THE RECOGNITION AND TREATMENT OF CONGENITAL FLAT FOOT IN INFANCY

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Congenital flat foot is a rare condition. In a special clinic for foot deformities only one case was found in 121 patients (Osmond-Clarke 1956). Adequate correction depends on recognition of the deformity within a few weeks of birth, and any child presenting with a rigid, dorsiflexed and everted forefoot should be regarded as having congenital flat foot until careful clinical and radiological examinations have excluded the possibility.

The rigid nature of the deformity distinguishes it from a simple postural talipes calcaneo-valgus, and even before the midtarsal bones have ossified careful antero-posterior and lateral radiographs taken with the foot at a right angle to the tibia will reveal the true nature of the complex deformity. This comprises: 1) dorso-lateral dislocation of the navicular bone on the talus; 2) equinus and varus of the talus; and 3) equinus of the calcaneus. In our view the heel deformity is a constant feature. It is often unnoticed, being masked by the soft tissues surrounding the heel and the much more obvious dorsiflexion and inversion of the fore part of the foot. Failure to recognise and correct this important component of the deformity is responsible for the frequency of relapse.

Etiology—We believe that this condition is due to disparity of growth between the muscles and bones of the leg. It is seen in its most severe form in some cases of arthrogryposis when the muscles of the anterior compartment and the calf group fail to keep pace with the growth of the tibia. The flexor muscles of the toes and the tibialis posterior muscle are unaffected. The foot breaks in the midtarsal region, the talus occupies a vertical and varus position from lack of support of the sustentaculum tali and the navicular comes to lie above the head of the talus. There is no evidence of agenesis or lack of growth potential in the bones themselves and, if they are placed in the correct position without undue soft-tissue tension, they will grow normally.

TREATMENT

The object of treatment is to restore a competent medial ray of the foot, and the first step is to replace the navicular bone on the front of the head of the talus. If the condition is diagnosed early, this can often be achieved by repeated manipulation of the forefoot into plantar-flexion and inversion, holding the correction in a closely fitting plaster. But if this does not succeed within a few weeks antero-lateral soft-tissue release should be performed. This should include division of the tight structures and a sliding elongation of the extensor tendons. It is essential that full correction of this component of the deformity be obtained and held for about three months.

When the dorsiflexion and valgus deformity of the fore part is fully restored, equinus of the hindfoot is corrected by elongation of the calcaneal tendon (tendo Achillis) and, if necessary, posterior capsulotomy of the ankle joint. The position of the calcaneus can be controlled by inserting a small Steinmann pin into it which is incorporated in the final plaster (Wainwright 1964). Check radiographs through plaster should confirm that the medial ray of the foot has been restored to normal. The pin may be removed when the plaster is changed, but the corrected position should be retained in plaster for about four to six months.

As in club foot, there are all degrees of severity and some cases associated with severe arthrogryptic changes are impossible to correct fully by stretching and soft-tissue release operations. Nevertheless, even in such cases, vigorous attempts to correct the tight soft
tissues will often produce a reasonably plantigrade foot and reduce the extent of bone correction required in the future.

Delay in treating this deformity adds considerably to the difficulties of correction. Operations on the bones or joints of the foot in small children may cause unpredictable growth disturbance with stiffness of the foot, and in most cases should be regarded as a confession of failure to diagnose and treat this rare condition soon enough.

CASE REPORTS

Case 1—Girl. Severe degree of congenital flat foot in a child suffering from generalised arthrogryposis. In view of the severe multiple deformities no treatment for the foot was indicated.

Case 2—Girl. Bilateral congenital flat foot first seen at the age of four months. Treated by repeated manipulations of the forefoot into plantar-flexion, followed by elongation of the tendo calcaneus. This child has been under treatment for fifteen years (Figs. 1 to 4). The feet are mobile and painless with well developed longitudinal arches.

Case 3—Boy. Severe bilateral congenital flat foot first seen at the age of three months (Figs. 5 and 7). Treated by repeated manipulations of the forefoot into full equinus (Fig. 6) followed
Case 3. Figure 5—Photograph before operation. Figure 6—To show position in plaster.

Case 3—Antero-posterior and lateral radiographs before operation.

Case 3. Figure 8—Radiograph one year after operation. Figure 9—Four years after operation.
later by elongation of the tendo calcaneus (Fig. 8). Four years later the deformity of the feet appears fully corrected (Fig. 9).

Case 4—Girl. First seen at the age of twenty months with rigid congenital flat foot. Lateral radiograph of the left foot revealed a vertical talus with some equinus of the calcaneus (Fig. 10). Treated by repeated manipulations of the forefoot into plantar-flexion over a period of four months (Fig. 11). At this stage the calcaneal tendon was lengthened, the posterior capsule of the ankle divided and the equinus of the calcaneus controlled by the insertion of a Steinmann pin. Antero-posterior and lateral radiographs of the left foot taken at the age of four and a half years show full correction of the deformity.

Case 5—Boy. First seen at the age of four and a half months with a congenital, rigid flat foot on the right side (Fig. 12). The deformity of the forefoot and hindfoot was corrected by manipulation, elongation of the calcaneal tendon and posterior capsulotomy, the position being maintained by a pin in the calcaneus (Fig. 13). The lateral radiograph at the age of three years shows full correction of the deformity.

Case 6—Girl. Typical congenital flat foot first seen at the age of three months (Fig. 14). Sporadic manipulations of the fore part of the foot were performed up to the age of four years (Fig. 15). No attempt was made to correct the equinus deformity of the calcaneus.
At the age of four and a half years a soft-tissue correction operation was performed together with removal of a dorsal wedge of bone from the neck of the talus. This was followed later by correction of the hindfoot deformity (Fig. 16). The cosmetic appearance is reasonably good and the foot has remained painless but rather rigid.

Case 7—Girl. First seen at the age of three months with rigid, congenital flat foot on the right side. Treated by repeated manipulations of the forepart of the foot followed by lengthening of the calcaneal tendon and posterior capsulotomy of the ankle. At the age of three years the foot appears clinically normal and the radiographs show full correction of the deformity.

Case 8—Girl. First seen at the age of four months with rigid, congenital flat foot on the right side. Treated by manipulations of the forefoot into equinus and correction of the equinus deformity by elongation of the calcaneal tendon and posterior capsulotomy. At the age of three years the peroneus brevis tendon was transferred to the inner side of the foot. At the age of five years the foot appears fully corrected and the lateral radiograph shows normal alignment of the talus with restoration of the longitudinal arch.
Case 9—Girl. First seen at the age of seven months with rigid, left congenital flat foot. The forefoot deformity was corrected by repeated manipulations followed by lengthening of the tendo calcaneus to correct the hindfoot deformity. Subsequent radiographs show correction of the deformity with restoration of the longitudinal arch.

Case 10—Boy. Severe, rigid right congenital flat foot first seen at the age of three months. Manipulation and release of the contracted tendons and ligaments in front of the foot and ankle were performed, followed by lengthening of the calcaneal tendon and division of the posterior capsule of the ankle. This case was associated with other evidence of arthrogryposis, and, although the position was much improved, correction was incomplete.

Case 11—Boy. Bilateral rigid, congenital flat foot first seen at the age of two weeks. The deformity was corrected by repeated manipulations, followed by lengthening of the calcaneal tendon. Later radiographs taken at the age of five years show normal alignment of the talus with restoration of the longitudinal arch.

SUMMARY
1. Eleven cases of congenital flat foot were studied, five of which are illustrated.
2. Ten of these cases were treated in infancy and followed for at least three years. In two cases the follow-up period was ten years and fifteen years.
3. An essential component of the deformity is equinus of the calcaneus, and treatment consisted of correction of the forefoot deformity by repeated manipulation, followed later by elongation of the calcaneal tendon and capsulotomy of the ankle.
4. The importance of recognising the deformity and beginning treatment in infancy is stressed.

REFERENCES