

HALLUX INTERPHALANGEAL ARTHRODESIS

A Clinically Illustrated Technique

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Arthrodesis of the hallux interphalangeal joint is indicated for a variety of common pedal deformities. Any pathological process that compromises digital and metatarsophalangeal joint stability may necessitate fusion at the interphalangeal level to alleviate symptoms. Common podiatric conditions that affect the hallux interphalangeal joint in this manner include Charcot-Marie-Tooth disease, rheumatoid arthritis, hallux varus, hallux malleus, hallux abductus interphalangeus, post-traumatic degeneration and iatrogenic conditions.

Proposed methods of fusion encompass a wide spectrum of techniques involving internal fixation, external fixation, and splintage. Jones' original extensor hallucis longus tenodesis, in conjunction with tenosuspension of the first metatarsal in 1917, stimulated the subsequent refinements in procedures to their current state. Over the last fifteen years, arthrodesis of the hallux interphalangeal joint has been accomplished with cerclage wires, Kirschner wires, 2.0-mm, 2.7-mm, and 3.5-mm cortical screws, the 4.0-mm cancellous screw, and external fixators. The purported indications for each have varied, depending on bone stock, concomitant procedures such as first metatarsophalangeal implant arthroplasty, and patient specific circumstances. The following technique description utilizes the Synthes 4.0-mm fully-threaded cancellous screw for reliable, consistent fusion of the hallux interphalangeal joint in the appropriate patient.

CLINICALLY ILLUSTRATED TECHNIQUE



Figure 1. Elliptical skin incision over the interphalangeal joint.



Figure 2. Dissection at the dermal-subcutaneous interface.

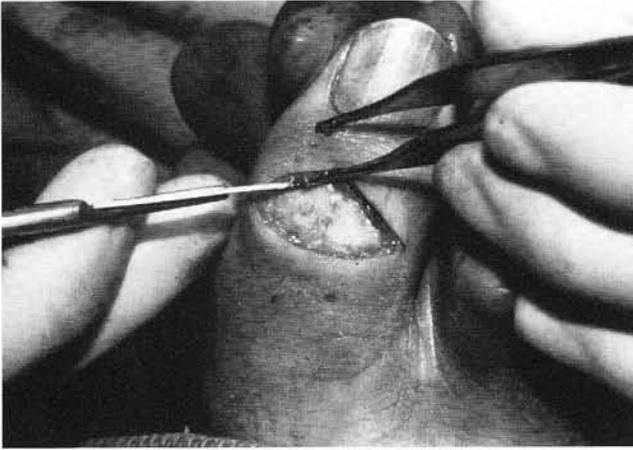


Figure 3. Reflection of the thin deep fascia exposing the extensor hallucis longus tendon.

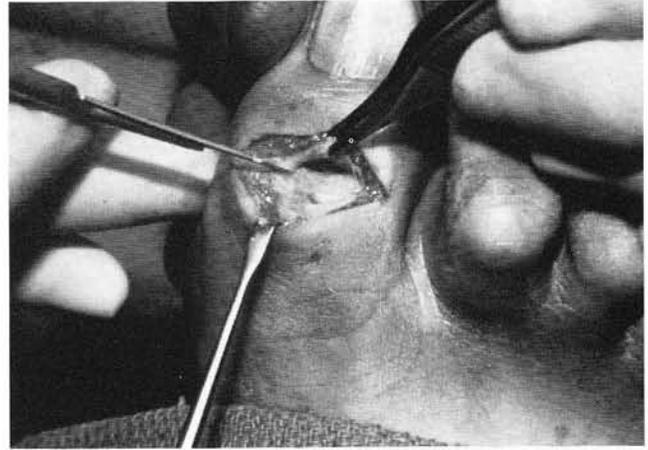


Figure 4. Transverse tenotomy of the EHL and entrance into the interphalangeal joint.

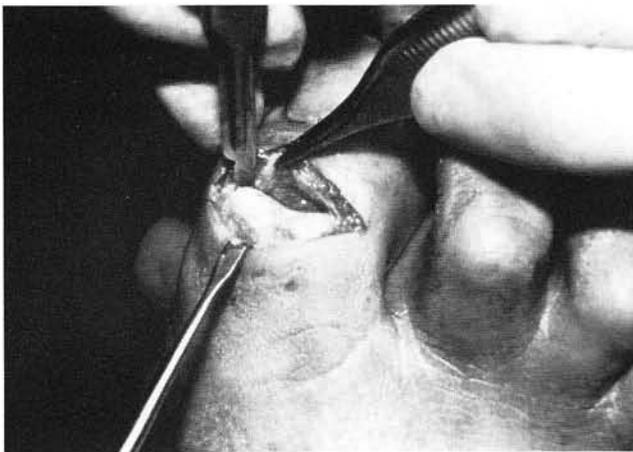


Figure 5. Dissection of the collateral ligaments and exposure of the head of the proximal phalanx.

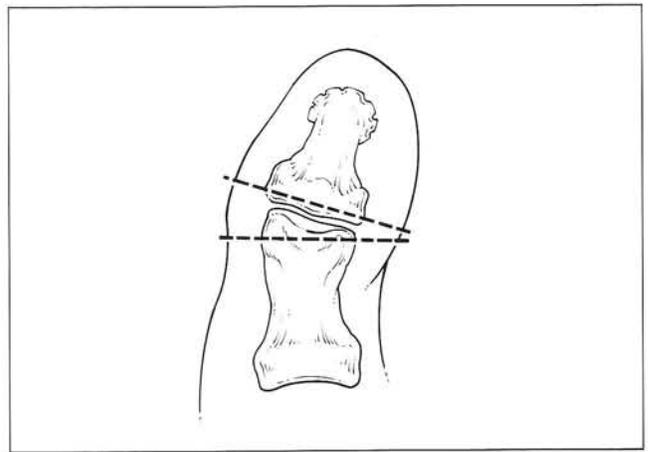


Figure 6. Joint resection, taking into account any angular deformity present.

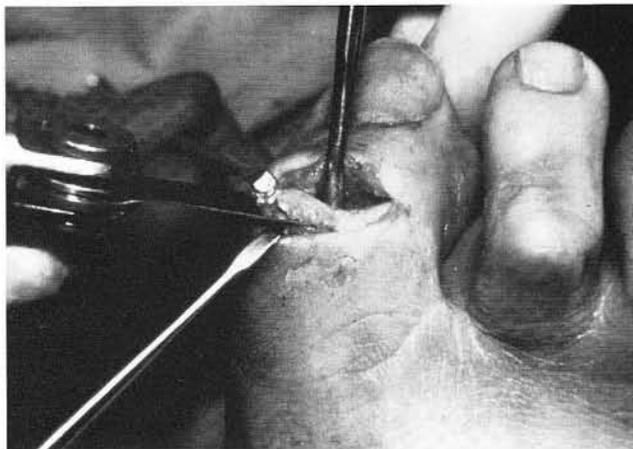


Figure 7. Resection of the head of the proximal phalanx with power instrumentation.

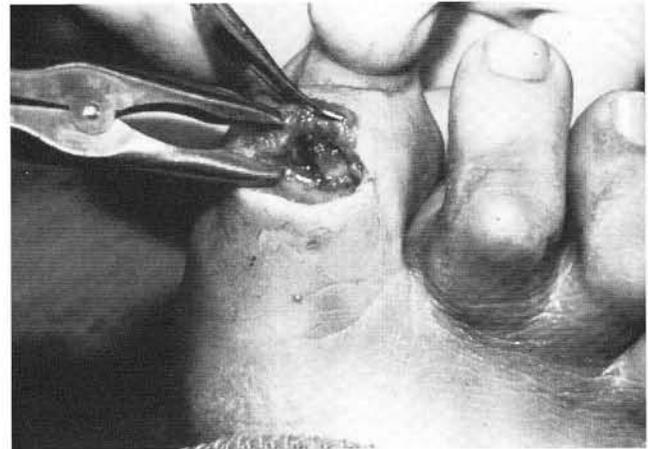


Figure 8. Resection of the base of the distal phalanx with hand instrumentation.

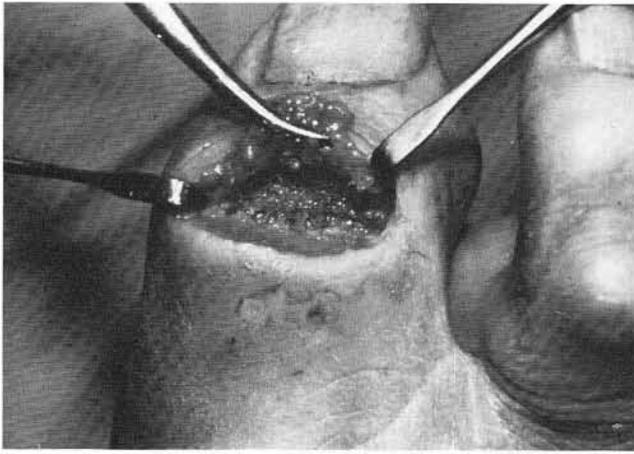


Figure 9. Prepared fusion site with contiguous subchondral bone exposed. The joint is ready for fixation technique.

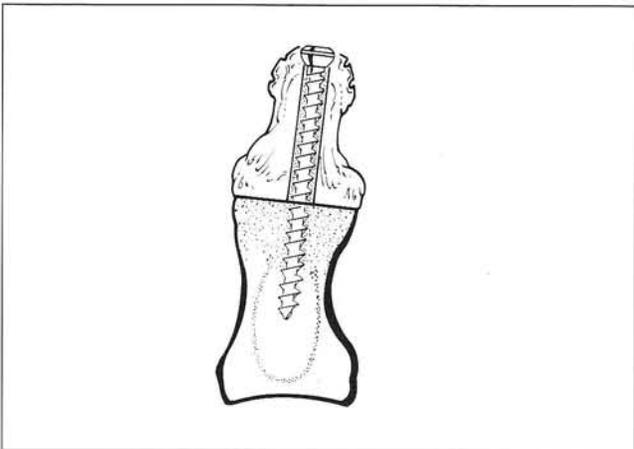


Figure 11. The fully-threaded cancellous screw allows maximal thread purchase into denser subchondral bone of the proximal phalanx.

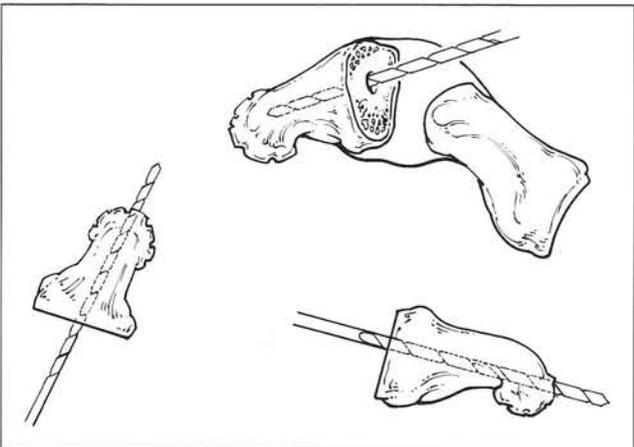


Figure 13. Thread hole in distal phalanx with a 2.5-mm hand drill. The drill is centered in all planes.

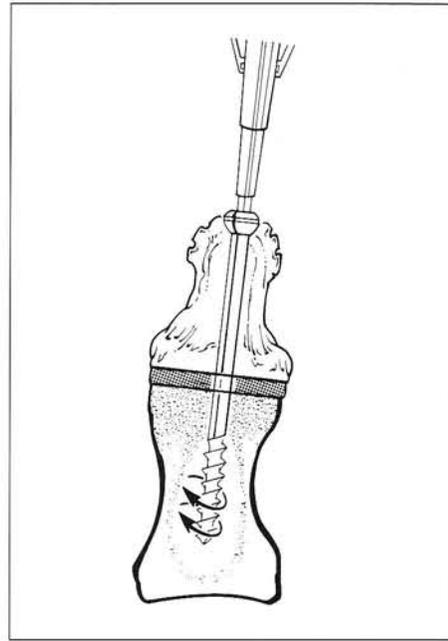


Figure 10. A potential pitfall of the partially-threaded cancellous screw is poor purchase in the soft intramedullary canal of the proximal phalanx. The screw spins freely without achieving compression at the joint.

FIXATION TECHNIQUE

Fully-Threaded Cancellous Screw

- Thread Hole: (2.5-mm)
- Countersink: *
- Depth Gauge: *
- Overdrill: (3.5-mm)
- Tap: (3.5-mm)
- Screw: (FTCS)

Figure 12.

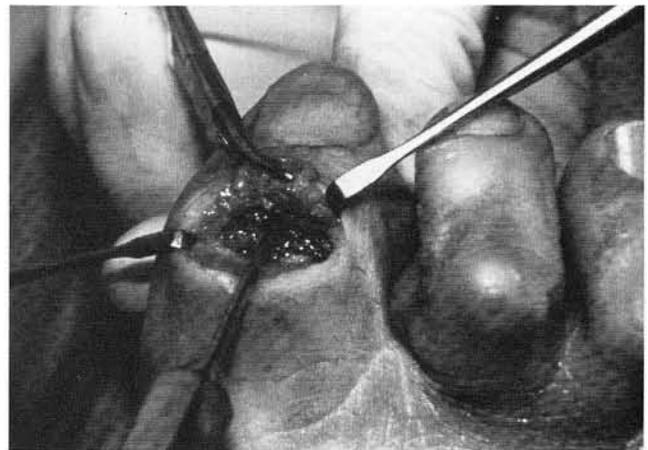


Figure 14. Entrance of a 2.5-mm drill centrally into the base of the distal phalanx from within the joint.

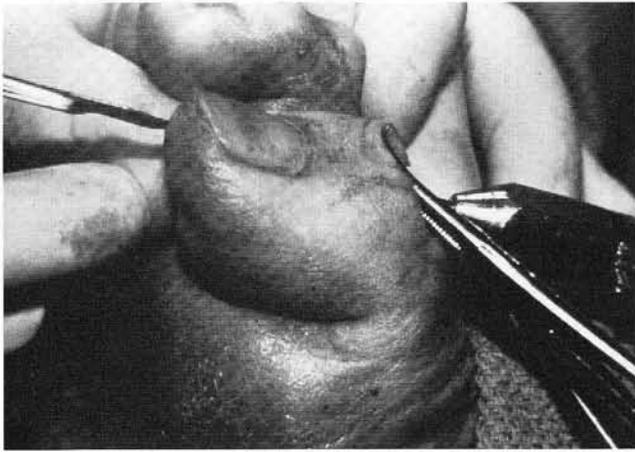


Figure 15. A small linear incision for exit of the drill and eventual insertion of the screw.



Figure 16. Completion of the thread hole in the distal phalanx.

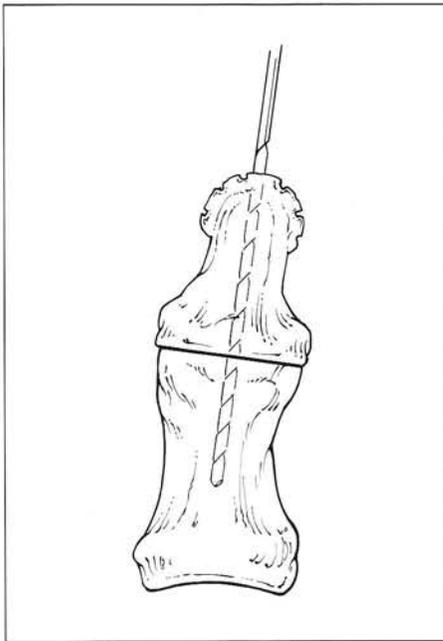


Figure 17. Thread hole into the proximal phalanx.



Figure 18. A 2.5-mm. thread hole from distal to proximal and centrally located in the proximal phalanx while the joint is apposed.

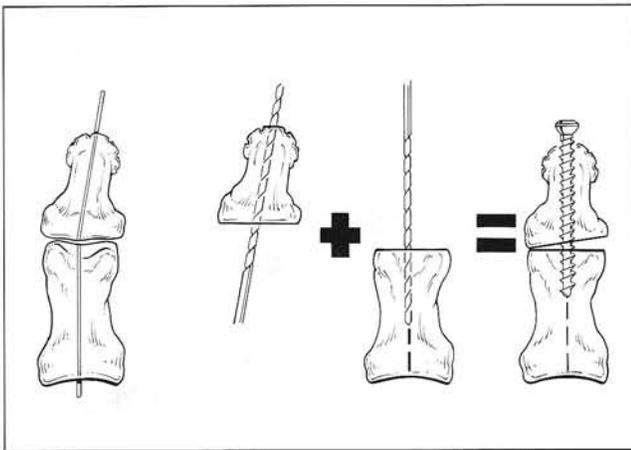


Figure 19. Potential mal-alignment or gap is possible at the fusion site if the distal and proximal phalanges are drilled separately.

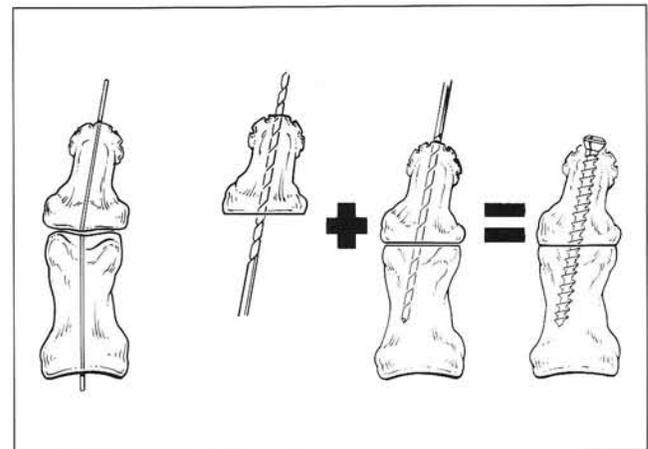


Figure 20. Solution to the potential gap at the interphalangeal joint is to complete the thread hole into the proximal phalanx while the joint is apposed.

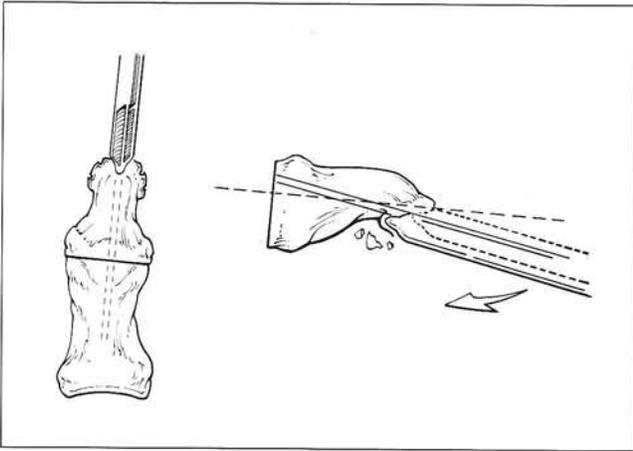


Figure 21. Demonstration of the countersink of the distal phalanx. Care must be taken not to deviate from central and fracture the tuft.

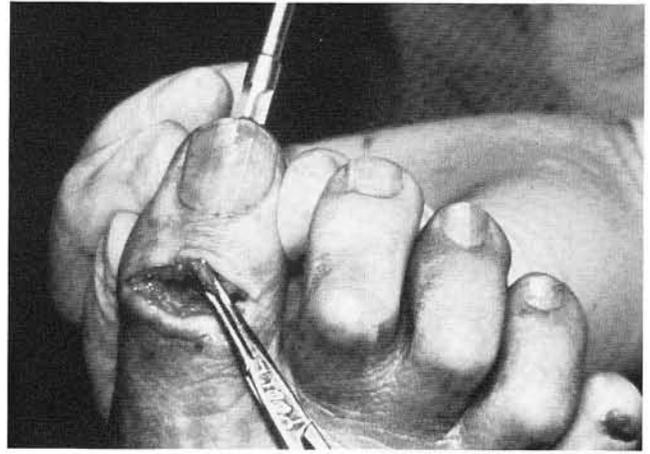


Figure 22. The countersink of the distal phalanx.

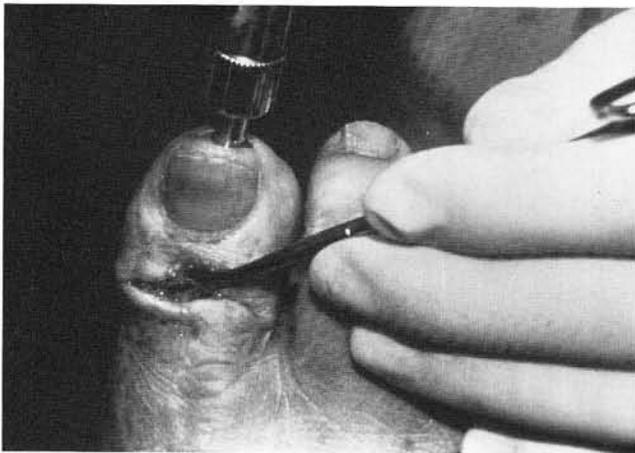


Figure 23. Depth gauge is performed with the joint flush and apposed.

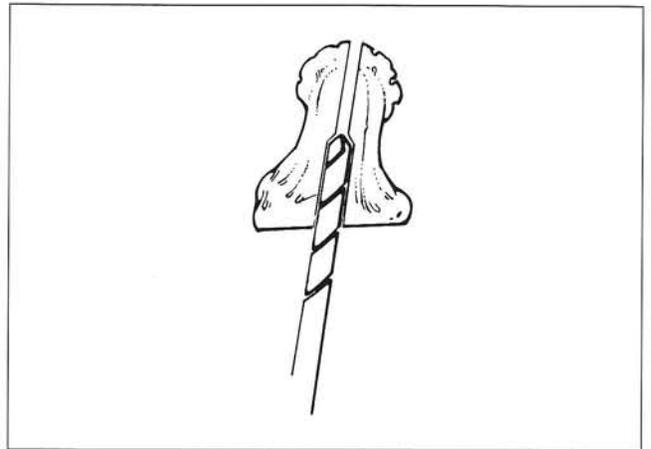


Figure 24. Overdrilling of the distal phalanx is necessary to achieve a lag effect with a fully-threaded screw.

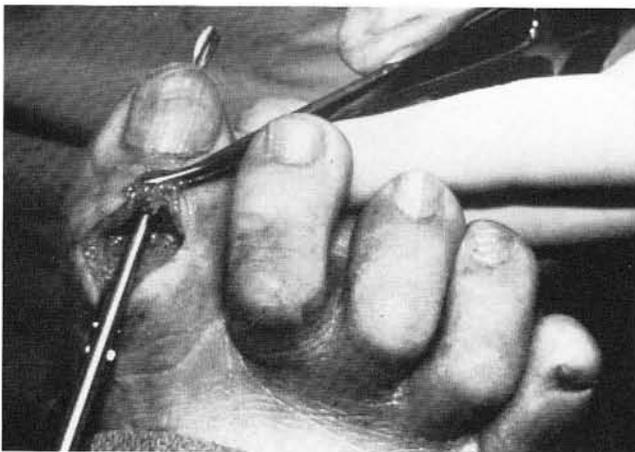


Figure 25. Overdrilling of the distal phalanx from proximal to distal, exiting the pulp of the hallux. A 3.5-mm drill is used as no 4.0-mm drill exists.

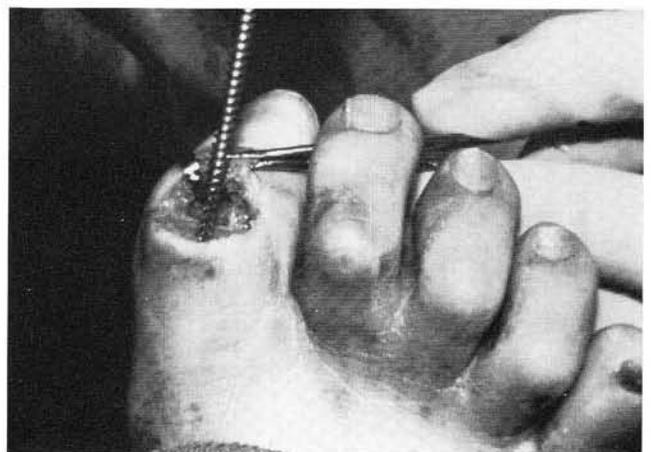


Figure 26. The proximal phalanx is tapped with a 3.5 x 1.75-mm tap.

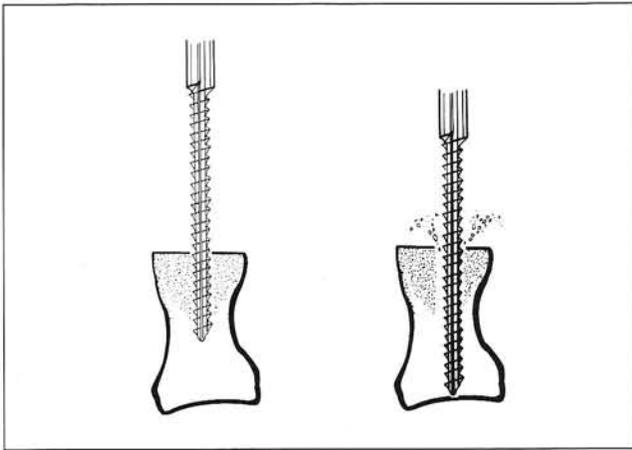


Figure 27. Care is taken not to tap indiscriminately into the base of the proximal phalanx as this may strip the threads in good subchondral bone at the head of the phalanx.

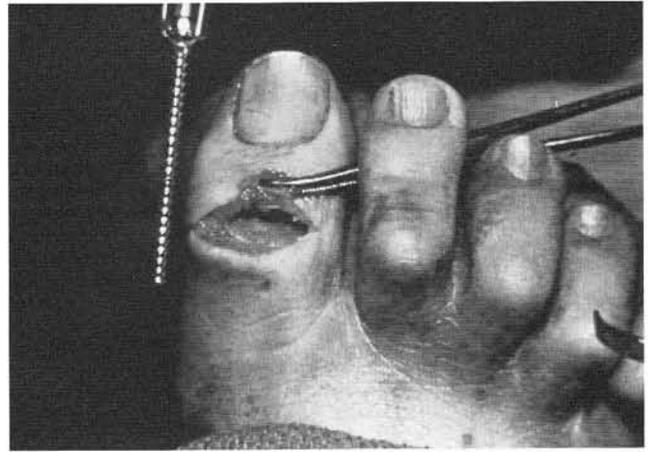


Figure 28. A 4.0-mm fully-threaded cancellous screw.

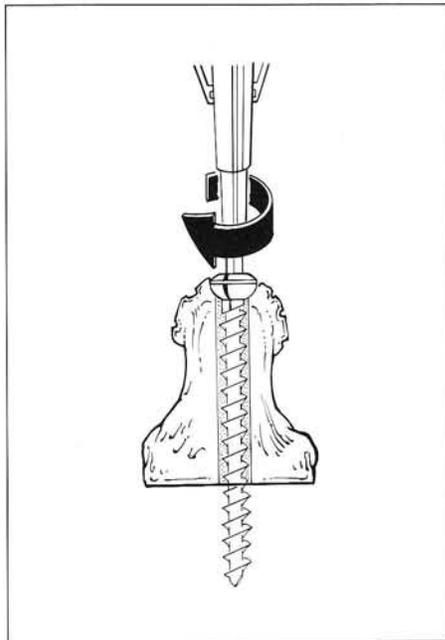


Figure 29. The thread pattern in the distal phalanx must be stripped to allow for interfragmentary compression via the lag technique. This is because the overdrill is 3.5-mm and the screw thread pattern is 4.0-mm. Therefore, the .5 mm differential must be stripped to create an effective gliding hole in the distal phalanx.

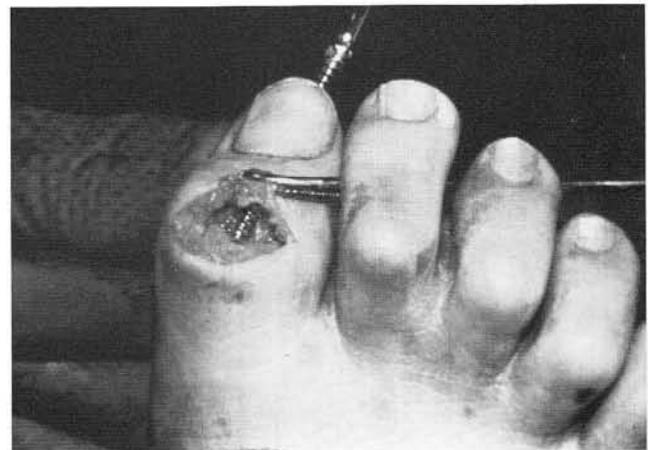


Figure 30. The insertion of a fully-threaded screw into the distal phalanx with subsequent stripping of the 3.5-mm thread pattern.

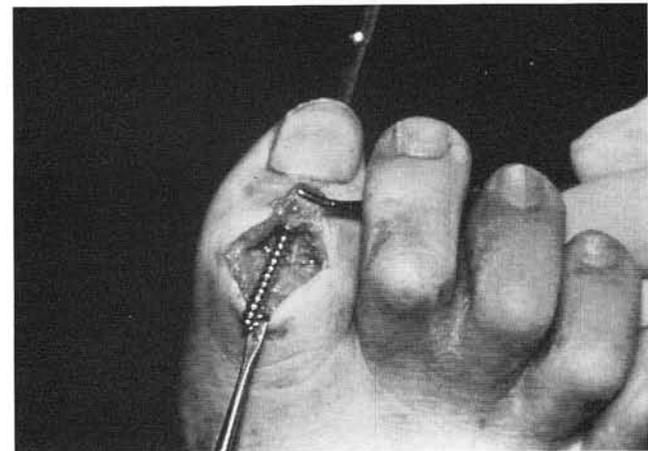


Figure 31. Insertion of the screw into the proximal phalanx.

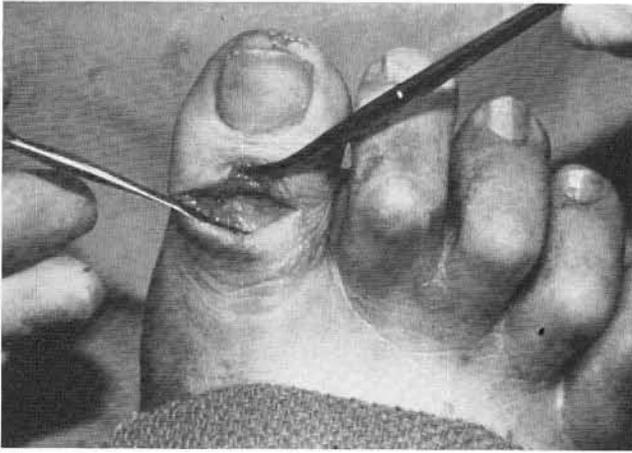


Figure 32. The apposition and fit is confirmed at the interphalangeal fusion site.

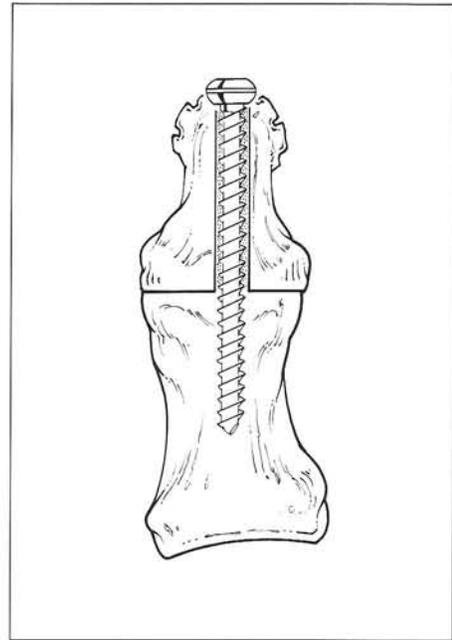


Figure 33. A 4.0-mm fully-threaded cancellous screw inserted in the lag technique with overdrilling of the distal phalanx.

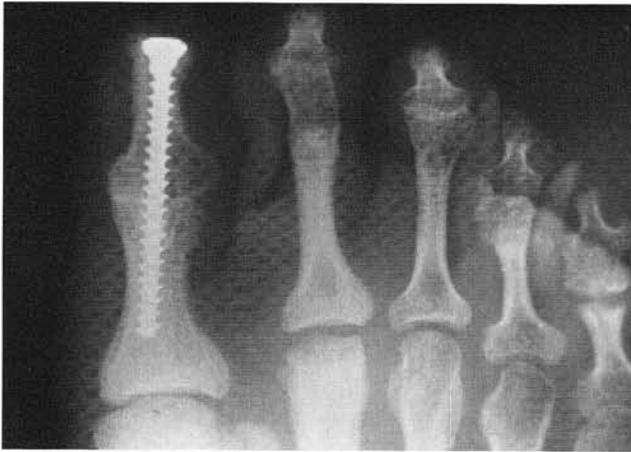


Figure 34. Postoperative radiograph using the fully-threaded cancellous screw.



Figure 35. Long term follow-up radiograph with successful fusion of the hallux interphalangeal joint.

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