A male infant was first seen in the newborn nursery for a left congenital clubfoot deformity with no additional malformations. Treatment was begun immediately. Weekly application of plaster casts to the left foot for gentle correction of the deformities (forefoot adduction, inversion, and equinus) was continued for nine weeks. The feet were then strapped to a Denis Brown boot splint (Fig. 80) for 12 weeks, with the affected foot progressively turned into valgus. The boot splint was then discontinued for longer periods until the child began walking, when it was employed only at night for one year. When the child was 2 years of age, straight-last boots were used for day wear.

DIAGNOSIS

Left clubfoot of the talipes equinovarus type. (Clubfoot is a congenital deformity of the foot, which is twisted out of shape or position).

TREATMENT AND FURTHER COURSE

When the child was 2 years old, there was difficulty putting the left foot into a shoe, and recurrence of the deformity was apparent. An anteroposterior roentgenogram showed a loss of the normal angle between the talus and calcaneus (Fig. 61A, B); a lateral roentgenogram showed no displacement of the calcaneus. A tarsal-achilles lengthening corrected the equinus deformity, and the foot was positioned in maximum dorsiflexion. When the boy was 7 years of age, lateral and antero-
Clinically, the feet were symmetrical. The boy wore regular shoes; the left foot was plantigrade and pliable, and dorsiflexion and plantar flexion of both feet were equal.

**DISCUSSION**

Hippocrates\(^{30}\) is credited with the first description of clubfoot, a deformity that occurs in 1/1,000 births.\(^{31}\) Hippocrates believed that the deformity resulted from mechanical causes, and that treatment should begin early in life. Other than in medical literature, clubfoot appears in novels and pictorial arts from the sixteenth to the nineteenth century.\(^{32}\) Various aspects of clubfoot are difficult to understand and more difficult to solve, e.g., therapy and treatment, x-ray analysis, maintenance of correction, and etiology.\(^{7,16,17,37}\)

**Embryology**

Discuss the development of the foot. In the fifth week of development, a paddle-shaped hind limb bud appears at the level of L\(_4\) to S\(_3\).

By the seventh week this bud begins to segment, first proximally and then distally into the hip, thigh, leg, and foot rays. Skeletal development proceeds in the same direction, with the bones of the foot forming about the connective tissue surrounding the plantar artery.

The digits of the foot are clearly defined by the eighth week, the lower limb assumes the fetal position, and the primary centers of ossification appear in the larger bones of the hind limb.

Ossification centers (Table 6) appear in the calcaneus and talus in the fifth and seventh fetal months, respectively. Only these two tarsal bones show ossification at the time of birth; moreover, it is the position of those two bones in relation to the metatarsals that determines the degree of deformity in clubfoot. Some metatarsal and phalangeal bones show ossification centers during fetal life; other bones of the foot possess ossification from the first to the fifth year postnatally.
Causes

What factors may contribute to the formation of clubfoot? Mechanical compression of the fetus in abnormal postures during the later months of pregnancy, nervous system malformations, spinal deformities, arrested development, and hydraulic pressure and congenital dislocation of the talocalcaneonavicular joint are theories used to explain congenital clubfoot.

Classification

What terms describe the variety of congenital clubfoot deformities? The following classification (Fig. 62) includes the majority of congenital clubfoot deformities:

1. Talipes calcaneovalgus—heel is turned outward from the midline of the body and the anterior part of the foot is elevated.
2. Talipes calcaneovalgus—heel is turned toward the midline of the body and the anterior part of the foot is elevated.
3. Talipes calcaneus—foot is dorsiflexed.
4. Talipes cavovalgus—longitudinal arch of the foot is dorsiflexed and heel is turned outward from the midline.
5. Talipes cavus—longitudinal arch of the foot is abnormally high.
6. Talipes equinovarus—heel is elevated and turned outward from the midline of the body.
7. Talipes equinovarus—heel is turned inward from midline of the leg and the foot is plantar flexed (typical clubfoot).
8. Talipes equinovarus—foot is plantar flexed.
9. Talipes planovalgus—heel is turned outward from the midline of the leg and outer border of the anterior part of the foot is higher than the inner border.
10. Talipes valgus—heel is turned outward from the midline of the leg.
11. Talipes varus—heel is turned inward from the midline of the leg.

Associated Malformations

Spinal defects, neurologic impairment, and abnormal muscle insertions accompany congenital clubfoot.
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