

## THE PATHOLOGY OF CONGENITAL METATARSUS VARUS

### *A Post-mortem Study of a Newborn Infant*

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A case of congenital metatarsus varus from an autopsy of a newborn infant was explored. Contracture of the anterior tibialis muscle was present as well as alterations in size and shape of the first cuneiform bone. Furthermore, subluxations in the fore- and midfoot were observed, especially round the first cuneiform bone. It is concluded that congenital metatarsus varus may be classified as a subluxation followed by secondary bone changes and contractures in the soft tissues.

*Key words:* congenital deformities; foot deformities; metatarsus varus; pathology of metatarsus varus.

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Congenital metatarsus varus is a rather common foot deformity which even at birth may appear in different degrees of severity. The combination of the forefoot inversion-adduction and the hindfoot valgus make it difficult to determine the mechanism by which the deformity occurs. Experiments in stillborn infants with normal feet have shown that a subluxation of the tarsal and metatarsal bones distal to the joint of Chopart in the direction of supination caused a deformity of the forefoot similar to metatarsus varus (Reimann & Werner 1975). However, it was only possible to induce the deformity after multiple capsulotomies. Furthermore, it proved possible to obtain the combination with the hindfoot valgus provided the hindfoot was initially in a position of dorsiflexion. This study is an attempt to explore the anatomy of the feet from an autopsy of a newborn infant with unilateral metatarsus varus.

#### CASE REPORT

The investigations were performed at the Laboratory of Paediatric Pathology, Rigshos-

pitalet, Copenhagen. The feet explored were from a boy weighing 3415 g who died from asphyxia within 24 h after birth. Apart from microcephaly, no signs of malformations of the spine or central nervous system were present. There was a right-sided metatarsus varus; the left foot was normal or in slight calcaneovalgus (Figure 1 A). Radiographic examination showed a talo-calcaneal angle of about 45° on both sides and a pronounced adduction-inversion of the metatarsal bones on the right side (Figure 1 B.)

#### *Dissection*

The dissection was performed through an arcuate incision on the medial side of the foot and ankle region. All the muscles looked normal, but there was a definite tension of the anterior tibialis muscle, most pronounced on the metatarsus varus side. The insertion of the tendon of the anterior tibialis seemed normal on both sides with attachment to the first cuneiform bone as well as to the base of the first metatarsal bone.

Biopsies for histologic examination were taken

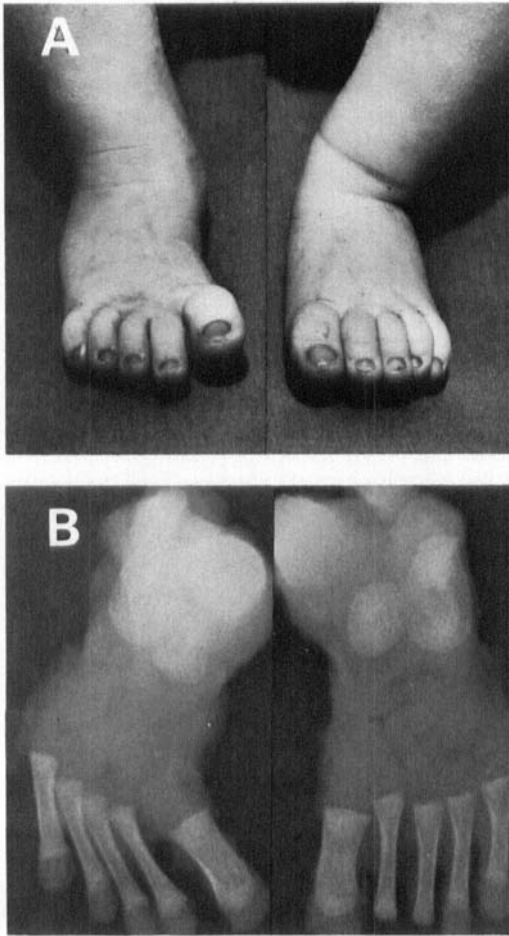


Figure 1. Newborn boy with right-sided metatarsus varus.

A: Photograph. B: Radiographs.

from the anterior tibialis muscle on both sides at the same level. The biopsies were fixed in 10% buffered formalin phosphate, embedded in paraffin and 6  $\mu$ m thick sections were stained with hematoxylin-eosin and v. Gieson. The examination revealed no signs of increased interstitial connective tissue on the right side compared with the left. On both sides, the muscle cells were normal with nuclei situated peripherally. No signs of neurogenic atrophy with groups of atrophic muscle fibrils were observed.

After removal of the muscle, the metatarsus varus deformity on the right side was still present with adduction-inversion of the forepart of the

foot and prominence on the lateral border, and it was not possible to correct it by manipulations.

A marked subluxation was present between the first cuneiform bone and the adjoining bones (Figure 2). Subluxation between the second and third cuneiform bones and the base of the second and third metatarsal bones was also observed. It was obvious that the size and shape of the first cuneiform bone on the metatarsus varus side were altered, and that the metatarsal bones were twisted in the direction of adduction-inversion. Furthermore, it was observed that the prominence at the lateral border of the foot was made up of the second and third cuneiform bones together with the cuboid bone, and that the navicular bone showed no signs of medial luxation in relation to the head of the talus, as seen in club-foot. From these observations, it was obvious that the most pronounced changes were located around the first cuneiform bone, which was studied in more detail.

After removal of the first cuneiform bone from both sides, a markedly different cavity appeared on the two sides (Figure 3). The size and shape were altered at the metatarsus varus side. The surface articulating with the base of the first metatarsal bone was broadened and divided by a longitudinal crest. The surface articulating with the navicular bone and the second cuneiform bone was also slightly broadened. The other bones in the fore- and midfoot on the metatarsus varus side showed no significant changes.

The ligaments and joint capsules seemed normal except for a slight degree of thickening at the medial side of the forefoot.

## DISCUSSION

The various pathological changes previously described in metatarsus varus mainly represent operative observations, i.e. from patients more than 1 year of age. These findings may be interpreted as secondary to a chronically abnormal position. The role of the anterior tibialis as an aetiologic factor has been mentioned, and an abnormal insertion of the tendon has been demonstrated in some cases (Peabody & Muro 1933); in the present case, the insertion was estimated to



Figure 2. Photograph of both feet after removal of skin and soft tissues.

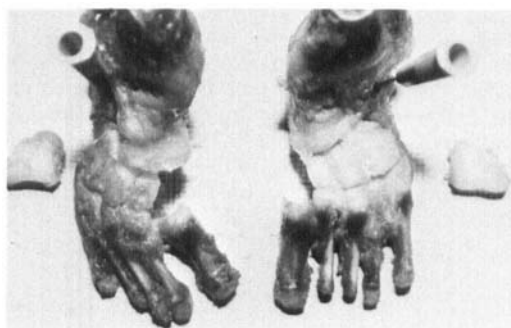


Figure 3. Photograph of both feet after removal of the first cuneiform bones. Note the different cavity on the two sides.

be normal. Furthermore, no signs of myo- or neurogenic alterations were found by histologic examination.

Changes of the bones and contractures of liga-

ments and joint capsules have been observed at operations in resistant cases (Heyman et al. 1958); the use of wedge osteotomy of the first cuneiform bone in such cases (Lincoln et al. 1976) supports the observations reported here.

The changes of the bones, especially the first cuneiform bone, already at birth prove that the deformity had developed *in utero*. These findings are consistent with the response to treatment and the lack of spontaneous recovery before weight-bearing, and they support the findings of our previous study (Reimann & Werner 1975).

It may be concluded that metatarsus varus belongs to a group of congenital foot deformities with subluxations of unknown origin, followed by secondary alterations of the bones and soft tissue contractures.

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