LAPIDUS ARTHRODESIS: A Different Perspective

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Fusion of the first metatarsal-cuneiform joint can correct positional deformities at the first metatarsal while offering significant structural stability to the medial column. A modification to previous fusion techniques, using well-established internal fixation principles, will be presented.

INDICATIONS

The Lapidus procedure was initially developed to address the bunion deformity, secondary to metatarsus primus adductus. Although not usually the procedure of choice in hallux valgus, use of the Lapidus procedure for correction of this deformity deserves discussion. The Lapidus procedure is currently performed in cases of severe hallux valgus. The recommended guidelines vary by author. Saffo et al. report an average intermetatarsal angle of 15° in their study, while Goldner and Gaines will consider fusion in IM angles of 30°. Other presentations of hallux valgus, such as the neurologic and salvage deformities, may also require the medial column stability this procedure provides.

The Lapidus is a versatile procedure also currently used to affect positional and structural changes within the medial column. Medial column malalignment commonly presents with metatarsocuneiform instability. The instability may be a result of severe hypermobility, degenerative joint disease, or trauma. As a result, these manipulations ultimately affect the entire forefoot and rearfoot.

At the Podiatry Institute, the Lapidus procedure is usually not performed as an isolated procedure, but is more commonly used in conjunction with other stabilizing procedures of the midfoot. First metatarsal-cuneiform joint fusion serves as the cornerstone of reconstruction in complex procedures and techniques involving the medial column, such as Lisfranc's arthrodesis, medial column fusion, or Charcot reconstruction. Structural and functional stability of the medial column is paramount in these cases to insure a stable weight-bearing platform and a return to normal ambulation.

TECHNIQUE

The authors' technique involves the medial application of a 1/3 tubular plate in conjunction with a 4.0 mm partially-threaded cancellous screw. The lag screw is directed from plantar-distal to dorsal-proximal and securely fixates the plantar aspect of the metatarsal-cuneiform joint.

The metatarsal-cuneiform joint is exposed through a dorsal-medial incision. This is often a proximal extension of the hallux valgus incision. Dissection is carried down through the subcutaneous fascia, being aware of the medial neurovascular structures, (the marginal vein and dorsal cutaneous nerve). Care should also be taken to avoid the dorsalis pedis and deep peroneal nerve within the first interspace. Incision through the deep fascia will directly expose the tibialis anterior and extensor hallucis longus tendons. The tibialis anterior tendon is either retracted inferiorly or transected, depending upon its position. The tendon may be transected linearly or Z-plastied for later repair. The extensor hallucis longus is retracted laterally. The periosteum is sharply incised and reflected as a distinct layer with a #15 blade and periosteal elevator.

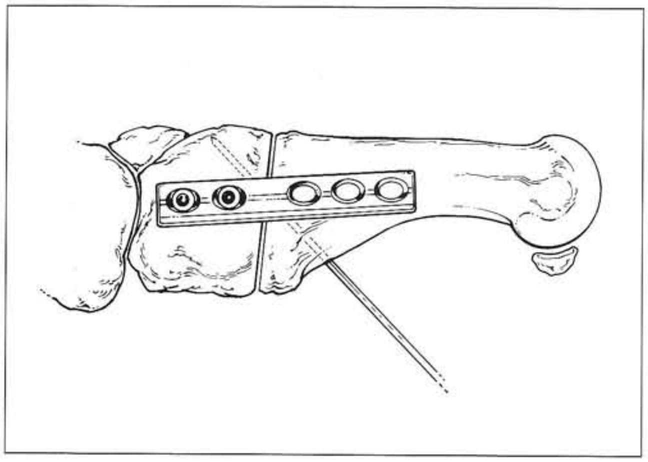


Figure 3A, 3B. *Proximal Anchor Screws.* 3.5 mm cancellous screws are placed within the medial cuneiform to anchor the plate proximally. These screws are placed concentrically through the plate into the bone.

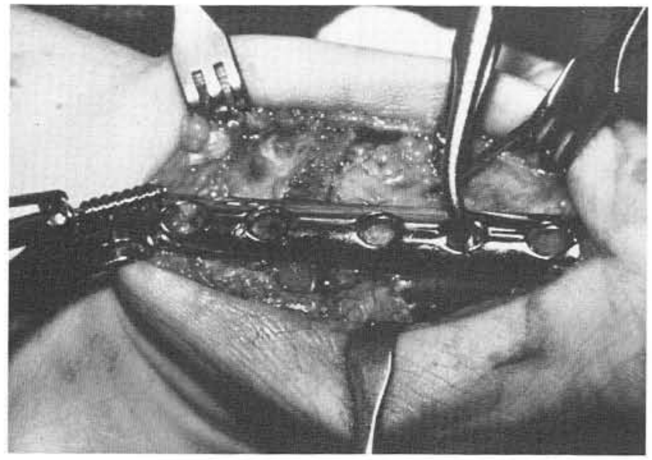


Figure 3B.

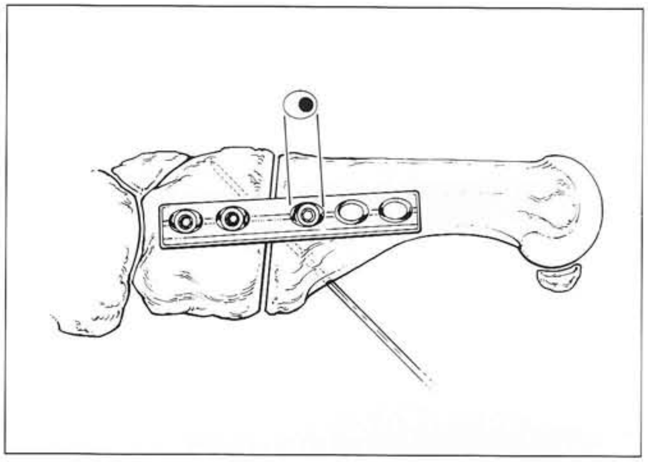


Figure 4A, 4B. *Load Screw (partially tighten).* Placement of the "load" screw is essential in achieving axial compression across the metatarsal-cuneiform joint. The screw hole just distal to the joint is drilled eccentrically distal to achieve this effect. A 3.5 mm cortical screw is used here. As the screw head engages the distal edge of the hole, it will slide proximal to a concentric position taking the first metatarsal with it. The screw is only taken to two-finger tightness at this point.

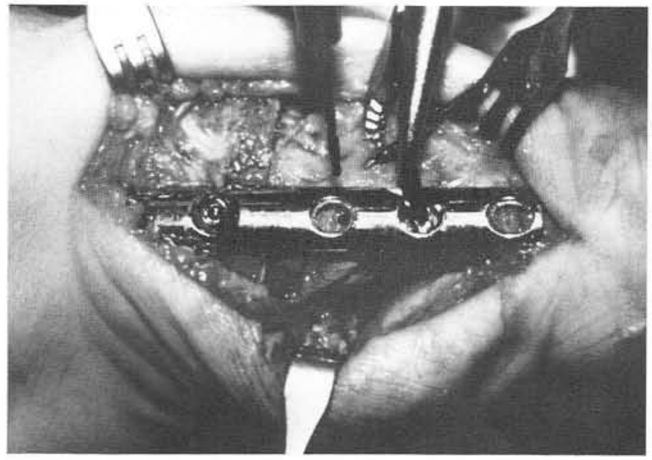


Figure 4B.

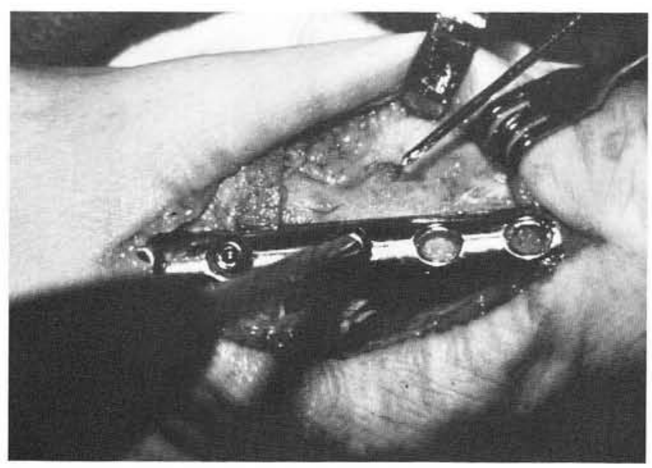
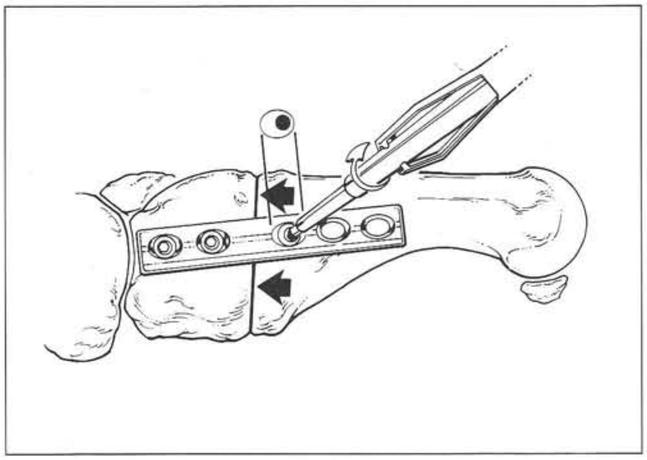


Figure 5. *Removal of Temporary Fixation.* Complete tightening of the load screw would not afford pure compression due to the oblique placement of the temporary fixation. The 0.062 K-wire is removed.



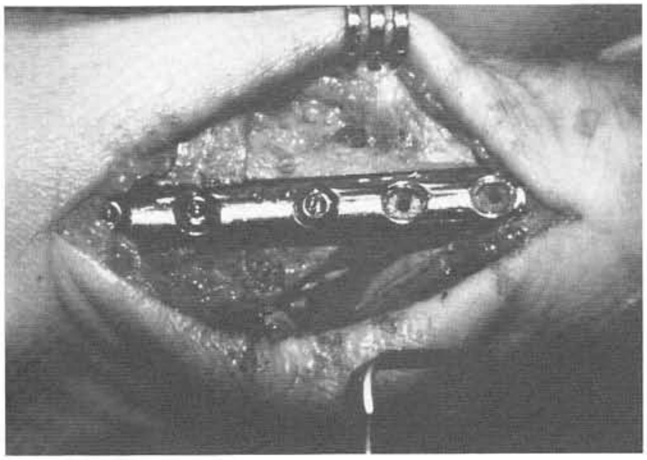
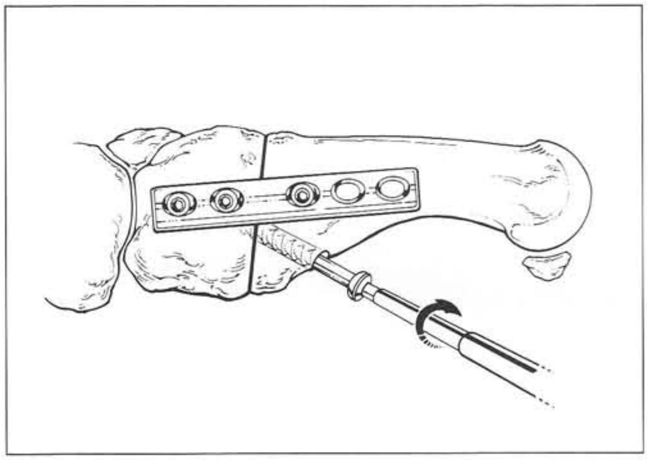


Figure 6A, 6B. *Secure Load Screw.* With removal of the temporary fixation, the load screw is now secured and active axial compression can be visualized across the joint.

Figure 6B.



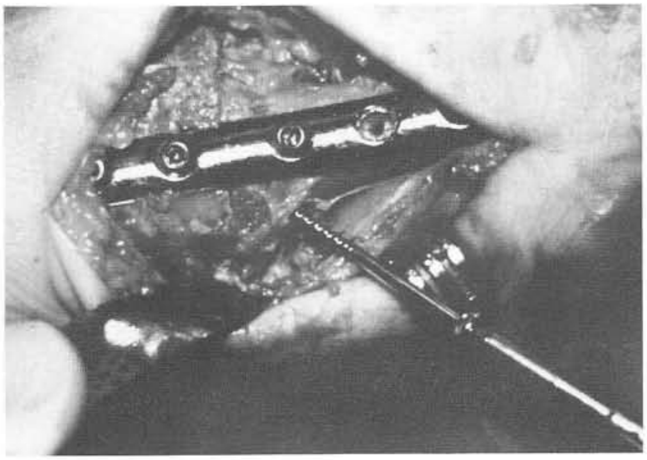
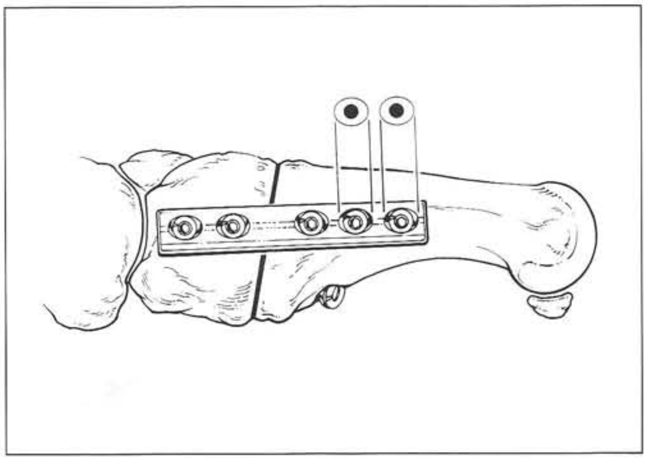


Figure 7A, 7B. *Interfragmental Screw.* A 4.0 mm partially-threaded cancellous screw is now placed obliquely across the metatarsal-cuneiform joint. Ideal fixation is directed plantar-distal to dorsal-proximal, however screw placement dorsal-distal to plantar-proximal is also acceptable. If possible, the previous tract for temporary fixation can be used as a pre-drill. Secure placement of this screw will assure additional stability across the joint.

Figure 7B.



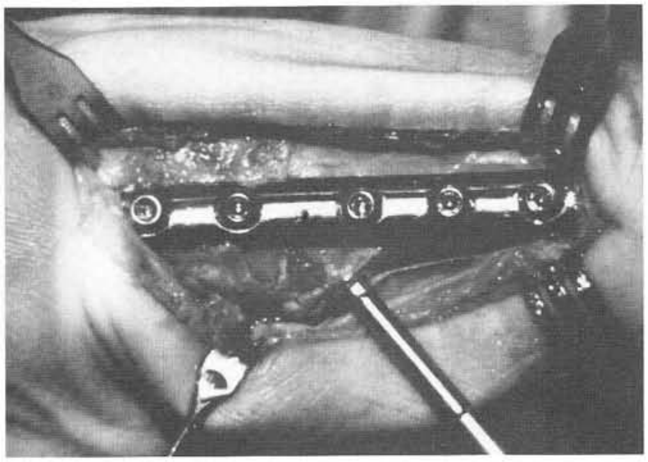


Figure 8A, 8B. *Insert Remaining Screws.* The remaining 3.5 mm cortical screws are now placed in a concentric fashion and tightened.

Figure 8B.

DISCUSSION

Application of a metal fixation plate for axial compression is a valuable technique. This form of plate fixation is best suited for axial compression across any two bones aligned transversely. This includes not only fusion along the medial and lateral columns, but is also applied effectively for transverse metatarsal and other long bone fractures.

Eccentric drilling for load screw placement is an important concept in successful application of this technique. The interfragmental screw will securely compress and stabilize the lateral portion of the metatarsal-cuneiform joint.

POSTOPERATIVE MANAGEMENT

A Jone's compression eggshell cast is the immediate postoperative dressing. The wound is examined after 3 to 5 days. The surgical drain, if used, is discontinued when drainage is minimal and at least one day before the first dressing change. At this time, a below knee cast is applied and the patient is maintained non-weight bearing for a minimum of 6 to 8 weeks. Careful clinical and radiographic follow-up is mandatory to insure osseus fusion prior to weight bearing.

BIBLIOGRAPHY

Albrecht GH: The Pathology and treatment of Hallux Valgus (in Russian). *Russk Vrach* 10:14-19, 1911.

Bacardi BE, Boysen TJ: Considerations for the Lapidus Operation. *J Foot Surg* 25(2):133-138, 1986.

Butson AR: A Modification of the Lapidus operation for Hallux Valgus. *J Bone Joint Surg(Br)* 62(3):350-352,1980.

Cain TD, Chang TJ: Manipulations of the First Metatarsal in Hallux Valgus Surgery (Revisited). In Ruch JA, Vickers NS (eds): *Reconstructive Surgery of the Foot and Leg, Update '92*. Tucker, GA, Podiatry Institute Publishing, 1992, pp. 244-247.

Clark HR, Vieth RG, Hansen ST: Adolescent bunions treated by the Modified Lapidus procedure. *Bulletin of the Hospital for Joint Diseases Orthopedic Institute*, 47(2):109-122, 1987.

Goldner JL, Gaines RW: Adult and Juvenile Hallux Valgus. *Orthopedic Clin N America* 7:863-867, 1976.

Hernandez A, Hernandez PA, Hernandez WA:Lapidus: When and Why? *Clin Podiatr Med Surg* 6(1):197-208, 1989.

Kleinberg S:Operative cure of hallux valgus and bunions. *American J Surg* 15:75-81, 1932.

Lapidus PW: The Author's Bunion Operation From 1931 to 1959. *Clin Orthop* 16:119-135, 1960.

Lapidus PW: The Elusive Bunion: Etiology, Mechanics, Treatment. *Orthopedic Review* III(4):35-45, 1974.

Lapidus PW: The operative correction of the metatarsus varus primus in Hallux Valgus. *Surg Gynecol Obstet* 54:183-191, 1934.

Lapidus PW: A quarter of a century of experience with the operative correction of metatarsus varus primus in hallux valgus. *Bulletin of Hospital of Joint Diseases Orthopedic Institute* 17:404-421, 1957.

Leboucq H: Le developement du premier metatarsien et de son articulation tarsienne chez l'homme. *Arch Biol*, 3:335, 1982.

Mauldin DM, Sanders M, Whitmer WW: Correction of Hallux Valgus with Metatarsocuneiform Stabilization. *Foot Ankle*, 11(2):59-66, 1990.

McCrea JD, Lichty TK: The First Metatarsocuneiform Articulation and Its Relationship to Metatarsus Primus Adductus. *J Am Podiatr Med Assoc* 69:700-706,1979.

Myerson M: Metatarsocuneiform Arthrodesis for treatment of Hallux Valgus and Metatarsus Primus Varus. *Orthopedics* 13:1025-1031, 1990.

Ruch JA, Chang TJ: Relative Strengths and Efficacy of Fixation Techniques in Osteotomies and Arthrodesis of the First Metatarsal. In Ruch JA, Vickers NS (eds): *Reconstructive Surgery of the Foot and Leg, Update '92*. Tucker, Ga, Podiatry Institute Publishing, 1992, pp. 233-236.

Rutherford RL: The Lapidus Procedure for primus metatarsus adductus. *J Am Podiatry Assoc* 64(8):581-584, 1974.

Saffo G, Wooster MF, Stevens M, Desnoyers R, Catanzariti AR: First Metatarsocuneiform Joint Arthrodesis: A Five-Year Retrospective Analysis. *J Foot Surgery* 28(5):459-465, 1989.

Sangeorzan BJ, Hansen ST: Modified Lapidus procedure for Hallux Valgus. *Foot Ankle* 9(6):262-266, 1989.

Straus WL: Growth of the human foot and its evolutionary significance. *Contrib Embryol* 19(101):93-134, 1927.

Truslow, W: Metatarsus Primus Varus or Hallux Valgus? *J Bone Joint Surg* 7:98, 1925.

Wanivenhaus, A: First Tarsometatarsal Joint: Anatomical Biomechanical Study. *Foot Ankle* 9(4):153-157, 1989.