Treatment of the Neglected and Relapsed Clubfoot

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KEYWORDS

• Clubfoot • Relapse • Neglected • Ilizarov • Ponseti • Foot osteotomies

KEY POINTS

- Tibialis anterior tendon transfers help rebalance relapsed clubfeet but only feet that are passively correctable.
- Extensive soft tissue releases for clubfoot relapse have a high rate of recurrence; the results are better in older children than in younger ones.
- The Evans and Lichtblau procedures lead to subtalar stiffness and gradual deterioration of results over time.
- Osteotomies across the cuneiform-cuboid axis only correct forefoot deformities and do not address hindfoot varus.
- Neglected and severe relapsed clubfeet can be corrected gradually with external fixators.
  - Correcting with osteotomies and external fixators has a high rate of recurrence.
  - Using external fixators for gradual correction after soft tissue releases does not provide consistent results.
  - Soft tissue distraction with an external fixator allows for clubfoot correction with decreased risks of neurovascular injury and a lower rate of recurrence.
- The Ponseti method of serial casting is a valid treatment option for nearly all neglected and relapsed clubfeet, except for those with bony synostoses or arthrodeses.

DEFINITION OF NEGLECTED AND RELAPSED CLUBFOOT

Idiopathic clubfoot deformities are the most common musculoskeletal congenital abnormalities. Treatment in much of the world has become standardized around the Ponseti technique. There are still several problems to be solved within the topic of clubfoot treatment—among the most challenging is the neglected and relapsed clubfoot.

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Ponseti stated, "regardless of the mode of treatment, the clubfoot has a stubborn tendency to relapse."[1] The rate of relapse is estimated between 10% and 50% regardless of the mode of initial correction used.[2–5] Proposed causes of deformity recurrence break into 2 groups: undercorrection[2,6] and continued activation of the primary factors that created the clubfoot initially.[1] The primary factors include muscle imbalances[7] and myofibroblasts in the medial fascia,[8,9] although presence of the latter has been disputed.[10] Contributing factors include postsurgical scarring and the underutilization of post-treatment bracing.[3,11] This review only considers relapses with elements of a clubfoot: equinus, heel varus, midfoot supination, cavus, and forefoot adductus. Relapsed feet with other deformities, such as severe heel valgus and/or forefoot abductus (the overcorrected clubfoot), or with a midfoot break (rockerbottom) are not discussed.

The definition of a neglected clubfoot is somewhat ill defined. There is a commonly understood social implication of neglect, similar to child neglect, where timely attention is not paid to the foot deformity. This definition varies with local cultural norms and expectancies of when a child's parents should seek treatment to avoid developmental delays, ambulation difficulties, and shoe wear problems. This article is more interested in a medical definition, in which a neglected clubfoot is not treated until after the age when the usual treatments are expected to produce a successful deformity correction. Turco[12,13] stated that his release was optimally performed between 1 and 2 years of age, but the upper limit was 6 years of age. Simons[14,15] noted that he had no minimum age but thought that the foot should be a minimum of 8 cm in length; he thought that his release was best suited for children less than 4 years of age. Although Ponseti did not express an upper age limit for successful application of his technique, he only reported on babies whose treatment was initiated before 6 months of age.[1,4,5,16] Subsequent reports have documented that the Ponseti method can be used to correct an initially untreated clubfoot well past the age of 12 months.[17–22] So, within an expanded age range, an obviously neglected clubfoot to one practitioner may be seen as merely a more challenging foot to another.

What makes a neglected or relapsed clubfoot different and more difficult to treat compared with a newborn's clubfoot? First, the feet are stiffer. The capsular tissues have hypertrophied with growth and weight bearing. In cases of previous surgical release, there is an element of thick scar formation. Second, the tarsal bones are further matured. The tarsal bones in an infant are largely, if not wholly, composed of cartilage, and correction of a clubfoot at this age occurs in part through morphologic changes of the cartilaginous bones as they respond to newer, more physiologic stresses.[1,23] Third, weight bearing may create trophic changes, such as skin callosities and mild bony hypertrophy at the site of impact, with hypoplasia of the correspondingly understressed structures. Fourth, there is theoretically an acclimation of the abnormally positioned muscles and tendons to the long-standing deformity. In the neglected clubfoot, for example, the abductor hallucis muscle becomes a powerful force maintaining forefoot supination and cavus; the tibialis anterior muscle becomes strong with hypertrophied tendon, whereas its antagonists, the peronei muscles, are overstretched and weak.

The goal of treating a neglected or relapsed clubfoot is the same as for a newborn's clubfoot: a plantigrade, flexible foot, which is pain-free, normal looking, and requiring no shoe modifications,[1,24] with the least chance for relapse. Although plantigrade is nearly always an achievable goal, flexible is more difficult because the foot usually is stiff at the onset. Interventions should be chosen with an eye toward preventing further intracapsular scarring or bony fusions, when possible. In addition, several treatment options shorten an already small foot, so there should be emphasis on