ORTHOPEDIC HOSPITAL, SOPHIES MINDE, OSLO
HEAD: CHIEF SURGEON E. PLATOU, M.D.

OPERATIVE TREATMENT OF PES CAVUS

By

IVAR ALVIK

Pes cavus or claw foot is characterised by an increase in the inflexion of the tarsus, thus making the angle between the back part and the front part of the foot less than usual. The high instep which is found to occur in this way is considered to be attractive nor can pes cavus really be termed pathological in cases of a slighter nature. On the other hand, however, from the purely functional point of view pes cavus is deemed of lesser value if compared with the physiological curvature of the foot.

If pes cavus bears too heavy a load, distention pains are not infrequently manifested in the plantar fascia and where the arch of a pes cavus is on the point of falling, it can sometimes cause stronger and more obstinate pain than the normal arch of the foot during lowering. Nor is pes cavus always easy to diagnose during lowering since the position at the time when it is admitted for treatment is apparently normal.

Owing to the increased vertical position of the calcaneus, with its correspondingly lesser and sharper surfaces of support and owing to the projecting rear upper corner of the posterior tuber of the calcaneus, pain in the heel is not uncommon. This occurs as a result of the irritation set up on pressure, which gives rise to local periostosis, peritendinitis and bursitis.

During weight-bearing and dorsal flexion the position of the front part of the foot causes dorsal subluxation of the basic joints of the toes which further induces the development of transverse flat foot and hammer toe. Troublesome callosity may occur partly under the prominent pads of the heads of metatarsals 1. and 5., and partly under the middle three metatarsal heads, according to whether transverse flat foot has developed or not. From the pathological-anatomic point of view, two types of pes cavus can be distinguished.

1. *Pes cavus simplex.* This is the lesser type in which all the metatarsals lie approximately on the same plane.

2. *Pes cavus complicatus* or *pes varo-cavus*. This is the more advanced form which in addition to the tarsal inflexion also shows metatarsal 1. in a more vertical position than the other metatarsals, in such a way that a smaller or larger angle is formed in the sagittal plane between metatarsal 1. and the other metatarsals, corresponding to the greater inflexion in the medial part of the foot. During weight-bearing metatarsal 1. presses the whole foot into the varus position owing to its vertical direction. If this malformity is not corrected within a reasonable time, secondary changes appear later in the talocrural joint and the rear part of the foot, while fixation of the varus position occurs. In many cases some adduction of metatarsal 1. and the first cuneiform bone is found, and also an increase in width, i.e. opening, of the joint space between the first and second cuneiform bones and between the base of metatarsals 1. and 2.

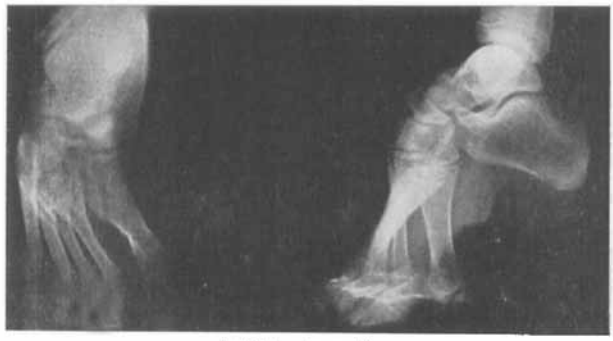
This distinction between pes cavus simplex and pes varo-cavus is of practical importance in the treatment.

In most cases pes cavus simplex can be treated conservatively and requires a supple sole, so that the pressure may be well distributed during weight-bearing, or a well-fitting claw foot sole. In a number of cases, callosity, clavus and hammer toe call for surgical intervention. In younger individuals a *subcutaneous fasciotomy of the plantar fascia followed by manual correction and plaster* produce satisfactory results as a rule, if this type of treatment is indicated. For older persons it may be found necessary to employ *Steindler's operation,* detaching the soft tissue on the underside of the calcaneus. In very many cases *transplantation of the extensor hallucis longus to the head* of metatarsal 1. has an extremely good effect both on the claw foot position in itself and also has a good local effect on metatarsal 1. It is probable that in many cases this operation can prevent a pes cavus simplex developing into a pes varo-cavus.

Pes varo-cavus often manifests indications for operative treatment. The surgical interventions which are then given consideration are normally skeletal interventions. The simplest is an *osteotomy of the first metatarsal* combined either with Steindler's operation or with a subcutaneous fasciotomy. Frequently the operation is not effective enough and there is a considerable tendency to recurrence. More radical operations are the dorsal cuneiotomy in Chopart's joint, in Lisfranc's joint, or the mid-tarsal resection. All three can be combined with an osteotomy of the first metatarsal in order to correct the vertical position, straightening at the same time the inflexion of the tarsal.

In the last three years I have made progress towards a modification and extension of the mid-tarsal resection, which, I think, offers

Fig. 1.



Before operation.

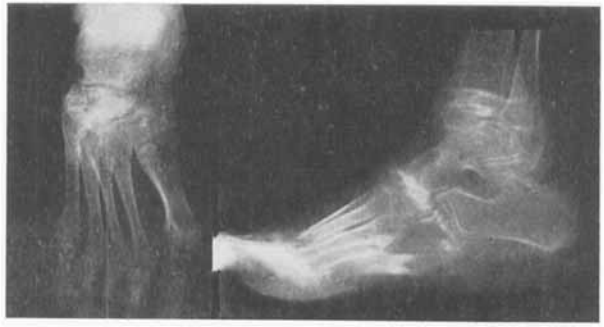
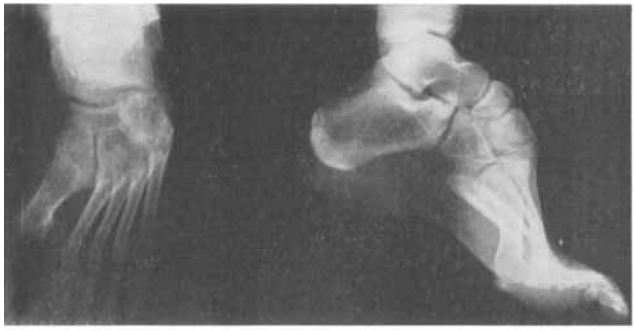


Fig. 2.
After operation.

several advantages. Initially the intervention proceeds along the lines of a normal mid-tarsal resection with a wedge placed in the joint between the cuneiform and navicular bones and continued through the cuboid bone. The wedge is made broader medially between the first cuneiform bone and the navicular bone than laterally. The first cuneiform bone and the first metatarsal can then be raised higher than the others and so the vertical position of the first metatarsal and the angle between this bone and the other metatarsal are straightened out. In order that the bones may be raised successfully, however, the connection between the first and second cuneiform bones and between the base of the first and second metatarsals must be freed, and at the same time the joint surfaces are resected. Thus two objects are achieved, in that the adduction position of the first metatarsal is corrected and in that ankylosis occurs in this joint, thus preventing recurrence. On fig. 1 the resection space and the wedge are indicated as shown on the skeletal foot.



Before operation.

Fig. 3.
After operation.

The corrected position is fixed in a plaster bandage and the patient may be allowed up with a walking plaster after 6 weeks approximately. Subsequently further immobilisation in the walking plaster is continued for about 2 months.

The roentgen photographs show the position of the skeletal foot before operation, i.e., the vertically placed metatarsal 1. and the angle between this and the other metatarsals, and the position after operation.

SUMMARY

Pes cavus is divided into 1. *Pes cavus simplex,* the lesser form, and 2. *Pes cavus complicatus* or *pes varo-cavus.*

A new method of operation for pes varo-cavus is described, consisting of an extension and modification of the mid-tarsal resection. The medial part of the wedge corresponding to the first cuneiform

bone is made broader than the lateral part and thus the considerable vertical position of the first metatarsal is corrected. The resection is lengthened forwards as well, through the joint between the first and second cuneiform bones and between the base of the first and second metatarsals. Thus the adduction position of the first metatarsal is centralised and as the result of ankylosis in the joint recurrence is prevented.

RESUME

Pes cavus est réparti en: 1) *Pes cavus simplex,* la forme bénigne et 2) *Pes cavus complicatus* ou *pes varo-casus.*

Une nouvelle méthode d'opération du pes varo-cavus est décrite. Elle consiste en un élargissement et une modification de la résection tarsale du milieu. La partie médiale du coin qui correspond à l'os cunéiforme est faite plus large que la partie latérale de manière à compenser la trop grande position verticale du 1er métatarsien. La résection est prolongée également en avant entre l'articulation des 1er et 2ème os cunéiformes et entre la base du 1er et du 2ème métatarsien pour supprimer la position d'adduction du 1er métatarsien et pour empêcher les récidives du fait que l'articulation en question devient ankylotique.

ZUSAMMENFASSUNG

Man unterscheidet beim Hohlfuss 1. *Den Pes cavus simplex,* die leichtere Form, und 2. den *Pes cavus complicatus* oder *Pes varo-cavus.*

Eine neue Operationsmethode für den Pes varo-cavus wird beschrieben, die in einer Erweiterung und Abänderung der tarsalen Resektion besteht. Der dem Os cuneiforme I entsprechende mediale Teil des Resektionskeiles wird breiter geformt als der laterale, so dass die grössere Vertikalstellung des 1. Metatarsus ausgeglichen wird. Die Resektion wird auch nach vorne durch das Gelenk zwischen 1. und 2. Os cuneiforme und der Basis des 1. und 2. Metatarsus vorgenommen, um die Adduktionsstellung des 1. Metatarsus aufzuheben und um mittels der Ankylosierung der erwähnten Gelenke ein Rezidiv zu verhindern.