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Tips, Quips, and Pearls

"Tips, Quips, and Pearls" is a special section in The Journal of Foot & Ankle Surgery®, *which is devoted to the sharing of ideas to make the practice of foot and ankle surgery easier. We invite our readers to share ideas with us in the form of special tips regarding diagnostic or surgical procedures, new devices or modifications of devices for making a surgical procedure a little bit easier, or virtually any other "pearl" that the reader believes will assist the foot and ankle surgeon in providing better care.*

Arthroscopic Deltoid Repair: A Technical Tip

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ABSTRACT

Deltoid ligament repair can be challenging, and implementation of an arthroscopic method can be useful in terms of minimizing morbidity associated with open dissection, as long as the repair is effective and durable. In this brief report, we describe a method of arthroscopic deltoid ligament repair that we have found to be useful.

The deltoid ligament complex is the primary stabilizer against the valgus force of the ankle. Deltoid ligament injuries are often associated with ankle fractures caused by the rotational force. In the conventional treatment of ankle fractures, injuries to the deltoid ligament do not require routine exploration if the lateral side of the joint has been stabilized. Currently, repair of the deltoid ligament is recommended if medial instability is present, even after fixation of an isolated lateral malleolar fracture (1,2).

The deltoid ligament complex is primarily divided into superficial and deep components. In previous studies, the deep deltoid ligament was considered the major contributor to ankle stability against a valgus load, and the superficial deltoid ligament was considered to contribute only minimally to stability in previous studies (3–5). In contrast, a recent study suggested that repair of the anterior deltoid ligament (the talonavicular and tibiospring ligaments) appears to be adequate in limiting postoperative lateral talar excursion, thereby indicating that the anterior deltoid ligament might have a larger contribution to medial stability than previously thought (1). Any dynamic instabilities can be addressed during diagnostic arthroscopy (6). We believe that repair of the anterior (superficial) deltoid ligament would be sufficient treatment for instability due to deltoid ligament rupture. Also, medial instability due to deltoid ligament rupture could be detected and easily repaired using arthroscopy. The purpose of the present report was to describe an arthroscopic deltoid repair technique for medial instability with the deltoid ligament to the ankle.

Surgical Technique

Although we have found this technique useful in practice, for the purposes of this report, all procedures were performed using fresh cadaver specimens. The patient is placed on the operating table in the supine position and general or spinal anesthesia is used. A thigh pneumatic tourniquet is applied. The valgus stress test is conducted using 2 standard arthroscopy portals (anterolateral and anteromedial). Joint examination, including evaluation of the deep deltoid ligament, should be performed. Arthroscopic treatment of any accompanying lesions is performed during the diagnostic arthroscopic examination. To prepare for anchor insertion, the synovial tissue and periosteum are removed immediately distal to the anterior deltoid ligament, with the bleeding bony surface of the medial malleolus exposed using a motorized burr. A drill hole is made perpendicular to the anterior surface of the anterior colliculus, and the anchor is inserted through the anteromedial portal.

An absorbable Bio-SutureTak (Arthrex, Naples, FL) anchor is tagged with 2 sutures, one FiberWire and 1 TigerWire (Arthrex). The 4 strands of each suture are pulled out using a suture retriever in the

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distal portion of the anterior deltoid ligament between the tibialis anterior and posterior tendons. The 4 strands of each suture should also be located in "the safe zone" between the saphenous and tibial nerves. One strand of each suture is pulled out through the hole of the other strand using a suture retriever. Each knot is tightened with the foot inverted and dorsiflexed. The portals are then sutured in a routine manner (Figs. 1 and 2).

Postoperatively, the patients are immobilized in a posterior splint. The sutures are removed after 2 weeks, after which a short leg cast is applied (non-weightbearing) for 2 weeks. The cast is then changed to an Aircast ankle brace (DJO Global, Vista, CA), with tolerable weightbearing permitted. Full weightbearing should not be allowed until complete recovery of ankle joint motion, elimination of pain, and healing of the associated fracture is confirmed.

Discussion

Deltoid ligament rupture is commonly associated with ankle fracture. Hintermann et al (7) reported that >40% of ankle fractures had a deltoid ligament injury discovered through arthroscopic examination. Whether a ruptured deltoid ligament associated with a fracture of the malleolus should be repaired is still being discussed in reported studies (8). Recently, however, the opinion that such injuries can be a source of persistent pain or pronation deformity has increased (1,7,9,10). Disruption of the deltoid ligament complex can cause the talus to laterally migrate or tilt within the mortise. Some studies have shown that even small deviations in anatomic alignment will result in greatly reduced joint contact areas (11). As the total contact area decreases, the total stress per area increases, theoretically increasing the damage in specific areas of the ankle joint during physiologic loading (1). Thus, medial instability of the ankle joint due to deltoid ligament rupture causes poor outcomes for the accompanying ankle fracture and complications such as osteoarthritis (1,11). Clinical studies have shown radiographic signs of osteoarthritis in ankles with a lateral talar shift of >2 mm (9). Currently, the repair of the deltoid ligament is recommended if medial instability is present (1).

Previous studies have reported that the anterior deltoid ligament contributes minimally to medial stability of the ankle (3–5). Other anatomic studies have shown that the posterior tibiotalar ligament is the primary component of the deep deltoid (2,12). Jeong et al (3) suggested that the posterior tibiotalar ligament was an important stabilizer of the medial plantar arch and that this dysfunction was often associated with a tibiospring ligament disorder, which contributes to medial ankle instability. In their study, superficial deltoid ligament injuries were more frequently observed than deep deltoid ligament injuries (3). In another cadaveric study, Earll et al (13) reported that ankle joint changes occur after sectioning of the superficial deltoid ligament complex. The joint contact area decreased by

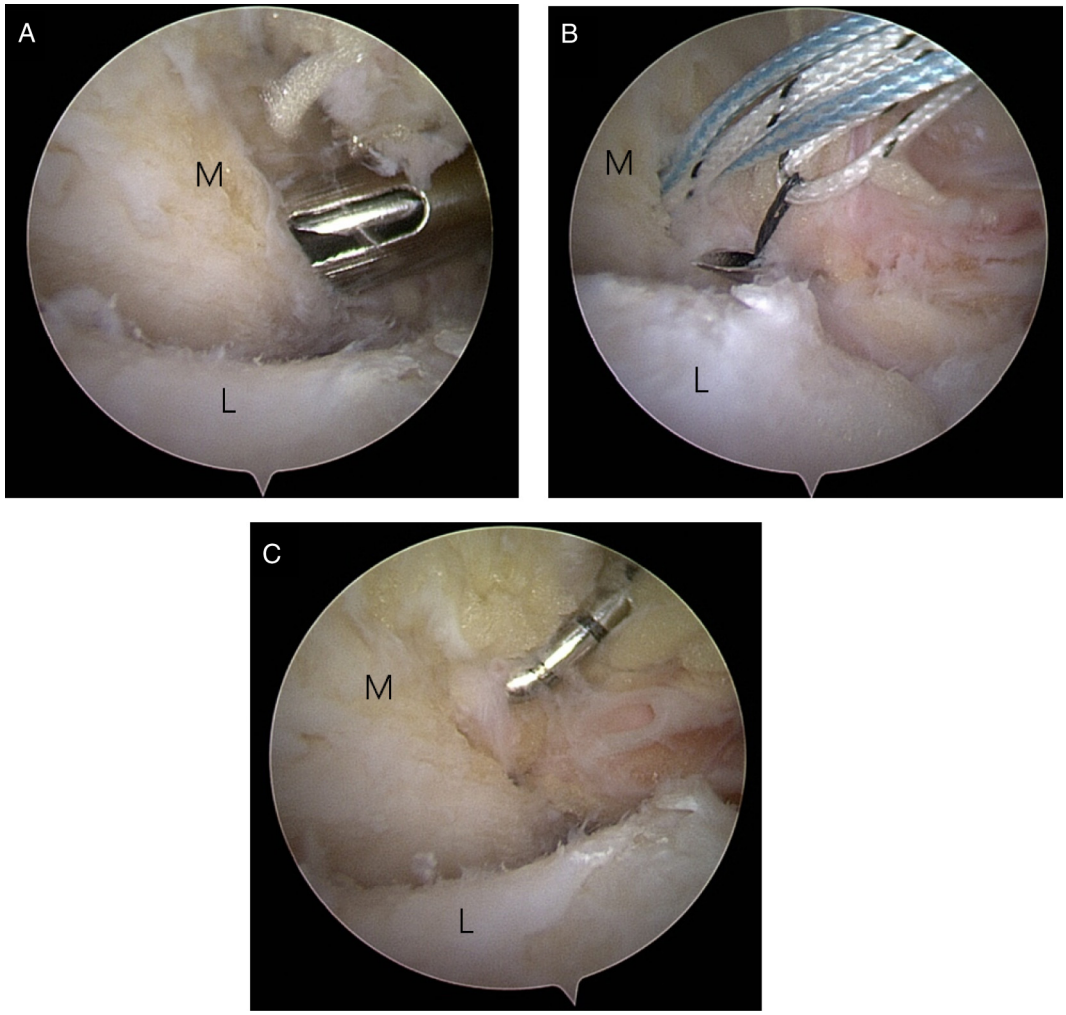

Fig. 1. Arthroscopic photographs showing arthroscopic repair of deltoid ligament: (*A*) predrilling to fix the Bio-SutureTak (Arthrex) anchor; (*B*) the 4 strands of each suture pulled out in the distal portion of the anterior deltoid ligament between the tibialis anterior and posterior tendons; and (*C*) the stability of the anterior deltoid ligament is checked with a probe after each knot is tightened. L, talus; M, medial malleolus.