

MANUFACTURED SHOES AND ORTHOPEDIC SHOES

Third Edition

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Manufactured Shoes and Orthopedic Shoes

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When one asks a boy or an adult with hemophilia to consider wearing orthopedic shoes, one often hears reactions such as: "Oh no, those ugly black boots are not for me." ... "They will be so heavy that I will get bleeds anyhow." Or, "By wearing these ordinary shoes I hope my calf muscles will stretch."

Orthopedic shoes are no longer black, heavy, square boots, but can be fashionable or sporty as well as functional.

Case History

It took me some years to convince A.B., a patient with severe hemophilia A and an inhibitor, to wear orthopedic shoes.

He had a full-time job that involved standing and walking. He complained of severe pains in his forefeet (the portion of the foot that is nearest to and includes the toes), not caused by bleeding but excess strain. Due to calf and ankle bleeds years ago, he had developed two equinus feet (the position of the foot in which the toes touch the ground but the heel does not). When he walked, his forefeet supported his whole body weight because his heels did not touch the ground, and because the heel raise of his ordinary shoes was insufficient. When I told him why he was experiencing this pain, he said: "Yes, but I hope that by wearing shoes like this my calf muscles and ankle joints will stretch and I will be able to stand and walk again with my heels on the ground." I tried to explain to him that scar tissue, which had been there for so many years, would not stretch any more. After a lengthy discussion, he agreed to try a pair of orthopedic shoes, which he found more comfortable, and he had less trouble continuing with his work. He has been wearing orthopedic shoes ever since.

Introduction

Why do we need shoes at all?

Most people walk over 200,000 kilometres during their lifetime. This is only possible with healthy legs and feet. In a large part of the world, shoes are used to protect and support the

foot. In Europe, shoes have been used since prehistoric times. In warmer climates, people may walk barefoot or use sandals to protect the soles of their feet from injury, for example from sharp stones.

Shoes protect the feet, not only from the cold and direct injuries from stones, glass, and other debris on the ground, but also from the impact each step causes, depending on the material used for the sole. There is a difference between walking on a thick carpet and jumping the last two steps of the stairs and landing on both feet on a concrete floor. Good shoes that fit well can be found in shops and do not need to be manufactured individually.

What classifies shoes as good?

To fulfill the functions of protection and support, a shoe should fit properly. This means that the part around the heel should fit snugly in order to keep the foot (especially the heel) in the correct position while standing or walking. The part around the forefoot and all five toes should leave ample room in length, width, and height. The instep of the shoe should close, preferably with laces or Velcro, to prevent the foot from sliding forward in the shoe. People have differently shaped feet, so proper-fitting shoes should be selected by measuring the length and width of both feet. All shoes are manufactured on a last, which is a dummy model of the foot. Not all feet are identical; generally, Europeans have narrower feet than Americans. Hence there is a difference in the European and American lasts.

When choosing a shoe, the fit is more important than the brand name, particularly when buying shoes for children, who may be overly concerned with fashion and brands.

The shoe uppers and inner sole should preferably be made of leather or, in the case of sports shoes, of a material through which perspiration can evaporate. Leather can absorb a lot of moisture, which it exudes when the shoes are not being worn. To support the foot, the

counter (heel cuff) and the shank portion of the inner sole should be firm in order to preserve the form of the shoe over time. To facilitate the normal walking movement of the ankle and foot, especially the part of movement when the heel is off the ground and one moves forward on the forefoot, the sole should not be stiff and should have a bent form, or, as we say, "toe spring".

The material of the sole determines the shock-absorbing properties of the shoe. A leather sole does not give much shock absorption, whereas different kinds of rubber have more or less elasticity. The shoe sole even plays a role in absorbing forces when running on tiptoe.

The outer sole is in contact with the surface upon which the wearer is walking. The material used also determines whether the shoe will glide and slip on the ground or, on the contrary, provide a good grip that prevents slipping. A stiff, thick outer sole will give more protection from sharp stones and protrusions from the ground than a thin sole.

The choice of the material for the outer sole thus depends on the purpose for which the shoe is manufactured: for ballroom dancing an elegant shoe which glides easily on the dance floor will be manufactured with a thin leather sole, whereas a climbing boot will have a thick, stiff rubber sole with a molded surface for protection and grip. In sports shoes, shock-absorbing properties are very important, and a lot of research has been done by some well-known companies. In other words, a good shoe is a shoe that fits the wearer and is fit for the occasion.

When choosing shoes, select a shoe that is not too small or narrow, nor too large or wide. It is also important for children that their shoes fit well, though it is understandable that some parents may prefer to buy shoes a bit too large so that the child can "grow into them." When one has to stand and walk for long periods, the shock-absorbing properties of the sole are much more important than when one sits for most of the day.

In warm climates, sandals are often used. The described properties of the sole are also applicable to sandals. Sandals, too, can be individually manufactured according to special requirements.

Wear and Tear

When looking at used shoes, one sees that some people wear out the heels of their shoes either on the outside or on the inside. When this occurs, the shoes should be repaired. This is the reason that children should not share shoes with their brothers or sisters. Remember that the shoe is the base upon which we stand. If the heel is tilted, the body must compensate and this compensation causes stress on muscles and ligaments.

Inlays (Inner Soles)

When to use inlays

If a foot needs a little more support, an inlay can be worn in an ordinary shoe as long as there is enough space left to accommodate the foot.

An inlay can be prescribed to support and correct the following foot problems:

- **Different forms of flat feet:** Sometimes the heads of the metatarsal bones are prominent and painful and the skin may thicken due to pressure and friction. In this case, an inlay with a cushion that covers those painful spots is very helpful. A cut-away in the inlay on the very spot where the head(s) of the metatarsal bone(s) touch the inlay will diminish local pressure points.
- **Claw foot:** A claw foot (where the foot has a high, rigid arch) can also be supported with an inlay. Care should be taken that the arch is not made higher than it already is. Because of the form of the foot and the toes, it is often difficult to fit this foot in a custom-made shoe because the upper part of the clawed toes will rub against the shoe upper, which causes painful friction on the toes.
- **Foot mal-alignment:** Abnormal position of the limb.

Adaptations

For patients with musculoskeletal problems, the following individual adaptations of shoes are possible and advisable.

Recurrent bleeds in the ankle joints

A bleed should of course be stopped with factor replacement therapy, and physiotherapy may be provided to attempt to restore normal function. It has been suggested that shock waves caused by the heel striking the ground when walking may be part of the cause of joint bleeds.

Therefore, shock-absorbing material in the heel and sole of the shoe seems to be important. If one prefers to wear shoes with a leather sole, the shock-absorbing material may be placed inside the shoe under the heel to diminish the transferred energy. Ready-made heel pads (for instance, Viscoheel®) are available. There are also inlays made of a jellylike silicone substance that not only accommodate the heel, but also part of the foot. This material gets warm during use, which may not be comfortable in warm climates.

Arthropathy of the ankle joints

- **Mild or moderate hemophilic arthropathy:**

In most cases, there will be some pain during standing and walking. There will also be a limited range of motion with no or only a few degrees of dorsal flexion possible (a person with this limitation can walk on tiptoe, but not on his heels with his toes free from the floor.) For a normal walking pattern, dorsal flexion is vital, so the shoe should facilitate this motion. Apart from its shock-absorbing properties, the form of the shoe sole should facilitate the rolling movement of the footstep. Such an adaptation of the sole is called a rocker bottom. The position of the ankle and foot in the shoe can be fine-tuned by raising or lowering the heel a few millimetres to half a centimeter, and shifting the rocker bottom forward or backward. These adjustments can make a difference between comfortable and painful walking. When the shock-absorbing material is not put inside the whole shoe, but just in the heel of the shoe, it is called a cushion heel. A sample or trial shoe with material that can easily be removed or added may be helpful to find the optimal individual adaptation. An inlay may be used to support the natural foot form. The inlay should preferably be made of cork and leather, perhaps with a soft intermediate layer, and not of metal or plastic because these materials are too rigid.

- **Severe arthropathy of the joints of the ankle and hind foot:** If the movement of these joints is painful with every step, an individually designed orthopedic shoe with a high upper, fitting snugly around the ankle, and a roller bar or rocker bottom, can fix the ankle and foot in the least painful position and facilitate walking. Instead of this high orthopedic shoe, an arthrodesis socket can also be made. This socket can be worn in ordinary shoes as long as the shoe is wide enough to accommodate the foot with the socket and the heel raise of the shoe is in accordance with the heel raise of the socket. Both the orthopedic shoe and the socket should be made using a plaster mould.

When making the plaster mould, the foot should be held in its most comfortable position during standing and walking and it should not be forced into much dorsal flexion. A sample shoe can be manufactured in a relatively short time with cheap material to enable the patient to try it out before finalizing the design and making the actual shoes.

Communication between patient, shoe technician, and doctor about the individual needs and wishes of the patient are very important. With modern materials and expert knowledge, it is possible to make a light, comfortable, and attractive orthopedic shoe; the shoe technician can copy designs that are in fashion.

Equinus foot

An equinus foot is usually the consequence of a previous calf bleed that was not properly treated. If a heel raise of less than 3 cm is needed, this can be added under the heel of a normal shoe. If the heel raise needs to be higher than 3 cm, or if there is a difference in size between the two feet, individually manufactured orthopedic shoes are a must. An excessive heel raise placed under an ordinary shoe will distort the original form of the shoe. The upper part will wrinkle and the foot will slide forward until the toes are compressed against the front of the shoe.

An advantage of individually made orthopedic shoes is that part of the heel raise can be put under the inlay in the shoe, so that the exterior

of both shoes is similar. In addition, the shoe technician and doctor will also look for leg length discrepancy. An adjustment to the other shoe may be necessary to accommodate the equinus foot comfortably and ensure equal leg length.

Leg length discrepancy

An equinus foot may cause leg length discrepancy. A difference in leg length may also be caused by contractures in the hip and/or knee of one leg. Recurrent joint bleeds in a knee or ankle during the growth period may lead to overgrowth, resulting in a longer leg. If there is a difference in the length of the legs, a raise for one shoe is needed. As mentioned before, this can partly be built into the shoe so that it is less noticeable.

If, however, the difference in leg length has recently arisen due to a fresh bleed, a temporary shoe alteration should be applied. If the contracture diminishes as a result of treatment, the heel or shoe raise should be adapted to the new situation at once. Active communication between patient, doctor, and shoe technician is vital.

Conclusion

Everybody should wear shoes that fit their feet and are fit for the occasion. There are many good shoe shops and many different brands and styles of shoes to be found. Some problems can be prevented and/or solved with ready-made shoes. Patients with foot problems should contact their musculoskeletal specialist (orthopedic surgeon, physiatrist, physiotherapist), preferably the person who is working closest with an orthopedic shoe technician. Tell him or her your problem, on what occasions you would like to use the shoes, and your cosmetic requirements. You will see that though shoe technicians are not magicians, there is more to orthopedic shoes than just ugly, heavy, black boots.





