CHAPTER **10**

HALLUX VARUS: Congenital vs. Acquired

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The hallux varus deformity is an extremely challenging, but rewarding deformity to treat. Both acquired and congenital forms of hallux varus exist. Acquired hallux varus is secondary to overcorrection of hallux valgus, and congenital hallux varus is observed at birth. Comparing the etiology and treatment of both forms gives a better understanding of the hallux varus deformity in general. The comparison stresses the variety of the presentation. It helps to identify the specific deforming force of that particular hallux varus case. As is common with most complex deformities, no single deformity is exactly the same as another.

A greater understanding of the deformity will improve the overall treatment of the deformity. In this paper both the acquired and congenital forms of deformity will be reviewed, through the use of clinically illustrated case histories.

ETIOLOGY

Acquired hallux varus is an uncommon complication following the correction of hallux valgus (Fig. 1). The deformity can be noticed immediately postoperatively, or several months after the initial surgery. In a review of 1100 McBride bunionectomies, Janis and Donick reported the rate of acquired hallux varus to be 1.6%. Feinstein and Brown reported an occurrence rate of 1.1% in a review of 878 hallux valgus procedures of different varieties. The majority of these procedures were a McBride bunionectomy with a fibular sesamoidectomy.

Figure 1. Acquired hallux varus secondary to an aggressive base wedge osteotomy.

Several factors can play a role in creating an acquired hallux varus, including staking of the metatarsal head, excessive tightening of the medial capsule, excessive plantar lateral release, adductor tendon transfer, fibular sesamoidectomy, overcorrection of the intermetatarsal angle, overcorrection of the PASA, and aggressive postoperative bandaging. The lack of a sagittal groove or the presence of a round metatarsal head are also important contributing factors. It is often a combination of these factors that creates the deformity.

Congenital hallux varus is less common then the acquired type and is best addressed in infancy. If the deformity is not addressed or is undercorrected, the soft tissue imbalance will create osseous changes that will maintain the deformity into adulthood (Fig. 2).

Historically, congenital hallux varus has been classified into three types. The primary type involves a tight band of tissue which extends from the medial aspect of the base of the first metatarsal and inserts into the base of the proximal phalanx, pulling the toe to the midline. The tight band of tissue described in the early literature is probably the abductor halluces. The secondary type is associated with forefoot deformities (metatarsus adductus). The tertiary type is associated with severe skeletal abnormalities such as diastrophic dwarfism. Congenital hallux varus is not considered to be hereditary.

The greatest deforming factor in congenital hallux varus is the pull of the abductor halluces into the base of the proximal phalanx. This is more critical and has more of a tendency to result in the development of hallux varus when the pull is

Figure 2. Untreated congenital hallux varus. Note the negative PASA.

primarily medial. The insertion to the abductor halluces occurs at the medial aspect of the base of the proximal phalanx 20% of the time. It inserts into the plantar medial aspect of the base 80% of the time.

TREATMENT

Treatment of acquired hallux varus depends on the degree of severity of the deformity, and whether the deformity is symptomatic. Asymptomatic hallux varus is usually very flexible and not very severe. The tibial sesamoid is usually peaking but not dislocating over the medial aspect of the metatarsal head. These generally go untreated and are monitored for an extended period of time. Symptomatic hallux varus usually requires surgical intervention, and can involve soft tissue releases and tendon transfers, soft tissue procedures and osseous correction, or joint destructive procedures.

Congenital hallux varus cases are usually treated in infancy with manipulation, casting, and splinting. Cases which are resistant to conservative treatment are treated with abductor tendon releases and skin plasty techniques. Abductor halluces tenotomies are frequently performed with Heyman, Herndon, and Strong procedures in correction of a congenital hallux varus with concomitant metatarsus adductus. Congenital hallux varus cases which go untreated and are symptomatic will require soft tissue and osseous correction. If the patient is older and significant arthrosis has developed, joint destructive procedures may be considered.

In order to address each specific case and determine a surgical procedure it is necessary to carefully evaluate the deformity through preoperative and intraoperative assessment.

PREOPERATIVE ASSESSMENT

A proper preoperative assessment is critical in identifying deforming forces which have helped to create the deformity as well as identify those that maintain the deformity. Patient age, activity level and length of time that the varus has been present are important.

Clinical evaluation includes determining the amount of hallux adductus, flexibility or rigidity of the varus, the quality and quantity of the range of motion of the first metatarsophalangeal joint, presence of a flexion contracture of the interphalangeal joint (IPJ) and whether it is rigid or flexible. It will also include determining if there are any associated forefoot deformities such as digital adductus. Soft tissue adaptation will have occurred. The abductor halluces will have tightened and bowing and shortening of the extensor halluxis longus (EHL) tendon will have developed. Muscle tendon imbalance of the hallux will have created a flexion contracture at the IPJ, which leads to a cocked-up and dysfunctional hallux.

Radiographic evaluation will help to identify the following findings that can help to create hallux varus: presence or absence of the fibular sesamoid, peaking of the tibial sesamoid, arthrosis of the joint, staking of the metatarsal head, intermetatarsal angle, and PASA. The presence or absence of the fibular sesamoid plays a role in acquired hallux varus. The absence of the fibular sesamoid may make it difficult to obtain long-term correction with soft tissue procedures only. Even if the tibial sesamoid is relocated back underneath the metatarsal head via soft tissue releases and transfers, the soft tissue attachments (flexor halluces brevis) will be stronger on the medial side and will tend to gain mechanical advantage. This will cause a recurrence of the hallux varus.

Arthrosis of the joint needs to be identified to determine whether a joint destructive procedure will be required. A Keller, an implant arthroplasty, or an arthrodesis procedure are all viable options when long-term arthrosis is present.

It is important to evaluate the amount of articular surface remaining on the metatarsal head, to give an idea whether the sagittal groove is still present. Obviously, the lesser the amount, the more difficult it will be to reconstruct the joint so that the hallux will not slip off the side of the metatarsal head while dorsiflexing.

Over-correction of the IM angle is an uncommon cause of the acquired hallux varus. However the presence of this will usually require a reverse osteotomy for correction. In untreated congenital hallux varus cases, the author has noted a negative PASA. This would be created by osseous adaptation to the tight abductor halluces tendon.

INTRAOPERATIVE ASSESSMENT

Intraoperative assessment is required to properly correct hallux varus. A systematic and complete periarticular release of the joint is performed first. This will include release and tagging of the abductor halluces tendon, EHL lengthening, and complete medial and lateral release. After soft tissue release is performed, the foot is placed in a loaded position. The surgeon will identify whether the hallux still shifts into adductus. Then the hallux is placed through its range of motion and the surgeon checks to see whether the hallux drifts into adductus as it dorsiflexes. If this occurs, osseous procedures will need to be performed. Specific osseous procedures are determined depending on the specific situation. Quite commonly distal metatarsal head procedures will provide adequate correction. Joint destructive procedures are performed on elderly inactive patients, in the case of severe joint instability, or in cases where an osseous procedure could not be successfully performed.

CASE HISTORIES

Case History #1

A 39-year-old active female was seen with a chief complaint of pain in the first metatarsophalangeal joint. She also related that pain occurred along the medial aspect of the left great toe when she wore shoes. The patient's history included a juvenile hallux valgus deformity that was surgically corrected 25 years previously using a true McBride and an opening wedge osteotomy of the first metatarsal. The patient recalled that her great toe turned inward immediately after the procedure, and has become worse over the past several years.

The clinical examination revealed a non-reducible hallux varus deformity (Fig. 3A). Crepitus was noted on the medial aspect of the joint during range of motion testing. The hallux was cocked up with a flexible flexor contraction of the interphalangeal joint. Radiographs revealed a staked first metatarsal head, a medial dislocation of the hallux, medial peaking of the tibial sesamoid, and the absence of the fibular sesamoid (Fig. 3B). The

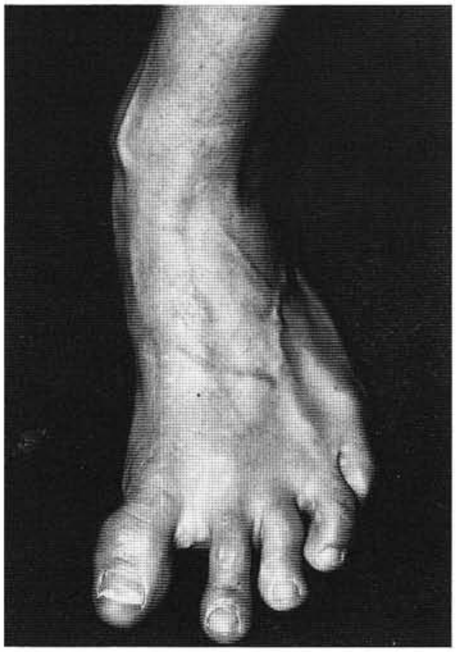

Figure 3A. Clinical appearance of case #1.

Figure 3B. Radiographic appearance of case #1.

intermetatarsal angle was approximately 5 degrees. Conservative therapy had failed and the patient desired surgical correction.

The goal of the procedure was to correct the deformity and maintain motion of the joint. The difficulty however with maintaining the motion was in preventing recurrence. With the fibular sesamoid absent and the sagittal groove compromised from the staked metatarsal head, it was somewhat questionable whether the joint could be realistically reconstructed and the joint motion maintained over the long-term. It was determined that in order to reconstruct the joint, the joint would have to be realigned by an osteotomy of the first metatarsal head and the deforming forces negated by tendon balance techniques. If this could not be accomplished, an arthrodesis or an implant arthroplasty would be required. Obviously, these were not the desired procedures because of the young age and activity level of the patient. It was decided to attempt a distal osteotomy with tendon re-balancing first and perform a salvage procedure at a later date if needed.

A dorso-medial approach was used. The abductor tendon was released and tagged for later transfer to the lateral capsule (Fig. 4). A "Z" length-

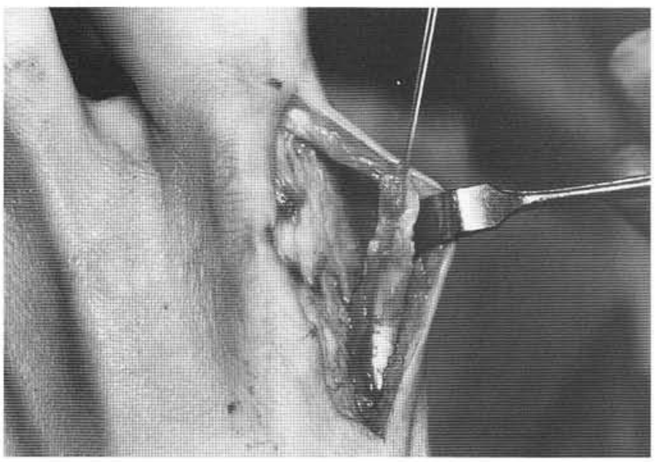

Figure 4. Abductor tendon is detached from the base of the proximal phalanx and tagged for later transfer.

ening of the long hallux extensor was performed (Fig. 5). Inspection of the joint revealed significant erosion of the dorsal medial aspect of the first metatarsal head, and the absence of a sagittal groove (Figs. 6A, 6B). A reverse Austin osteotomy was performed and temporarily fixated to translocate the first metatarsal head medially and correct the varus. Upon loading the forefoot, the

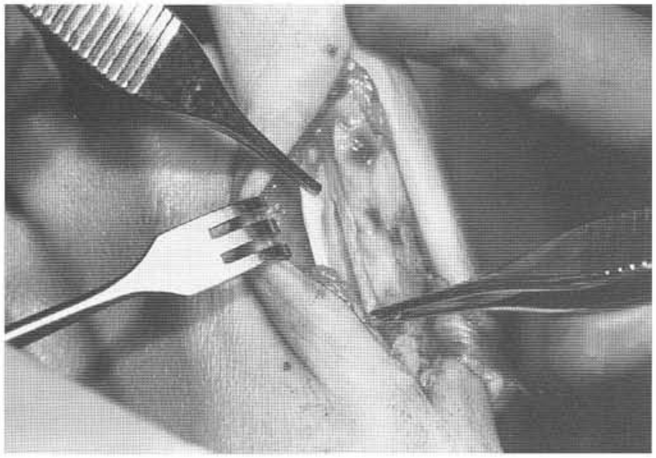

Figure 5. "Z" lengthening of the long extensor tendon is performed.

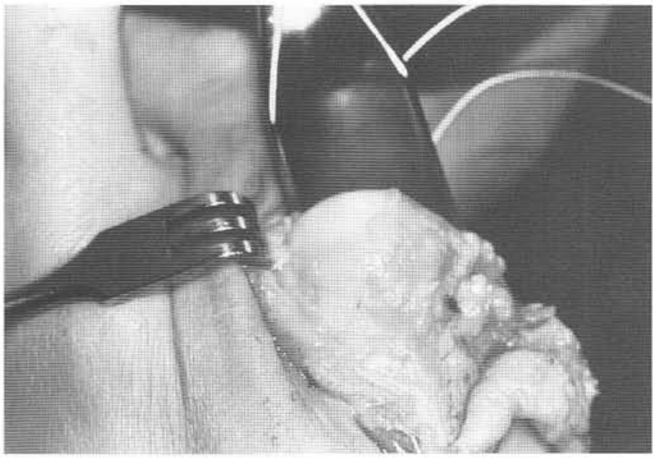

Figure 6A. Intraoperative view of the metatarsal head. Note the degenerative changes at the dorso-medial aspect.

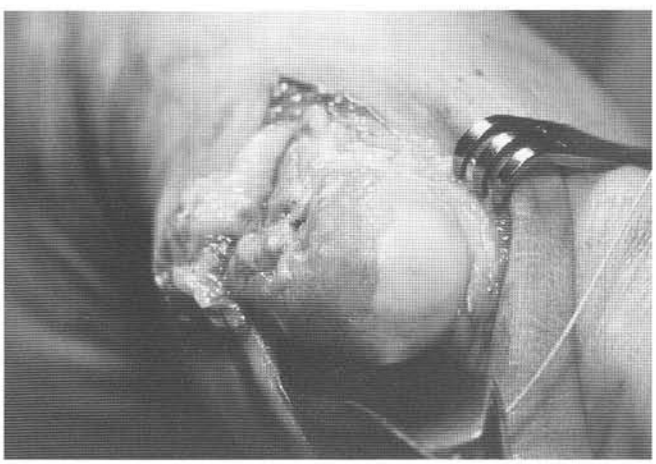

Figure 6B. Degenerative changes are apparent at the dorso-medial aspect.

hallux was rectus, but when dorsiflexing the hallux the varus deformity was apparent. This deformity was demonstrated by an intraoperative radiograph with the hallux dorsiflexed (Fig. 7). Note that the hallux is adducted and the tibial sesamoid is peaking medially. This was because the dorsal medial aspect of the first metatarsal head was absent as a result of the previous surgery. Another factor was that the joint cartilage of the metatarsal and the proximal phalanx were not in alignment. It appeared that a high PASA angle in the previous surgery was not addressed.

Figure 7. Intraoperative radiograph revealing temporary fixation after a reverse Austin osteotomy. This was used to identify the sesamoid position on hallux dorsiflexion. Note that the sesamoid is still peaking medially, and that the hallux is still in a varus orientation when dorsiflexed.

In order to realign the joint cartilage, a wedge of bone with a medial base and a lateral apex was resected from the plantar portion of the proximal segment (Figs. 8A, 8B). Removal of this wedge realigned the joint but also caused a relative increase in the dorsal medial aspect of the first metatarsal head. The hallux did not have as much tendency to drift into varus during dorsiflexion as demonstrated by the intraoperative radiograph (Fig. 9). Note that the hallux is realigned in a rectus position and the tibial sesamoid is in a better position. Permanent fixation was then inserted. A 0.062 inch K-wire was placed across the

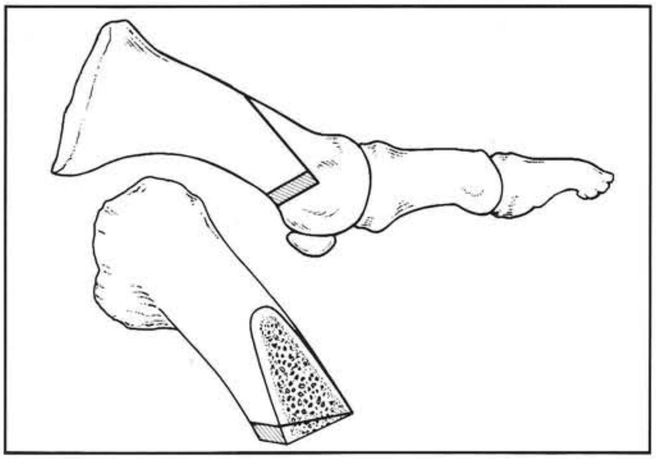

Figure 8A. The wedge of bone resected from the plantar proximal aspect of the Austin osteotomy.

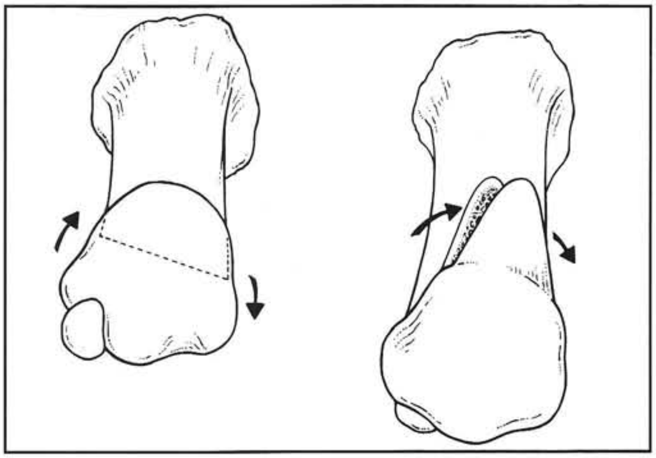

Figure 8B. Note the frontal plane correction secondary to wedge removal with the transverse plane correction of PASA.

metatarsophalangeal joint in a over-corrected position to allow the capsular tissue to adapt (Fig. 10). The abductor tendon was rerouted laterally underneath the long extensor and sutured into the lateral joint capsule. The extensor tendon was reapproximated at its lengthened position, and final wound closure was performed.

The postoperative management consisted of two weeks of non-weight bearing in a surgical shoe. The wire was then removed, and weight-bearing in a surgical shoe was initiated. The patient was able to ambulate in sneakers in three-and-a-half weeks. Consolidation of the osteotomy was noted at six weeks. The patient is currently one year postoperative, and the correction has been maintained (Figs. 11, 12). This case exemplifies the complexity of the acquired hallux varus deformity.

Figure 9. Intraoperative radiograph with hallux dorsiflexion following removal of a wedge to correct PASA. The hallux alignment and tibial sesamoid position have improved.

Figure 10. Postoperative radiograph reveals final fixation with a 0.062 K-wire across the joint, holding it in an over-corrected position.

Figure 11. Radiographic appearance, one year postoperative.

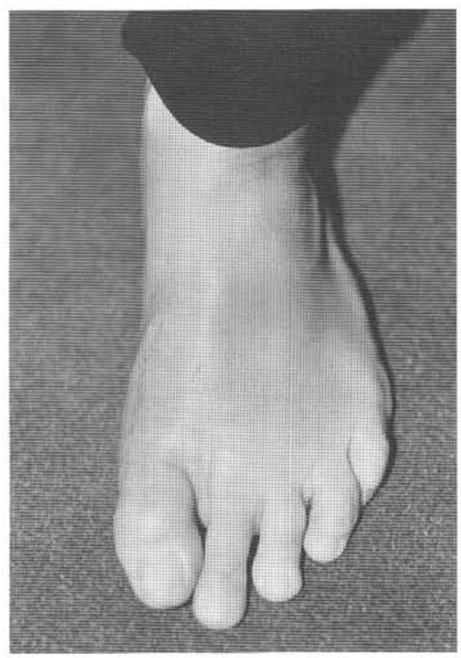

Figure 12. Clinical appearance, one year postoperative.

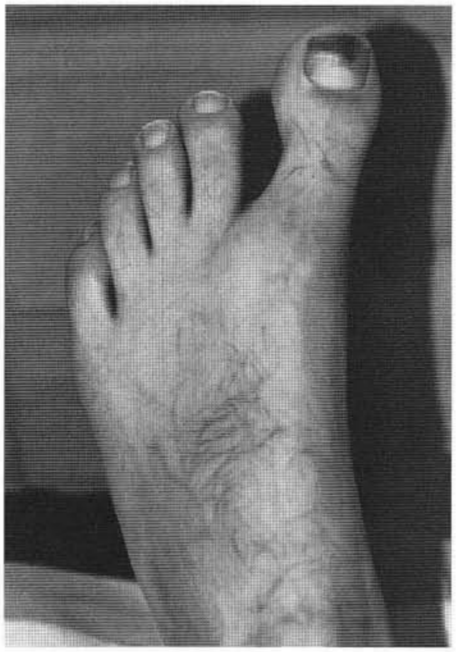

Figure 13A. Clinical appearance of case #2.

Figure 13B. Preoperative radiograph of case #2.

Case History #2

A thirty-eight-year-old white male presented with a chief complaint of a painful left great toe. He injured the toe when running after his young son. The patient stated that both great toes had always pointed inward, but since the injury, the left great toe turned inward to a greater degree.

Clinical examination revealed abnormally long halluces, and bilateral hallux adductus with the left being more significant than the right (Fig. 13A). No significant contraction was present at the interphalangeal joint. First metatarsophalangeal joint motion was decreased, but without crepitus. Standard radiographs showed an elongated first metatarsal, peaking of the tibial sesamoid, and a high negative PASA (Fig. 13B).

The goal of the procedure was to correct the hallux varus and increase first metatarsophalangeal motion. The primary deforming force was deemed to be the elongated first metatarsal and the negative PASA. It was decided to perform a Green-Watermann type osteotomy to shorten the metatarsal and correct the PASA.

Soft tissue releases were performed (Fig 14). A Green-Watermann osteotomy was performed. The osteotomy was fixated with 3.5 cortical screw (Figs. 15A, 15B). It was noted that the only thing interfering with total reduction of the varus was lateral soft tissue hypertrophy of the great toe (Fig. 16). The hypertrophy was an adaptation of the

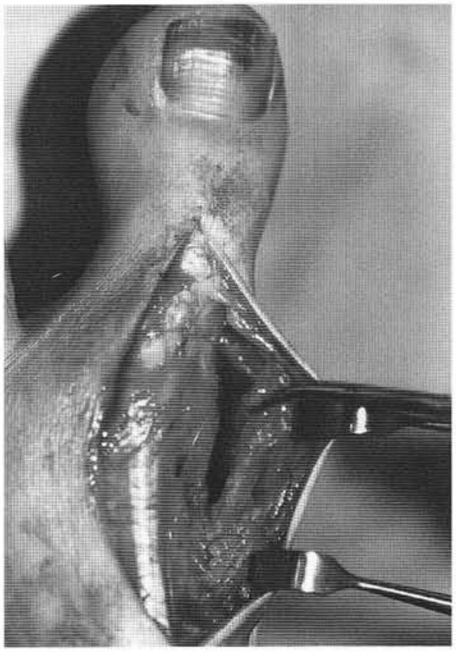

Figure 14. Abductor tendon is tagged for later transfer to the lateral capsule.

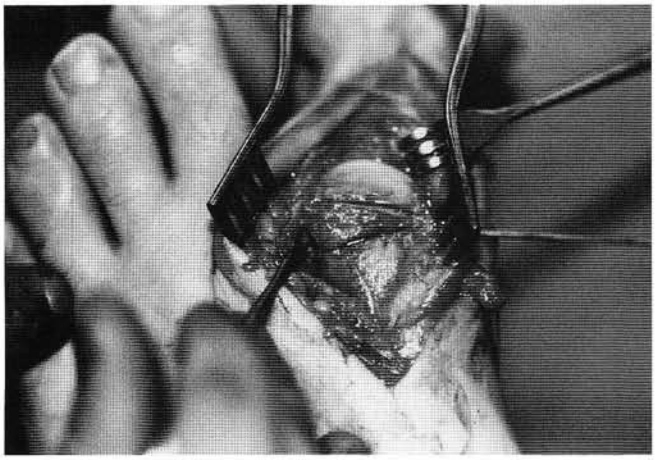

Figure 15A. Dorsal view of the Green-Watermann osteotomy. Note the clinical negative PASA.

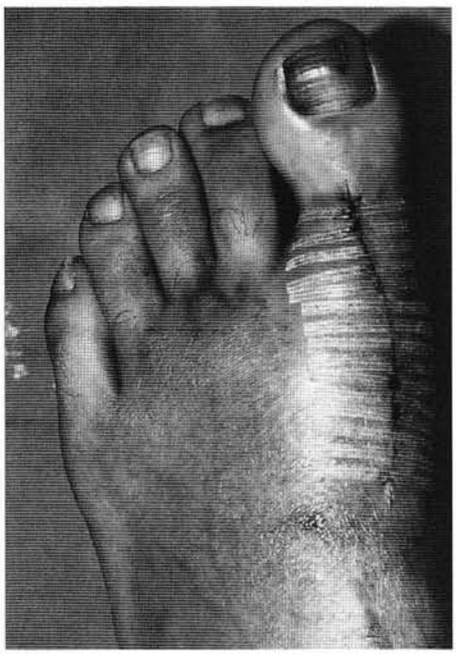

Figure 16. Postoperative clinical view reveals lateral soft tissue hypertrophy which prevents total reduction of varus.

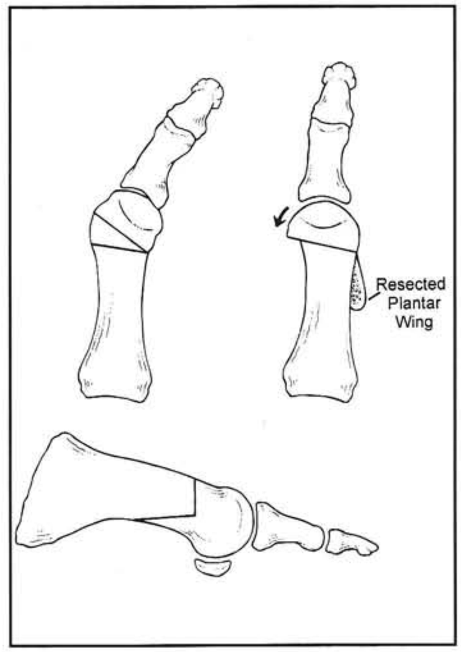

Figure 15B. Illustration of osteotomy. Note medial aspect of plantar wing which is excised.

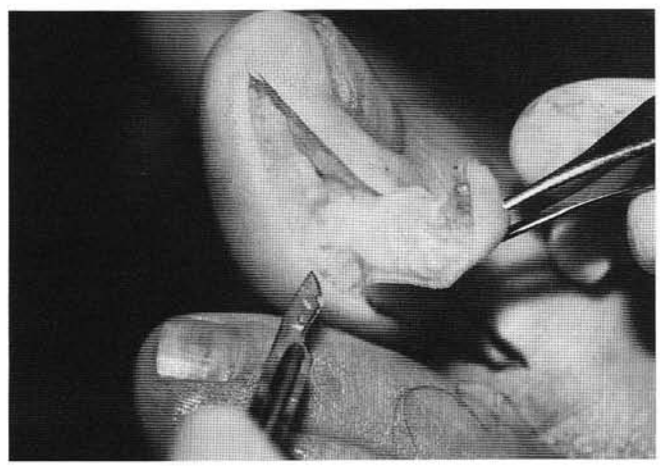

Figure 17. A lateral wedge of skin is excised for better correction.

long-term varus position. A wedge of skin was excised from the lateral aspect of the hallux to allow the hallux position to be rectus (Fig. 17). Final radiographs revealed correction of the PASA, and a normal metatarsal parabola (Figs. 18A-18C). The patient was partial weight-bearing for one week followed by a gradual increase to full weight-bearing. He was full weight-bearing in a sneaker in three weeks due to the stability of the osteotomy. First metatarsophalangeal motion has improved since the procedure.

CONCLUSION

Acquired and congenital hallux varus cases have a similar presentation but different etiology. Therefore correction varies according to specific deforming forces which have been identified.

Figure 18A Postoperative view after removal of lateral tissue wedge.

Figure 18B. Postoperative radiograph, dorsal-plantar view.

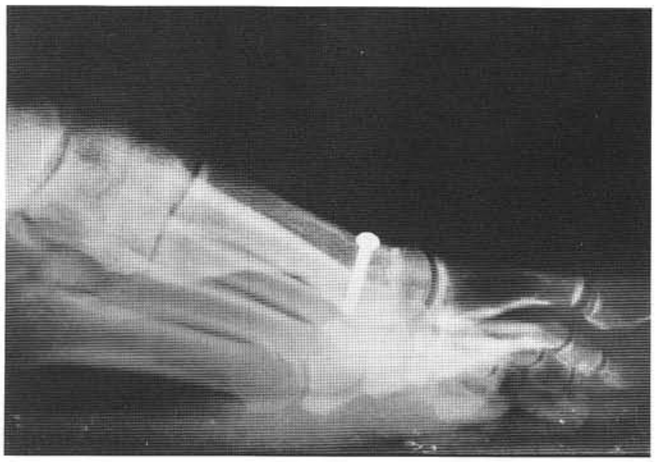

Figure 18C. Postoperative radiograph, lateral view.

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