Pediatric Foot and Ankle Deformities: An Introduction

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Unlike long bone deformities, where most often only one or two bones are affected, foot and ankle deformities usually involve **multiple bones and joints** (Table 1). Thus, a careful assessment of the **site** of the deformity (hindfoot, midfoot, forefoot), **type** of deformity (varus, valgus, supination, pronation, adduction, abduction), and the particular bones and joints that are involved is a prerequisite for preoperative planning.

The **goals** in the management of foot deformities are to obtain a plantigrade, painless, and functional foot and ankle. In general, fusion of joints should be avoided if possible, as this will ultimately increase the stress on adjacent joints and may lead to pain and future degenerative changes in those joints. In this section, six cases are discussed: gradual correction through soft tissues only (cases 111, 112), acute correction of cavus deformity (case 113), gradual correction through midfoot osteotomies with a TSF mitter frame (case 114), foot stump lengthening (case 115), and correction of severe rotational deformities of the foot (case 116). Several other foot cases are discussed in detail in the section ▶ Pediatric Arthrogryposis: An Introduction and the Adult Deformity section (Volume 3 of this Atlas).

The **status of the soft tissues,** especially after multiple surgeries, crush injuries, or burns, is of special importance when deciding whether a gradual versus acute correction will be performed. In addition, the **severity of the deformity** is another factor to consider. **Acute correction** may be indicated in mild to moderate deformities (case 113), whereas acute correction of severe deformities may necessitate resection of significant amounts of bone and shortening the foot in order to obtain adequate correction. This has to be taken into consideration, especially if the deformity is unilateral. Prophylactic **tarsal tunnel release** is to be considered for large acute corrections. **Gradual correction**, on the other hand, has the advantage of allowing the simultaneous correction of numerous deformities that would have been otherwise very difficult and unsafe to correct without excessive soft tissue dissection and/or resection of bone. In many cases, especially before the age of 8 years, this may be possible through soft tissue distraction only (cases 111, 112). At an older age, osteotomies and gradual correction through these osteotomies is usually, but not always, necessary (case 114). A possible complication of midfoot osteotomies is **premature consolidation** of the distracted site at the level of the osteotomy (case 115).

In many pediatric foot and ankle cases, muscle imbalance is one of the precipitating causes of these deformities, and correction of the bony and soft tissue deformities is only one step in the surgical treatment. **Correcting the muscle imbalance** by appropriate muscle transfer, particularly in neuromuscular conditions such as in children with Charcot-Marie-Tooth disease, is key to maintaining the correction (cases 111, 113).

In skeletally immature patients, the **possibility of recurrence** of the deformity is to expected, hence the importance of adequate follow-up. This also needs to be clearly explained to the patient and the family.

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Table 1 Details of the 6 Pediatric Foot and Ankle Deformity cases discussed in this Atlas

Case	Diagnosis	Problems	Surgery and key points
111	7 year old boy, crush injury right leg, leading to compartment syndrome 2 years prior to presentation	Severe equinovarus right ankle, muscle imbalance in foot	Gastrocsoleus recession, gradual correction through soft tissue with TSF (no osteotomy) tibialis posterior tendon transfer. Initial distraction of ankle joint
112	15 year old female with scleroderma	Severe rigid equinus deformity foot, congruent ankle joint articulating surfaces, LLD 4 cm	Percutaneous TAL and plantar fascia release. Gradual correction with TrueLok fixator, constrained hinges. Initial distraction ankle joint
113	14 year old boy, Charcot-Marie-Tooth	Severe cavus deformity foot, muscle imbalance (strong tibialis posterior, weak tibialis anterior, and peroneus brevis)	Radical plantar release, osteotomy first metatarsal, tibialis posterior transfer to mid-dorsum foot through interosseous membrane, peroneus longus tenodesis to brevis
114	14 year old female with multiple surgeries for correction of clubfeet	Rigid midfoot cavus and adduction deformity, dense scar tissue, ankle joint narrowing	Gradual correction through midfoot osteotomy with Gigli saw, TSF mitter frame, simultaneous distraction of ankle joint, and correction of foot deformities
115	10 year old girl with congenital midfoot amputation	Short foot stump leading to unstable gait as family refused prosthesis	Midfoot osteotomy and lengthening using standard Ilizarov frame
116	4 year old boy with infantile myofibromatosis	LLD 11 cm, anteromedial tibial deformity, rotational deformity of foot, heel valgus	Double-level tibial osteotomies, distraction through proximal osteotomy, acute derotation 30° through distal osteotomy; after completion of lengthening, conversion of frame to derotation construct to correct remaining rotational deformities through gradual soft tissue distraction