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## **Flat Feet in Adults**

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Flatfoot is a lack of the medial longitudinal arch of the foot. Adults with flat feet demonstrate several biomechanical inefficiencies in the foot and ankle, and a variety of gait abnormalities. The development of clinical problems is dependent on the levels of activity and the amount of repetitive stress the feet must endure.

People spend an average of four hours each day on their feet, and take 8,000 to 10,000 steps every day. In some jobs and many sports, these amounts are more than doubled. During an average day, the feet support a combined force equivalent to several hundred tons. In addition to carrying the weight of the body, each foot acts as a shock absorber and a lever to propel the leg and body forward, and serves to balance and adjust the body to uneven surfaces.

The various problems associated with flat feet can interfere significantly with normal daily activities, and limit participation in recreational and competitive sports. Flat feet are the result of a loss of the normal arch from a breakdown of the supportive collagen structures or a lack of development of a normal arch .

### **Flexible Flatfoot Associated Pathology<sup>11</sup>**

- medial longitudinal arch strain with pain in the spring ligament
- *abductor hallucis* strain, pain, and spasm
- plantar fascial inflammation
- "jamming" at the first metatarsophalangeal joint with resultant traumatic arthritic changes
- plantar fascial insertional strain and inflammation, with or without calcaneal exostosis (heel spur)

- periarticular fibrocystitis of the second metatarsophalangeal joint (Morton's syndrome)• "pinching" of the calcaneofibular ligament
- secondary fifth-toe contraction deformities
- shearing hyperkeratotic lesions beneath the metatarsal heads
- second or third intermetatarsal space neuritis or neuroma
- sinus *tarsi* syndrome
- Achilles tendinitis
- Anterior or posterior Achilles bursitis
- *peroneus longus* spasm
- *tibialis* posterior overuse (posterior shin splints)
- *tibialis* anterior overuse (anterior shin splints)
- patellar tendinitis
- medial collateral knee ligamentous strain
- patellofemoral syndrome
- synovial plica syndrome
- popliteus muscle syndrome
- iliotibial band syndrome at knee or hip level
- hip adductor tendinitis
- greater trochanteric bursitis
- hamstring muscle strain and spasms (usually at night)

- lumbosacral muscle spasms
- sciatic neuritis
- L4, L5, S1 disc narrowing symptoms
- cervical muscle spasm
- temporomandibular joint syndrome

### **Congenital Flatfoot**

Until about the age of two years, infants have flat feet, due to the presence of a large medial fat pad, and incomplete development of the foot structures.<sup>1</sup> As children begin to walk and spend more time on their feet, this fat pad slowly decreases, resulting in a noticeable medial longitudinal arch.<sup>2</sup> A study of the developing arch in children has confirmed that 28-35 percent of school children have an apparent flatfoot deformity, but 80 percent of those are classified as "mild."<sup>3</sup> Follow-up evaluations have determined that 90 percent of these children will have normal arches by the age of 10 years.<sup>4</sup> The remainder never develop an arch, and are considered to have a "congenital flatfoot."

### **Acquired Flatfoot**

As adults, some of those who develop a normal arch gradually lose it. This occurs secondary to a breakdown of the normally strong and dense connective tissues of the foot. It is the ligaments and connective tissues that support the medial longitudinal arch,<sup>5</sup> not muscular strength.<sup>6</sup> Normal alignment depends on a complex arrangement of dense collagenous fibers, and no single structure provides all of the support.<sup>7</sup> Problems with this arch will develop when these supportive tissues are put under excessive stress. This can be caused by high loads for sudden, brief periods, or by more moderate, but repetitive stresses over longer periods, resulting in an "acquired flatfoot."

### **Rigid Flatfoot**

The overwhelming majority of flat feet are considered "flexible," and will respond well to external support. In some cases, however, the arch never develops because of a bony abnormality (most commonly a tarsal coalition). This results in a "rigid" flatfoot, which can be greatly aggravated by attempts to provide external support with inserts and orthotics. Differentiation is important, but can be easily done during the

examination. If an arch is present when the patient is sitting with the foot dangling, or when standing up on the toes (toe-raise test), then the flatfoot is "supple and is correctable with an arch support."<sup>8</sup> If the foot remains flat and rigid during this test, any attempt to lift up or support the arch can be painful, and corrective orthotics generally are avoided. Evaluation by a foot specialist is usually necessary to determine the underlying cause of a rigid flatfoot. Treatment may consist of accommodative orthotics and/or surgery.

### **Associated Terminology**

Two descriptive terms are often used interchangeably with flatfoot, and can contribute to confusion. *Pes planus* is the more technical term that represents a flattening of the longitudinal arch; the arch is lower than established normal parameters when standing, especially on radiographic evaluation.<sup>9</sup> *Hyperpronation* (or excessive pronation) refers to excessive medial deviation of the talus during gait, primarily during the stance phase of gait.<sup>10</sup> Both of these problems are found in patients with flexible flatfoot, and will interfere with lower extremity biomechanics. An extensive list of the varied symptom complexes and health problems caused by flexible flatfeet has been compiled by Dr. Yale (Table 1).<sup>11</sup>

### **Energy Cost/Athletic Performance**

An interesting study assessed the effects of arch supports on oxygen consumption in 20 subjects with flat feet who complained of fatigue and "weariness."<sup>12</sup> The participants were 18-38 years old, and had no specific foot symptoms. Their heart rates, blood pressures, and walking oxygen consumption were measured on a treadmill - first without, and then with arch-supporting orthotics. The results demonstrated that use of the orthotics significantly improved their gait efficiency, and decreased their oxygen consumption during normal walking. These responses can be extrapolated to athletic performance. It has long been observed that a flat foot, and hyperpronation, in particular, can interfere with performance in a number of sports.<sup>13</sup>

### **Support From Orthotics**

To improve the biomechanics of the foot and provide permanent support for the medial longitudinal arch, most patients will need custom-fitted orthotics. Active patients generally benefit from flexible orthotics, most beneficial for athletes and workers who must be on their feet for many hours each day. A recently published study found that custom-made flexible orthotics cast in a weightbearing position significantly improved the alignment of the foot, and increased the medial longitudinal arch when standing.<sup>14</sup> The materials and fit of an orthotic are critical, since support is needed for all three arches of the foot, along with

cushioning and shock absorption in a comfortable insert. Additional padding under the forefoot is a recent addition that appears to be very helpful.

## **Conclusion**

Flatfoot in adults may be congenital (the medial arch never developed), or acquired (the connective tissues no longer can support the medial arch). A rigid flatfoot is due to an osseous deformity, such as a tarsal coalition. As long as a flat foot is flexible, orthotic support for the medial arch can improve foot and ankle biomechanics, decreasing hyperpronation and enhancing performance in daily activities and during sports.

## *References*

1. Magee DJ. *Orthopedic Physical Assessment* . Philadelphia: WB Saunders; 1987, 329.
2. Kemp HC. *Current Pediatric Diagnosis and Treatment*. Norwalk: Appleton and Lange;1984,614.
3. Notari MA. A study of the incidence of pedal pathology in children. *J Am Podiatr Med Assn* 1988;78:518-521.
4. Wetton EA. The Harris and Beath footprint: interpretation and clinical value. *Foot & Ankle* 1992;13:462-468.
5. Huang CK, et al. Biomechanical evaluation of longitudinal arch stability. *Foot & Ankle* 1993;14:353-357.
6. Basmajian JV, Stecko G. The role of muscles in arch support of the foot. *J Bone Joint Surg* 1963;45A:1184-1190.

7. Kitaoka HB, et al. Stability of the arch of the foot. *Foot & Ankle* 1997;18:644-648.
8. Hoppenfeld S. *Physical Examination of the Spine and Extremities*. New York: Appleton-Century-Crofts;1976,232.
9. Forrester D, Kerr R, Kricun ME. *Imaging of the Foot and Ankle*. Gaithersburg: Aspen Pubs;1988.
10. Gould N. Evaluation of hyperpronation and pes planus in adults. *Clin Orthop Rel Res* 1983;181:37-45.
11. Yale JF. The conservative treatment of adult flexible flatfoot. *Clin Pod Med and Surg* 1989;6:555-660.
12. Otman S, et al. Energy cost of walking with flat feet. *Prosthets and Orthots Intl* 1988;12:73-76.
13. Subotnick SI. *Sports Medicine of the Lower Extremity*. New York: Churchill Livingstone;1989,159.
14. Kuhn DR, et al. Radiographic evaluation of weight-bearing orthotics and their effect on flexible pes planus. *J Manip Physiol Ther* 1999;22:221-226.

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