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Hohmann Osteotomy

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Osteotomy for hallux valgus in the 1990s has evolved from those procedures of simple design with inadequate or no fixation to extremely complex osteotomies designed to allow relatively straightforward internal screw fixation.¹⁻³ The Hohmann osteotomy is an efficacious time-proven procedure for the correction of hallux valgus that has progressed with our concepts of rigid internal fixation to yield an important procedure in today's surgical armamentarium.^{1,4}

Hohmann recognized the potential to address deformity on more than one cardinal body plane.⁵⁻¹⁰ Most procedures were attempts to correct only one aspect of the deformity. For example, the Reverdin operation utilized wedge resection within the metatarsal head to reduce the valgus or abduction of the great toe while the Mitchell procedure shifted the metatarsal head laterally to reduce splaying of the first metatarsal.¹¹⁻¹²

Kelikian called the Hohmann procedure a dual-plane displacement osteotomy,¹³ as Hohmann described both lateral and plantar displacement. The addition of a medially based trapezoidal wedge allows for reduction of hallucal abduction as well as for reduction of metatarsus primus varus or elevatus corresponding to lateral or plantar shift of the capital fragment.

Variations of the Hohmann procedure have been used in cases of hallux valgus and hallux valgus rigidus with good success. Although originally described as a trapezoidal osteotomy, this osteotomy has undergone several modifications or versions in the literature. The British literature somewhat confuses a number of these distal osteotomies as being much the same. Turnbull and Grange referred to Peabody or Mitchell modifications of this procedure as well as drawing similarities between the Hohmann and Wilson osteot-

omies.¹⁴⁻¹⁷ Grace et al. described an osteotomy and labeled it a Hohmann; however, it appears to be more akin to a Peabody.¹⁸

The Hohmann osteotomy to be discussed is also performed as a closing-wedge-type procedure similar to the Peabody¹⁵ or Barker,¹⁷ performed obliquely although not to the same degree as a Wilson,^{16,19} but with transposition of the capital fragment much as described by Hohmann²⁰ (Fig. 13-1). These are somewhat different osteotomies with a certain variation between authors. The orientation of the osteotomies and their potential for correcting various aspects of a hallux valgus deformity does vary as well as their potential complications.²¹ The Mitchell osteotomy is associated with a greater amount of shortening than are the Hohmann- or Wilson-type osteotomies.^{22,23}

THE OSTEOTOMY

The Hohmann osteotomy was originally described as an extra-articular osteotomy,⁵⁻¹⁰ although today it is usually performed in conjunction with other procedures, for example, capsule tendon balance of the first metatarsophalangeal joint. The osteotomy itself is usually performed as a closing-wedge-type osteotomy in the first metatarsal neck.

The transverse plane orientation of the osteotomy in relationship to the long axis of the second metatarsal determines whether the first metatarsal will shorten or lengthen as a result of the lateral transposition of the capital fragment (Fig. 13-2). The Hohmann osteotomy has been effective particularly in its ability to reduce lateral adaptation of the articular surface of the first metatarsal or the proximal articular set angle

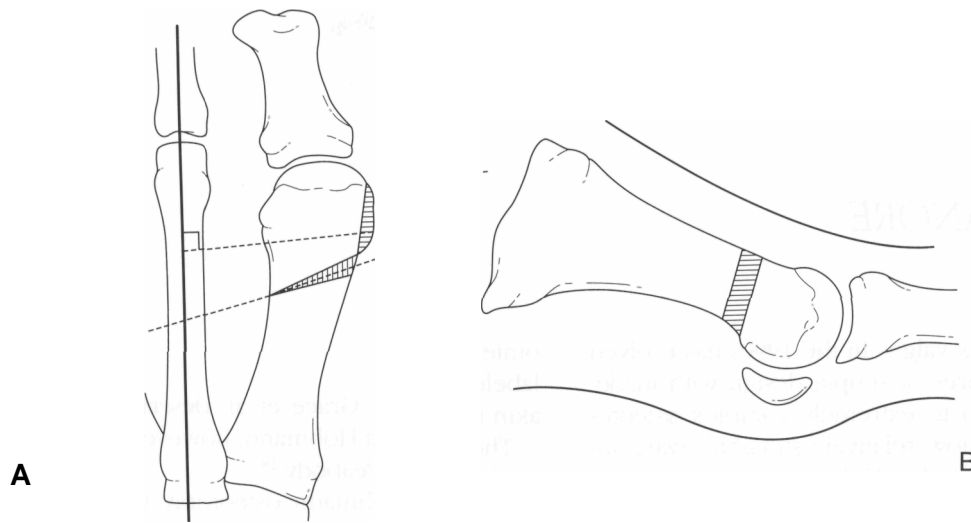


Fig. 13-1. (A & B) The proposed modified Hohmann osteotomy is generally performed as a closing-wedge or medially based cuneiform osteotomy in the metatarsal neck.

(PASA). If this is elevated, the surgeon may reduce the PASA through a medially based, cuneiform-shaped osteotomy. If the PASA is within normal limits, the osteotomy is performed as an oblique single cut.

After removal of the medial wedge of bone, the lateral hinge is feathered, and the osteotomy is then

completed so as to provide optimal bone-to-bone contact. Whether a wedge of bone is removed or simply a solitary osteotomy is performed, the osteotomy is completed through the lateral cortex. This allows for transpositional and rotational movements of the capital fragment (Fig. 13-3). Lateral transposition moves

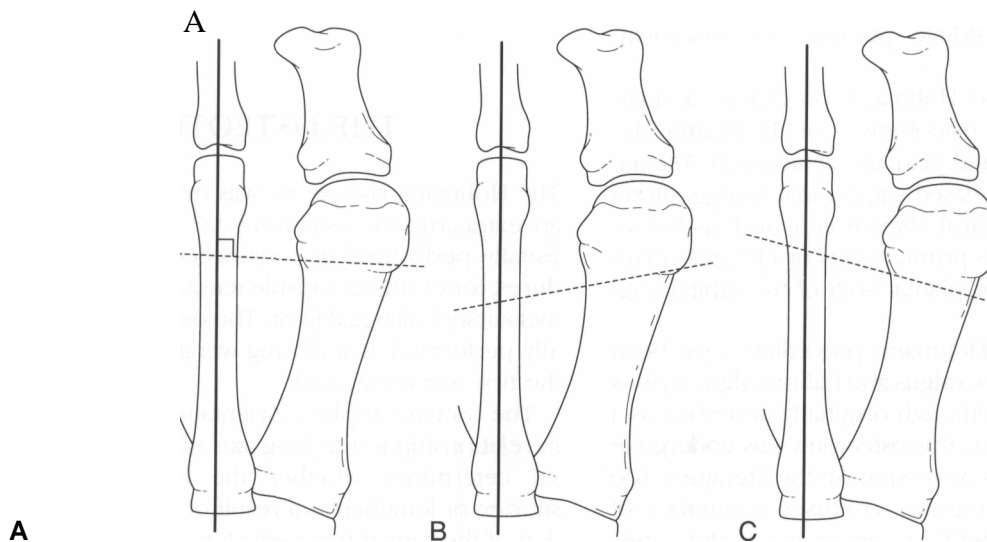


Fig. 13-2. Axis of the osteotomy. (A) An osteotomy perpendicular to the long axis of the second metatarsal will neither lengthen nor shorten the first metatarsal. An osteotomy therefore may be designed to either shorten (B) or lengthen (C) the first metatarsal.

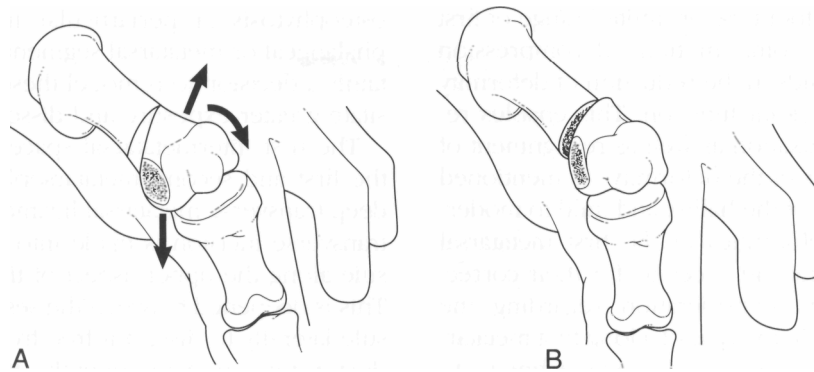


Fig. 13-3. Displacements of the osteotomy. **(A)** Reduction of PASA and plantar flexion. **(B)** The capital fragment may be transposed laterally to reduce intermetatarsal angle, rotated to correct axial rotation, or transposed plantarly to improve the sagittal plane alignment of the first metatarsal. In addition to removal of a medial wedge to correct cartilage adaptation, these displacements give the Hohmann osteotomy the potential of significant multi-planar correction of a hallux valgus deformity. The Hohmann may also be utilized as a shortening osteotomy to provide joint decompression through linear reduction of the first metatarsal.

the first metatarsal head closer to the second, thereby achieving a relative reduction of the intermetatarsal angle. The osteotomy is usually performed so that some shortening of the first metatarsal will accompany lateral shift. Shortening of the metatarsal segment will provide decompression of the first metatarsophalangeal joint.

The capital fragment may also be transposed plantarly. This is desirable in cases of mild to moderate metatarsus primus elevatus or to compensate for the shortening that may have occurred. Caution is recommended as both lateral and plantar transposition may significantly reduce bony contact between the metatarsal head and shaft. The capital fragment may also be rotated in the frontal plane before fixation to accomplish reduction of hallucal axial rotation or an oblique range of motion. It is recommended that the toe be placed through a range of motion before preliminary fixation. Adequate and good-quality range of sagittal plane motion is an objective (See Fig. 13-3.)

OBJECTIVES

The goals of surgery are correction of the hallux valgus deformity and restoration of a functional and pain-free first metatarsophalangeal joint. This procedure is indicated in cases of moderate to severe hallux

valgus where specific osseous abnormalities must be addressed (Table 13-1). The procedure is particularly beneficial in the reduction of the PASA and intermetatarsal angles to as much as 18 degrees. Indications are as follows:

Hallux Valgus

moderate to severe deformity
particularly efficacious in cases of very high PASA
the more flexible the foot, the greater the potential for transverse plane correction (intermetatarsal and hallux abductus angles).

Recurrent Hallux Valgus

excellent procedure in cases of revision surgery;
allows for multisegmental correction

Hallux Valgus Rigidus

in cases of combined deformity, particularly a mild deformity in a rigid foot type; use as a decompression osteotomy

Table 13-1. Hohmann Osteotomy for Hallux Valgus

Segment of Deformity	Corrective Maneuver
Elevated PASA	Medial wedge
Tight joint	Shorten
Elevatus or short first metatarsal	Plantar-flex
Valgus (axial) rotation	Rotation of capital fragment

In cases of a rigid foot type or limited range of first metatarsophalangeal joint motion, decompression through shortening aids in the reduction of deformity and improvement of joint function. This enables reduction of joint subluxation as well as realignment of the osseous segments of the deformity. As mentioned earlier, axial rotation of the hallux and mild to moderate sagittal plane deformities of the first metatarsal may be addressed, and the necessity for their correction is an important consideration regarding the choice of procedure. In the case of a long first metatarsal with an index plus, this is an excellent technique to reduce its length.

Our use of the Hohmann osteotomy is similar to the objectives of the derotational, angulational, transpositional osteotomy (DRATO) by Johnson and Smith²⁴; that is, multiplanar correction with a single osteotomy. The Hohmann osteotomy for hallux valgus is always performed in conjunction with soft tissue components of capsule/tendon balance, which may include medial capsulotomy and capsulorrhaphy, lateral release, and fibular sesamoidectomy or adductor transfer, in addition to removal of the medial eminence.

SURGICAL TECHNIQUE

The procedure may be performed from a medial or dorsal longitudinal incision. The dorsomedial approach is preferred, as it allows for greater ease of first intermetatarsal space exposure.

In cases with a very large medial eminence or a large hallux abductus, a significant amount of capsule is removed with the capsulotomy. This may be performed either with a lenticular capsulotomy, which is my preference, or with an inverted L, in which a section of capsule is then removed from the vertical arm.

The lenticular capsulotomy allows expedient and adequate exposure to the first metatarsal for performance of the osteotomy and its fixation. Subperiosteal dissection is carried out dorsally and medially with severing of the medial collateral ligaments. A screw will be placed from the dorsal cortex of the first metatarsal, and therefore this area is included in the dissection. Consideration must be given for the potential of avascular necrosis with distal first metatarsal osteotomies, and thus no dissection of the plantar or lateral aspects of the metatarsal is performed at this time. If

osteophytosis or periarticular lipping of either the phalangeal or metatarsal segment is present, then certainly a decision to remodel these areas would necessitate greater exposure and dissection.

The first intermetatarsal space is entered between the first and second metatarsophalangeal joints. The deep transverse metatarsal ligament is severed. A long transverse incision is made into the lateral joint capsule along the upper aspect of the sesamoidal bulge. This is deepened between the sesamoid and joint capsule laterally to dissect it free from the conjoined adductor tendon. Subsequently, the fibular sesamoid may be systematically released through severing its proximal and distal attachments to the lateral head of the flexor hallucis brevis and oblique head of adductor hallucis tendon/aponeurosis. The conjoined tendon is usually left undisturbed from its insertion into the lateral aspect of the proximal phalanx. If an adductor transfer is deemed necessary, it may be dissected free at this time. On occasion, the fibular sesamoid may be completely excised in the presence of severe deformity or degenerative changes. Symptoms associated with the sesamoids should be assessed preoperatively.

The medial eminence of the first metatarsal is resected. Caution should be taken with removal of the bump, erring on the side of less resection. The medial eminence is usually resected slightly oblique in the coronal plane so that the tibial sesamoidal groove is left intact plantarly. The osteotomy is then marked on the bone with an osteotome and mallet before its actual performance to allow assessment of the geometry of the cuts. The osteotomy is made in a cuneiform orientation with the base medially. The most distal cut begins just behind the tibial sesamoid, and the second is proximal enough to correct the lateral adaptation of the articular surface. The lateral apex is oriented somewhat proximal so that some degree of shortening will occur with lateral shift of the capital fragment. As is the use of a medially based wedge, this is a patient-dependent variable and must be assessed individually.

Before the actual performance of the osteotomy, some additional dissection is required. Lateral and plantar subperiosteal dissection is performed at the exact site of the marked osteotomy. Usually only the width of a # 15 blade is all the dissection that is necessary, in an effort to preserve the vascular integrity of the first metatarsal head. The osteotomy is then begun

perpendicular to the medial resected surface at both the proximal and distal arms of the wedge. Once the osteotomy is begun the cuts may be redirected proximally as outlined or marked on the bone. (This just helps to ensure the desired amount of bone is removed.) The wedge is completed before the lateral cortex so that the hinge may be "feathered" to allow flush apposition of the cut surfaces after cutting through the lateral cortex. As a result of even slight shortening, decompression of the joint and displacement (lateral or plantar) of the capital fragment is accomplished quite readily.

Frontal plane position is determined by placing the toe through a range of motion, thus aligning the toe and its excursion of motion in the sagittal plane. This usually involves varus rotation of the capital fragment.

This osteotomy must be fixated. Indications are as follows:

Correction of moderate to high PASA
Correction of hallucal axial rotation
Good technique for shortening the first metatarsal joint decompression
Revision bunion surgery
Hallux abductus valgus or hallux valgus rigidus (rigid foot type, metatarsus adductus)

The osteosynthesis provides stability to achieve osseous union, but more importantly rigid internal fixation should maintain the optimal position of the osseous fragments in correction until union is achieved. For the Hohmann, this is usually in the form of screw fixation. A cancellous screw from the dorsal surface of the metatarsal shaft directed in a distal and plantar direction is the preferred fixation (Table 13-2). There are numerous variations of the exact direction of the screw, the screw utilized, and the technique, but the principles of interfragmentary compression with a lag technique are followed (Fig. 13-4). Generally a partially threaded screw is chosen that purchases only the cancellous bone of the capital fragment. The lag geometry of the screw draws the capital fragment into or up against the shaft tightly so that there is no movement between the two. In addition to an interfragmentary screw, a second point of fixation is recommended as this is a through-and-through planar osteotomy. This second point of fixation will protect the screw from rotatory and potentially disruptive forces. A 0.062-in.

Table 13-2. Hohmann First Metatarsal Osteotomy with 4.0-mm Cancellous Screw

Preliminary fixation

Place a 0.045-in. Kirschner wire from the medioplantar aspect of metatarsal proximal to the osteotomy and drive the wire in a distal and dorsal direction.

Pilot hole

A 2.0-mm twist drill is utilized; the hole is begun 15 mm proximal to the osteotomy and in the center of the metatarsal shaft; the hole is drilled in a plantar-lateral direction.

Countersink

Performed with a 5.5-mm oval side cutting burr; the countersinking must be coaxial; performed in the *same* direction as pilot hole and *only* of the proximal cortex.

A trough is created in the dorsal cortex that allows oblique insertion of the screw.

Depth measurement

Utilizing a small fragment depth gauge, or preferably use a 0.045-in. K-wire.

The K-wire is inserted dorsally through the pilot hole entirely through the metatarsal head.

The base of the proximal phalanx is plantar flexed, and then abutted against the metatarsal head; this will push the K-wire proximal until it is flush with the articular surface.

Clamp the wire with a curved stat at the bone edge within the dorsal trough; remove the wire still clamped, and measure it against a ruler.

Tap

The 3.5-mm diameter, 1.75-mm pitch tap is utilized.

Insertion of the 4.0 mm cancellous screw'

Usually the exact screw length as measured (or 1 mm less if odd size) is inserted while maintaining retrograde pressure on the capital fragment. The screws most commonly used are 28- and 30-mm; range: 26-38 mm.

Removal of preliminary fixation

The K-wire used for initial fixation is removed.

Two-point fixation

A 0.062-in. K-wire is inserted from proximal lateral to medial plantar to provide rotatory stability and further rigidity of fixation.

Resection of the medial prominence of first metatarsal

The overhanging ledge of metatarsal shaft is resected flush with medial shaft

Lavage, check of fixation, wound closure

Copious wound lavage/irrigation.

Recheck screw tightness and rigidity of fixation.

Kirschner wire is usually used as the neutralization pin described. The exact technique of osteosynthesis is further described by means of the illustrations of Fig. 13-4. Large deformities often require capsuloplasties or an adductor transfer. Once the osteotomy is fixated, the necessity for additional capsule tendon procedures can be evaluated.

Avoidance of unrestricted weight-bearing is essential to maintaining the integrity and compression of the osteosynthesis. Functional bracing in the form of a

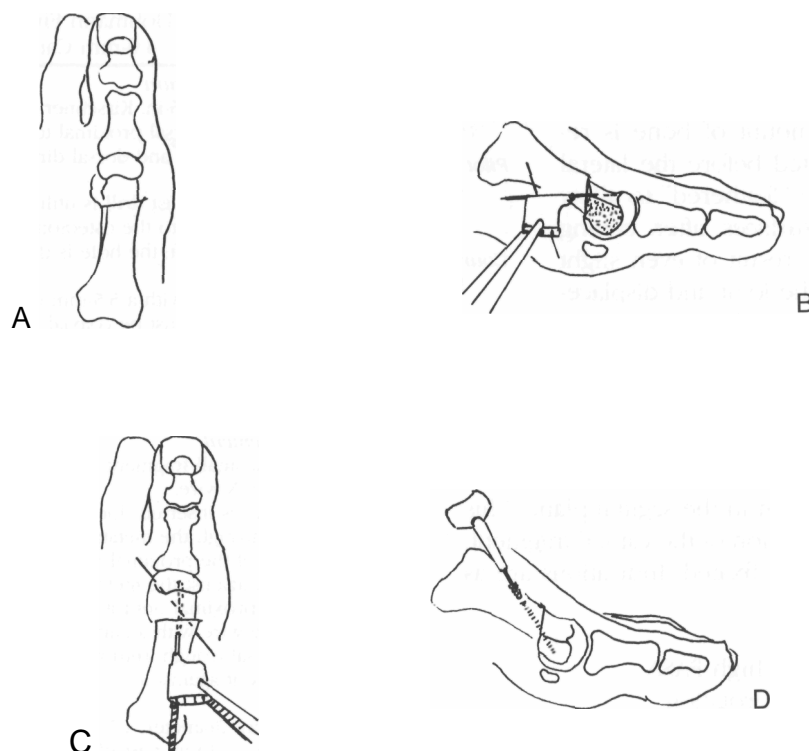


Fig. 13-4. Technique of internal fixation. (See also Table 13-2.) (A) Performance of the osteotomy. (B) Preliminary fixation. (C) Pilot hole (equivalent to screw core diameter). (D) Countersink. (*Figure continues.*)

below-knee walker is recommended. This is used by the patient for 4 to 6 weeks until the osteotomy is clinically solid and edema has resolved. The Kirschner wire is usually removed at 3 to 4 weeks postoperative when little or no dressing is required. The use of bracing offers the advantage of early range of motion of the joint reconstruction while allowing for easy dressing changes and wound care. A below-knee cast is certainly an alternative but is not conducive to postoperative rehabilitation.

The patient is usually able to put on a pair of gym shoes immediately when coming out of the brace. Initially, it is better to wean the patient from the immobilization device by first allowing use of the gym shoes around the house. Ambulation and activities should be guarded until approximately 6 weeks postoperative. Radiographs are recommended at 2 and 6 weeks, and at 3 months, postoperatively. If any resorption is noted at the 6-week radiograph, an unstable osteosynthesis is

indicated and the patient should be followed closely until osseous union is observed (Fig. 13-5).

RESULTS

Grace et al.¹⁸ noted loss of position of the Wilson osteotomy in 10 of 31 feet; no internal fixation was utilized. This did not occur with the Hohmann, which was fixated with a Kirschner wire. They acknowledged that neither of the original authors utilized any fixation even though the osteotomies are inherently unstable. Pedobarographic analysis demonstrated increased loading of the lateral metatarsals following either of these osteotomies. Grace et al. also cautioned use of the Hohmann procedure in older patients with preexisting osteoarthritic findings as it was associated with degenerative changes postoperatively.

Winston and Wilson²⁵ performed a true trapezoidal

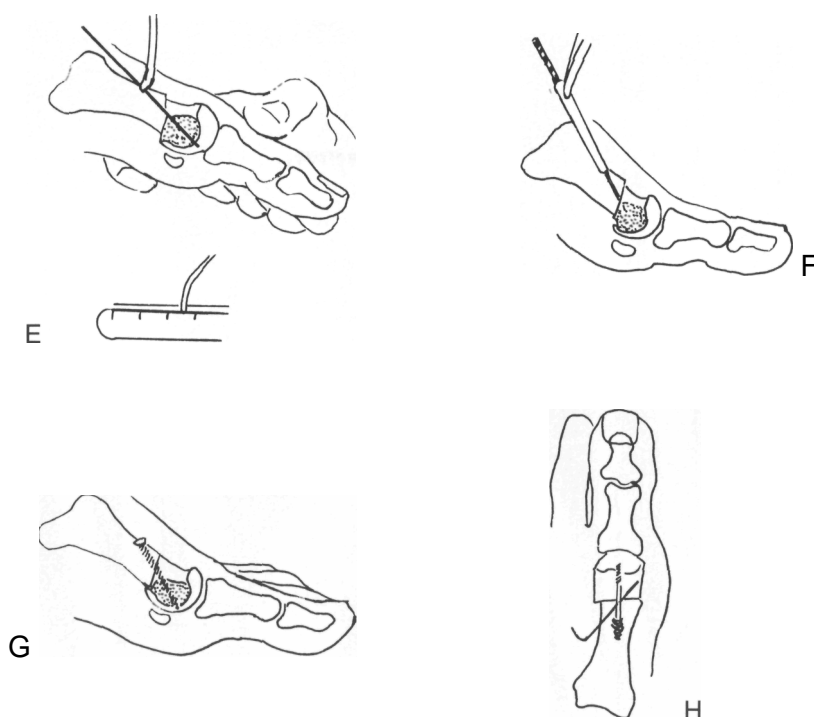


Fig. 13-4 (Continued). (E) Depth measurement. (F) Tap. (G) Insertion of the 4.0-mm cancellous screw. (H) Removal of preliminary fixation; two-point fixation; resection of the medial prominence of first metatarsal; lavage, check of fixation, wound closure.

wedge Hohmann but cautioned on the amount of bone removal to minimize shortening. Their paper discussed surgical technique, and they admitted to good results in their 15 cases although no analysis was provided. They discussed divergent postoperative courses allowing immediate weight-bearing in a surgical shoe or a below-knee cast for 5 to 6 weeks with an initial non-weight-bearing period. No comparison of results or further details was given.

Warrick and Edelman⁴ described an oblique elongated Hohmann as this would be more amenable to AO fixation and principles. In 11 patients (15 feet), they lagged a 3.5-mm cortical screw from medial proximal to lateral distal. They reported good results and maintenance of osseous position with screw fixation.

Tangen²⁶ recommended a modified technique of the Hohmann-Thompson osteotomy using a peg-and-hole plantar lateral and wire suture fixation. Tangen reported 97% good to excellent results on 177 patients (109 feet) with an average follow-up of 4 years.

Non-weight-bearing was instituted for the first 2 weeks followed by unrestricted walking in a cast shoe.

A similar type of modified osteotomy that was described by Rowe et al.²⁷ appeared much like a Roux-modified Mitchell. These authors reported long-term, complete relief of symptoms in all 20 patients (32 feet) postoperatively. The osteotomies were fixated with a Kirschner wire for 6 weeks and ambulation was limited to weight on the heel for the same period of time. Interestingly, with followup, these authors now recommend routine prophylactic osteotomy of the second and third metatarsals to prevent callosities postoperatively.

Excessive shortening may be a problem and a relative contraindication to the procedure would be a short first metatarsal, index minus of more than 4 mm. Our results from more than 150 procedures do show that lateral weight transfer may be an occasional problem, but that capsulitis/metatarsalgia is responsive to orthotic management and that a keratotic lesion is un-



Fig. 13-5. Case of severe hallux valgus. (A) A 63-year-old woman with severe hallux valgus deformity. Components of the deformity include an elevated intermetatarsal angle, increased PASA, axial rotation of the hallux, tibial sesamoid position of 7, and a large hallux abductus angle with lateral joint subluxation. (B) Postoperative radiograph at 2 weeks illustrating reduction of deformity and restoration of a congruous joint space. Fixation was accomplished with a 3.5-mm fully threaded cancellous screw (1.75-mm pitch) with a 5-mm head and a 0.062-in. Kirschner wire used as a neutralization pin to protect the interfragmentary screw. (*Figure continues.*)

likely unless already present preoperatively or displacement occurs before clinical union. Judicious use of plantar transposition is the best cure for this problem. The modified Hohmann osteotomy has become a versatile procedure that allows correction for some very difficult types of deformities of the first metatarsophalangeal joint.

DISCUSSION

The Hohmann osteotomy has continued to show its usefulness. This procedure fills a gap between distal osteotomy of the Austin or short Z variety and the

closing-base wedge of the first metatarsal. When comparing the Hohmann and chevron-type distal metatarsal osteotomies,²⁸ the use of the Hohmann procedure has been reserved for the more severe deformity (see Fig. 13-5). Often these deformities require correction at more than one level; for example, joint subluxation, adaptation of the articular surface, or increased intermetatarsal angle.

In the more severe, long-standing hallux valgus deformities, an increase in the intermetatarsal angle is usually accompanied by lateral joint adaptation at the head. The Hohmann osteotomy has been useful in allowing correction of both segments of the deformity with a single osteotomy. Certainly there are limits, but the Hohmann has been effective in intermetatarsal an-



Fig. 13-5 (Continued). Radiographs were taken (**C**) at 6 months and (**D**) 2 years postoperatively. The screw was removed at approximately 1 year postoperatively. Excellent range of motion was maintained throughout. Lateral radiograph (**E**) demonstrates proper placement of the interfragmentary screw. The screw can best prevent dorsal tilting and stabilize the capital fragment against ground reactive forces if the screw crosses the osteotomy in its plantar half and purchases the plantar portion of the metatarsal head.

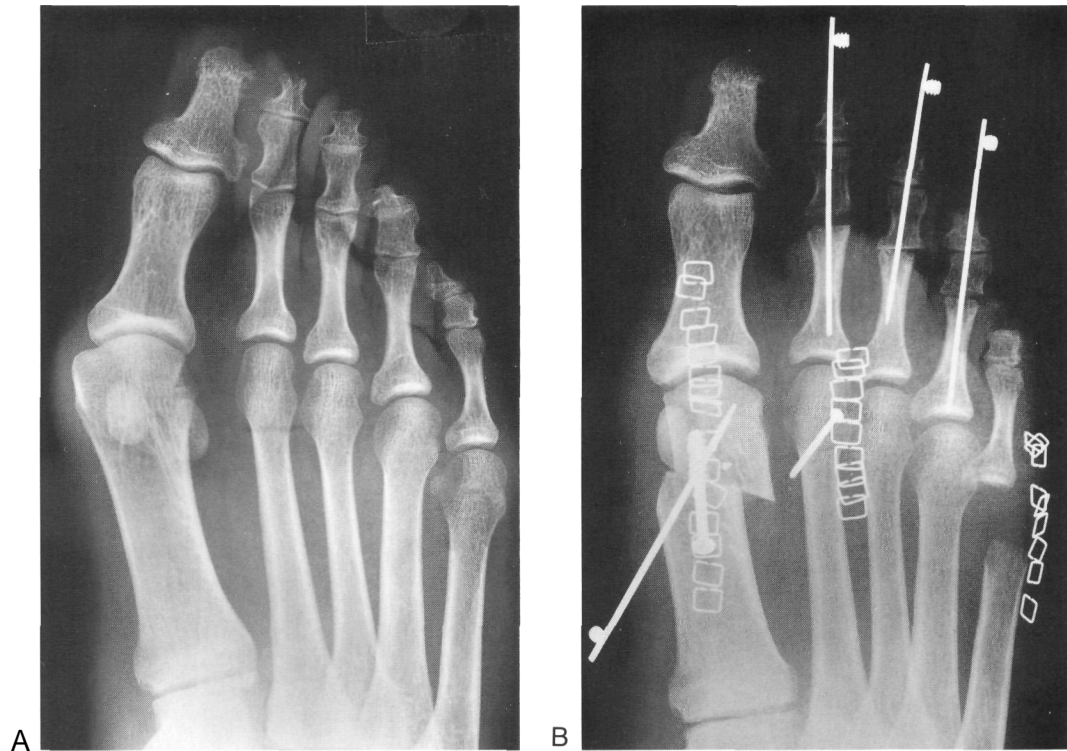


Fig. 13-6. Case of hallux valgus rigidus in a 40-year-old man. (A) The transverse plane deformity is not that significant but the patient has a limitation of motion and the entire forefoot possesses a certain rigidity. The long first metatarsal was shortened through lateral shift of an oblique osteotomy. Postoperative radiographs (B) at 2 weeks. (*Figure continues.*)

gles upwards of 18 to 19 degrees, depending on the flexibility of the forefoot. The Hohmann offers correction of the frontal plane bunion deformity, that of hallucal axial rotation. Not only is the cosmetic appearance of the toe restored but the procedure also provides for a return of sagittal plane motion. This is unique in hallux valgus procedures, and it certainly fills a void when the indications present.

Decompression is usually accomplished by shortening of the osseous segment, thereby widening or increasing the adjacent joint space. Such techniques are useful to provide a restoration of normal joint motion or at least to attempt to maintain a reasonable joint excursion. Joint decompression is a useful adjunct in correcting severe transverse plane abnormalities associated with hallux valgus, recurrent hallux valgus deformities with limited joint motion, or cases of hallux valgus rigidus (Fig. 13-6).

The Hohmann also has been effective in the rigid foot type of deformity. The deformity might not be that severe, but soft tissue releases are inadequate to allow freedom of joint excursion and correction of the deformity. These are feet that are probably best described by the European label of hallux valgus rigidus in which aspects of both pathologies coexist. The Hohmann osteotomy is an excellent technique to provide for joint decompression of the first metatarsophalangeal joint. The Hohmann provides joint relaxation, probably as a result of some shortening, but allows repositioning of the hallucal proximal phalanx on the metatarsal head and joint movement. Actually, it is this finding that lead to the use of the Hohmann in cases of metatarsus adductus where the deformity may not be that impressive but attaining correction and maintaining the great toe in a good position may be difficult.

The form of fixation most often utilized has been a



Fig. 13-6 (Continued). Postoperative radiographs at (C) 6 weeks and (D) 3 months. The postoperative radiographs reveal maintenance of position with gradual filling-in of lateral overhang by displacement of the capital fragment. Only with rigid internal fixation can patients such as this immediately begin range of motion and, as the surgery was intended, to restore or improve the available motion.

4.0-mm, partially threaded, cancellous screw. This screw is placed in a dorsal-proximal to plantar-distal direction. The screw should cross the osteotomy in the plantar half (Fig. 13-7). In this manner, the screw orientation provides an optimal vector of mechanical stability opposing any ground reactive forces that would tend to cause either dorsal displacement of the entire head or simply a dorsal tilt. A medial to lateral orientation of the screw also in the proximal to lateral direction does allow perforation of the lateral cortex for purchase of the screw but at the expense of limiting adequate resection of the medial aspect of the first metatarsal shaft. This medial to lateral screw placement also offers less mechanical stability to ground reactive forces that tend to displace the osteotomy.

A second point of fixation is always recommended, which has usually been an obliquely placed, 0.062-in. Kirschner wire. This may be placed from dorsolateral

proximal and to plantar-medial and distal, piercing the medioplantar cortex. An alternative technique pierces the articular surface dorsolateral; the wire is then driven out the medial side of the first metatarsal shaft. The wire may then be retrograded medially until the tip underlies the articular surface. I have also utilized Orthosorb as a secondary point of fixation, but overall my impression is that the Orthosorb provides little if any contribution to the stability of the osteosynthesis. Regardless how stable the osteosynthesis appears, it is still recommended to limit weight-bearing through the limb and operated foot. Early weight-bearing has resulted in loss of fixation, dorsal tilt of the capital fragment, pathologic fracture of the dorsal cortex, and prolonged morbidity or reoperation from osseous displacement or nonunion. Part of the discontent with this and similar procedures results from the complications of osteotomy displacement and mal-

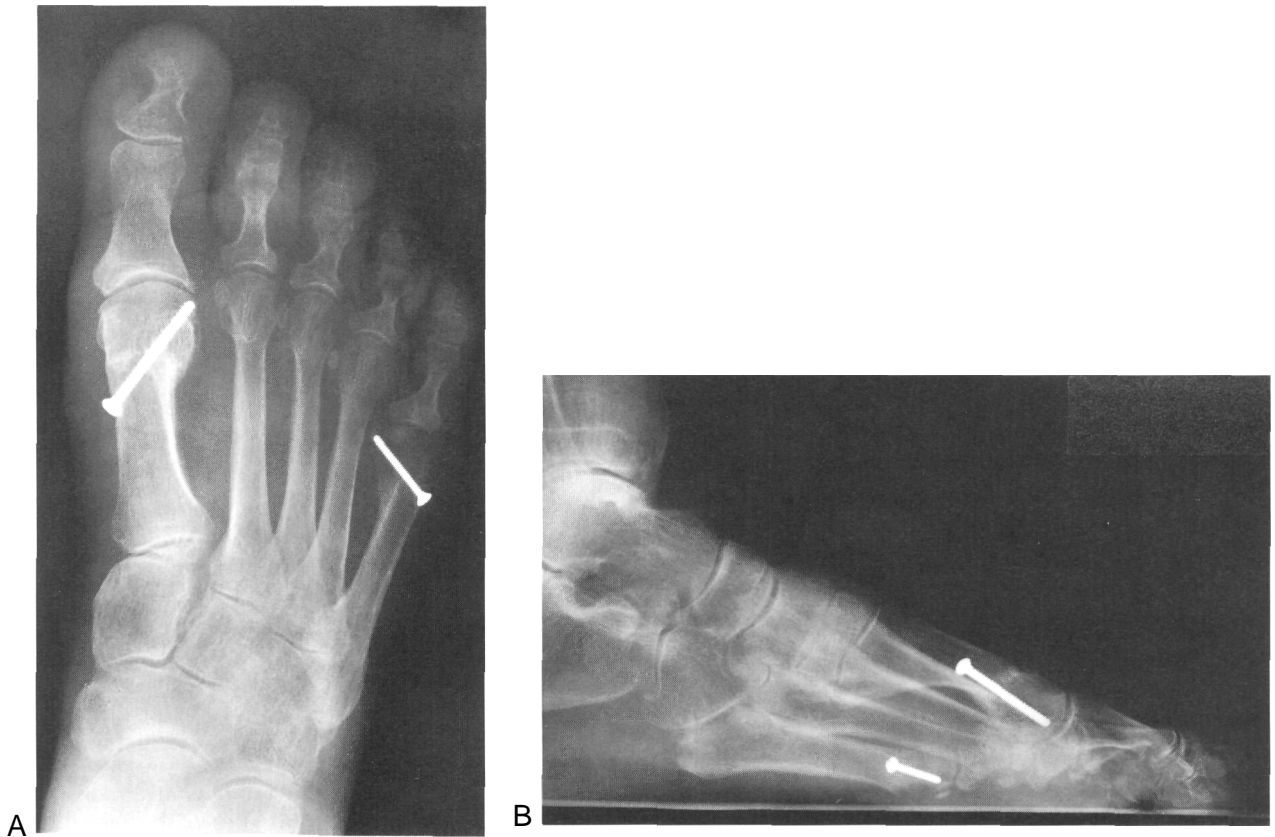


Fig. 13-7. (A & B) An alternative method of fixation is placement of the screw in a medial to lateral direction with purchase of the lateral cortex. Commonly a 2.7-mm cortex screw such as this is used. The problem with this technique is the head of the screw may impede resection of the medial shaft of the metatarsal after transposition and fixation of the osteotomy. This is a concern because the patient is usually presenting with an unsightly medial bump. Note the sagittal plane position of the screw; it is unlikely to withstand much loading, and adequate external immobilization is recommended. Results of this case actually are quite acceptable, mainly as a result of the negligible lateral shift of the capital fragment. (Case courtesy of Robert G. O'Keefe, Chicago.)

union. Careful attention to the osteosynthesis and adherence to the prescribed postoperative course minimizes their occurrence.

A definite consideration for the performance of this osteotomy is an adequate bone density to allow some type of fixation. Union is fairly predictable so long as the stability of the fixation is maintained during the postoperative period. Even the postmenopausal female with some degree of osteopenia is capable of undergoing this osteotomy, but control of the postoperative weight-bearing is essential. Experience with the Hohmann-type procedures verifies both the favor-

able comments as well as the difficulties or complications that may ensue. Iatrogenic metatarsus primus elevatus is a complication of nonfixated or poorly fixated first metatarsal osteotomies. Rigid fixation is probably the major contribution to the recent success of this procedure.

This osteotomy is powerful in its ability to correct deformity particularly when combined with joint decompression (shortening), fibular sesamoidectomy, and adductor transfer/medial capsulorrhaphy. Caution is suggested, as hallux varus has occurred with overzealous capsule-tendon balancing techniques. The

Hohmann osteotomy has continued to show its usefulness during the past 12 years. It is particularly valuable for more severe bunions wherein correction at more than one level of deformity is desirable.

SUMMARY AND CONCLUSIONS

Osteotomy for hallux valgus and hallux valgus rigidus in the 1990s involves sophisticated multicut osteotomies, and usually a secure osteosynthesis to preserve the correction obtained through osteotomy as well as to encourage a successful and timely period of osseous healing.

The Hohmann osteotomy as performed today is really a hybrid of several of the distal first metatarsal osteotomies. The thought processes and techniques of its application reflect the potential usefulness of the procedure. Hohmann recognized the potential to address deformity on more than one cardinal body plane although most procedures were attempts to correct only one aspect of the deformity. Kelikian called the Hohmann procedure a dual-plane displacement osteotomy, as Hohmann described both lateral and plantar displacement; in addition, however, a medially based trapezoidal wedge allowed for reduction of hallux abduction and the reduction of metatarsus primus varus through lateral shift or elevatus as a result of plantar shift of the capital fragment.

The modified Hohmann osteotomy has become a versatile procedure that has allowed correction for some very difficult types of deformities of the first metatarsophalangeal joint. The host of variations possible has allowed this procedure to correct hallux valgus and hallux valgus rigidus with a good amount of success.

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