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Hallux valgus: A narrative review

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Abstract

A hallux valgus is a complex deformity of the first ray of the forefoot. This deformity is, at times, red and painful and can disrupt daily activities. One aspect of the 3-dimensional deformity is the bunion or medial protrusion that comes from the hallux's lateral displacement and pronation. Huge amounts of discomfort and changed joint mechanics can result from hallux valgus. It's still unclear what causes biomechanical problems exactly. Female sex, age, restrictive footwear, and family history are risk factors. Hallux valgus frequently coexists with other foot conditions such as pes planus, metatarsus adductus, and equinus contracture. When nonoperative treatment fails, surgery is a possibility for patients in order to reduce pain, rectify the deformity, enhance first-ray stability, and improve quality of life. A variety of soft tissue balancing techniques, metatarsal osteotomies, and fusions of either the metatarsophalangeal (MTP) or tarsometatarsal (TMT) joint have been described as treatments for hallux valgus. The choice of operations is determined by the deformity's degree and location, as well as the surgeon's preferences. Current developments in surgical methods include rotational deformity repair and minimally invasive surgery.

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Introduction

A bunion, often referred to as hallux valgus (HV), is one of the most prevalent forefoot abnormalities. As a result of the first metatarsus' adduction, or "metatarsus primus varus," HV causes the proximal phalanx to deviate laterally and the first metatarsal head to deviate medially. The exact etiology is not entirely understood, however. According to one study, the prevalence of HV tends to be 15:1 higher in women than in males, and it is more prevalent in people who wear high heels or tight shoes (1).

Imaging is crucial in determining whether there is damage to the first metatarsophalangeal (MTP) joint because it can help doctors diagnose hallux valgus deformity, which is generally diagnosed by a physical examination. The focus of treatment is on trying out non-surgical options initially, such as wearing wider shoes, using orthotics, and wearing night splints. Surgical intervention is the next suggested step if conservative treatment is unsuccessful. Bony union often occurs 6 to 7 weeks after surgery, with good patient tolerability (2).

In this review, we aimed to explain the etiology of hallux valgus and patient evaluation and to address the available treatment options.

Hallux valgus

The etiology, time of incidence, and stages of HV cases we observed in the clinic, as well as the patient's general medical status, differ significantly. There is not usually a correlation between the degree of deformity in the finger and the clinical level of complaint. Due to these variations, there is no standard surgical treatment applicable to all instances. Throughout the source books, several initiatives that compete with one another are described.

Etiology and epidemiology

The actual etiology is not entirely understood, however, numerous hypotheses have been offered. Several contributing variables, including heredity, short first metatarsal, dorsiflexed first metatarsal, flexible or rigid forefoot varus, flexible or rigid pes planovalgus, gastrocnemius equinus, poor foot mechanics, and joint hypermobility, are likely responsible for HV deformity. Curiously, rheumatoid arthritis predisposes patients to HV deformity, although gouty arthritis, psoriatic arthritis, and other arthritic disorders do not. In addition, HV deformity is more prevalent in connective tissue disorders such as Marfan syndrome and Ehlers-Danlos syndrome, as well as Down syndrome (3).

HV deformity is widespread in those who wear tight shoes and high heels, which is a commonly stated reason. Yet, males who wear practical footwear frequently have pronounced HV deformity, whereas women who wear footwear that compresses their feet severely do not. This has led to the theory that footwear exacerbates an underlying bone deformity rather than being the primary cause (1).

HV deformity is a rather prevalent disorder. It affects roughly 23% of persons aged 18 to 65 and up to 36% of adults aged 65 and older. HV malformation occurs in as many as 30 percent of adult females (4).

Pathophysiology

Static and dynamic structures at the first metatarsophalangeal (MTP) and first tarsometatarsal (TMT) joints make the first ray unstable. Attenuation of the medial supporting components of the first ray leads to medial deviation of the first metatarsal and lateral deviation and pronation of the hallux, generating a gradual varus deformity at the first TMT joint. The sesamoid apparatus shifts as the metatarsal head slips medially and rotates in the frontal plane. Hence, the first metatarsal head lies on the medial sesamoid and the lateral in the first intermetatarsal (IM) region. The MTP joint deformity also bowstrings the hallux flexor and extensor tendons laterally, deforming the phalanx as the misplaced abductor hallucis plantar flexes and pronates it. First metatarsal head prominence causes medial prominence at the first MTP joint.

There are some accompanying pathologies to hallux valgus (5):

Metatarsus primus varus

Exophytic enlargement on the medial side of the distal end of the metatarsal

Hypertrophy and inflammation of the bursa over the medial prominence (bunion)

Lateral deviation of the thumb

Lateral contraction of the metatarsophalangeal joint capsule

Subluxation of the sesamoids under the metatarsal head

The development of a hammer toe-like deformity in the second finger in 15-20%

Forefoot expansion

Degenerative osteoarthrosis

Calluses

Pes planus

Achilles tendon contracture

Table 1: Traditional Radiographic Classification of Hallux Valgus Deformity (Severity Based)

Severity of Deformity	Hallux valgus angle (HVA)	First-second intermetatarsal angle (IMA)	Treatment
Normal	<15°	<9°	None
Mild	<20°	9-11°	Distal osteotomy ±soft tissue procedure
Moderate	20-40°	11-16°	Proximal osteotomy ±soft tissue procedure
Severe	>40°	>16°	Proximal osteotomy or first tarsometatarsal arthrodesis ± soft tissue procedure

Clinical evaluation

History

Forefoot pain on the medial side is how patients with hallux valgus commonly present. The concomitant hammertoe deformity or the transfer metatarsalgia brought on by altered walking patterns may also cause patients to experience discomfort in their lesser toes. Patients may describe a pronounced protrusion or hump on the medial side of the forefoot. Because of the medial prominence at the first MTP joint, there may also be complaints about difficulty wearing specific types of footwear. People frequently talk about having symptoms that don't go away after trying other shoes or activities.

Physical examination

In both a seated and standing posture, the physical examination includes a comprehensive foot assessment. Toenail alterations, skin lesions, and the overall position of the first ray should all be checked on the foot. Identify the particular site of discomfort based on history and palpation of the foot. Pain at the medial eminence is typical of people with hallux valgus. Moreover, patients may experience widespread pain at the first MTP joint, pain from lesser toe abnormalities, or pain from transfer metatarsalgia at the lesser metatarsal heads. To rule out neurovascular insufficiency, a complete neurovascular evaluation is crucial. In order to determine whether the first ray is reducible in the frontal plane, it is important to evaluate the first ray's range of motion, ligamentous laxity or contractures, and passive correction of the deformity, including internal rotation of the hallux. It is important to thoroughly examine the first MTP joint for any skin changes, discomfort, crepitus, or decreased motion indicative of arthritic changes. It's crucial to check for any further concurrent processes, such as pes planus, equinus of the Achilles complex, or first ray hypermobility (6).

Radiographic examination

The afflicted limb should have weight-bearing anteroposterior (AP), lateral, and axial sesamoid images taken. The AP image is used to calculate the hallux valgus angle (HVA), 1-2 intermetatarsal angle (IMA), and distal metatarsal articular angle (DMAA) (**Figure 1A**). The first metatarsal's longitudinal axis and distal articular surface produce an angle called the DMAA (**Figure 1B**). It is used to measure the congruity of the first MTP joint, with a typical range of 10 degrees. Many investigations have demonstrated the reliability of the HVA and IMA, however, the DMAA has been shown to be less dependable. The low reproducibility of this measurement may be due to the possibility that variations in the DMAA are more closely related to the rotation of the metatarsal head than actual angulation changes. The hallux valgus interphalangeus (HVI) angle, which results from the intersection of the longitudinal axes of the proximal and distal phalanges, should also be taken into account because, in cases where the HVI angle is increased, an adjunctive procedure like an Akin osteotomy may be required to fully correct the deformity (7).

The sesamoid axial view is crucial for determining how the sesamoids relate to the first metatarsal head's

Figure 1: (A) Traditional hallux valgus measures demonstrated on anteroposterior (AP) radiographs. The number 1 corresponds to the first-second intermetatarsal angle (IMA); the number 2 corresponds to the hallux valgus angle (HVA). (B) The distal metatarsal articular angle (DMAA) is shown, which can be used to assess first metatarsophalangeal (MTP) joint congruity. (C) Shows the axial sesamoid view demonstrating the normal anatomic location of the sesamoids in relation to the crista.

cristae and for checking for sesamoid subluxation or first metatarsal rotation (**Figure 1C**). In AP radiographs, the existence of a "round sign" assesses the rotation of the first metatarsal as well as the form of the lateral border of the first metatarsal head. Examining the first MTP joint for any signs of arthritic changes is crucial. A useful method for providing a 3-dimensional examination of hallux valgus to further understand the pathophysiology of the deformity is weight-bearing computed tomographic (CT) scanning.

Classification systems

Traditional classification methods have used the AP view on radiographs to determine the severity of hallux valgus in the frontal plane based on the HVA, IMA, and DMAA (**Table 1**) (8)

Treatment

Nonoperative treatment

The goal of non-operative care of hallux valgus symptoms is to lessen the irritation of the medial eminence. To reduce discomfort, blistering, and bursitis, patients should be instructed on the right footwear, which includes wearing cozy shoes with a large toe box. Cushions and toe spacers might also assist to lessen pain. Patients should be told that while changing their shoes and activities may lessen their symptoms, doing so does not treat the underlying condition and will not thereby lessen the deformity

Operative treatment

Non-surgical procedures are considered unsuccessful if they are unable to reduce discomfort. Surgical management should then be taken into account. Surgery is typically indicated by symptoms (difficulty with ambulation, pain). It's interesting to see that radiographic appearance doesn't matter much. Surgeons can choose the best course of action based on the severity of the deformity and the presence of arthritis. With the purpose of correcting HV deformity, over 150 surgical techniques have been documented. Even though there are numerous processes presented, each one uses one of the fundamental strategies indicated below:

Osteotomy

First metatarsal bone is sliced and moved into a less adducted position. The surgical approach determines the cut's place and shape. For instance, a chevron osteotomy uses a wedge-shaped incision, whereas a Wilson osteotomy uses a straight cut. The cut may be in the neck, in the shaft (scarf osteotomy), or close to the base of the metatarsal (proximal osteotomy) (distal osteotomy). The chevron osteotomy has received the greatest attention. Chevron osteotomy outperformed the other treatment modalities in a randomized control experiment that contrasted it with no treatment or orthosis. With an 80% satisfaction rate, the hallux abductus angle was normal in the osteotomy group at 12 months. However, the osteotomy group reported moderate footwear issues in about 61% of the patients. Moreover, the surgical group required more sick days and spent more on foot care. A distal metatarsal open technique is most frequently used, leaving a 3 to 5-cm scar. Yet, more people are becoming familiar with more recent minimally invasive procedures. A study comparing minimally invasive surgery to open osteotomies found no meaningful difference in the success of the procedure, however, the minimally invasive surgery took less time and left a smaller scar. Also, a randomized control experiment contrasting open chevron osteotomies with less invasive ones discovered comparable clinical and radiological outcomes between the two treatment groups (9).

Arthroplasty

With arthroplasty, the first MTP joint's motion is preserved while the pain is reduced (replacing the joint with an implant or removing the joint). Total joint

arthroplasty and hemiarthroplasty have both been developed. Hemiarthroplasty needs less bone resection and preserves toe length. Patients with severe hallux rigidus undergo an interpositional arthroplasty, which helps preserve the joint range of motion. The Keller resection is the most popular type of arthroplasty. To enhance dorsiflexion and decompress the joint, up to 50% of the proximal phalanx is removed during this treatment. Following a Keller's arthroplasty, 75% of patients were pleased with the outcomes, and 88% experienced no further pain. Nonetheless, 12% of patients or so reported more discomfort (10).

Soft tissue procedures

The McBride procedure is the one that primarily deals with soft tissue. In this treatment, the fibular sesamoid is removed, resulting in hallux medial deviation, MTP joint hyperextension, and interphalangeal joint flexion. It's interesting that no papers have independently examined soft tissue techniques for HV deformity repair. One study compared the chevron + adductor tenotomy to the chevron osteotomy alone. They discovered no differences in patient satisfaction or mechanical correction.

Complications

Surgery for hallux valgus is accompanied by a variety of complications. The most frequent complication, with rates ranging from 8% to 78%, is recurrence. A rare but fatal complication is avascular necrosis (AVN). Metatarsal shortening or dorsal malunion may cause transfer metatarsalgia, which most frequently affects the second metatarsal. proximal crescentic osteotomies have historically been linked to dorsal malunion. Surgery professionals need to be mindful of the hallux varus problem. Hallux varus is not very common. It is related to technical errors including over-resection of the medial aspect of the metatarsal head, overtightening of the medial capsule, excessive lateral capsule release, overcorrection of the first IMA, and excision of the lateral sesamoid (11-14).

Conclusions

The prognosis for HV deformity is generally positive. Patients ought to initially try conservative treatments. Surgery should then be considered if the patient's pain and functionality do not decrease. Recovery following surgery depends on the procedure. Healing after any bone treatment, like an osteotomy, takes about 6 to 7 weeks (corresponding to the complete bony union). Healing could take longer if the patient smokes. After surgery, patients often continue their jobs six to twelve weeks later. It has been demonstrated that recovery can take up to a year after surgery (15,16).

Surgical methods and procedures affect how postoperative complications develop. Although newer approaches are showing promise, long-term studies are required to compare them to conventional corrective procedures.

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