THE REVERDIN OSTEOTOMY WITH ORTHOSORB® FIXATION

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In 1881, Reverdin described a wedge resection of bone from the first metatarsal head, in an attempt to reduce lateral deviation of the metatarsal's articular cartilage. In 1982, McGlamry and Fenton described the concept of "reverse buckling" and a procedure which combined the principals of muscle tendon balancing about the first metatarsophalangeal joint with those of the Reverdin Osteotomy. A prerequisite for success with this procedure is a flexible metatarsus primus varus deformity. In a retrospective study of 25 procedures, McGlamry and Fenton reported an average decrease in the intermetatarsal angle of 2.7°.

In the author's experience, the Reverdin Osteotomy is an extremely powerful procedure when combined with a fibular sesamoidectomy and proper muscle tendon balancing. (Figures 1A,1B) The procedure is therefore useful in many

Figure 1A. Preoperative DP radiograph of a severe hallux abducto valgus deformity with metatarsus primus varus.

Figure 1B. Long-term DP radiograph following a Reverdin osteotomy, fibular sesamoidectomy, and muscle tendon rebalancing.

clinical situations. The limits of the procedure routinely encompass extreme deformities, especially in late adult life. It is in these clinical situations where poor bone quality and mild-to-moderate degenerative arthritis are often encountered. The procedure, however, will allow for correction without the need for a proximal osteotomy, or a more tenuous distal metaphyseal osteotomy. Traditionally, this osteotomy was stabilized with suture fixation, however, this is technically difficult to perform, and frequently unstable (Figures 2A - 2C). Furthermore, stability is compromised in the event that the lateral hinge should fracture.

Figure 2B. Passage of the suture needle medially across the osteotomy. Drill holes should be made to approximate the curvature of the needle.

SURGICAL TECHNIQUE

At present, bio-absorbable Orthosorb® Pins, (Johnson & Johnson Orthopaedics), are utilized for Reverdin osteotomy fixation. These pins are made of polyparadioxanone (PDS) which provides stability against shear and rotational forces during the period of initial bone healing. The pins are 1.3 mm in diameter, and undergo gradual resorption by hydrolysis.

Fixation is accomplished with the use of three pins situated in such a way as to provide maximal stability to the capital fragment. With the osteotomy held closed, the first pin is placed laterally and centrally within the metatarsal head

Figure 2A. A drill hole is made in the metatarsal head prior to suture stabilization of the distal osteotomy.

Figure 2C. Final suture fixation of the osteotomy with 2-0 absorbable suture.

cartilage, crossing the osteotomy into the metatarsal shaft. This pin will stabilize the lateral osseous hinge should fracture of the hinge occur, either intraoperatively or in the early postoperative period. (Figure 3)

Medially, two Orthosorb pins are crossed over one another. Two pins provide excellent cross-wire fixation at the medial base of the closed osteotomy (Figure 4A, 4B). When fixation is complete, rigid reduction of the osteotomy is maintained. Range of motion of the first metatarsophalangeal joint is, therefore, allowed without fear of osteotomy displacement.

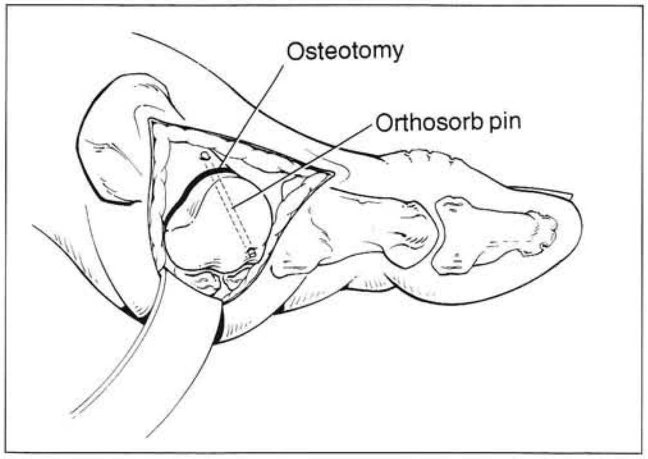


Figure 3. The first Orthosorb pin is placed laterally and centrally within the first metatarsal head cartilage. It passes through the osteotomy longitudinally into the first metatarsal shaft.

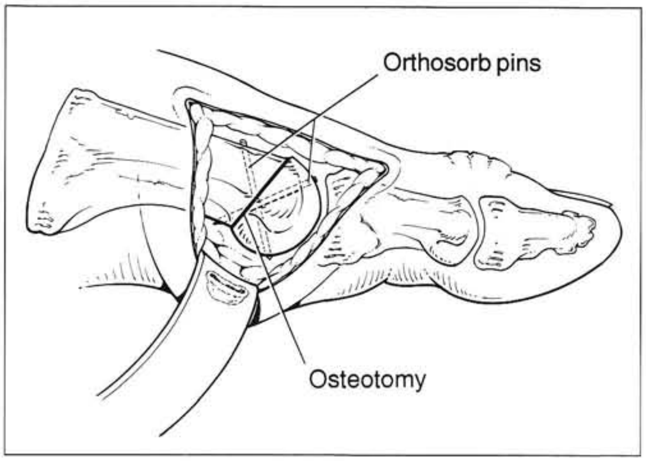


Figure 4A, 4B. Two Orthosorb pins are crossed medially to complete the fixation process. Pre-drilling is performed with a K-wire, and the pins are placed from the head into the proximal first metatarsal shaft.

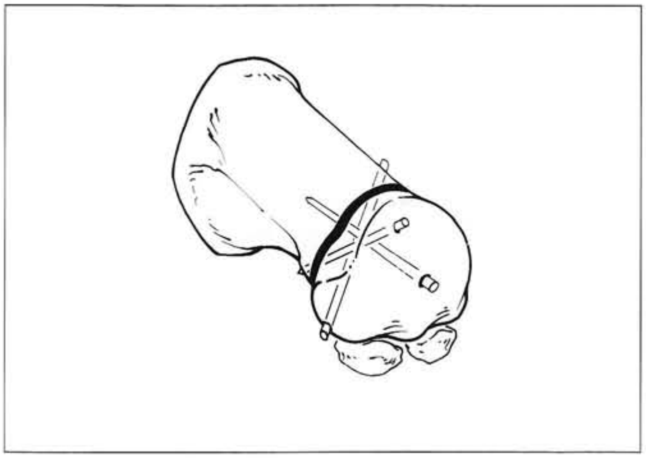


Figure 4B.

Figure 5. The patient is a 76 year-old female with a moderate to severe hallux abducto valgus and metatarsus primus varus deformity. The patient's chief complaint was a painful second hammer toe.

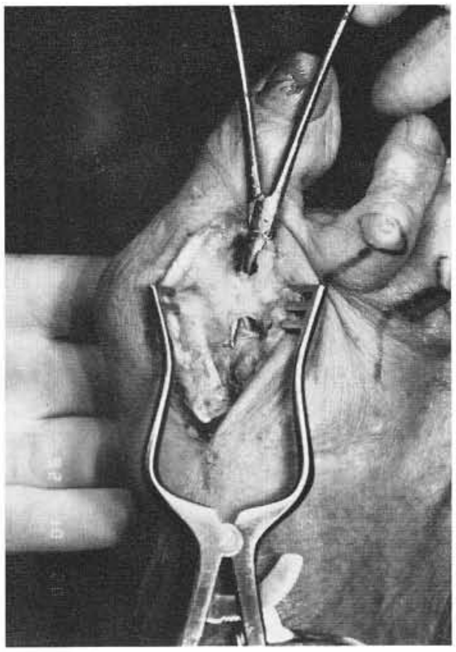


Figure 6. The deep transverse intermetatarsal ligament is transected. Selective release of the adductor halluces tendon is then performed, however the short lateral head of the flexor brevis tendon and lateral MPT capsule are preserved. Short extensor tenotomy and lateral capsulotomy are rarely performed.

Figure 7. A lateral sesamoidectomy is performed when hypertrophy or degeneration of the fibular sesamoid exists.

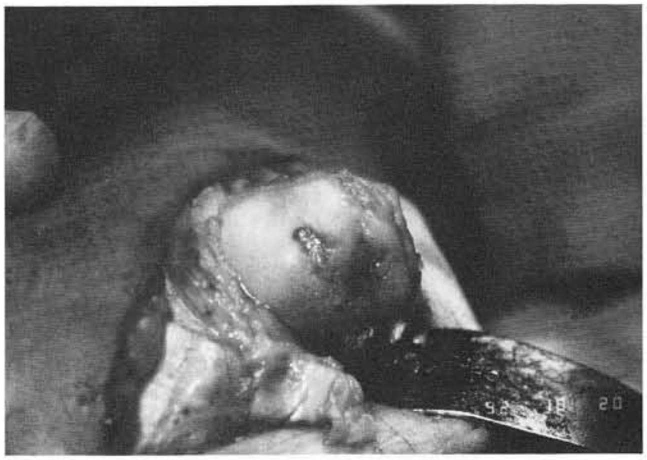
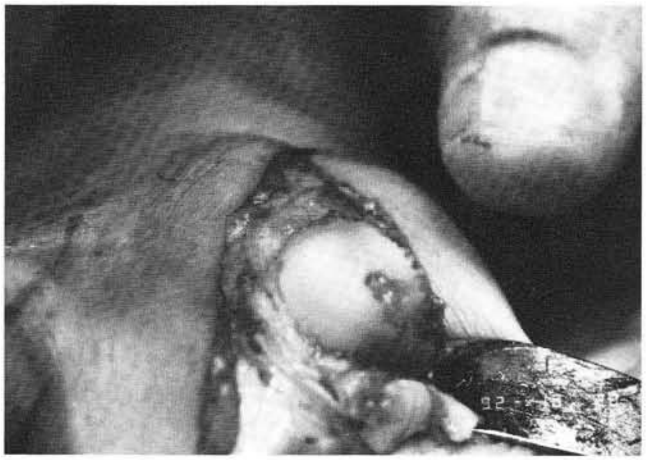


Figure 8. Axial view of the laterally deviated articular cartilage. Note the degenerated medial cartridge and dorsomedial exostosis.



Figures 9, 10. Removal of the medial exostosis further accentuates the lack of functional medial cartilage (9), and laterally deviated articular surface (10).

Figure 10.

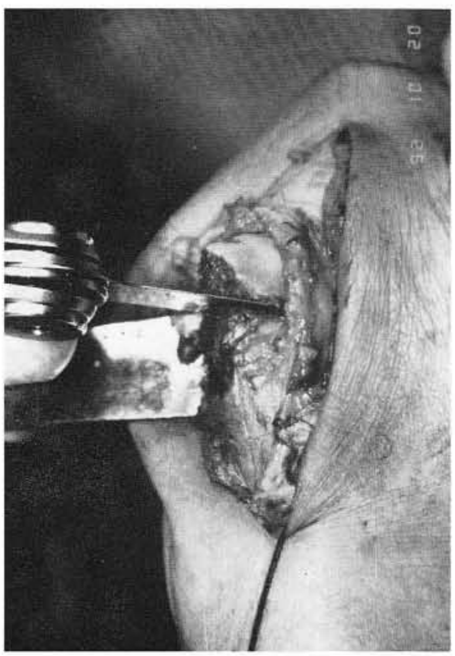


Figure 11. The first osteotomy is made distally and parallels the deformed articular cartilage. The cut is made approximately 3 to 5 mm proximal to the effective articular cartilage.

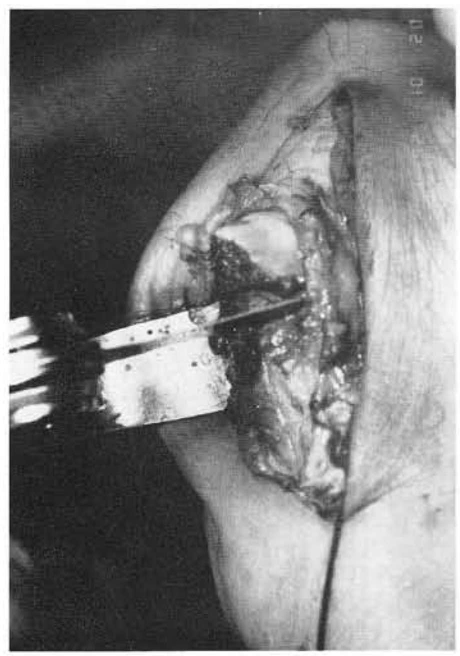


Figure 12. The second osteotomy (proximal) converges laterally on the first cut and is perpendicular to the long axis of the first metatarsal. A lateral cortical hinge is maintained, and soft tissue preserved about the lateral and dorsal lateral aspect of the first metatarsal head.

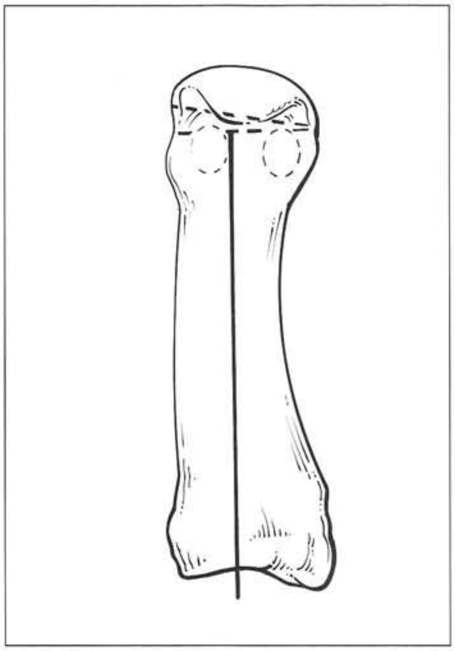


Figure 13A. Dorsal orientation of the Reverdin osteotomy.

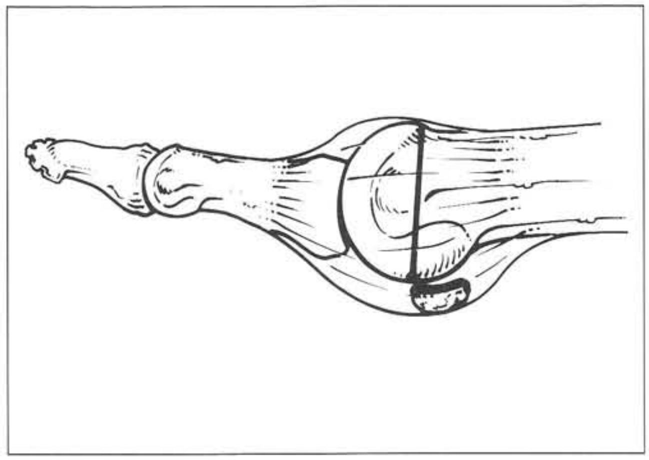


Figure 13B. Lateral view. Note that the osteotomy is distal to the sesamoids and distal to the weightbearing aspect of the first metatarsal head.

Figure 14. Appropriate wedge resection with unrestricted closure of the osteotomy.

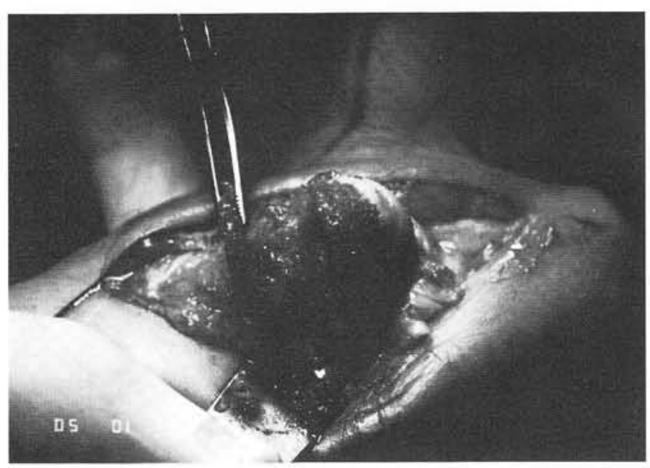


Figure 15. Manual compression prior to fixation. The osteotomy should be well opposed and stable.

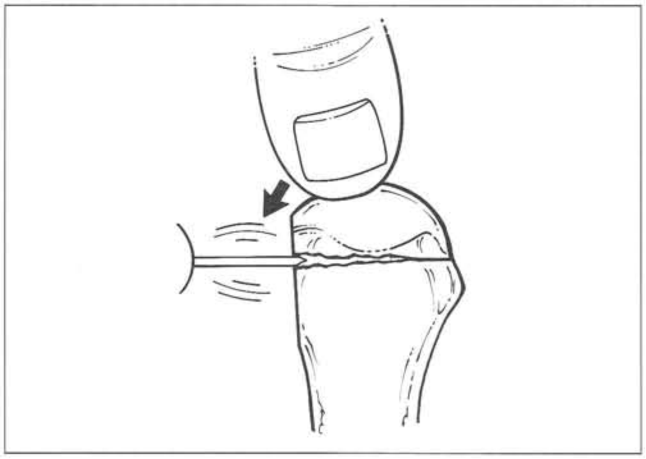


Figure 16. Feathering of the osteotomy is performed if the osteotomy fit is not anatomic or if the desired correction is not obtained.

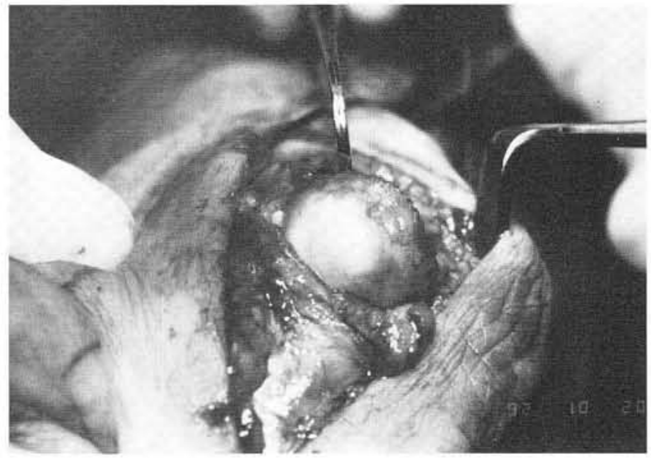


Figure 17. Derotated articular surface of the first metatarsal head.

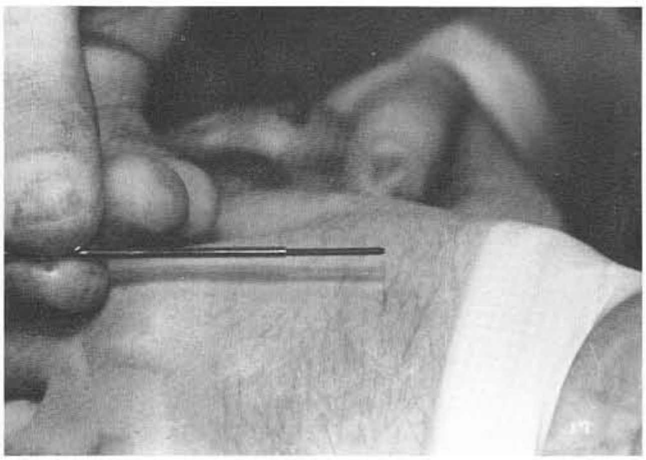


Figure 18. Orthosorb pin prior to placement across the osteotomy.

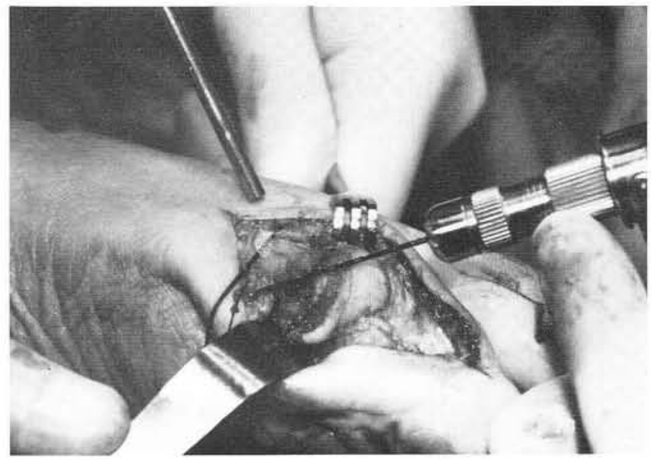


Figure 19. Orientation of the second orthosorb pin crossing the medial osteotomy site. A hole is predrilled with a K-wire prior to insertion of the Orthosorb pin.

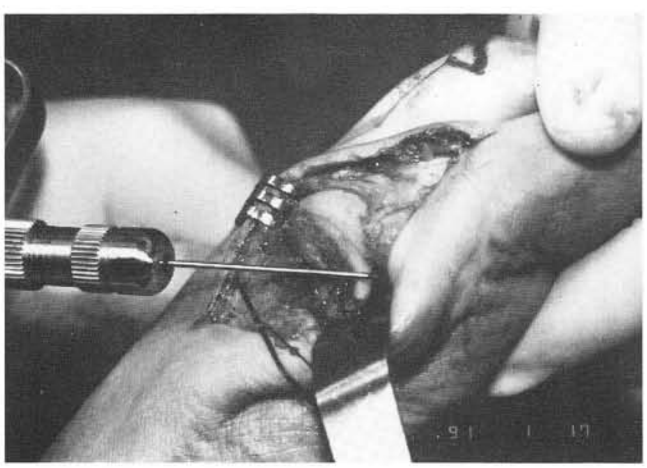


Figure 20. Orientation of the third orthosorb pin, to effect a crossed-pin fixation of the medial metatarsal head.

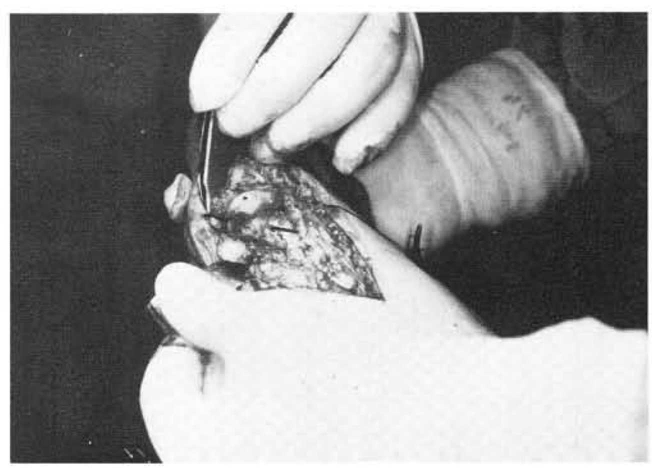


Figure 21. While holding the capital fragment compressed, the pins are secured.

CONCLUSION

The Reverdin osteotomy, combined with fibular sesamoidectomy and muscle tendon balance, is a powerful technique in the repair of hallux valgus deformities. Although preoperative assessment of first metatarsal mobility and proximal articular set angle are paramount, intraoperative evaluation is confirmatory. A step-by-step approach to dissection, osteotomy orientation with appropriate wedge resection of bone, and stable osseous repair are detailed. Through proper evaluation and exact technique, favorable results are obtained.

RISK MANAGEMENT

Complications encountered with this procedure include over- or under- correction, unstable osseous fixation, avascular necrosis of the distal metatarsal head, and intra-articular fracture of the capital fragment. It should be understood that osseous alignment alone does not insure a good result. Quality and range of motion, and precise muscle tendon rebalancing must also be taken into account. These factors dictate the success or failure of the operative procedure.

REFERENCES

1. Reverdin J: De La Deviation En Dehors Du Gros Orteil (Hallux Valgus, Vulg Oignon Bunions, Bollen:) Et De Son Traitement Chirurgical *Trans Int Med Congress* 2:408, 1881.
2. Fenton CF, McGlamry ED: Reverse buckling to reduce metatarsus primus varus. *J Am Podiatry Assoc* 72:342-346, 1982.