Should pes planus be assessed by a surgeon?

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Introduction

Pediatric foot anomalies are frequently encountered. Parents often consult a specialist due to fears of a deformity or permanent handicap of the foot, while subconsciously considering the orthopedic insoles.

Among pediatric foot anomalies, flat feet are especially frequent since all children are born with a hidden plantar arch. Its prevalence in preschool children can reach 44% (1).

Although pes planus had been defined as a decrease or absence of the longitudinal medial arch of the foot, there is no consensus on what should be considered as a normal plantar arch morphology. Numerous authors have considered painless flat feet without functional handicap as “normal anatomical variants”.

The lack of an international consensus and the heterogeneity of the definitions and measuring methods render the management of pediatric flat feet a challenge. Furthermore, the indications to orient patients to a specialized orthopedic surgeon have not been well defined.

The aim of this chapter is to guide the primary care physicians in the management of these patients based on the available literature.

Age criteria

The sole is constituted by three separate arches that support the foot and help distribute the weights. These arches also play an important role during propulsion: The medial longitudinal arch, the lateral longitudinal arch, anterior transverse arch.

The medial longitudinal arch includes the first three metatarsals, the three cuneiforms, the navicular, the talus, and the calcaneum. Its structure allows the foot to function correctly. It is sustained by a number of aponeurotic, ligamentous (plantar calcaneonavicular ligament or spring ligament) and muscular structures that allow the lengthening and shortening of the arch during the gait cycle. Generally, children are born with flat feet due to persistent medial fat cushions and a medial longitudinal arch that remains to be developed. This arch will not be visible until the age of 4-5 years with the increased rigidity of the bony and ligamentous structures. Furthermore, reinforcement of the intrinsic and extrinsic muscles also aids in maintaining this arch during the upright position (2). Leg derotation during the younger years also participates in correcting the physiologic flat feet in younger children (Figure 1 a-d).

Maturation of the plantar arch continues after preschool and numerous studies have confirmed that, even though the foot's primary anatomical modifications take place before the age of 6 years, clinical and radiographic "normal" values are achieved at the earliest at age 9 or 10 years (2,3), and sometimes even at adolescence (4).

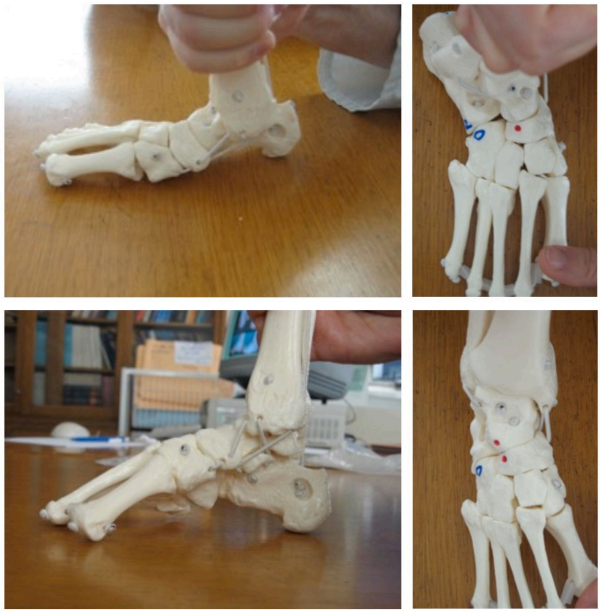


Figure 1: 1a and b: medial and dorsoplantar views of a foot in internal rotation. 2a and b: same foot in external rotation

Consequently, consulting a specialist should be avoided for flexible flat feet before the age of 5, since a flatter plantar arch is a normal phase of development during this period. After the age of 5, there is no consensus on the management. Although there is no solid evidence, a surgical consult is not very useful unless there is pain or fatigue.

Etiological criteria

Pediatric flat foot may be defined as either flexible or rigid. The flexible flatfoot is characterized by a medial longitudinal arch during rest when the hallux is dorsiflexed, and which disappears in the standing position while bearing weight on the foot (Figure 2), whereas rigid flatfoot presents an insufficient or permanently absent medial arch.

Although there is a scarcity of prospective studies tackling pain in treatment-naive flexible flatfeet, the majority are painless and do not require management. They are more frequent in shorter boys with a high body mass index (5).

Figure 2: Flexible flatfoot correction after extension of the hallux

Some flexible flatfeet are associated with a short Achilles tendon which can sometimes lead to pain and functional discomfort which may justify either conservative or surgical therapy (6-8).

Contrarily, a specialized surgical consult should be sought in all children presenting with rigid flatfeet in order to rule out a possible convex foot or synostosis of the hindfoot.

- A convex foot includes a significant equinus of the hindfoot with a rocker bottom foot (Figure 3 a and b). If the pathology is not diagnosed before walking age, the symptoms appear later and include difficulties while bearing weight and shoe wearing (5,9). Clinical exam shows an equinus and valgus of the hindfoot, and abduction and dorsiflexion of the forefoot in the newborn. The diagnosis must be confirmed by a radiograph that shows a fixed vertical position of the talus and a dorsal dislocation of the navicular bone over the talus (Figure 4) (10).

Figure 3: a and b: clinical aspect of rigid flatfeet: convex foot

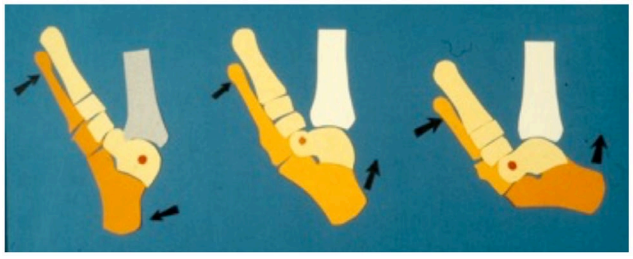


Figure 4: bony architecture of the convex foot

- Tarsal coalition or a tarsal synostosis corresponds to the abnormal fusion of two or more bones. The reported prevalence is of 2% (5). This abnormal bridge may be fibrous, cartilaginous, or a

combination of these anomalies. Talocalcaneal and calcaneonavicular coalition represents up to 90% of tarsal bone fusions with a mean age of appearance of these symptoms of 8 to 12 years old (11). Most of these tarsal coalitions are initially asymptomatic. Stiffness and pain generally appear after minor trauma or a change physical activity level due to a decrease in the mobility of the subtalar joint (9) (Figure 5 a and b).

Tarsal coalitions are at the origin of the ankle pain and acquired proprioceptive issues that may simulate recurrent sprains, thus being the real issue leading the patient to consult a physician.

Finally, clinical asymmetry between the feet should also garner some attention, suggesting a unilateral etiology that should also be investigated.

Figure 5: 5a: bilateral pes planovalgus. 5b: lack of correction of hindfoot valgus after standing on the tips of the toes, suggesting a tarsal coalition on the left side

Tolerance criteria

A recent Spanish cross-sectional observational study (12) on 835 adult patients showed a prevalence of flatfeet of 26.62% in the population and highlighted a direct relationship between the presence of flatfeet and lower quality of life and functional scores of the foot. An interesting study (13) examined and compared the function of the foot during ambulation in children aged 7 years or more, between asymptomatic and symptomatic flatfeet as well as typically developing feet. Notable modifications of the hindfoot's dorsiflexion and an increase in supination and abduction of the forefoot in patients with flatfeet compared to typically developing were shown. Nevertheless, contrary to what was expected, no differences were found in foot kinematics between symptomatic and asymptomatic flexible flatfeet. Interestingly, differences were found in the kinematics of the ankle, with a difference in propulsion in asymptomatic rigid flatfeet, which could lead to fatigue and overuse of the extensor muscles.

Therefore, the hypothesis is that symptoms depend on soft tissue attrition and subjective pain thresholds, rather than functional differences.

There is a lack of high-quality evidence to guide the management of pediatric flatfeet, but it seems that painless flatfeet have a low risk of evolving toward chronic, painful flatfeet in adulthood. Consequently, there is insufficient evidence to support the prophylactic treatment of painless flatfeet in children (14).

Rare and differential diagnoses

- Peroneal spasm without coalition:

Although peroneal spasm is most often associated with tarsal coalition, such spasms have been observed after trauma or ligamentous injury. Controversies exist on the proper designation and etiology, since EMG studies have demonstrated an absence of muscle spasm but rather an organic shortening of the muscles (11,15) (Figure 6).

Figure 6: Peroneal spasm

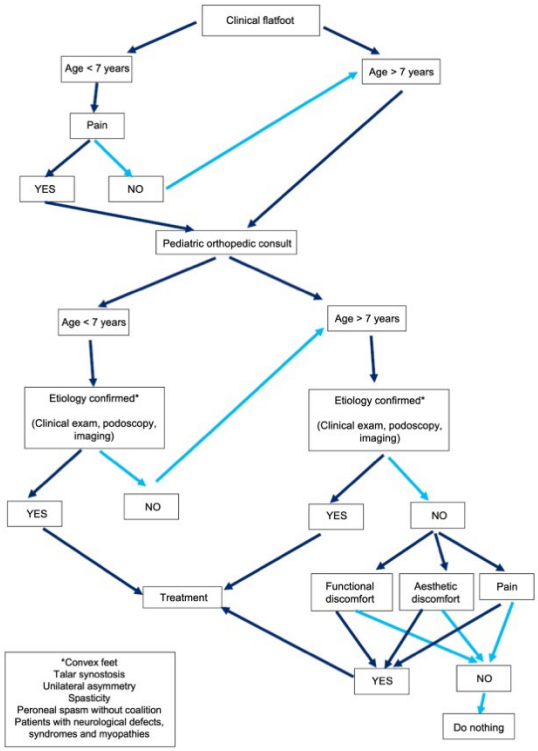
- Patients with neurological defects, syndromes and myopathies:

Anomalies of the peripheral nervous system or of the muscles supporting the longitudinal medial arch may also lead to flatfeet (16). In such cases, pes planus is due to either spasticity of the gastrocnemius-soleus complex (17) or to weakness of the underlying supporting muscles (18).

Take Home Messages:

In conclusion, during clinical examination of pes planus, reducibility and mobility of the hindfoot should be assessed. In the case of pain or stiffness, hindfoot synostosis should be ruled out.

Practically speaking, an asymptomatic flexible flatfoot does not require surgery. In case there is stiffness or pain, a surgical consult is recommended.



Decision tree for the management of flatfeet

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