CHAPTER 6

ANKLE INSTABILITY: The Brostrom-Gould Procedure

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Soft tissue injuries of the lateral ankle are extremely common and account for nearly one-third (31.1%) of podiatric emergency room visits. Most of these injuries are initially managed in a conservative fashion, with most patients undergoing a short period of non-weight bearing and protective casting or bracing. This is followed by rehabilitation of the ankle with proprioceptive retraining and peroneal strengthening exercises. Most studies indicate an 80% success rate with conservative treatment, with the remaining 20% developing some degree of chronic lateral ankle instability. This inversion instability normally has a mechanical and functional component. The mechanical component is due to rupture or laxity of the lateral collateral ligaments, and is evident on stress radiographs as an abnormal increase in the talar tilt or anterior drawer tests. Most authors currently agree that talar tilt is the more radiographically significant test, while the anterior drawer test is best appreciated clinically. Functional instability implies that the patient has subjective complaints of the ankle being weak, painful or frequently "giving way." These patients may or may not have radiographic mechanical instability of the ankle joint. The examiner should always be suspicious of the possibility of subtalar instability in the patient with chronic functional inversion laxity of the ankle joint, especially in the absence of demonstrable collateral ligament deficiency. Because the calcaneofibular ligament crosses both the ankle and subtalar joints, it is felt that in grade three sprains with rupture of this ligament, both joints may be destabilized.

Most literature recommends conservative treatment for the initial lateral ankle injury, except in athletic patients with high functional demand, or in patients with a history of lateral ankle instability or the presence of an osteochondral fracture. However, if primary surgical repair does, in fact, decrease the likelihood of chronic instability, then other patients that have high functional demands on the ankle may also be candidates for primary surgical intervention.

Brostrom published a study comparing three methods of treatment, with follow-up averaging 3.8 years. Primary surgical repair was performed on 95 patients followed by 3 weeks of immobilization; cast immobilization alone was performed on 82 cases, and ankle strapping with early immobilization was the treatment for 104 cases. The most successful results were achieved with primary surgical repair, since 97% of those cases treated surgically had no functional instability. The two other methods were satisfactory, with functional stability achieved in 80% of those cases treated by casting or strapping.

There are also those who believe that clearing the hemarthrosis and reinforcing the anatomic repair with non-absorbable sutures shortens the rehabilitation period for patients undergoing primary repair. Ruth, in 1961, performed a comparison study between surgical repair and cast immobilization. Of the 32 surgically-repaired ankles examined 2.5 years later, all were noted to be stable, and 3 presented with only minor symptoms. Of the 72 ankles treated with cast immobilization, only two-thirds were stable at 2 years post-injury, with only 30 indicating a 90% or better return to function.

There is controversy in the literature regarding the preferred method of treatment for chronic ankle instability. There are those who advocate primary repair of the remaining portions of the ankle ligaments, while others espouse ligament reconstruction with the use of tendon transfers, or grafting with synthetic materials. The authors believe that in the majority of cases, the ends of the ruptured ligaments can be identified and reapproximated primarily, yielding an equally strong repair of the ankle ligaments as compared to the tenodesis type of procedure.

Liu and Baker tested the static restraints of various surgical procedures, including the

Chrisman-Snook, Watson-Jones, and modified Brostrom, versus intact and severed ATF and CF ligaments. Their study demonstrated that the modified Brostrom procedure had less anterior talar dislocation and talar tilt than was seen on the cadavers which had the tendon transfer procedures performed. Interestingly, none of the procedures equaled the static restraints of intact ligaments. Even if intra-operatively the ligaments are found to be atrophic and not repairable, a primary repair can be converted at that time to a ligament reconstruction procedure with the use of a three-incisional approach. Other advantages of initial primary repair include preservation of subtalar joint motion, shorter rehabilitation period, preservation of peroneal tendon strength, fewer wound healing problems, and a reduced chance of sural nerve entrapment.

There are certain instances where a ligament reconstruction or "tenodesis" procedure is more desirable. These situations include a documented component of subtalar instability alone or in combination with ankle instability, failed previous primary repair, or in the cavus foot with a plantarflexed first ray. In the latter, a peroneus longus transfer is particularly desirable. Most members of the Podiatry Institute faculty initially recommend primary repair of the damaged ligaments for the chronically unstable ankle except in the previously mentioned situations.

If primary repair is to be performed, there is the consideration of repairing one or both of the collateral ligaments. Colville demonstrated that the anterior talofibular and calcaneofibular ligaments act together to resist inversion of the ankle in all angles of plantarflexion. Cass and Settles in cadaveric specimens also concluded that talar tilt occurred only when the anterior talofibular ligament (ATFL) and calcaneofibular ligament (CFL) were released. The author's current recommendation is that if primary repair of the ligaments is attempted, both ligaments should be repaired.

THE BROSTROM-GOULD PROCEDURE

Between the years of 1964 and 1966, Lennart Brostrom published a series of articles discussing the management of soft tissue lateral ankle injuries. The procedure he described involved identification and shortening of the elongated collateral ligaments without the use of synthetic materials or other autogenous structures. This procedure was modified by Nathaniel Gould and included mobilization of the lateral portion of the extensor retinaculum and attachment to the distal fibula, superficial to the ligament repair. Because the extensor retinaculum arises from the calcaneus and courses parallel to the CFL, the component of subtalar instability is also addressed as well as reinforcing the primary ligament repair. This procedure is particularly ideal in athletes such as gymnasts and ballet dancers who need preservation of subtalar joint range of motion, as well as peroneal muscle function and strength.

Hamilton, in 1953, reported the results of 28 modified Brostrom procedures with 55% of the patients being professional ballet dancers, and the rest comprising recreational athletes and non-athletes. The average follow-up period was 7 years, and the results were 26 patients with an "excellent" outcome, 1 "good," and 1 "fair" result.

Surgical Technique

This procedure is normally performed with the patient placed in the lateral decubitus position. Local anesthesia with intravenous sedation is employed. Due to the ease of hemostasis in this area, a tourniquet is not necessary. The important landmarks are identified, including the borders of the fibular malleolus and the accurate location of the anterior talofibular and calcaneofibular ligaments. Of particular note is orientation of the CFL, which arises from the anterior aspect of the distal fibular malleolus and progresses posteriorly and inferiorly parallel to the anterior border of the malleolus (Fig. 1).

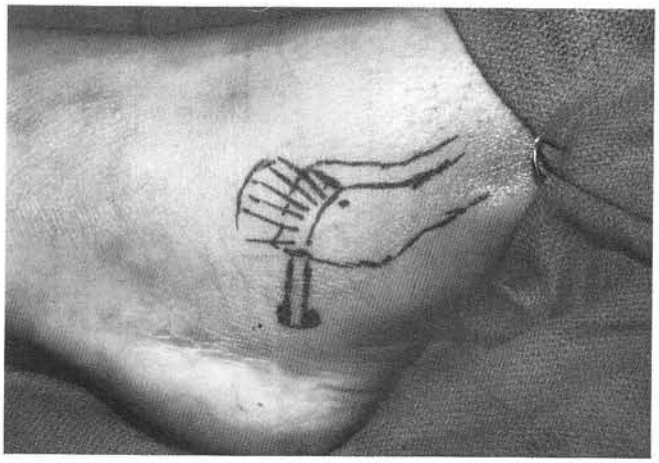

Figure 1. Identification of landmarks.

The skin incision is placed very close to the malleolus and extends across the body of the ATFL and CFL (Fig. 2). It is important to note that the superior and inferior portions of the incision are in close proximity to the intermediate dorsal cutaneous and sural nerves, respectively. Careful dissection is critical in this area to avoid damage to these structures. Another occasional error is placement of the incision too far inferior, leading to accidental dissection into the subtalar joint. Following reflection of the subcutaneous tissue and deep fascia, the intra-capsular ATFL is identified (Fig. 3). The ligament is incised, exposing the ankle joint, and a mid-body section of the ligament is then removed (Fig. 4). The joint is also inspected for the possible presence of an occult osteochondral fracture of the talus.

Dissection is then directed toward the distal portion of the fibula where the peroneal sheath is incised (Fig. 5). The peroneal tendons are retracted inferiorly, providing access to the extra-capsular CFL (Fig. 6). A non-absorbable suture is placed in the distal portion of the ligament prior to removing a section (Fig. 7). After removal of the lax portion of the ligament, the remaining portions are approximated with a non-absorbable suture (Fig. 8). While an assistant holds the foot in a slightly dorsiflexed and everted position, the ATFL ligament is reapproximated (Fig. 9). The extensor retinaculum is then identified along the anterior portion of the wound. After adequate mobilization of the retinaculum, its lateral border is brought superficial to the ATFL repair and sutured to the fibular periosteum (Fig. 10). The subcutaneous tissue and skin are then closed, followed by the application of standard dressing materials and a compressive below-knee cast. It is important to maintain the foot slightly dorsiflexed and everted during the soft tissue closure as well as application of the dressing and cast in order to protect the repair (Fig. 11).

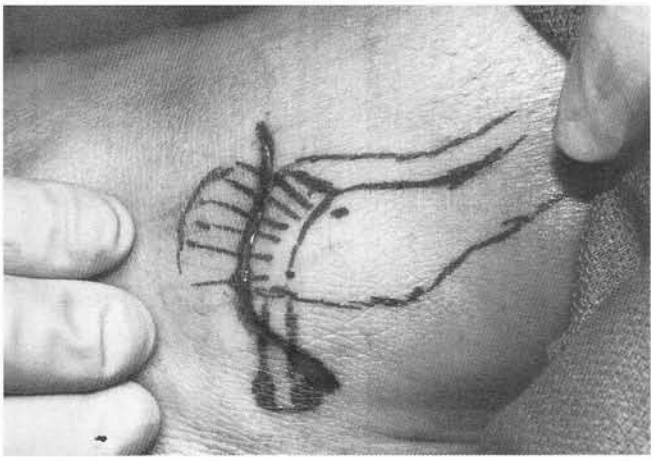

Figure 2. Curvi-linear incision across the collateral ligaments.

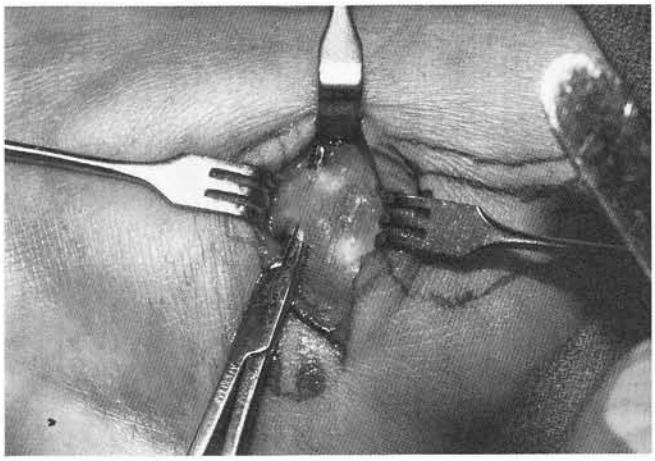

Figure 3. Identification of ATFL.

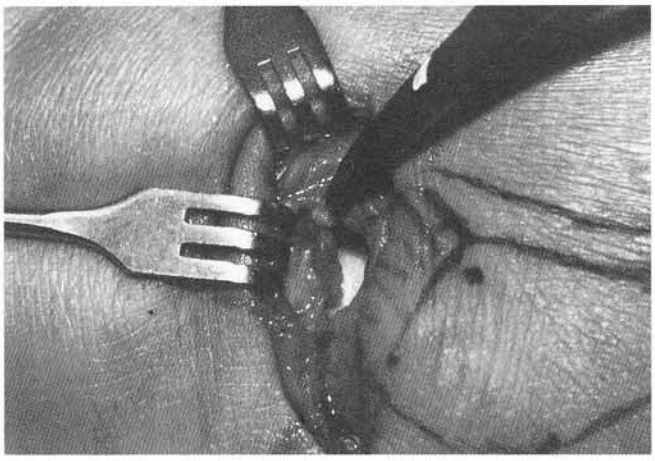

Figure 4. Sectioning of ATFL and exposure of the ankle joint.

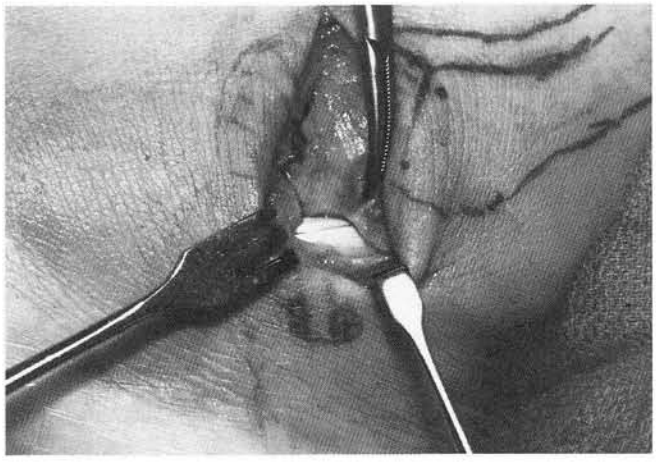

Figure 5. Reflection of the peroneal sheath.

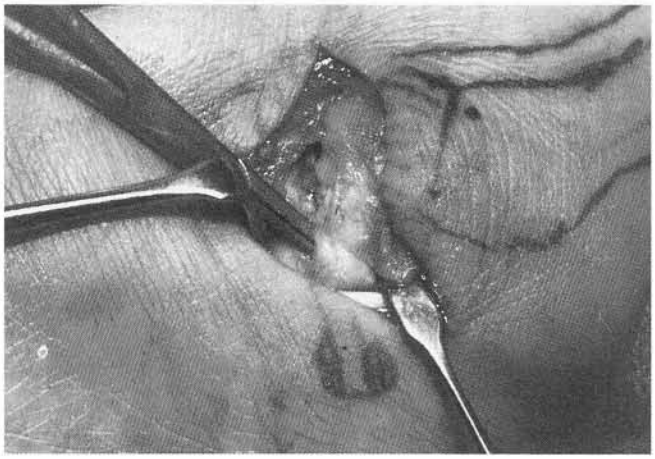

Figure 6. Identification of CFL.

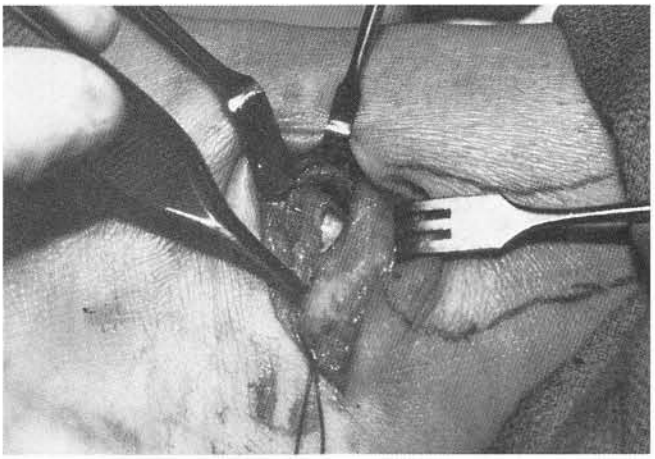

Figure 7. Placement of non-absorbable suture in the distal portion of CFL.

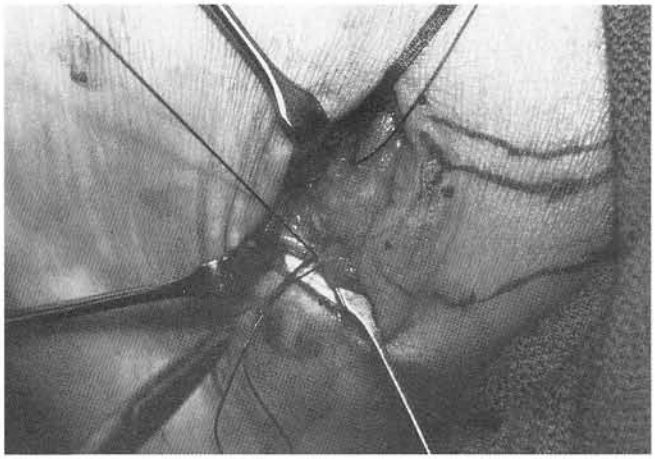

Figure 8. Approximation of CFL after the mid-body section removed.

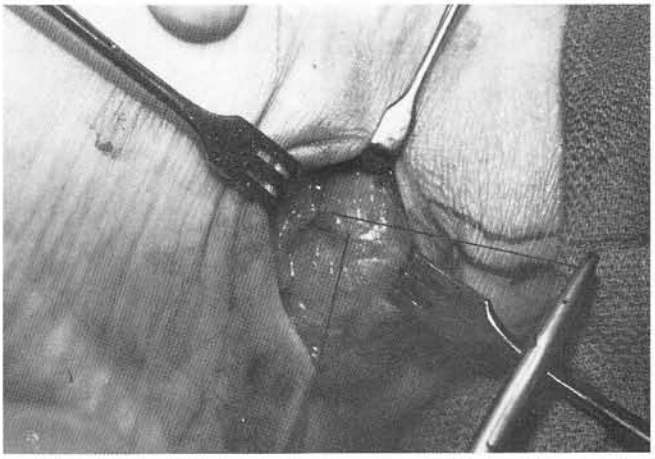

Figure 9. Approximation of ATFL.

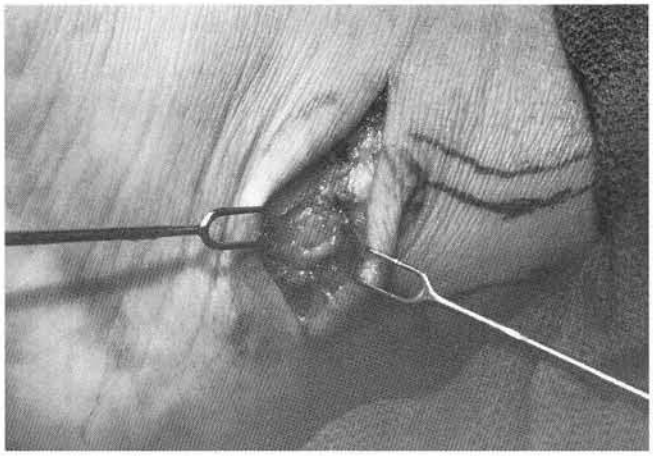

Figure 10. Extensor retinaculum is mobilized and sutured to the fibular periosteum.

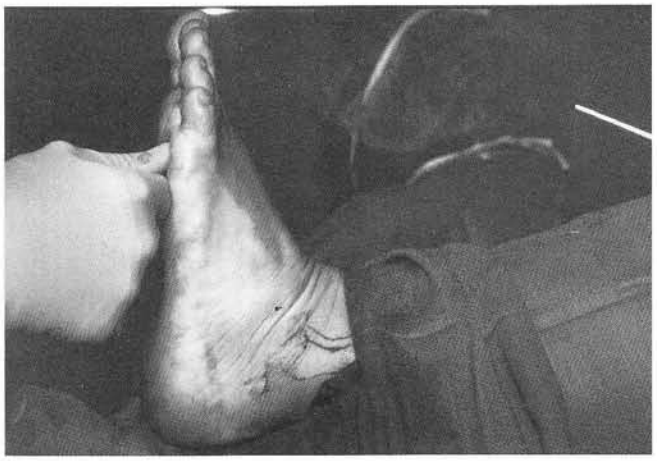

Figure 11. Position of the foot as it is held during closure and casting.

Postoperative Management

Initially, the patient is maintained in a non-weight-bearing compression cast for 10 to 14 days. A weight-bearing below-knee cast is then applied for two additional weeks. At the beginning of week five, the ankle is protected with an air stirrup brace, and range of motion exercises are begun. Swimming and isometric peroneal exercises are also encouraged.

CONCLUSION

Primary repair generally offers a high success rate with relatively low surgical morbidity. The authors routinely utilize this procedure for the initial surgical repair of the chronically unstable ankle. Overall, the complication rate with this procedure is very low. However, it is possible to restrict ankle joint plantarflexion if too large a section of the ATFL and joint capsule are removed. It is necessary to make certain that the ankle has adequate sagittal plane range of motion after the repair is complete.

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