Introduction: Why Are There so Many Different Surgeries for Hallux Valgus?

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KEYWORDS

• Hallux valgus • Bunion • Etiology • Chevron • Lapidus • Scarf

KEY POINTS

- More than 100 different surgical procedures have been described for the treatment of hallux valgus.
- Multiple etiologic factors have been linked to the development of hallux valgus, potentially explaining the multitude of surgical procedures available to correct the deformity.
- Despite the variety of surgical options for treating hallux valgus, there is no gold standard.

INTRODUCTION

An important pathology of the foot, namely, hallux valgus (HV), is ever present in a foot and ankle surgeon's practice and widely discussed in the literature. Invariably common, the prevalence of HV in the general public has been reported to potentially be between 23.0% and 35.7%.[1–3] In 1994, it was estimated that approximately 209,000 HV surgeries were performed annually in the United States.[4] The number of patients undergoing deformity correction is surely much higher currently. Despite the widespread presence of the pathology, there is no shortage of surgical options to address HV.

ETIOLOGY

Extrinsic Causes

One of the possible reasons for the diversity of surgical options for HV is the spectrum of etiologies of the deformity. Footwear was one of the early explanations given for the

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development of HV. Thought to be an extrinsic cause as early as 1909, high heels and narrow toe-box shoes are frequently associated with HV.[5] Although increasing heel height increases forefoot loading,[6] there is not complete penetrance of HV in women who wear high heels. It is possible, however, that abnormal forefoot loading caused by high heels may exacerbate the deformity.[7] In addition, there is no link between footwear and the development of juvenile HV.[8]

Intrinsic Causes

Multiple intrinsic factors have been evaluated as causes of HV. These include a long first metatarsal, the shape of the metatarsal head, and soft tissue imbalances across the hallux metatarsophalangeal (MP) joint. A long first metatarsal has been thought to be a risk factor for development of HV. In a study assessing patients with HV, it was found that 80% had a zero-plus first metatarsal (first metatarsal greater or equal in length when compared with the second metatarsal). This finding is in contrast to control subjects, of whom 80% had a shorter first metatarsal.[9] Another anatomic variant linked with HV is a round first metatarsal head. Although the flattened or square-shaped head is considered more stable,[10,11] a rounded head has been reported to be unstable and may be at higher risk for HV recurrence after surgical intervention.[12] It is important to consider that there is no accurate method of describing the metatarsal head and its appearance may change depending on metatarsal supination and pronation. Therefore, it is not clear as to whether anatomic variants of the first metatarsal directly cause HV.

The static stabilizers of the first MP joint are often compromised in order for the deformity to develop. The collateral ligament, medial sesamoid ligament, and joint capsule make up the medial restraints. In the presence of HV, these structures are mechanically attenuated and have abnormal collagen organization at the histologic level.[13] However, it is more likely that pathology of these structures is due to HV, rather than a cause.[14] The dynamic stabilizers of the first MP also play a role and show muscle imbalance in the presence of deformity. These stabilizers include the adductor hallucis and abductor hallucis, with the latter causing great toe plantarflexion and abduction.[15] With regard to the extensor and flexor hallucis longus, as the deformity progresses, the moment arm of the extensor hallucis longus and flexor hallucis longus migrates laterally. This augments the deforming force of the muscle to pull the toe into valgus.[16,17]

Other kinematic factors of the foot have been linked with HV. As an example, hypermobility of the first ray in the sagittal plane and its role in HV is a source of significant discussion in the orthopedic literature. Hypermobility of the first ray may lead to elevation of the first metatarsal, which results in increased pronation, increased medial load on the MP joint, and valgus stress on the hallux.[18] This finding has led some authors to argue that there is increased recurrence of HV if the tarsometatarsal joint has not been fused.[19] Others have demonstrated that sagittal plane hypermobility improves with osteotomies alone.[20] It is important to also consider hypermobility in the coronal plane, which can lead to medial deviation of the metatarsal and subsequent HV. This factor may potentially be more important than sagittal plane mobility, because the latter has not been proven to be a definitive cause.[21] Another kinematic variant implicated in HV is a tight Achilles tendon, causing increased forefoot loading.[22–24] Although there have been reports of an association between HV and decreased ankle dorsiflexion,[10,25] other authors have not discovered the same relationship.[26]

Last, pes planus has been associated with HV deformity with multiple potential biomechanical reasons. The deformity causes an elevation of the first ray and, therefore, a functional long first metatarsal.[27] In addition, the peroneus longus is less able to