Pediatric Flatfoot

Pearls and Pitfalls

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KEYWORDS

• Pediatric • Pes planus • Flatfoot • Hindfoot valgus • Orthoses • Evans procedure • Calcaneal lengthening osteotomy • Calcaneal-cuboid-cuneiform osteotomy

KEY POINTS

- Asymptomatic, flexible flatfoot is a normal childhood variant that decreases in prevalence as children reach preteenage years.
- Conservative measures in the initial management of symptomatic flatfoot include Achilles stretching and both prefabricated and custom in-shoe orthoses.
- The calcaneal lengthening osteotomy (Evans procedure) and calcaneal-cuboid-cuneiform osteotomy are both surgical options for children with overall good outcomes.
- Arthrodesis is associated with long-term adjacent joint arthritis, including the tibiotalar joint; thus, the procedure is not routinely recommended for use in children and is considered a salvage procedure by most surgeons for ambulatory patients.
- Surgical treatment outcomes of painful flexible flatfeet are reported to be good to excellent in most (85%–95%) patients. Long-term follow-up studies are still needed.

INTRODUCTION

Many children have physiologic flatfeet, which is almost uniformly asymptomatic and flexible. When flatfeet become painful and/or stiff, there is often a role for orthopedic involvement in the patient's care. A full differential must be explored via a complete patient evaluation, including history, physical examination, and imaging studies, before intervention may be recommended. There is little evidence that nonoperative measures, including medications, physical therapy, and orthoses/braces, are effective in addressing symptoms or deformity. Operative options include hindfoot/midfoot osteotomies, arthroereisis, and arthrodesis, different procedures have varying profiles of efficacy, long-term outcomes, and complications. Most procedural options have strong outcome profiles that relieve patients of their symptoms and correct associated deformities.

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In order for surgeons to advise parents, it is critical that they understand the normal variation encountered among childhood feet. Infants are commonly born with flatfeet, and the longitudinal arch forms over the first decade of life. Among children 3 to 6 years of age, 44% have flatfeet with an average 5.5° of hindfoot valgus. From age 3 to 6, the prevalence of flatfeet decreases from 54% to 24% as the arch matures.[1] Boys' arches mature in a delayed fashion relative to girls', 1 year later. Flatfeet tend to persist among overweight and obese children.[1,2]

The flatfoot deformity has been defined as a complex, variable deformity, which includes excessive plantarflexion of the talus, subtalar eversion during weight bearing, and a combination of valgus, external rotation, and dorsiflexion of the calcaneus relative to the talar head.[1,3] The navicular also becomes abducted and dorsiflexed relative to the talar head, drawing the entire midfoot and forefoot into abduction and supination relative to the hindfoot. These deformities result in a "shortened" lateral column, as first described by Evans in 1975, although it is not clear whether this is a true length discrepancy or functional difference due to talonavicular joint malalignment.[4] In addition, an Achilles contracture can develop, plantarflexing the hindfoot and driving stresses through the talonavicular joint during the midstance phase of gait through the underlying soft tissues.[3]

Types of flatfeet typically seen in children and adolescents include the following:

- Flexible flatfeet
- Flexible flatfoot with Achilles tightness
- Rigid flatfoot
  - Coalition (talocalcaneal, calcaneonavicular)
  - Congenital vertical talus
  - Skewfoot
  - Neurogenic flatfoot (eg, myelomeningocele, cerebral palsy, poliomyelitis)

PATIENT EVALUATION OVERVIEW

History

It is important to approach the history of these patients as follows in order to help to differentiate physiologic from pathologic flatfoot:

- Determine reason for visit:
  - Concern about foot appearance/shoe wear
  - Pain related to foot deformity
  - Parental concern that flatfeet are abnormal and harmful if not treated[5]
- Assess developmental and past medical history: weakness, contractures, and/or spasticity may suggest neuromuscular cause
- Inquire about family history:
  - Familial hyperlaxity could suggest syndromes like Ehlers-Danlos or Marfan syndrome[6]
  - Some studies suggest flexible flatfeet may have a familial link[6,7]
- Assess for pain: location, duration, timing of symptoms
  - Location: Flexible flatfeet are typically painful or sore under the plantarmedial aspect of the midfoot and occasionally at the sinus tarsi. Patients with more rigid flatfeet typically present with pain in other locations as well.[8]
  - Duration/timing: Flatfoot pain is usually related to activity and relieved by rest. This is typically seen in both flexible and rigid flatfeet.[9] Night pain and pain at rest are not typical of flatfeet and warrant further investigation.
- Inquire regarding trauma: frequent ankle sprains may suggest tarsal coalition[10]