SURGICAL APPROACH TO THE LISFRANC REGION

David J. Caldarella, DPM

An atraumatic and reproducible dissection technique is the cornerstone for successful results in any surgical procedure. The principles of anatomic dissection are fundamentally similar, regardless of the anatomic position of the involved surgical site. An anatomic dissection technique to the Lisfranc region (tarsometatarsal joint) will be presented to serve as a guide for surgical intervention.

Conditions which may require surgical intervention in the Lisfranc regions include traumatic dislocation/subluxation, metatarsus adductus deformity, tendon transfers, soft tissue masses, infection, metatarsal fractures, neoplasms, Charcot degeneration, and compartment syndrome.

Accurate placement of the incisions for exposure of the Lisfranc region are critical in attaining an atraumatic dissection. Anatomical considerations that must be identified preoperatively include topographical bony landmarks, neurovascular structures, tendon position, and joint structure.

SURGICAL APPROACH TO THE LISFRANC REGION

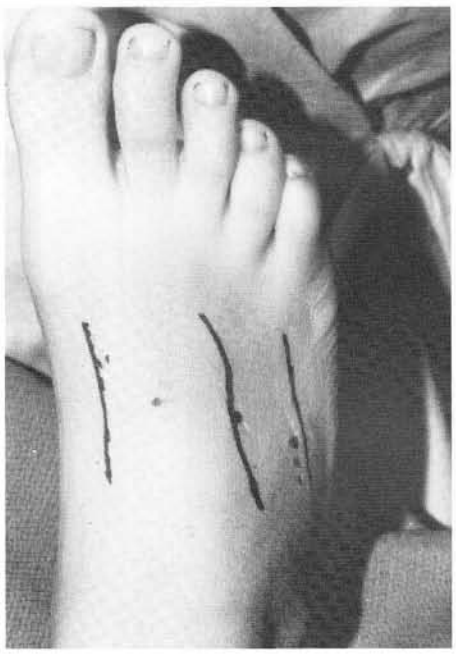

Figure 1. A three incisional approach is used to expose the entire tarso-metatarsal joint. The medial incision provides access to the first metatarsal-cuneiform region. A central incision is placed for access to the second and third metatarsal bases and their respective middle and lateral cuneiform. The third incision is placed laterally, to provide access to the fourth and fifth metatarsal bases and cuboid.

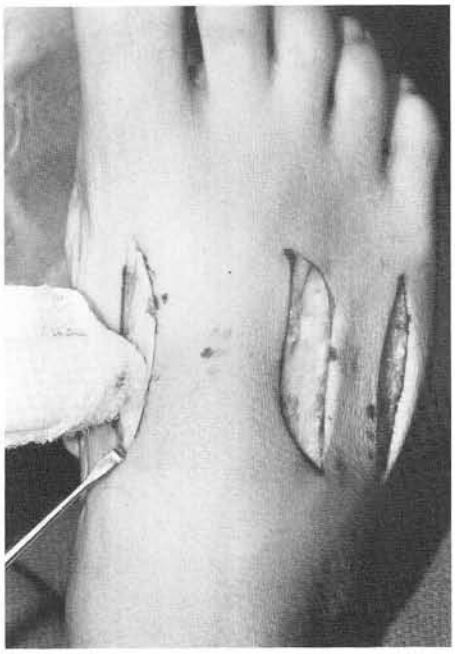

Figure 2. Once the dermis has been incised, a moistened sponge is used to reflect subcutaneous tissue. This blunt dissection technique is atraumatic and adequately separates the natural cleavage plane between the superficial and deep fascia.

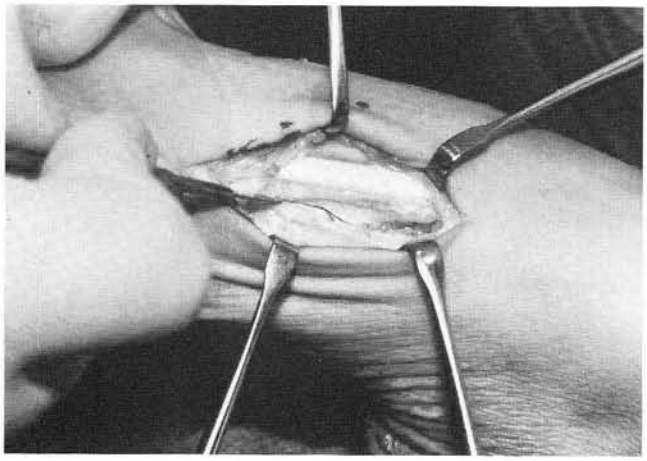

Figure 3. A medial view of the first metatarsal-cuneiform area reveals the deep fascial layer which is incised linearly. Care is taken to bisect the first metatarsal-cuneiform region equally, maximizing exposure dorsally and plantarly along the entire length of the incision. The extensor hallucis tendon is superiorly retracted.

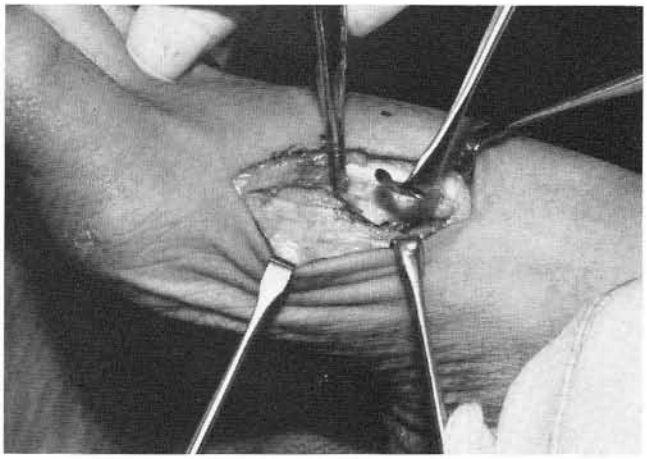

Figure 4. The deep fascial and periosteum layer are incised and reflected as one unit with initiation of reflection over the diaphysis of the first metatarsal. Periosteal dissection is started distally at this level because of its loose attachment to diaphyseal bone. A freer elevator is used.

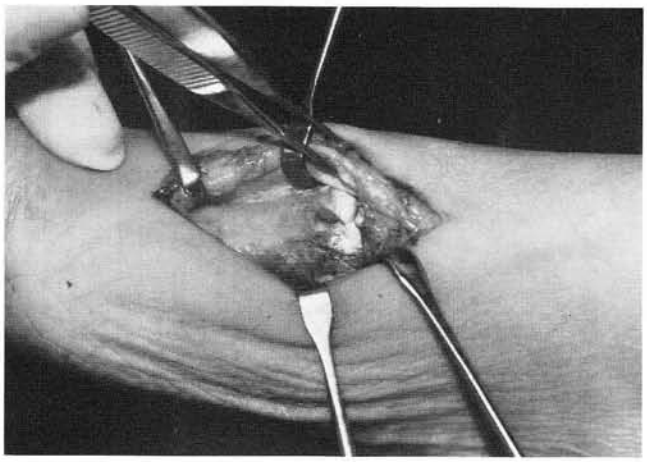

Figure 5. Periosteal dissection has been completed providing adequate exposure to the first metatarsal-cuneiform articulation. Sharp dissection with a #15 blade is often necessary for periosteal dissection at the metaphyseal region.

Figure 6. Following completion of the osseous procedure, closure of the medial incision begins proximally. The delicately preserved periosteum is approximated with an over-and-over interrupted suture technique. This method ensures excellent approximation of the vital periosteal layer and resists tear-through and loosening of the suture material.

Figure 7. The periosteum is closed as an individual layer along the entire length of the incision.

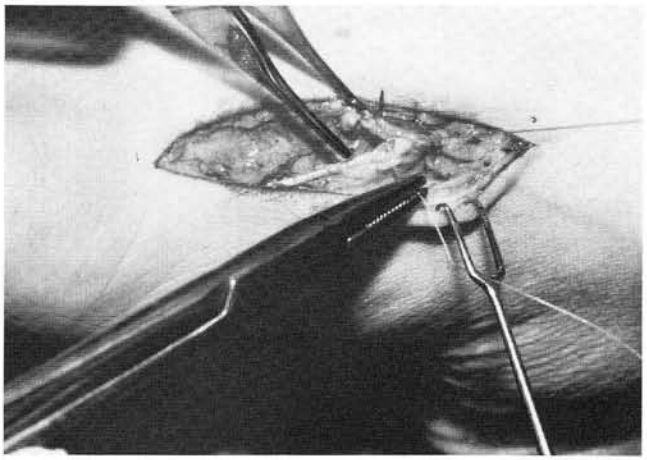

Figure 8. The deep fascia is now approximated either with a repeated over-and-over technique or continuously with a running interlocking stitch.

Figure 9. The subcutaneous or superficial layer is identified and approximated with a running absorbable suture.

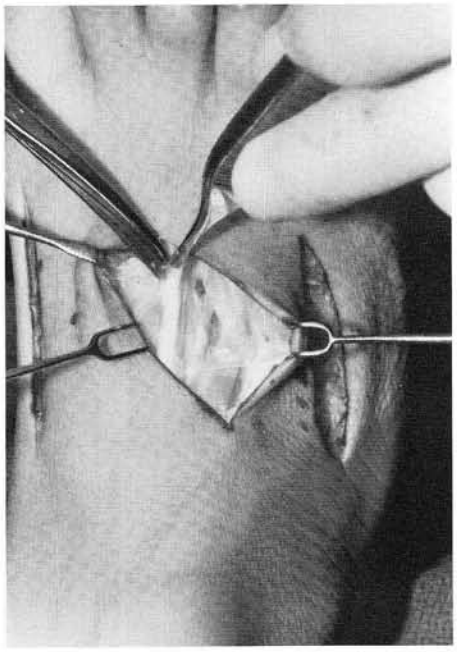

Figure 10. The central corridor to the Lisfranc region is the most technically difficult to dissect because of the many different structures running through the area and the multiple layers encountered. Following the skin incision, a delicate layer of superficial fascia is reflected and the delicate deep fascial layer is identified overlying the long extensor tendons. This tissue plane is punctured distally and will be repaired at closure.

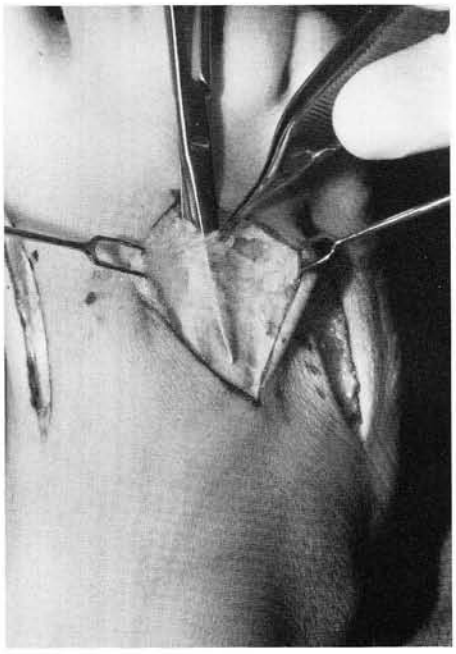

Figure 11. A Metzenbaum scissor is inserted into this portal and gently pushed proximally. The elevated tissue layer is a component of the inferior extensor retinaculum.

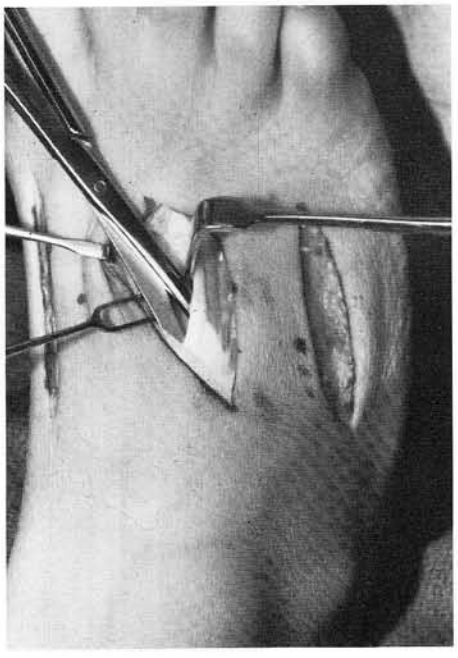

Figure 12. The long extensors are retracted laterally, preparing for exposure to the second metatarsal and middle cuneiform.

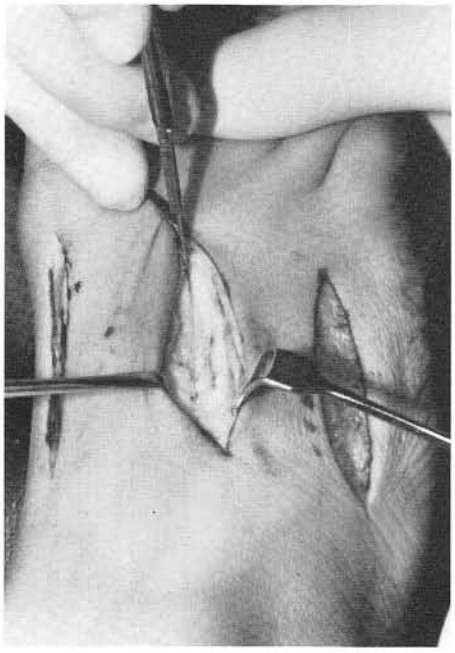

Figure 13. Once adequate retraction is obtained, the distal aspect of the second metatarsal is palpated proximally to the dorsal surface of the intermediate cuneiform. A proximal to distal linear periosteal incision is placed between the first and second dorsal interossei muscles. Care is taken to maintain contact and position on the dorsal aspect of the metatarsal shaft.

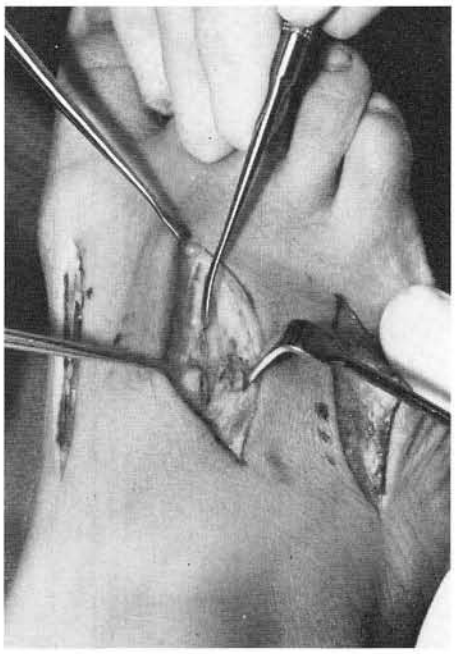

Figure 14. Periosteal dissection begins distally on the midshaft of the metatarsal. Care is taken to preserve this layer as it becomes thinner proximally, and more adherent to the metatarsal base and cuneiform bone.

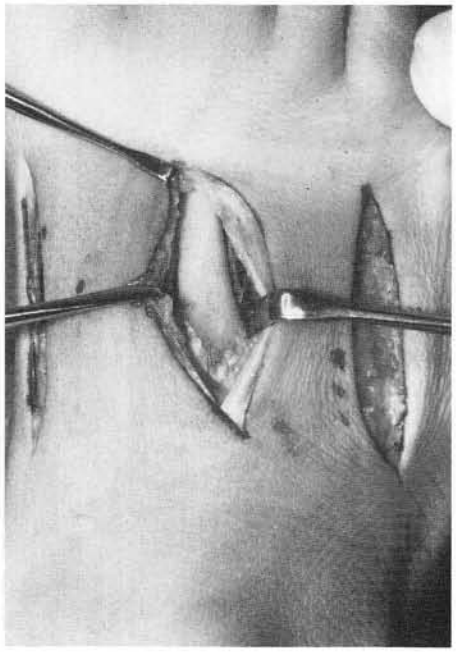

Figure 15. Exposure is now demonstrated to the second metatarsal base and respective articulation with the middle cuneiform. Minor adjustments in incisional planning will extend the amount of exposure safely and effectively depending upon the surgical procedure to be performed. The third metatarsal and lateral cuneiform are identified in similar fashion. The long extensor tendons are retracted, and the third metatarsal shaft is palpated.

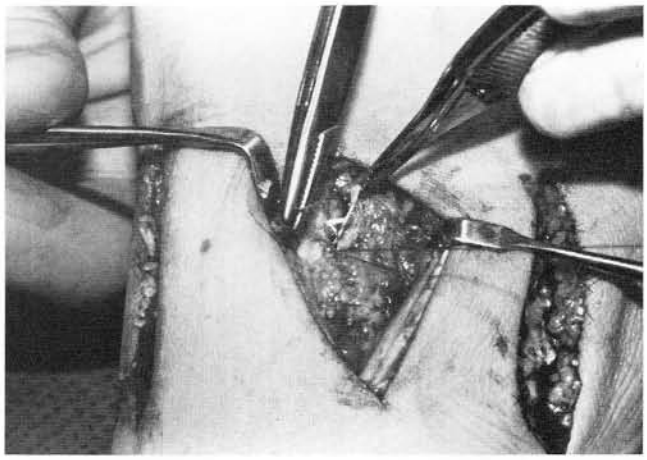

Figure 16. The central incision closure is the most technically demanding. Consideration is often given to closure of the central incision first, especially in reconstruction of an acutely dislocated Lisfranc joint. Any edema which will develop can hinder efforts to meticulously close the more delicate fascial planes in this area of the foot. The periosteum is identified at its proximal extent and reapproximated with an interrupted over-and-over suture technique.

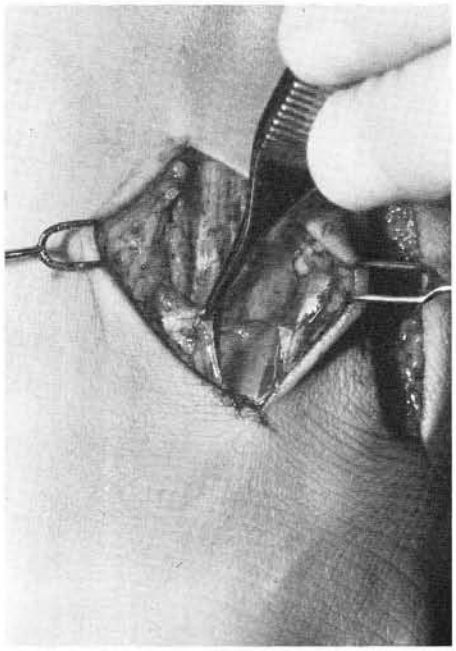

Figure 17. The deep fascia is identified and closed in a continuous running interlocking fashion. Following closure of the deep fascia, the subcutaneous layer and skin are closed separately with a running absorbable suture technique.

Figure 18. Attention is directed to the lateral incision and the superficial tissues are reflected.

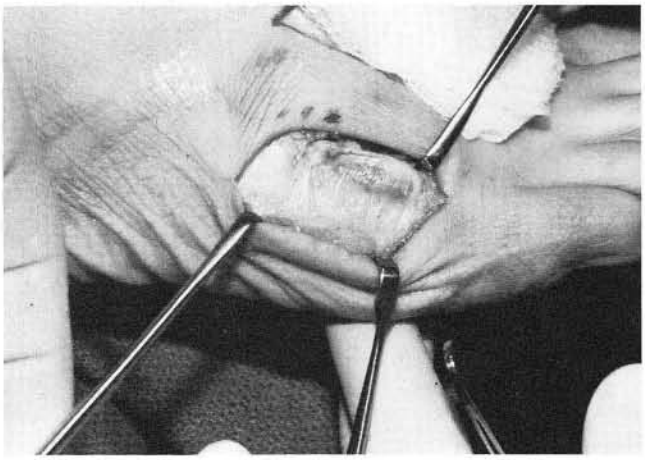

Figure 19. The deep fascial tissue overlying the fourth and fifth metatarsal shaft is identified.

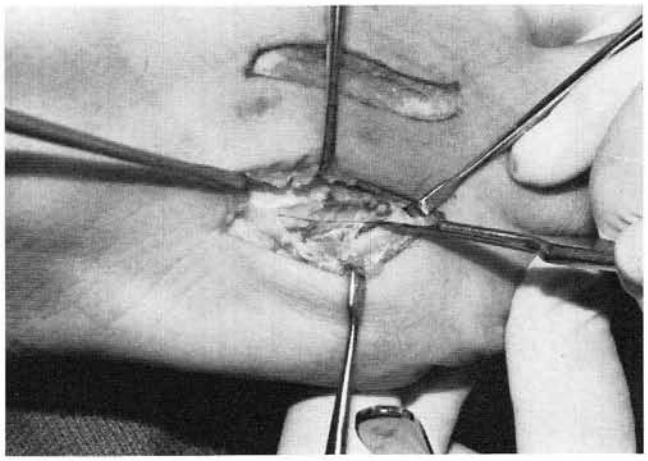

Figure 20. The midshaft of the fourth and fifth metatarsals are now palpated. A periosteal incision is made over the shaft of the fifth metatarsal.

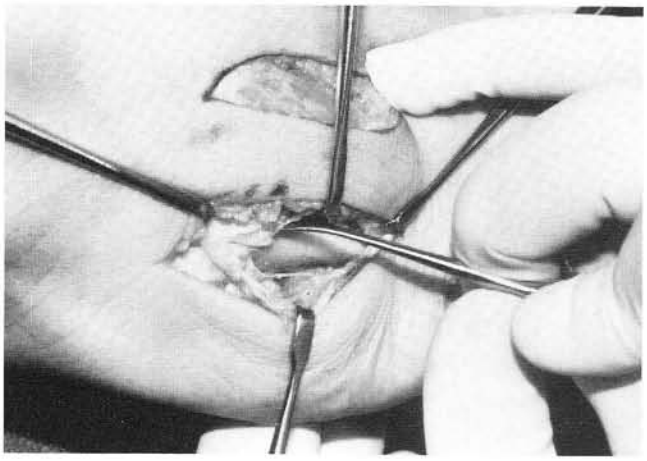

Figure 21. The periosteum is gently reflected from the shaft and base of the fifth metatarsal.

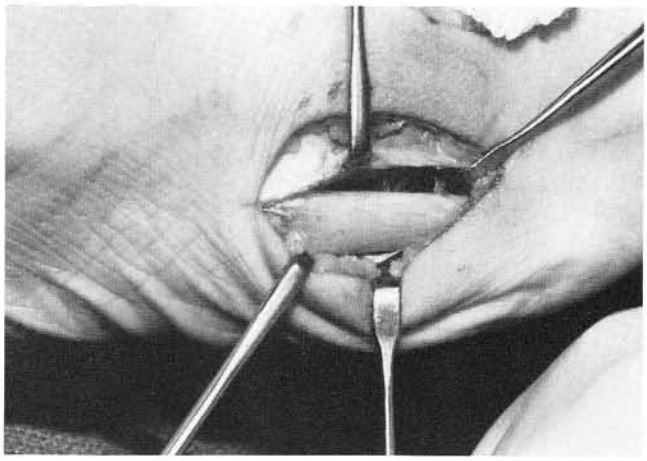

Figure 22. Full exposure of the fifth metatarsal is demonstrated. The fourth metatarsal is addressed in a similar fashion.

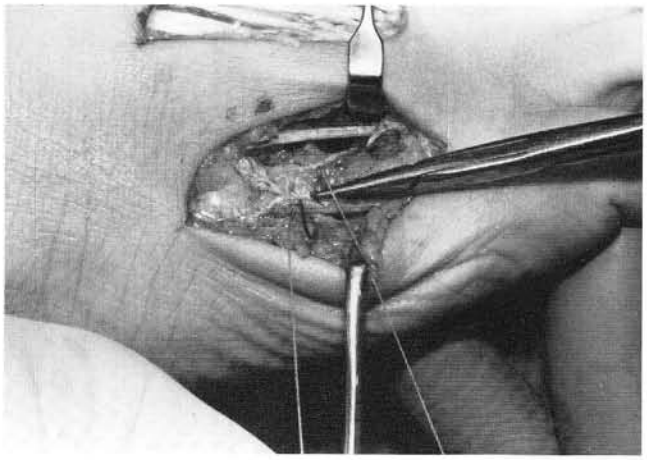

Figure 23. Following osteotomy and fixation of the fourth and fifth metatarsals, closure of the lateral incision begins at the periosteal level. This tissue layer is delicate, and care must be taken to preserve it. At times, the periosteum and deep fascia are reapproximated as one tissue layer.

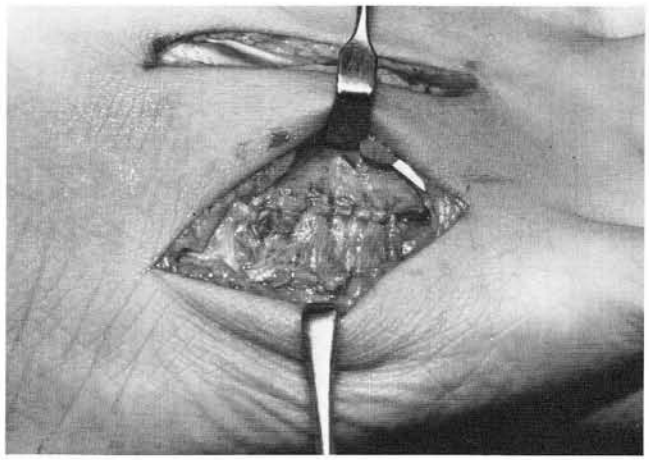

Figure 24. A final view illustrating closure of the deep fascia.

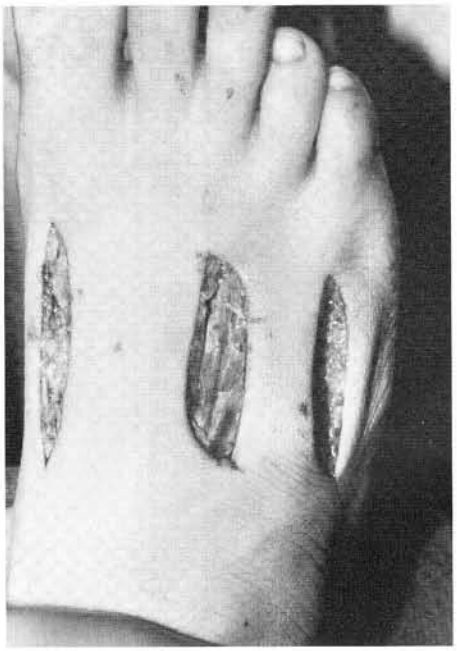

Figure 25. All three incisions prior to subcutaneous closure.

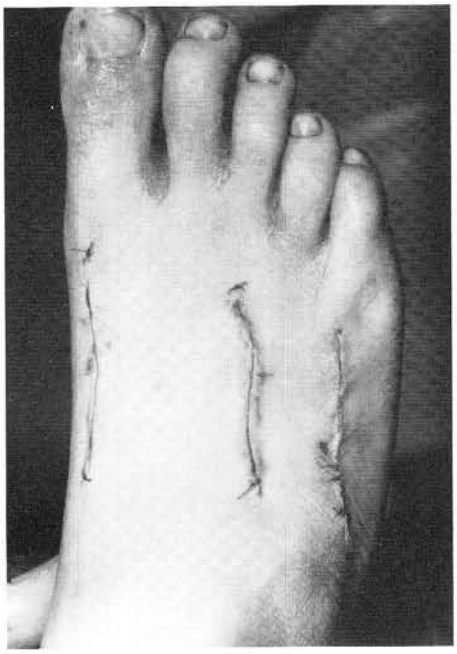

Figure 26. Final postoperative view following intradermal closure with 5-0 Dexon suture.

SUMMARY

This surgical approach to the Lisfranc region gives an easily reproducible, atraumatic access to this region of the foot. Variations of this dissection technique can be used to provide optimal exposure with preservation of anatomy and function. This approach is based on established methods of anatomic dissection in other areas of the foot. Universally, the integument, subcutaneous tissue and deep fascia are identified at their given position in the approach to the tarso-metatarsal region. Periosteal dissection is meticulously performed to preserve this delicate and vital tissue structure. Comprehensive preoperative planning and attention to detail, as well as meticulous dissection will optimize operative results and diminish postoperative complications.