

# Surgical Treatments of the Lateral Ankle Sprain

**Bavornrit Chuckpaiwong, M.D.**

*Department of Orthopaedic Surgery, Faculty of Medicine Siriraj Hospital, Mahidol University, Bangkok 10700, Thailand.*

**Siriraj Med J 2009;61:104-106**

**E-journal: <http://www.sirirajmedj.com>**

## 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.<sup>1-7</sup> However, long term disability from this injury is a major prohibiting factor delaying return to sports and even normal daily activities.<sup>8-10</sup> 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.<sup>11</sup>

Among these ankle injuries, even many patients who have received a proper treatment still develop persistent unstable or sometimes painful ankle.<sup>12</sup> De Vries JS et al.<sup>12</sup> 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: Chonral injury, osteochondral (OCD) lesion of the talus, anterolateral scar impingement.

1.2 Extra-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.<sup>13,14</sup> It has been reported to be as high as 81% of the patients with unexplained chronic ankle pain.<sup>15,16</sup> 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.<sup>17</sup> suggested that all lateral talar lesions were associated with trauma whereas 64% of the medial lesion are associated with trauma while Chuckpaiwong et al.<sup>18</sup> 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

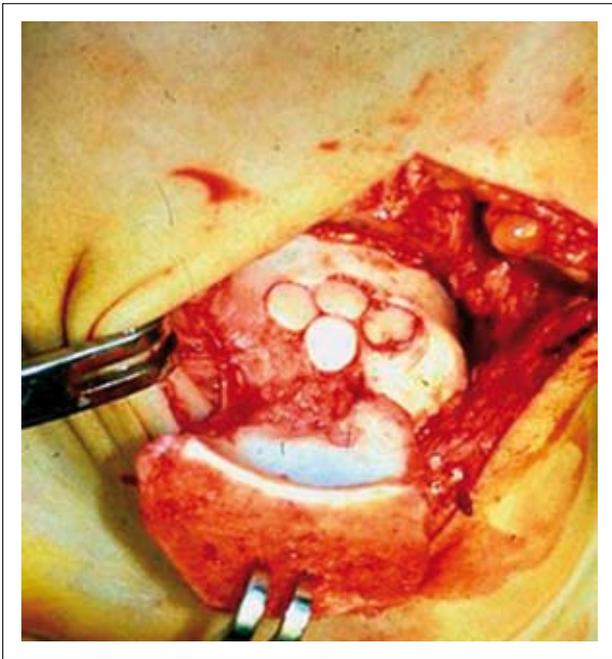
1.1.1.1. Arthroscopic debridement: This intervention is appropriate for the lesion less than 5-10 mm. The advantage is its minimally invasive technique, simplicity, and faster recovery.<sup>19</sup> This can be used in an isolated problem.

1.1.1.2. Marrow stimulation procedure (Micro fracture, subchondral drilling, etc.): This procedure is recommended for lesion less than 15 mm.<sup>18</sup> The advantage is its minimally invasive technique, simple, faster recovery and long term result is more reliable than arthroscopic debridement alone.<sup>20</sup>

1.1.1.3. Open debridement: usually perform simultaneously with ligament reconstruction.<sup>19</sup>

1.1.1.4. Osteochondral autograft transfer (OAT) or Osteochondral allograft transfer procedure: This procedure is appropriate for lesions of 5-15 mm.<sup>21-23</sup> 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.<sup>24</sup> or as a secondary operation after failure of the primary procedure.<sup>25</sup> The advantages of this procedure are that the healed tissue will be hyaline



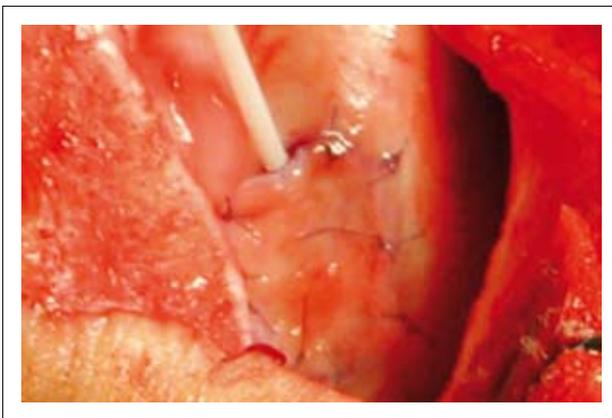
**Fig 1.** Osteochondral Autograft Transfer(OAT) for the moderate osteochondral lesion of the talus.

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.<sup>26</sup> The advantages are its minimally invasive technique, less pain and faster recovery. This can be used in an isolated problem. (Fig 4)



**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).

## 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.<sup>27</sup> Peroneus brevis tendon tear configuration is usually in longitudinal fashion around the posterior corner of the lateral malleolus.

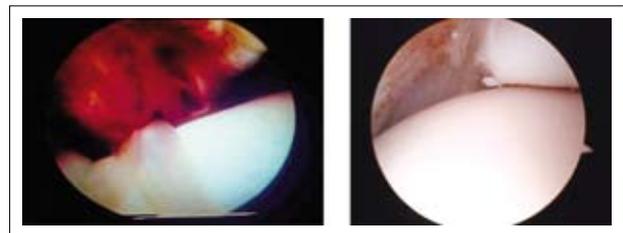
1.2.1.2. Tendon transfer: For lesion more than 50% tear.<sup>27</sup> Peroneus brevis to longus transfer is a commonly used procedure.

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.<sup>28</sup> 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 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, thickened and inelastic ligament) or it cannot be healed. A surgical intervention is considered when the patient has already received a completed conservative treatment, including physiotherapy and muscle strengthening program, but still has unstable ankle. Surgical options for lateral ligament reconstruction are

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

2.1.1. Brostrom repair with Gould modification<sup>29</sup>: This repair consists of a direct repair of the lateral collateral ligament and augmentation with inferior extensor retinaculum.

2.1.2. Karlsson repair<sup>30</sup>: 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<sup>31</sup>

2.2.3. Clanton procedure<sup>32</sup>

## REFERENCES

1. Agel J, Evans TA, Dick R, Pütukian M, Marshall SW. Descriptive epidemiology of collegiate men's soccer injuries: National Collegiate Athletic Association Injury Surveillance System, 1988-1989 through 2002-2003. *J Athl Train.* 2007 Apr-Jun;42(2):270-7.
2. Agel J, Olson DE, Dick R, Arendt EA, Marshall SW, Sikka RS. Descriptive epidemiology of collegiate women's basketball injuries: National Collegiate Athletic Association Injury Surveillance System, 1988-1989 through 2003-2004. *J Athl Train.* 2007 Apr-Jun;42(2):202-10
3. Borowski LA, Yard EE, Fields SK, Comstock RD. The Epidemiology of US High School Basketball Injuries, 2005-2007. *Am J Sports Med.* 2008 Dec;36(12):2328-35.
4. Fong DT, Man CY, Yung PS, Cheung SY, Chan KM. Sport-related ankle injuries attending an accident and emergency department. *Injury.* 2008 Oct;39(10):1222-7
5. Nelson AJ, Collins CL, Yard EE, Fields SK, Comstock RD. Ankle injuries among United States high school sports athletes, 2005-2006. *J Athl Train.* 2007 Jul-Sep;42(3):381-7.

6. Samuel AO, Obehi OH. Epidemiology of Soccer injuries in Benin City, Nigeria. *Br J Sports Med.* 2008 Oct 23.
7. Yard EE, Schroeder MJ, Fields SK, Collins CL, Comstock RD. The epidemiology of United States high school soccer injuries, 2005-2007. *Am J Sports Med.* 2008 Oct;36(10):1930-7.
8. van Rijn RM, van Os AG, Bernsen RM, Luijsterburg PA, Koes BW, Bierma-Zeinstra SM. What is the clinical course of acute ankle sprains? A systematic literature review. *Am J Med.* 2008 Apr;121(4):324-331.e6.
9. Hubbard TJ. Ligament laxity following inversion injury with and without chronic ankle instability. *Foot Ankle Int.* 2008; 29(3): 305-11.
10. Harmer PA. Incidence and characteristics of time-loss injuries in competitive fencing: a prospective, 5-year study of national competitions. *Clin J Sport Med.* 2008 Mar;18(2):137-42.
11. Kerkhoffs GM, Handoll HH, de Bie R, Rowe BH, Struijs PA. Surgical versus conservative treatment for acute injuries of the lateral ligament complex of the ankle in adults [review]. *Cochrane Database Syst Rev.* 2002;(3):CD000380.
12. de Vries JS, Krips R, Sierevelt IN, Blankevoort L. Interventions for treating chronic ankle instability. [review] *Cochrane Database Syst Rev.* 2006 Oct 18;(4):CD004124.
13. Bosien WR, Staples OS, Russell SW. Residual disability following acute ankle sprains. *J Bone Joint Surg Am.* 1955 Dec;37-A(6):1237-43.
14. Coltart WD. Aviator's astragalus. *J Bone Joint Surg Br.* 1952; 34: 545-66.
15. Ferkel RD, Zanotti RM, Komenda GA, et al. Arthroscopic treatment of chronic osteochondral lesions of the talus: long-term results. *Am J Sports Med.* 2008 Sep;36(9):1750-62.
16. Ferkel RD, Sgaglione NA, DelPizzo W. Arthroscopic treatment of osteochondral lesions of the talus: Long-term results. *Orthop Trans.* 1990;14 (172-73).
17. Canale ST, Belding RH. Osteochondral lesions of the talus. *J Bone Joint Surg Am.* 1980 Jan;62(1):97-102.
18. Chuckpaiwong B, Berkson EM, Theodore GH. Microfracture for osteochondral lesions of the ankle: outcome analysis and outcome predictors of 105 cases. *Arthroscopy.* 2008 Jan;24(1):106-12.
19. Verhagen RA, Struijs PA, Bossuyt PM, van Dijk CN. Systematic review of treatment strategies for osteochondral defects of the talar dome [review]. *Foot Ankle Clin.* 2003 Jun;8(2):233-42, viii-ix.
20. Tol JL, Struijs PA, Bossuyt PM, Verhagen RA, van Dijk CN. Treatment strategies in osteochondral defects of the talar dome: a systematic review [review]. *Foot Ankle Int.* 2000 Feb;21(2):119-26.
21. Gautier E, Kolker D, Jakob RP. Treatment of cartilage defects of the talus by autologous osteochondral grafts. *J Bone Joint Surg Br.* 2002 Mar;84(2):237-44.
22. Lee CH, Chao KH, Huang GS, Wu SS. Osteochondral autografts for osteochondritis dissecans of the talus. *Foot Ankle Int.* 2003 Nov;24(11): 815-22.
23. Hangody L, Kish G, Módis L, et al. Mosaicplasty for the treatment of osteochondritis dissecans of the talus: two to seven year results in 36 patients. *Foot Ankle Int.* 2001 Jul;22(7):552-8.
24. Giannini S, Buda R, Vannini F, Di Caprio F, Grigolo B. Arthroscopic autologous chondrocyte implantation in osteochondral lesions of the talus: surgical technique and results. *Am J Sports Med.* 2008 May;36(5): 873-80.
25. Micheli L, Curtis C, Shervin N. Articular cartilage repair in the adolescent athlete: is autologous chondrocyte implantation the answer? *Clin J Sport Med.* 2006 Nov;16(6):465-70.
26. Ferkel RD, Karzel RP, Del Pizzo W, Friedman MJ, Fischer SP. Arthroscopic treatment of anterolateral impingement of the ankle. *Am J Sports Med.* 1991 Sep-Oct;19(5):440-6.
27. Krause JO, Brodsky JW. Peroneus brevis tendon tears: Pathophysiology, surgical reconstruction and clinical results. *Foot Ankle Int.* 1998 May; 19(5):271-9.
28. Dameron TB Jr. Fractures of the proximal fifth metatarsal: selecting the best treatment option. *J Am Acad Orthop Surg.* 1995 Mar;3(2): 110-114.
29. Gould N, Selligson D, Gassman J. Early and late repair of lateral ligament of the ankle. *Foot Ankle.* 1980 Sep;1(2):84-9.
30. Karlsson J, Bergsten T, Lansinger O, Peterson L. Surgical treatment of chronic lateral instability of the ankle joint. A new procedure. *Am J Sports Med.* 1989 Mar-Apr;17(2):268-73.
31. Chrisman OD, Snook GA. Reconstruction of lateral ligament tears of the ankle: An experimental study and clinical evaluation of seven patients treated by a new modification of the Elmslie procedure. *J Bone Joint Surg Am.* 1969 Jul;51(5):904-12.
32. Clanton TO. Instability of the subtalar joint. *Orthop Clin North Am.* 1989 Oct;20(4):583-92.