Painful Flexible Flatfoot

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KEYWORDS

• Flexible flatfoot • Pes planovalgus • Pes equinovalgus • Treatment • Pain

KEY POINTS

- Flexible flatfoot (FFF) has 2 subtypes: pes planovalgus and pes equinovalgus.
- Most FFF patients are asymptomatic and only those that become symptomatic require treatment.
- Conservative treatment remains the mainstay in FFF and it is usually in the form of arch support orthotics and exercises.
- Surgical intervention, using arthrodesis or nonarthrodesis procedures, is warranted when conservative treatment fails.
- Nonarthrodesis procedures are preferred and arthrodesis procedures are the last resort when all other treatments fail.

BACKGROUND

No study in the literature adequately defines flatfoot in terms of measurable radiographic or clinical values.[1] The absence of the medial arch, the hindfoot valgus, and the relative forefoot to midfoot supination define this entity. A flatfoot is called "flexible" when forefoot supination and dorsiflexion of the hallux in a weight-bearing position restores the arch, a positive Jack's test (**Fig. 1**).[2] It is the most common form of flatfoot. We distinguish 2 subtypes of flexible flatfoot (FFF): pes planovalgus and pes equinovalgus. The hallmark between the subtypes is the tightness of the heel cord. As the name implies, the heel cord is tight in the equinovalgus form. Clinically, bringing the hindfoot into neutral allows the differentiation between the two. Harris and Beath[3] were the first to describe pes equinovalgus using the term "hypermobile flatfoot" in a cohort of Canadian soldiers. Characteristics of the hypermobile flatfoot are persistent since childhood, corrects when unloaded from weight bearing, associated with a short tendoachilles, and has abnormal relationships of the tarsal bones. The incidence of symptoms is higher in this group of patients.[3]

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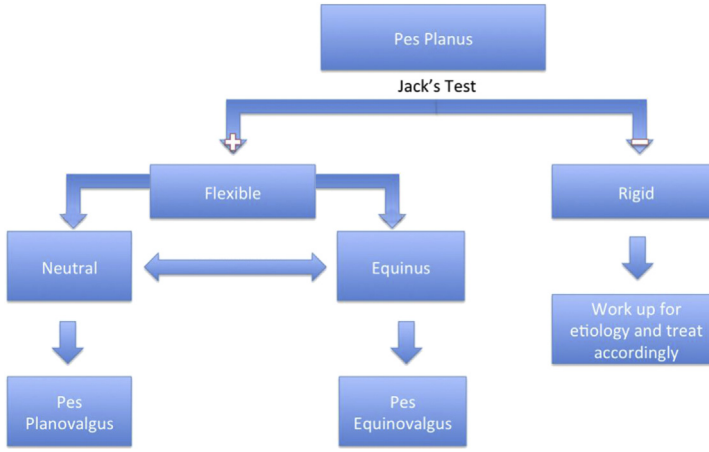

Fig. 1. Diagnosis algorithm for flatfoot.

DEVELOPMENT AND RISK FACTORS

Reports regarding the true incidence of FFF vary. Harris and Beath had the largest cohort of FFF looking into the incidence in 3619 Canadian soldiers.[1,3–5] In their study, these authors reported a 20% incidence of FFF. The many factors associated with flatfoot include age, gender, ethnicity, and shoe wearing. Early in life, flatfoot is a normal stage of development. The medial arch develops through the normal process of growing.[6–9] Vanderwilde and colleagues[8] studied a population of normal children in Columbia in the first 5 years of life. They concluded that young children are flatfooted and the arch develops as they grow beyond 5 years of age. Another study conducted in Austria showed similar results and exhibited a reduction of flatfoot in more than 50% of the children between the ages of 3 and 6 years.[10] Other authors looked into the effect of shoe wearing and found that FFF was more prevalent in the shod versus the unshod children.[11,12] Flatfoot occurs more frequently among obese school children.[13–17] Ethnicity can also play a role, with a higher incidence of flatfoot in African-Americans compared with Caucasians.[18–20]

The several theories defining the etiology of FFF depend on the anatomy of the foot and the surrounding musculature. The earliest theories focused on muscle imbalance and weakness around the foot as the primary causes of flatfootedness.[21] Later, the bony anatomy and the ligamentous laxity of the midfoot joints were proposed as the main factor.[22–24] Harris and Beath[3] distinguished between the passive and the active support of the foot. The passive support is the bony and the ligamentous structures of the foot. The active support is the muscular envelope that includes muscles belonging to the foot alone and others that insert in the foot but originate in the leg. The passive support is the primary arch support and the active support comes into play when the passive support fails. Basmajian and Stecko[24] studied the muscle electrophysiology while applying different loads to the foot. They concluded that the bony and ligamentous structures are the primary restraints of the arch and that the muscles come into play with excessive loads.[25] These muscles play a principal, active role in the stabilization of the foot during propulsion.[25]

PATHOPHYSIOLOGY

To understand the pathophysiology of the flatfoot and the principles of treatment, one must be aware of the importance of the subtalar and the midtarsal anatomy.[26] The