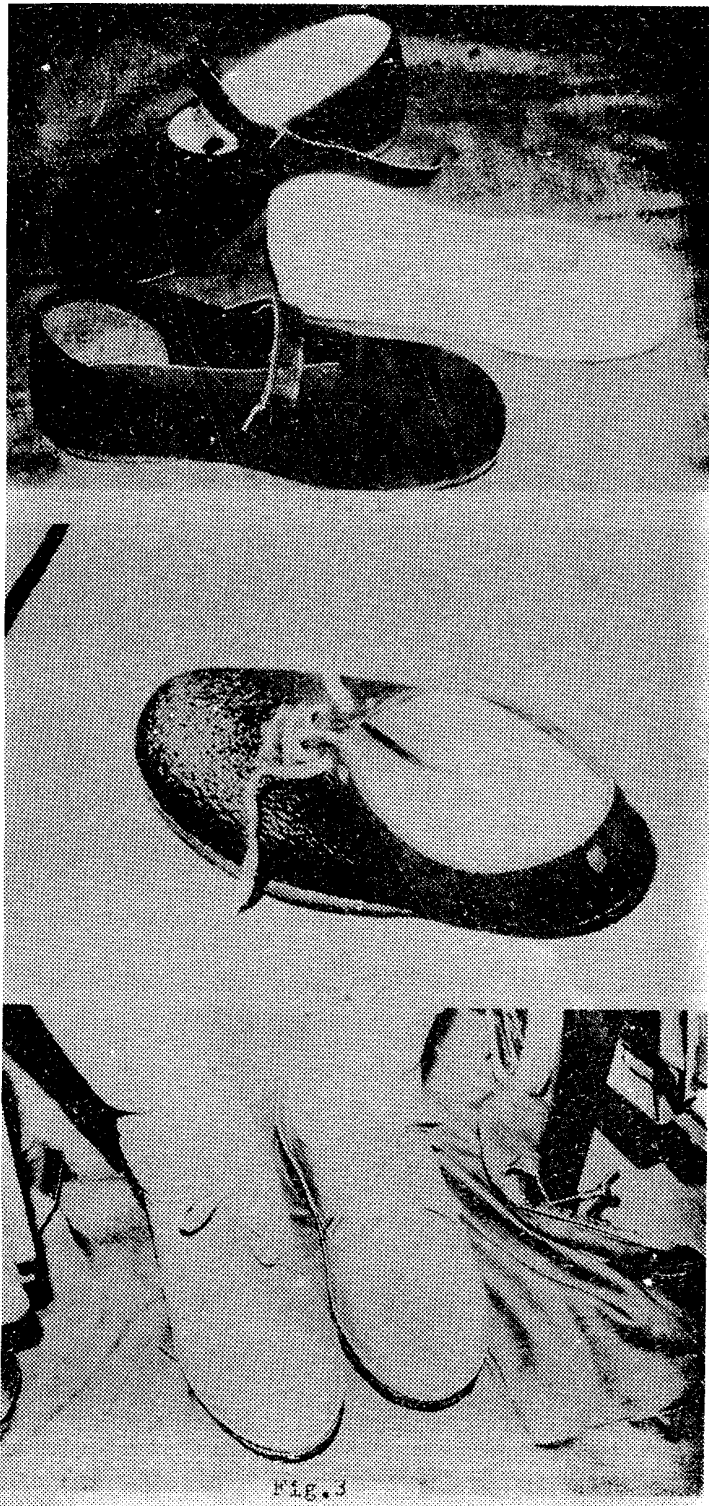


FIG. 3



fig. 4



fig. 5

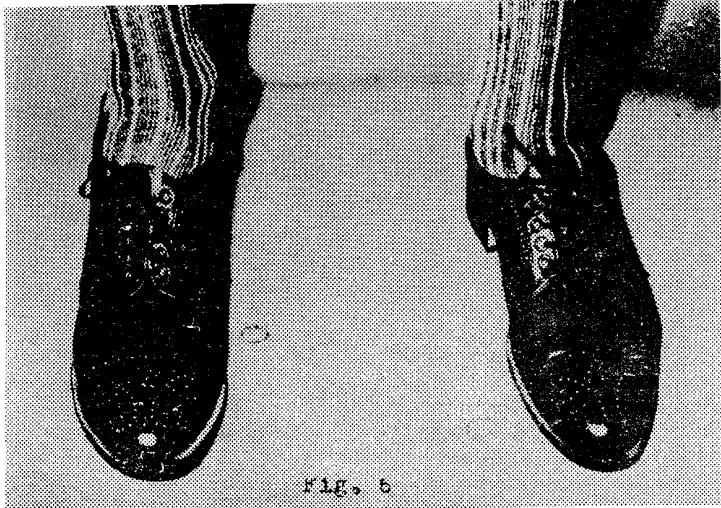


fig. 6