22

Hallux Varus

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Hallux varus resulting from both iatrogenic and idiopathic causes has been reported throughout the podiatric and orthopedic literature. Although hallux varus acquired as a complication of bunion surgery occurs much more frequently, those unique cases of congenital deformity may occasionally present to a practitioner's office.

Hallux varus has been reported as a simple transverse plane deformity, and in those cases is referred to as hallux adductus. The classic hallux varus deformity, however, is triplanar, involving supination of the first metatarsophalangeal joint, hyperextension of the first metatarsophalangeal joint, and hyperflexion of the hallux interphalangeal joint (Fig. 22-1). The hallux is deviated or subluxed medially with a nonpurchasing digit in varus rotation with a possible negative angle between the first and second metatarsals.[1,2]

Congenital hallux varus is classified as one of two types. In the primary type, the varus is the only deformity to be noted. The secondary type is associated with congenital metatarsus adductus, equinovarus, or clubfoot, neuromuscular disorders such as are seen with polio, and other teratogenic anomalies.[3-7]

Abnormal insertion of the abductor hallucis muscle is thought to be a cause of the primary type. In only a few percent of individuals does the abductor ride purely on the medial aspect of the foot. Its usual insertion is the plantar medial base of the proximal phalanx along with the flexor hallucis brevis. Altering its insertion would change its directional pull and likewise its function across the metatarsophalangeal joint, leading more to adduction than to stabilization or flexion.[4]

Cases of the second type of congenital hallux varus have been reported in association with supernumerary phalangeal or metatarsal bones. These have involved duplication of the distal phalanx, both proximal and distal phalanges, and occurred in combination with syndactyly. A triangular to trapezoidal malformation of the proximal phalanx, as well as a congenital absence of the fibular sesamoid, has been described.[3,7-11] It should be recognized that true hallux varus is a deformity of the first metatarsophalangeal joint. Medial deviation of the hallux seen with metatarsus adductus and clubfoot is secondary to a deformity whose apex is found more proximally.[12]

Although acquired hallux varus is most often seen following bunion surgery, two other etiologies should not be overlooked. Joint subluxation following a chronic inflammatory process, as seen with rheumatoid arthritis or other systemic disorders, is known to occur. With weakening of the joint capsular structures, the hallux may drift in a medial direction.[2,13-14] Trauma as a source of deformity has also been reported. Sport injuries that disrupt the lateral joint structures can lead to metatarsophalangeal joint instability, resulting in medial deviation of the hallux.[2,13-15]

Numerous procedures or combinations of procedures have been found to predispose the surgical outcome to a varus deformity. Postoperative hallux varus has occurred following most bunion procedures, including but not limited to the Mayo, Stone, Silver, and Peabody bunionectomies and metatarsal shaft osteotomies, but it is most commonly associated with the McBride technique.[2,5,11,12,16-22] Historically, excision of the fibular sesamoid was thought to be the primary etiology; however, a sesamoidectomy done as an isolated procedure will not produce the varus.[1,16-23] It is

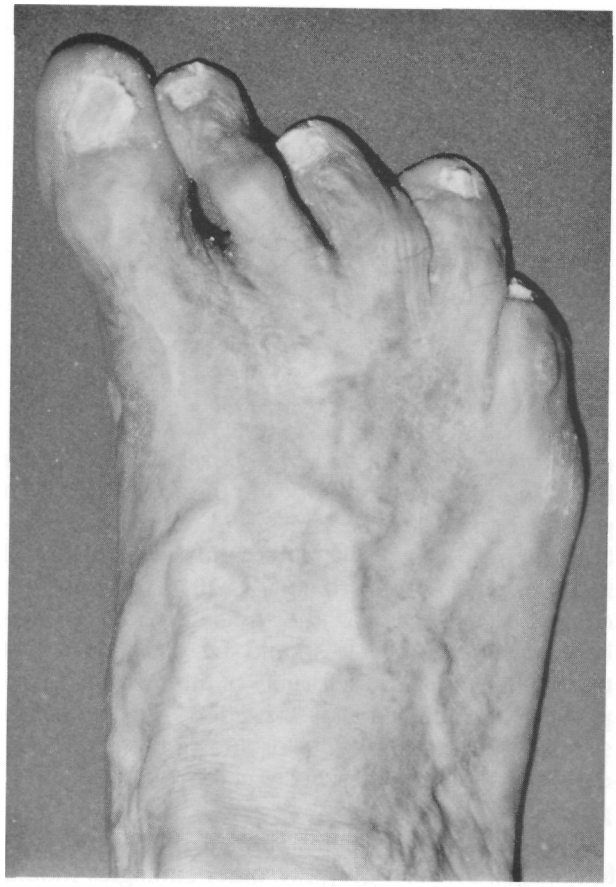

Fig. 22-1. Clinical presentation of hallux varus.

Fig. 22-2. Hallux varus following fibular sesamoidectomy.

the combination of surgical errors described below that give rise to this complication.

Excision of the Fibular Sesamoid. Excision of this sesamoid removes the fulcrum about which the lateral head of the flexor hallucis brevis acts, thereby reducing its effectiveness in contraction. This allows the medial head to gain a mechanical advantage and, with time, can cause the hallux to deviate medially (Fig. 22-2).

Staking of the Metatarsal Head. When the first metatarsophalangeal joint is in normal alignment, the medial proximal base of the proximal phalanx travels in the sagittal groove. When this groove is removed by overly zealous osseous resection, its stabilizing effect is lost and the hallux may drift medially. Plantarly, the groove forms the medial border of the tibial sesamoidal groove. Resection of this border allows medial displacement of the tibial sesamoid and with it the medial head of the flexor hallucis brevis gains a mechanical advantage over the lateral head of the flexor hallucis brevis. Contraction of this muscle then contributes to or increases the deformity (Fig. 22-3).

Over-correction and Undercorrection of Osseous Deformities. A negative angle between the first and second metatarsals tends to create a varus deformity. As the intermetatarsal angle decreases, the medial vector pull of the soft tissues increases. Once this angle becomes negative, the vector force that helps to correct a hallux valgus deformity now moves in favor of a varus or

Fig. 22-3. Hallux varus resulting from excessive resection of the medial eminence and resulting in a dynamic imbalance.

adducted position. If additional procedures weaken the lateral stabilizing structure, varus deformity may result. When the metatarsal is moved toward a rectus position during hallux valgus surgery, osseous deformity of the metatarsal head and proximal phalanx must be addressed. Failure to recognize an abnormal proximal articular set angle or distal articular set angle or deviation (i.e., overcorrection) in bone shape may result in a varus postoperatively.

Transection of Adductor Hallucis and Lateral Head of the Flexor Hallucis Brevis Tendons. Sacrifice of both these tendons appears to be the significant factor in causing imbalance of the intrinsic musculature around the first metatarsophalangeal joint. Once the balance is disrupted, medial structures will dominate. Incidence of varus formation is significantly reduced when these procedures are performed individually.

Overaggressive Medial Capsulorrhaphy. This error again alters the balance along the first metatarsophalangeal joint, favoring medial deviation.

Aggressive or Excessive Postoperative Bandaging. When the digit is bandaged in an overcorrected position for a prolonged period of time, adaptive changes and wound scarring occur that then maintain the deformity.

Medial Tibial Sesamoid Subluxation Fo llowing Adductor Transfer. Transfer of the adductor hallucis tendon to

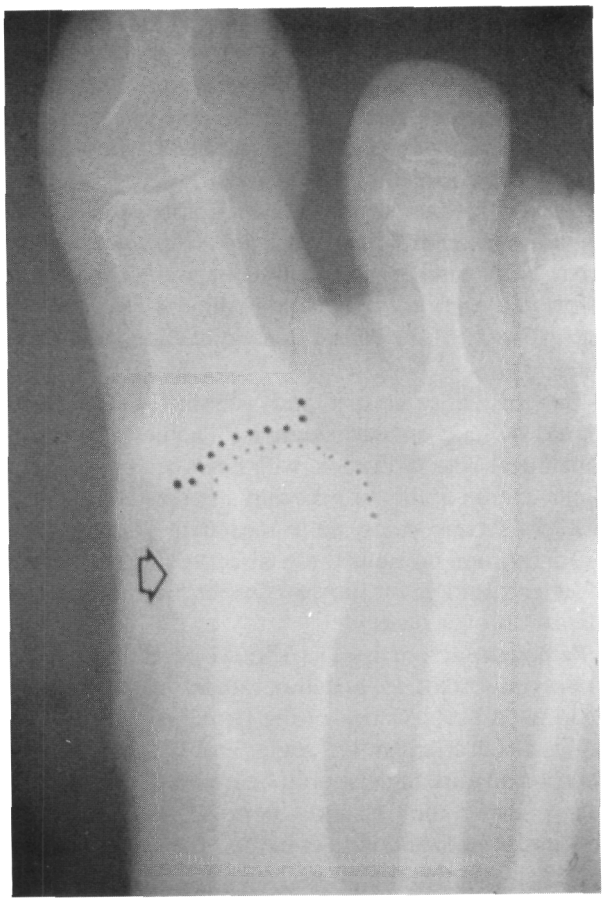

Fig. 22-4. Tibial sesamoid subluxation following adductor hallucis tendon transfer.

the medial joint capsule or tibial sesamoideal ligament is done to maintain the corrected sesamoid position following derotation of the apparatus from the first interspace. If the tendon is not of sufficient length or is inserted too far distally, an increase in transverse tension across the joint results. This encourages medial dislocation of the tibial sesamoid, destabilizing the intrinsic musculature and contributing to the deformity (Fig. 22-4).

CORRECTION OF HALLUX VARUS

When evaluating a varus deformity for correction, it is important to use the same criteria as are employed in hallux valgus surgery. First, inherent genetic factors should be reviewed. The shape of the first metatarsal should be determined. More transverse plane motion is available with a round metatarsal head, whereas less motion can occur if it is more square in shape. A long metatarsal creates an abnormal parabola that affects the biomechanics of gait. Muscle compensation may occur with time, which can contribute to a varus deformity. Any other osseous malformations present that may contribute to the deformity should be identified.

The patient's history and physical examination should include an evaluation for ligamentous laxity. Subclinical Ehlers-Danlos will have an effect on a joint's overall ability to maintain a corrected position. Questions concerning neuromuscular disorders are also important because these disorders can obviously affect gait and may initiate osseous or musculature adaptation over time.

Radiographic parameters should be examined. All angles important to a hallux valgus correction are again used here. Values of the proximal articular set angle, distal articular set angle, and hallux abductus interphalangeus angle should be noted. The degree of splay between the first and second metatarsals should be determined and also whether the deformity involves simply the transverse plane or is multiplanar. Any elevatus should be noted, and the patient's gait should be observed.

Next, it should be determined whether the varus deformity is static or dynamic. Static deformity results from overcorrection following an osteotomy. It is frequently present immediately postoperatively and is usually corrected by an osteotomy aimed at reversing the deformity. Dynamic deformity results from a disruption in the normal balance of muscle, tendon, and capsule around the first metatarsophalangeal joint.[16,20,24] Treatment, then, is determined by the duration, flexibility of the deformity, joint integrity, and any muscle and soft tissue imbalance. Conservative therapy such as bandaging and splinting in a valgus attitude may be helpful only if the complication is recognized quickly. If the deformity has been in existence for some time, a stepwise surgical repair is indicated, using any combination of soft tissue and osseous procedures.

When addressing a varus correction, the soft tissues around the first metatarsophalangeal joint should first be evaluated to determine their influence in creating and maintaining the deformity. The medial capsule should be opened in such a manner as to allow for lengthening and closure, as seen with the V-to-Y or U-flap techniques. A contracted extensor hallucis longus tendon should be lengthened by Z-plasty, and a medially inserted abductor hallucis should be released, lengthened, or transferred laterally. Transecting the deep transverse intermetatarsal ligaments or freeing up its remaining scar will allow for better assessment of first metatarsal flexibility. The lateral joint capsule should be tightened on closure with excision of any redundant tissue. In some cases, total degloving of the first metatarsal head may be necessary to release long-standing adhesions.

Soft tissue corrections alone usually are not sufficient for complete repair. The shape, condition, and position of the first metatarsal must be evaluated. Metatarsals that have been staked or joints which have significant cartilage erosion may be corrected by Keller, implant arthroplasty, or joint fusion procedures. A technique of choice will be determined by the patient's age, activity level, and bone quality. When an implant arthroplasty is being considered, joint stability must be thoroughly evaluated. Implants, by design, are meant only to act as joint spacers and therefore they will not stand up to abnormal biomechanical forces over time.

If the tibial sesamoid is dislocated medially, transferring the adductor hallucis tendon laterally to derotate the apparatus may be attempted. If it cannot be relocated back under the first metatarsal head, the tibial sesamoid should be removed and the interphalangeal joint arthrodesed. The extensor hallucis longus tendon may also be split or transferred in toto to attempt joint realignment. The tendon can be routed deep to the deep transverse intermetatarsal ligament and anchored into the lateral base of the proximal phalanx.

Osseous correction of a negative intermetatarsal angle may be achieved by a reverse distal metaphyseal or reverse base wedge osteotomy, depending on the degree of deformity. A reverse Reverdin-type procedure may be used to correct an abnormal proximal articular set angle, and other osseous deformities of the proximal phalanx may be addressed by Akin or reverse Akin osteotomies.[16,25]

As has been discussed, a sequential approach in the treatment of hallux varus is essential. The reduction must be based on the clinical and radiographic evaluation of the patient. Without appropriate evaluation, procedures may be undertaken that either will not reduce the deformity or will result in recurrence.

REFERENCES

1. Banks AS, Ruch JA, Kalish SR: Surgical repair of hallux varus. J Am Podiatr Med Assoc 78:339, 1988
2. Campbell's Operative Orthopedics. Vol. 2, 7th Ed. CV Mosby, St. Louis, 1986
3. Neil MJ, Conacher O: Bilateral delta phalanx of the proximal phalanges of the great toes. A report on an affected family. J Bone Joint Surg Br 66:77-80, 1984
4. Thomson SA: Hallux varus and metatarsus varus. A five year study. Clin Orthop 16:109, 1960
5. Haas SL: An operation for correction of hallux varus. J Bone Joint Surg Am 20:705, 1938
6. Bilotti MA, Caprioli R, Testa J, Cournoyer R Jr., Esposito FJ: Reverse Austin osteotomy for correction of hallux varus. J Foot Surg 26:51, 1987
7. Jahss MH, Nelson J: Duplication of the hallux. Foot Ankle 5:26, 1984
8. Horwitz MT: Unusual hallux varus deformity and its surgical correction. (Case report.) J Bone Joint Surg Am 19A, 1937
9. Jahss MH: Spontaneous hallux varus: relation to poliomyelitis and congenital absence of the fibular sesamoid. Foot Ankle 3:224, 1983
10. Mills JA, Menelaus MB: Hallux varus. J Bone Joint Surg Br 71:437, 1989
11. Greenfogel SI, Glubo S, Werner J, Sherman M, Lenet M: Hallux varus—surgical correction and review of literature. J Foot Surg 23:46, 1984
12. Joseph B, Jacob T, Chacko V: Hallux varus—study of thirty cases. J Foot Surg 23:392, 1984
13. Hunter WN, Wasiak GA: Traumatic hallux varus correction via split extensor tenodesis. J Foot Surg 23:321, 1984
14. Joseph B, Chacko V, Abraham T, Jacob M: Pathomechanics of congenital and acquired hallux varus: a clinical and anatomical study. Foot Ankle 8:137, 1987
15. Mullis DL, Miller WE: A disabling sports injury of the great toe. Foot Ankle 1:22, 1980
16. Hawkins FB: Acquired hallux varus: cause, prevention and correction. Clin Orthop 76:169, 1971
17. Janis LR, Donick II: The etiology of hallux varus: a review. J Am Podiatry Assoc 65:233, 1975
18. Feinstein MH, Brown HN: Hallux adductus as a surgical complication. J Foot Surg 19:207, 1980
19. Midkiff LC: Surgical hallux varus reduction. J Am Podiatry Assoc 64:160, 1974
20. Miller JW: Acquired hallux varus: a preventable and correctable disorder. J Bone Joint Surg Am 57:183, 1975
21. Johnson KA, Spiegl PV: Extensor hallucis longus transfer for hallux varus deformity. J Bone Joint Surg Am 66:681, 1984
22. Turner RS: Dynamic post-surgical hallux varus after lateral sesmoidectomy: treatment and prevention. Clin Orthop 9:963, 1986
23. Langford JH, Maxwell JR: A treatment for post-surgical hallux varus. J Am Podiatr Med Assoc 72:142, 1982
24. Zinsmeister BJ, Griffin JM, Edelman R: A biomechanical approach to hallux varus. J Am Podiatr Med Assoc 75:613, 1985
25. Wood WA: Acquired hallux varus: a new corrective procedure. J Foot Surg 20:194, 1981

SUGGESTED READINGS

Bateman JE: Pitfalls in forefoot surgery. Orthop Clin North Am 7:751, 1976

Harkless LB, Wallace GF: Clinics in Podiatric Medicine and Surgery; Complications of Foot Surgery. Vol. 8, No. 2. WB Saunders, 1991

Joplin RJ: Sling procedure for correction of splay-foot, metatarsus primus varus, and hallux valgus. J Bone Joint Surg Am 32:779, 1950

Joplin RJ: Follow-up notes on article previously published in the Journal Sling procedure for correction of splay-foot, metatarsus primus varus, and hallux valgus. J Bone Joint Surg Am 46:690, 1984

Kimizuka M, Miyanaga Y: The treatment of acquired hallux varus after the McBride procedure. J Foot Surg 19:135, 1980

Mann RA: Complications in surgery of the foot. Orthop Clin North Am 7:851, 1986

McGlamry ED, McGlamry R: Reconstructive Surgery of the Foot and Leg. Update '88. Podiatry Institute, 1988