

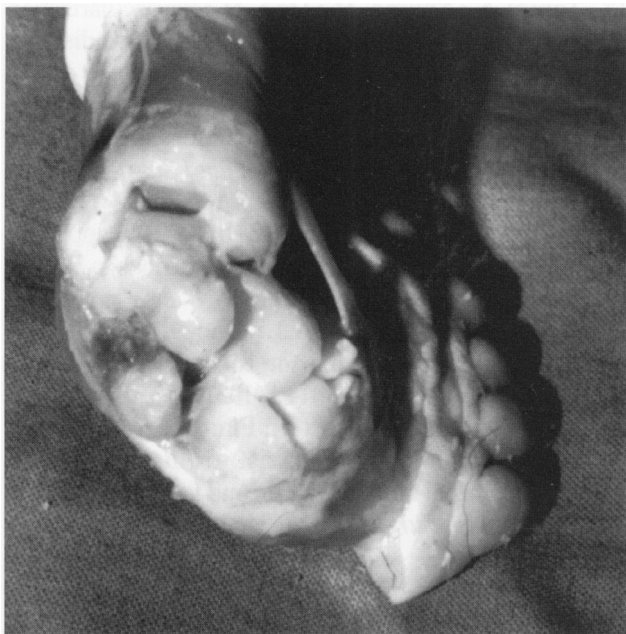
# CORRECTION OF THE TALAR NECK ANGLE IN CONGENITAL CLUBFOOT WITH SEQUENTIAL MANIPULATION AND CASTING

Ignacio V. Ponseti, M.D.

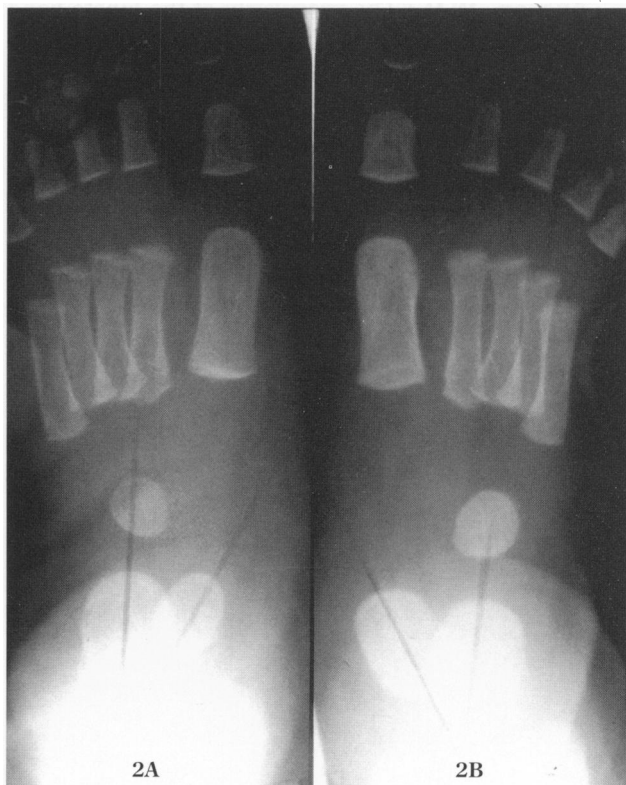
In congenital clubfoot, the neck of the talus deviates medially and plantarly in varying degrees depending on the severity of the deformity<sup>1</sup>. The mean medial talar neck angle in the normal foot measures 30 degrees in newborns and 18 degrees in adults on an anteroposterior radiograph<sup>11</sup>. In clubfoot, this angle can measure as high as 80 degrees<sup>9</sup>. In severe cases, the deformity is an impediment to dorsiflexion of the ankle since the head of the talus and the displaced navicular abut against the anterior aspect of the medial malleolus (Fig. 1)<sup>4</sup>. Attempts to dorsiflex the ankle before correcting the medial talar neck angle and the displacement of the navicular will cause lateral rotation of the body of the talus, in turn causing an incongruent ankle joint and posterior displacement of the lateral malleolus. This is

a common complication observed in patients treated with faulty manipulations and plaster cast applications, as well as with surgery<sup>12</sup>.

Correction of the talar neck angle and the displaced navicular can be accomplished by slowly stretching the medial tarsal ligaments and tendons while holding the foot in supination<sup>7</sup>. The talus remodels as the direction of the loading forces on the head shifts laterally and bone grows in the proper direction<sup>2</sup>. In our experience, this can be done by gentle manipulation followed by plaster cast application to maintain the improved alignment of the foot. A week is necessary for each cast to give the low static loadings sufficient time to induce bone and cartilage remodeling. Eight to ten weeks of treatment are usually sufficient to correct the clubfoot deformity in infants (Fig. 2)<sup>6</sup>.



**Figure 1.** Anterior aspect of the ankle of a clubfoot of a three day old infant. The navicular and cuboid have been dislocated medially. The medial angulation of the talar neck prevents dorsiflexion of the talus because the talar head abuts against the anterior aspect of the medial malleolus. Forced dorsiflexion of the talus will cause the talus to rotate laterally in the ankle mortise causing posterior displacement of the lateral malleolus.



**Figure 2**  
**A.** This radiograph illustrates the orientation of the center of ossification of the talus in a three month old infant with a treated left clubfoot.  
**B.** This radiograph demonstrates the center of ossification of the talus in the normal right foot.

Dept. of Orthopaedics  
University of Iowa College of Medicine  
200 Hawkins Dr.  
Iowa City, Iowa 52242

Anteroposterior and lateral roentgenograms of the treated clubfeet of our patients show that the medial and plantar deviation of the talar neck is normal and that the lateral malleolus is not posteriorly displaced<sup>8</sup>. Our results suggest that the irregularities observed in the ossification center of the talus and the increased talar neck angle in clubfeet are not primary as stated by some authors<sup>5,10</sup> but secondary to abnormal loading pressures<sup>3</sup>. Also, the posterior displacement of the lateral malleolus appears to be an iatrogenic deformity caused by the lateral rotation of the body of the talus in the ankle mortise. This occurs when the foot is abducted while the calcaneus is in varus, and dorsiflexed before the talar neck angle is corrected.

Since a large percentage of the tarsal bones are cartilaginous in the infant and the center of ossification in the clubfoot is not centrally located, MRI studies are being conducted to visualize when the talar neck angle and other tarsal deformities correct. In our experience, within six to eight weeks of treatment the medial talar neck angle corrects sufficiently for the foot to be dorsiflexed at the ankle after the tendo Achilles is sectioned.

#### BIBLIOGRAPHY

1. **Adams, W.:** *Club-foot. Its Causes, Pathology and Treatment*. Ed. 2. Philadelphia, Lindsay & Blakiston, 1873.
2. **Carter, D.N.; Orr, T.E.; Fyhrie, D.; and Schurman, D.J.:** Influences of mechanical stress on prenatal and postnatal skeletal development. *Clin. Orthop.*, 219:237-250, 1987.
3. **Farabeuf, L.H.:** *Précis de manuel opératoire*. Ed. 4. Paris, Masson, 1983.
4. **Hjelmstedt, A., and Sahlstedt, B.:** Talar deformity in congenital clubfeet. An anatomical and functional study with special reference to the ankle joint mobility. *Acta Orthop. Scand.*, 45:628-640, 1974.
5. **Irani, R., and Sherman, M.D.:** The pathological anatomy of the clubfoot. *J. Bone and Joint Surg.*, 45A:45-52, 1963.
6. **Ponseti, I.V.:** *Congenital Clubfoot: Fundamentals of Treatment*. New York, Oxford University Press, 1996.
7. **Ponseti, I.V., and Smoley, E.N.:** Congenital clubfoot: The results of treatment. *J. Bone and Joint Surg.*, 45A:261-275, 1963.
8. **Ponseti, I.V.; El-Khoury, G.Y.; Ippolito, E.; and Weinstein, S.:** A radiographic study of the skeletal deformities in treated clubfeet. *Clin. Orthop.*, 160:30-42, 1981.
9. **Settle, G.W.:** The anatomy of congenital talipes equinovarus: Sixteen dissected specimens. *J. Bone and Joint Surg.*, 45A:1341-1354, 1963.
10. **Shapiro, F., and Glimcher, M.D.:** Gross and histological abnormalities of the talus in congenital clubfoot. *J. Bone and Joint Surg.*, 61A:522-530, 1979.
11. **Siegel, M.I.:** Reply to "Comparative anatomy of the talus in relation to idiopathic clubfoot" [letter]. *Clin. Orthop.*, 102:268-269, 1974.
12. **Swann, M.; Lloyd-Roberts, G.C.; and Caterall, A.:** The anatomy of uncorrected clubfeet. A study of rotation deformity. *J. Bone and Joint Surg.*, 51B:263-269, 1969.