Surgical Treatments of the Lateral Ankle Sprain

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Background
Lateral ankle sprain is one of the most common injuries presenting at the emergency room. It is also one of the most common sport-related injuries. However, long term disability from this injury is a major prohibiting factor delaying return to sports and even normal daily activities. The conservative treatment for ankle sprain includes initial management (rest, ice, compression, elevation) and functional treatment (short immobilization, early range of motion, muscle stretching and strengthening, neuromuscular training and advance plyometric exercise) is used as a standard treatment approach.

Among these ankle injuries, even many patients who have received a proper treatment still develop persistent unstable or sometimes painful ankle. De Vries JS et al. reported up to 20% of ankle sprain develop to chronic ankle instability. This group of patients can be managed by surgical intervention. This article will review the indication methods and details of the common surgical interventions for ankle sprain.

Surgical indications for ankle sprain
1. Painful sprained ankle: Patient will complain about painful ankle which is either related to daily activities or to specific sport-related activities.
2. Unstable ankle: Patients will complaint about loose, unstable, giving way or recurrent ankle sprain.

Pathoanatomy
1. Painful ankle:
1.1 Intra-articular lesion: Chondral injury, osteochondral (OCD) lesion of the talus, anterolateral scar impingement.
1.2Extra-articular lesion: Tendon injury (Peroneal tendon, tibialis posterior tendon, tibialis anterior tendon, Achilles tendon, etc.), small fracture of the foot (Lateral process of talus, anterior process of calcaneus, cuboid, etc.), nerve injury (sural nerve, superficial peroneal nerve, etc.).
2. Unstable ankle
2.1 Lateral collateral ligament injury
2.2 Anterior talofibular ligament
2.3 Calcaneofibular ligament
2.4 Posterior talofibular ligament
2.5 Syndesmotic sprain: Missed syndesmotic sprain often mimics symptoms of the lateral ankle sprain and usually causes persistent painful ankle. (Treatment options for syndesmotic injury will not be discussed in this article)

Surgical options
1. Painful ankle:
1.1 Intra-articular lesion
1.1.1 Chondral lesion, Osteochondral lesion: An incidence of the osteochondral lesion of the talus ranging from 0.09-6.5% of the ankle sprain is based on independent literatures. It has been reported to be as high as 81% of the patients with unexplained chronic ankle pain. Medial lesions are more common and are tend to be deeper and cup shaped. Lateral lesions are shallow, wafer shaped and usually displaced. Canale et al. suggested that all lateral talar lesions were associated with trauma whereas 64% of the medial lesion are associated with trauma while Chuckpaiwong et al. could not find this association. A surgical intervention of this condition could be considered for a displaced lesion or a non displaced lesion which is not healed by conservative treatment within 2-3 months. Choice of surgical intervention and indications are as follow
1.1.1.1 Arthroscopic debridement: This intervention is appropriate for the lesion less than 5-10 mm. The advantage is its minimally invasive technique, simplicity, and faster recovery. This can be used in an isolated problem.
1.1.1.2 Marrow stimulation procedure (Micro fracture, subchondral drilling, etc.): This procedure is recommended for lesion less than 15 mm. The advantage is its minimally invasive technique, simple, faster recovery and long term result is more reliable than arthroscopic debridement alone.
1.1.1.3 Open debridement: usually perform simultaneously with ligament reconstruction.
1.1.1.4 Osteochondral autograft transfer (OAT) or Osteochondral allograft transfer procedure: This procedure is appropriate for lesions of 5-15 mm. The advantage of this procedure is that the healed tissue will be hyaline cartilage but the donor site morbidity is the major concern. (Fig 1)
1.1.1.5 Autologous chondrocyte Implantation (ACI): This procedure is appropriate for lesions larger than 15 mm. or as a secondary operation after failure of the primary procedure. The advantages of this procedure are that the healed tissue will be hyaline
cartilage and exhibit less donor site morbidity. However this surgery is a 2-stage procedure and the total cost is yet more expensive than other procedure. (Fig 2)

1.1.2. Anterolateral scar impingement: This condition is the prominent scar along the anterolateral side of the ankle. There are 3 primary sites where anterolateral scar impingement develops: superior portion of anterior inferior tibiofibula ligament (AITF), distal portion of AITF (Bassett’s ligament) along the anterior talofibular ligament and lateral gutter near lateral talar dome. The diagnosis can be made by a careful examination. (Fig 3) Radiography is usually needed to rule out the other associated condition.

1.1.2.1. Open debridement: usually perform simultaneously with ligament reconstruction.

1.1.2.2. Arthroscopic debridement: This procedure is the standard of care for anterolateral scar impingement. The advantages are its minimally invasive technique, less pain and faster recovery. This can be use in an isolated problem. (Fig 4)

1.2. Extra-articular lesion

1.2.1. Tendon injury: Major tendons injuries are Achilles tendon, peroneal tendon, tibialis posterior tendon and tibialis anterior tendon. From their location, peroneus longus and peroneus brevis are closed to the lateral collateral ligament. Therefore the injury to these tendons is commonly misdiagnosed as an ankle sprain. A careful examination can definitely differentiate these two conditions. In general, a surgical treatment for peroneal tendon tear is pain and weakness despite of adequate conservative treatment (8-10 weeks) and choices of surgical treatments are

1.2.1.1. Tendon repair and tubularization: For lesion less than 50% tear. Peroneus brevis tendon tear configuration is usually in longitudinal fashion around the posterior corner of the lateral malleolus.

1.2.1.2. Tendon transfer: For lesion more than 50% tear. Peroneus brevis to longus transfer is a commonly used procedure.

1.2.2. Fracture: A common fracture that can mimic ankle sprain is fracture of anterior process of calcaneus, lateral process of talus, cuboid or fifth metatarsal base. A general idea for these fracture(excluding fifth metatarsal base fracture) as follow

1.2.2.1. Excision: This procedure is appropriate for a small fragment.

1.2.2.2. Fixation: This procedure is appropriate for a large fixable fragment.

1.2.3. Nerve injury: Sural nerve and small branches of superficial peroneal nerve are the common nerve injuries after ankle twisting injury. Surgical intervention is rarely needed unless the nerve is totally

Fig 1. Osteochondral Autograft Transfer(OAT) for the moderate osteochondral lesion of the talus.

Fig 2. Autologous Chondrocyte Implantation(ACI) for the massive osteochondral lesion of the talus. Talar defect was repair with periosteum and filled with the pre-cultured chondrocyte.

Fig 3. Physical examination for anterolateral scar impingement, Point of tenderness at the scar lesion (usually at the anterolateral corner of the ankle).

Fig 4. Left figure shows the intra-articular view of the anterolateral scar. Right figure shows the finding after the anterolateral scar was removed.
disrupted. Optional surgical treatments for the patient who resists adequate conservative treatment are

1.2.3.1. Neurolysis: this procedure is appropriate for the patient who cannot grossly identify a neuroma.

1.2.3.2. Neuroma excision: this procedure is appropriate for the patient who can identify a neuroma. The possibility of numbness after surgery should be communicated to the patient before the operation.

2. Unstable ankle: A major cause of the unstable ankle is severe lateral ankle ligamentous complex injury. The ligament can be healed inappropriately (redundant, thick and inelastic ligament) or it cannot be healed. A surgical intervention is considered when the patient has already received a completed conservative treatment, including physotherapy and muscle strength training program, but still has unstable ankle. Surgical option for lateral ligament reconstruction are

2.1. Anatomic repair: To date, these procedures are the procedures of choice for the unstable ankle which is has failed to respond to conservative treatment.

2.1.1. Brostrom repair with Gould modification: This repair consists of a direct repair of the lateral collateral ligament and augmentation with inferior extensor retinaculum.

2.1.2. Karlsson repair: This procedure requires the identification of ATFL and CFL ligaments and then repairing them back with the pulled-through technique to their fibular attachments.

2.2. Non-anatomic reconstruction: Use in case of poor lateral ligament, soft tissue or failed anatomic repair. Many techniques have been proposed with their advantages and disadvantages (options). These following procedures are the more commonly used procedures.

2.2.1. Evan procedure

2.2.2. Modified Chrisman Snook procedure

2.2.3. Clanton procedure

REFERENCES


