



FLATFOOT

PES PLANOVALGUS



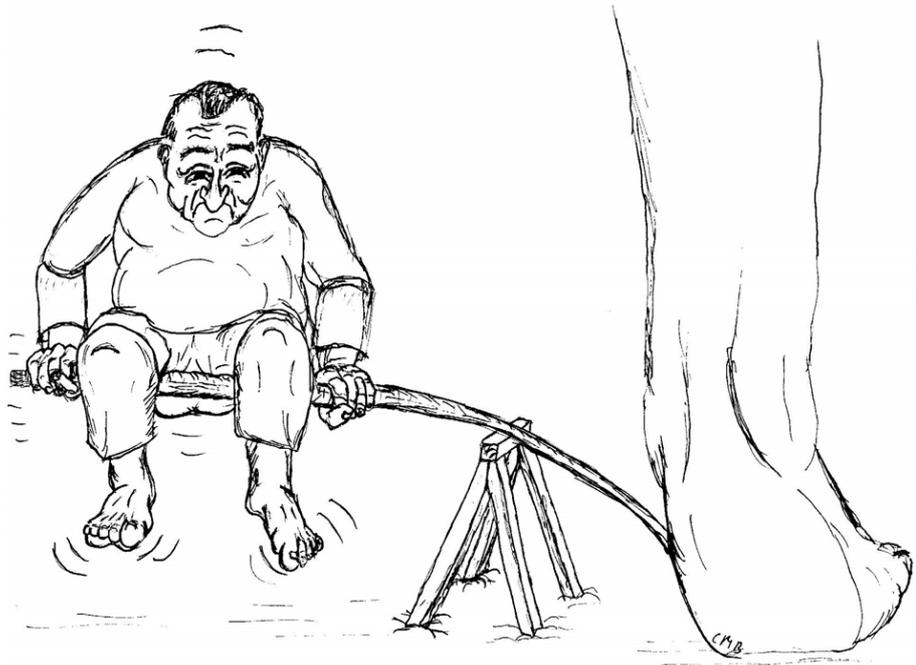
DEFINITION

Flatfoot (Fig. 1 left) can have various causes. Essentially, there are two types of flatfoot, the congenital flat foot and the acquired flat foot.

A) Congenital flatfoot includes mild forms that fall within the normal range of different foot shapes. More pronounced flatfoot deformities can involve skeletal changes, such as coalition and the os tibiale externum.

A coalition refers to an unusual connection between bones in the foot, leading to stiffness instead of mobility in the affected joint. The most commonly affected area is the subtalar joint.

The os tibiale externum is an additional bone nucleus that fails to fuse with the navicular bone during growth. It is located where an important tendon (the tibialis posterior tendon) attaches to support the foot's longitudinal arch.

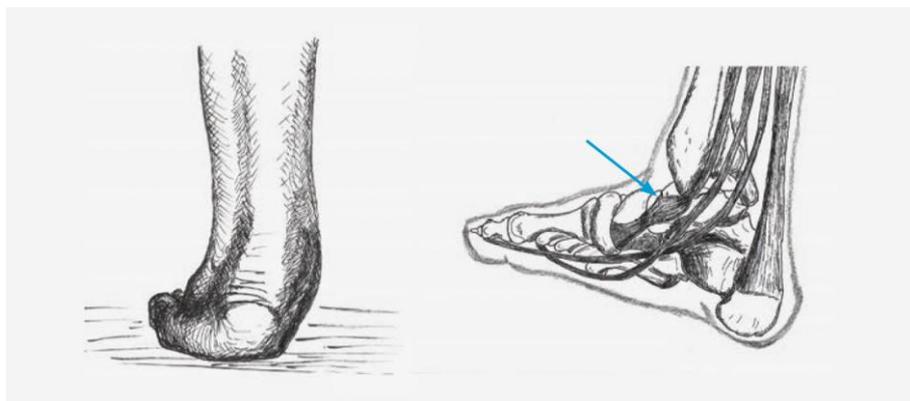




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B) Acquired flatfoot is not primarily a skeletal deformity but rather a change in the tibialis posterior tendon, which supports the foot's longitudinal arch. Over time, inflammation and degenerative changes can occur in the tendon, leading to pain and weakening of the tendon. As a result, the arch collapses, causing flatfoot (pes planovalgus), and the foot starts to turn outward (pes abductus). Initially, this malalignment is flexible/reversible, but over time, it can become fixed and is no longer reversible.

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- 1 Flatfoot (left) and tibialis posterior tendon with rupture/defect (right)



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SYMPTOMS

Most people with congenital flatfoot experience no problems. A coalition can remain undetected and asymptomatic for a long time, though about one-quarter of cases eventually develop pain. Because the lack of mobility in the subtalar joint must be compensated, the ankle joint often becomes very mobile and sometimes unstable. Affected individuals may report frequent ankle sprains since childhood.

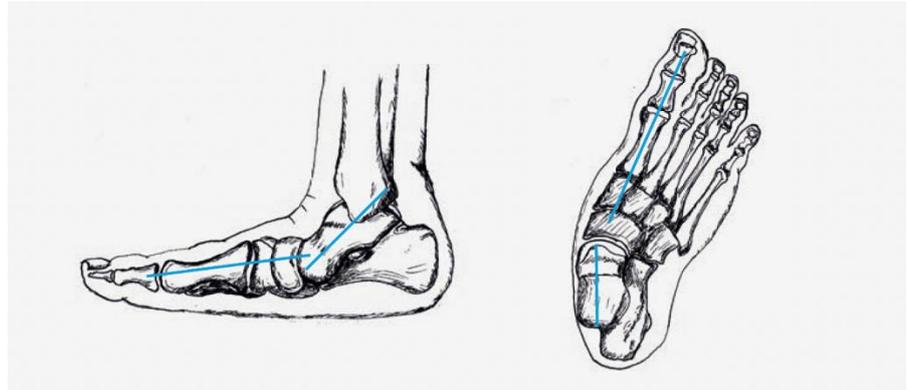
The os tibiale externum typically causes no discomfort. However, in some cases, particularly after trauma or a strong impact on medial midfoot, persistent pain and swelling can develop.

In acquired flatfoot (Fig. 2), pain and swelling can occur along the inner side of the foot. Additionally, changes in foot shape and posture become noticeable (increasing inward collapse, flattening or loss of the longitudinal arch, and outward-turned foot position). This condition is often caused by weakness in the tibialis posterior tendon. Over time, the foot can no longer maintain its longitudinal arch, and standing on tiptoe with one foot becomes impossible.



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- 2 Acquired flatfoot with a collapsed longitudinal arch (left) and outwardly rotated forefoot (right) due to rupture of the posterior tibial tendon



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EXAMINATION

During the examination, the deformity is assessed to determine whether it is fixed or flexible. Painful pressure points are identified, and tendon strength is tested. Joint mobility and potential instabilities are also documented.

The initial assessment includes weight-bearing X-rays to evaluate foot positioning. Additional bone nuclei may be visible (Fig. 3 left) and in some cases, a coalition (Fig. 3 right) may already be apparent.

Depending on the situation, further diagnostic tests may be necessary. An MRI provides better visualization of tendons, while a SPECT/CT can help identify a painful os tibiale externum.

- 3 X-ray image showing os tibiale externum (additional bone nuclei) left and

Lateral X-ray showing coalition between talus and calcaneus (subtalar joint) right



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TREATMENT

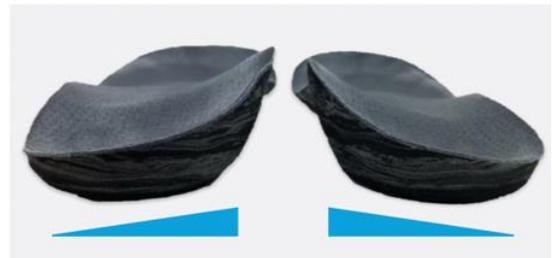
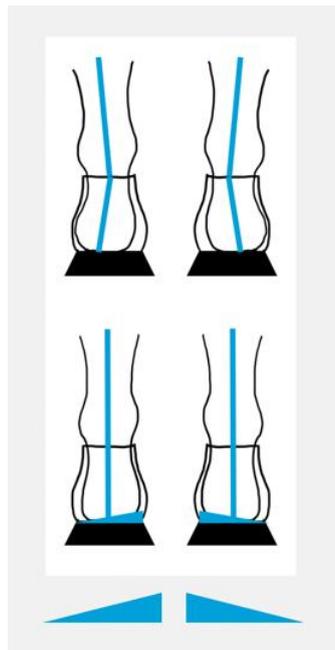
Due to the various causes and forms of flatfoot, treatment approaches vary significantly.

A) NON-SURGICAL

Congenital flatfoot does not require treatment unless it causes symptoms. Even in cases of coalition or os tibiale externum, treatment is only necessary if symptoms are present. Mild discomfort can sometimes be alleviated with insoles (Fig. 4).

For acquired flatfoot, early-stage treatment may involve heel wedges (Fig. 4 left), insoles (Fig. 4 right), and physical therapy to improve symptoms. Unfortunately, these measures do not lead to a lasting correction of the flatfoot malalignment. However, symptoms often worsen over time, eventually necessitating surgical intervention.

- 4 Heel wedges that correct the hindfoot (left) and Insoles that correct the hindfoot (right)



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B) SURGICAL

Various surgical procedures may be considered depending on the condition:

1. Painful Os Tibiale Externum

This cannot simply be removed, as this would damage the tendon attachment, weakening the tendon. Instead, the extra bone fragment is fixed to the navicular bone using a screw (Fig. 5, left). If the os tibiale externum is too small for fixation, it must be removed, and the tendon reattached with an anchor.

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- 5 Screwed external tibial bone (left) and stiffened lower ankle joint (right)



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2. Coalition Resection with Fusion in Corrected Position

Bone or fibrous connections can be surgically removed. However, since these joints lack cartilage and have never been mobile, they usually require fusion. This corrects and stabilizes the flatfoot position, alleviating pain and restoring function (Fig. 5, right).

3. Arthrorisis

This method is primarily used in children and supports the body's natural ability to form an arch. We use a metal implant resembling a screw (Fig. 6 left). Occasionally, we also use the procedure in adults, particularly in combination with other procedures. If the implant causes discomfort, it may need to be removed 1-2 years later.

4. Tendon Transfer and Realignment of the Heel

In flexible acquired flatfoot, a tendon transfer from the toe flexor strengthens the weakened tibialis posterior tendon (Fig. 6 right). Simultaneously, the heel is slightly shifted inward to relieve strain on the transferred tendon (Fig. 7), the bone is fixed with a screw (Fig. 6 left). This procedure effectively reduces pain, although some flattening of the arch may recur over time. Combining this procedure with arthrorisis can help prevent further malalignment (see above and Fig. 6 left).



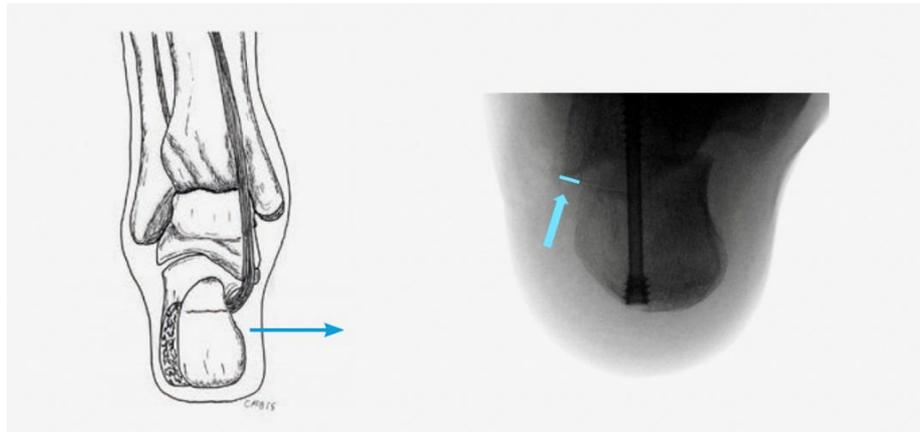
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- 6 Arthrorise (circled) and screw fixation after heel correction (left) and Tendon transfer (right)



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- 7 Corrected heel position



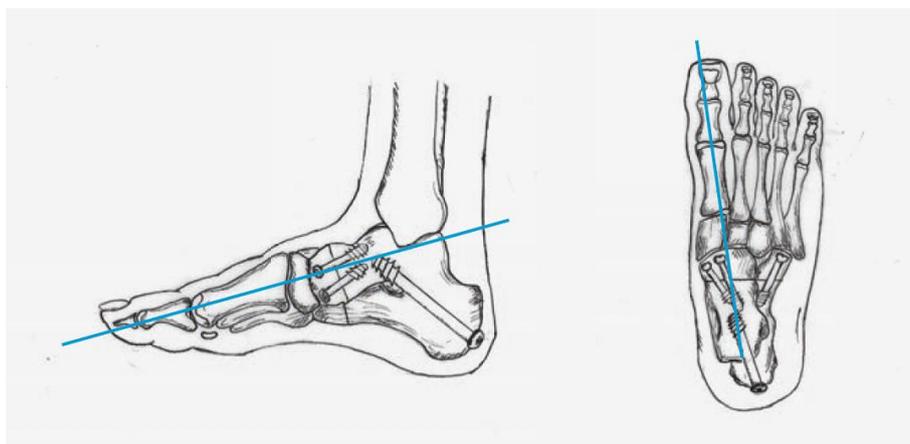
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5. Joint Fusion (Arthrodesis) for Fixed Flatfoot

In rigid flatfoot, certain joints no longer function, making tendon transfer ineffective. These joints are surgically fused in a corrected position (Fig. 8), which does not restore mobility but relieves pain and improves overall foot function. To stabilize the fusion, screws, plates, or clamps may be used, which usually do not require removal.

8 Correction of the deformity using arthrodesis



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RISKS AND COMPLICATIONS

All surgeries carry certain risks. Complications may arise during or after surgery, potentially delaying healing or requiring further intervention. These may include:

- Wound healing issues
- Infections
- Vascular injuries, postoperative bleeding, bruising/hematoma, blood loss
- Nerve damage
- Thrombosis, pulmonary embolism
- Loss of tendon tension with strength deficit or re-rupture
- Pseudarthrosis (lack of bone healing, nonunion) and loss of correction (malunion)
- Over/under correction and renewed malalignment
- Disturbing osteosynthesis material (screws, plate, staples)
- CRPS (Complex Regional Pain Syndrome)
- Residual discomfort



FOLLOW-UP TREATMENT

Surgery is only one part of the treatment. Proper post-operative care is crucial for a successful recovery. Upon discharge, patients receive detailed rehabilitation guidelines.

DRESSING AND WOUND CARE

Patients are instructed on proper wound care during hospitalization. Until the wound is completely dry, dressings should be changed daily, and no ointments or powders should be applied until the stitches are removed. Disinfection is not necessary. Always remove the entire dressing when changing. The new dressing must be dry and must not slip.

Once dry, a simple adhesive plaster is sufficient. An elastic bandage can protect and cushion the operated area somewhat. This also reduces the swelling that still exists. If there are concerns about wound healing, you should contact your family doctor or us directly.

Stitches are usually removed about two weeks after surgery. This is usually done by the family doctor. If you receive a cast, there is no need to change dressings. The stitches can be removed as part of a cast change. If the cast pinches or no longer sits properly, it has to be renewed.

SWELLING AND PAIN MANAGEMENT

Swelling can persist for weeks, sometimes up to twelve months. Elevating the leg is the most effective way to reduce swelling. This is especially important in the first 2-3 weeks after surgery. Short periods of getting up and moving around several times a day (walking, less standing) are recommended. If swelling and pain occur, the leg should be elevated.

However, despite these measures, pain in the operated foot can occur in the first days and weeks after the operation. Painkillers prescribed by us or the family doctor can be taken if necessary.

WEIGHT-BEARING

Depending on the type of surgery, generally partial weight-bearing is recommended. A Vacooped boot or cast (Fig. 9) must be worn for the first six weeks. Initially, patients should minimize standing to avoid excessive swelling and bleeding.

Partial Weight-Bearing

Partial weight-bearing allows the foot to bear about 15-25 kg, roughly the weight of the leg itself, and requires the use of crutches at all times. Physiotherapists provide training to ensure proper crutch use, including stair navigation.



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Partial weight bearing must be maintained until the first follow-up with us about 6 weeks after the surgery.

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- 9 Vacoped (left) and cast (Medicast, right)



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PERSONAL HYGIENE

While stitches are still in place, typically for the first two weeks, the foot should be covered with a plastic bag when showering. Once stitches are removed and the wound is dry and closed, exposure to water is permitted.

THROMBOSIS PROPHYLAXIS

Thrombosis prevention begins during hospitalization and depending on the surgery generally must be continued at home. In most cases, Fragmin 5000 IU injections are used once daily.

Patients receive instructions on self-administration. If self-injection is difficult, oral medication such as Rivaroxaban may be an alternative after suture removal and consulting your family doctor. Depending on individual risks, prevention continues at least until full weight-bearing without a cast or boot is possible, which typically takes six to eight weeks.

WORK ABILITY

Rest is essential in the first two weeks post-surgery. The duration of work incapacity depends on the type of surgery and physical job demands. A temporary lighter-duty work arrangement may allow earlier return.



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The initial sick leave is an estimate, and extensions can be arranged if needed. Therefore, please contact your family doctor or us. If recovery progresses well, patients may return to work earlier.

DRIVING, TRANSPORTATION

Resumption of driving depends on the surgery type, affected foot, and vehicle transmission type. Driving is not allowed while weight-bearing is restricted or while using crutches or a Vacoped boot/cast, except for left-foot surgery with an automatic car. If in doubt, patients are advised to avoid driving.

FOLLOW-UP

A follow-up with the surgeon occurs six to eight weeks after surgery. At this stage, patients usually transition out of the Vacoped boot or cast and reduce crutch use. Continued physiotherapy is crucial. Most daily activities can resume after about three months. Return to sports should be gradual to prevent overuse injuries after the sports break. Sport-specific timelines should be discussed with your physiotherapist or doctor.

For the hand-drawn illustrations, we would like to thank Dr. med. Claude Müller.



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