



Guided Growth With Temporary Hemiepiphysiodesis to Treat Ankle Valgus in a Skeletally Immature Individual: A Case Report



Guido A. LaPorta, DPM, FACFAS¹, Meghan M. Susek, DPM²

¹ Chief, Department of Podiatric Medicine and Surgery, Geisinger Community Medical Center, Scranton, PA; Residency Director, Geisinger Community Medical Center, Scranton, PA; and Fellowship Director, Northeast Regional Foot and Ankle Institute Limb Salvage and Reconstructive Surgery, Scranton, PA

² Podiatrist, Geisinger Wyoming Valley Medical Center, Wilkes-Barre, PA

ARTICLE INFO

Level of Clinical Evidence: 4

Keywords:

epiphysiodesis
lateral distal tibial angle
medial malleolar screw
pediatric

ABSTRACT

Guided growth is useful in correcting pediatric angular deformities. Ankle valgus is a coronal plane deformity and is often seen in skeletally immature patients with congenital or acquired lower extremity pathologic features. Temporary hemiepiphysiodesis with a percutaneous transphyseal medial malleolar screw is a surgical treatment capable of correcting the angular deformity and can offer effective correction. In the present case study, a 12-year-old male with dorsal–lateral peritalar subluxation and ankle valgus underwent a reconstructive procedure and temporary hemiepiphysiodesis with a percutaneous medial malleolar screw. After removal of the screw, reduction of his peritalar subluxation was achieved, improving his lateral–distal tibial angle from 81° preoperatively to 89° at the final follow-up examination. The patient returned to his preoperative sporting activities and ambulated comfortably and pain free in sneakers with orthotics. In conclusion, temporary hemiepiphysiodesis with a transphyseal medial malleolar screw is an effective treatment option for ankle valgus in a skeletally immature individual.

© 2016 by the American College of Foot and Ankle Surgeons. All rights reserved.

Ankle valgus is a coronal plane deformity and is often seen in skeletally immature patients with neuromuscular, genetic, congenital, or acquired lower extremity pathologic features (1). A variety of neuromuscular conditions, including Charcot-Marie Tooth disease, myelodysplasia, cerebral palsy, or poliomyelitis, can contribute to an ankle valgus deformity. Some genetic variations have shown an association with ankle valgus, including multiple hereditary exostoses and hemophilic arthropathy. Congenital conditions, including talipes equinovarus, vertical talus, longitudinal deficiency or pseudarthrosis of the fibula, tarsal coalitions, or flexible peritalar subluxation, can also cause an ankle valgus deformity. Valgus alignment can also develop during childhood because of trauma to the growth plates or after harvesting of a fibular bone graft (2,3).

Valgus ankle alignment can be the primary deformity or can be the result of compensation for a primary deformity proximal or distal to the ankle joint. With either etiology, when growth persists, the deformity becomes progressive and can lead to abnormal loading of the hindfoot and ankle and knee joints (3). When progressive and untreated, the deformity leads to pain, hindfoot pronation, lateral

impingement, difficulty with ambulation, and/or osteoarthritic changes to the ankle joint (4–6). Therefore, conservative and surgical treatment options must be considered to reduce the risk of such consequences.

Conservative treatment options include bracing and orthotics (6). These help to rebalance the ankle complex and disperse joint forces evenly; however, conservative treatment is not a permanent solution.

The goal of surgical correction is to restore the ankle joint to an anatomic position. Surgical treatments can include tenodesis of the Achilles tendon to the fibula or supramalleolar osteotomies with internal acute correction or gradual correction with external fixation. These options are successful when patients are skeletally mature. However, when the patient has open physeal plates, the option to guide growth of the distal tibial physis for deformity correction with hemiepiphysiodesis can also be highly successful (1,2,5,7,8).

In 1933, Phemister pioneered an epiphysiodesis technique to correct limb length discrepancies in which he acquired the bone graft from the physeal plate and reinserted it in a reversed position at the femur and proximal tibia, creating a permanent epiphysiodesis (9). Haas described a reversible technique in which he used wire loops to provide tension across the physis to arrest longitudinal bone growth and correct angular deformities in 1945 (9). Clark used bone staples in 1948 with successful results (1,7). Percutaneous transphyseal screws for angular correction were used by Métaizeau, in 1998, also with successful results (1).

Financial Disclosure: None reported.

Conflict of Interest: Guido A. LaPorta is a consultant for Small Bone Innovations, Stryker Orthopedics, and Orthofix.

Address correspondence to: Meghan M. Susek, DPM, Geisinger Wyoming Valley Medical Center, 1155 East Mountain Boulevard, Wilkes-Barre, PA 18705.

E-mail address: mmsusek@geisinger.edu (M.M. Susek).

Percutaneous epiphysiodesis using a transphyseal screw is a method of temporary physeal suppression. It is a minimally invasive technique with marginal fixation and little anesthesia or operating room time. The technique involves application of a fully or partially threaded screw across the physis or staples or the use of a tension-band plate. A slight risk of permanent physeal damage exists. The technique has been successful in treating ankle valgus with satisfactory results and with nominal physeal damage (4,7,9).

When considering the use of temporary hemiepiphysiodesis, measurement of the degree of valgus deformity and calculation of the remaining growth of the distal tibial physis are necessary to determine whether an epiphysiodesis procedure would be effective and the optimal time for implementation to yield the greatest effects (8). Radiographic analysis can determine the amount of ankle valgus deformity, and determination of the amount of growth remaining in the physis is predictable by defining the skeletal age or bone age of the individual.

Radiographic analysis can also help to quantify the amount of correction achieved by the surgical procedure. The lateral distal tibial angle (LDTA) as described by Paley and Herzenberg can be used to determine the amount of valgus deformity at the ankle joint. The angle is measured on weightbearing anteroposterior radiographs of the ankle as the angle between 2 lines, 1 from the mid-axis of the shaft of the tibia. The second, the ankle joint orientation line, is created by a line connecting the medial–distal- and lateral–distal-most aspects of the tibial plafond. The normal LDTA is $89^\circ \pm 3^\circ$ (6).

Defining the skeletal or bone age of the immature individual can gauge the amount of growth remaining in the physis. Dr. T. Wingate Todd compiled a set of radiographs from children with no gross physical or mental defects from the greater Cleveland area. He examined children at 3, 6, 9, and 12 months of age, every 6 months until and including to age 5 and yearly after their fifth birthday until age 14. He took radiographs of 6 areas: hand, foot, elbow, knee, hip, and shoulder (10,11). The collaboration of this work is known as the Brush Study Population and has been the basis for many popular bone age reference books. It is the foundation of three major bone age studies or atlases for reference, including the *Radiographic Atlas of Skeletal Development of the Hand and Wrist* by Greulich and Pyle (10), the *Radiographic Atlas of Skeletal Development of the Foot and Ankle* by Hoerr et al (11), and *A Radiographic Standard of Reference for the Growing Knee* by Pyle and Hoerr (12). Each of these atlases can be used to compare a current radiograph of a hand, foot, or elbow to a set of standard radiographic images in the appropriate atlas. This provides an estimation of the amount of skeletal growth remaining. The health of the physis must also be considered when determining how much growth remains because several conditions, including skeletal dysplasias and trauma, can be associated with abnormal physeal growth and, thus, the bone age might not necessarily be accurate (1,9,13).

Correlating the timing of surgical intervention with the amount of growth remaining in the physis is important for deformity correction and should be considered before performing a guided growth procedure. Defining the appropriate timing of hemiepiphysiodesis is challenging. The determination of the amount of growth remaining according to bone age is an approximation but should be evaluated. Often, the chronological age will differ from the bone age, which could alter the timing of the intervention. Disregarding the bone age and the growth remaining can result in over- or undercorrection of the valgus deformity.

Ankle valgus, if untreated, can lead to pain and difficulty with ambulation and daily activities; therefore, deformity correction is essential to restoring function, returning patients to their normal activities, and preventing early onset of osteoarthritis. We outline the case of a 12-year-old male with a flexible dorsal–lateral peritalar subluxation and ankle valgus deformity with an equinus contracture.

We used a temporary claw plate across the distal medial tibial physis for temporary hemiepiphysiodesis. In addition to the hemiepiphysiodesis, the intervention included a navicular cuneiform fusion, an Evans calcaneal osteotomy with an allograft, and percutaneous tendo Achilles lengthening. This combination of procedures produced an excellent outcome for our patient.

Case Report

Preoperative Evaluation

A 12-year-old male first presented to our office in December 2009 for evaluation of bilateral painful feet with obvious dorsal–lateral peritalar subluxation. At that time, the patient reported pain, bilaterally, that limited ambulation and prevented participation in athletic activities. The patient's medical history was unremarkable. The patient had a flexible dorsal–lateral peritalar subluxation deformity with equinus to the bilateral lower extremities (Fig. 1). Surgical intervention of the left lower extremity was performed in February 2010 and included a Scarf calcaneal osteotomy with bone graft, Cotton osteotomy with bone graft, and percutaneous gastrocnemius recession. The postoperative course was uneventful, and the patient reported significant relief, with an increase in function and diminished pain to the left lower extremity (Fig. 2). Secondary to successful treatment of the left lower extremity, the patient, with his parents, presented for correction of his right lower extremity in October 2010.

On evaluation of the right lower extremity ankle valgus, equinus and dorsal–lateral peritalar subluxation was evident. The LDTA preoperatively was 81° (Fig. 3). Surgical planning for the right lower extremity was thoroughly discussed with the patient and his family and included a navicular cuneiform fusion, an Evans calcaneal



Fig. 1. Preoperative weightbearing (A) lateral ankle, (B) heel axial, (C) anteroposterior ankle, and (D) dorsoplantar foot radiographic views.

Download English Version:

<https://daneshyari.com/en/article/2715188>

Download Persian Version:

<https://daneshyari.com/article/2715188>

[Daneshyari.com](https://daneshyari.com)