Hallux Rigidus: Etiology, Biomechanics, and Nonoperative Treatment

Paul S. Shurnas, MD

KEYWORDS

• Osteoarthritis • Rigidus • Hallux • Limitus
• Inherited • Bilateral

ETIOLOGY AND BIOMECHANICS

The term "hallux rigidus" describes a painful malady of the great toe metatarsophalangeal (MTP) joint characterized primarily by loss of dorsiflexion and progressive osteophyte formation about the MTP joint. Initially the condition was reported in 1887 by Davies-Colley,[1] who described a plantar-flexed position of the proximal phalanx relative to the metatarsal head and proposed "hallux flexus." Cotterill[2] reported on the same condition a few months later, however, and suggested the diagnosis of hallux rigidus. The commonly used terms "hallux rigidus" and "hallux limitus" are used to describe degrees of the same problem. DuVries[3] and Moberg[4] noted that other than hallux valgus, hallux rigidus is the most common problem of the first MTP joint.

The literature shows a higher incidence of female involvement.[5–10] Coughlin[7] reported that approximately 80% of patients with bilateral hallux rigidus had a history in their family of great toe arthritis or "bunions." Long-term follow-up of the same patients with hallux rigidus showed that more than 80% developed bilateral disease. Although numerous contributory factors have been hypothesized, there has been no proven association or correlation with first ray mobility, metatarsal length, Achilles or gastrocnemius contracture, planovalgus or cavus foot posture, hallux valgus, adolescent onset, type of shoe wear, occupation, or metatarsus primus elevatus.[7,11]

Trauma is the most common cause reported in the literature and may occur as a single, isolated injury (eg, fracture) or possibly the result of chronic repetitive microtrauma.[12] A traumatic episode is the most likely cause of unilateral hallux rigidus.[7] An injury that results in forced hyperextension[12] or plantar flexion (PF)[13]

Orthopaedic Foot and Ankle Surgery, Columbia Orthopaedic Group, 1 South Keene Street, Columbia, MO 65201, USA
E-mail address: pjshurnas@juno.com

Foot Ankle Clin N Am 14 (2009) 1–8
doi:10.1016/j.fcl.2008.11.001 **foot.theclinics.com**
1083-7515/08/$ – see front matter

may create compressive and shear forces that result in chondral or osteochondral injury. The resultant joint damage leads to progressive arthritic changes over time. A severe sprain or ''turf toe'' injury also may develop into arthritis. Younger, active patients with hallux rigidus may present after a sprain or jamming episode with an osteochondral defect of the MTP joint, but the diagnosis can be difficult, and oblique radiographs and MRI may be helpful.[14–18]

Other factors associated with hallux rigidus in the literature include a flat or chevron-shaped joint, metatarsus adductus, hallux valgus interphalangeus, bilaterality in persons with a positive family history, trauma in unilateral cases, and female gender.[6,7,19] The notion that instability of the first ray may predispose to hallux valgus is the corollary to the notion that a flat or chevron-shaped joint can lead to hallux rigidus. Such a constrained joint (congenital or acquired) may result more easily in jamming episodes and the resultant degenerative changes. Metatarsus adductus may be another underlying factor that creates abnormal stress on the MTP joint, but more research is needed regarding these potential causes to determine the mechanism.

Metatarsus primus elevatus (**Fig. 1**) is classically described as a fixed dorsal elevation of the first metatarsal in relation to the lesser metatarsals. For example, fixed elevation may occur iatrogenically after a first metatarsal osteotomy or may be caused by fracture malunion. Flexible elevation has been associated with posterior tibial

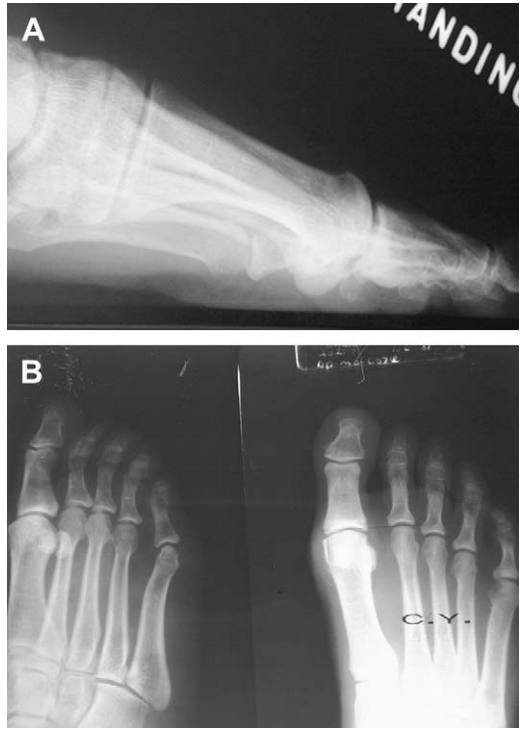

Fig. 1. Grade 1 hallux rigidus. (*A*) The lateral radiograph shows elevation of the first ray (elevatus) and often is the key finding in early grades to suggest hallux rigidus. (*B*) The metatarsal head is enlarged and the dorsal surface is prominent. Loose bodies and sesamoid irregularity are not obvious but may occur with any grade.