

## Samaritan Athletic Medicine Rehabilitation Guideline for Brostrom Repair – for Surgical Intervention for Chronic lateral Ankle Instability

### What is chronic ankle instability?

Chronic ankle instability (CAI) occurs when individuals have any or all the following: 1) ankle pain, 2) episodes of the ankle “giving way,” 3) feelings of instability in the ankle following a lateral ankle sprain. This can lead to significant deficits in function and may need to be treated surgically. Two types of chronic ankle instability have been identified: 1) Mechanical ankle instability (MAI) and 2) Functional ankle instability (FAI). MAI is caused by lengthened ankle ligaments. This typically happens because of repetitive ankle injuries. FAI is caused by deficits in body awareness and control and results in subjective instability without the presence of injured ligaments. Both FAI and MAI are considered CAI and may be successfully managed with physical therapy and stability training to address individual impairments.<sup>8</sup>

### Which structures are affected?

The anterior talofibular ligament is the most affected structure in a lateral ankle sprain. This ligament attaches the front of the fibula to the ankle bone (talus). The calcaneofibular ligament is also commonly injured with lateral ankle sprain, involved in about 1/3 of cases. The calcaneofibular ligament attaches the bottom of the fibula to outside aspect of the heel bone (calcaneus).

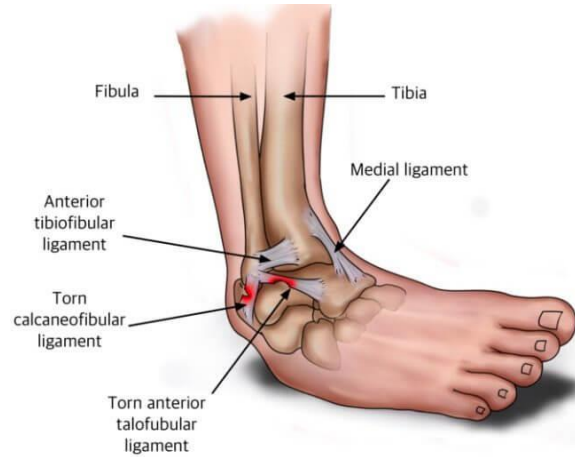


Figure 113 – Lateral Ankle Ligaments

### Diagnosing ankle instability

Several methods exist to diagnose chronic ankle instability. Your healthcare provider will assess your ankle by performing a physical exam that will include the following components: 1) assessment of ligamentous integrity; 2) range of motion, 3) strength, 4) balance, 5) functional movement and the ability to tolerate impact (via hopping)<sup>12</sup>. Your healthcare provider may also order diagnostic imaging to assess the integrity of structures in your ankle more specifically. This may include radiograph (x-ray) to rule out any bony involvement. A stress radiographs or stress ultrasound may also be indicated – each involve moving your joint while capturing the image to assess stability. Finally, an MRI (Magnetic Resonance Imaging) may be indicated to visualize the soft tissue structures (ligaments, tendons, muscles) of the ankle joint.<sup>12</sup>

## Non-surgical treatment options

Treatment options are individualized to your specific goals, activity level, and resulting functional impairments. Non-surgical intervention can be effective in restoring function and decreasing the likelihood of recurring injury, while avoiding the inherent risks of surgery.<sup>3,12</sup> Non-surgical intervention may include the use of external supports such as bracing or taping, and should be incorporated in skilled rehabilitation to improve body awareness/control and improve range of motion.

3, 12

## Surgical appropriateness criteria

- 1) Failed conservative management: 3-6 months.
- 2) Recurring symptoms including pain, feeling of giving way, or repeat ankle sprains.
- 3) Limited sports or other physical activity because of ankle injury.
- 4) Pain directly at the site of the injured ligament and physical exam findings of excessive ankle laxity.
- 5) Imaging exam findings of structural injury.<sup>8</sup>

## Surgical treatment

In cases when surgery is indicated, a procedure called a Brostrom repair is typically performed. The affected or torn anterior talofibular ligament (ATFL) - and on occasion the calcaneofibular ligament (CFL) - are cut, shortened, and sutured back together in a shortened position (Figure 2), with the goal of increased stability. The inferior extensor retinaculum (a soft tissue covering for the tendons of the muscles on the top of the foot) is tightly attached to the fibula for additional support. (Figure 3)

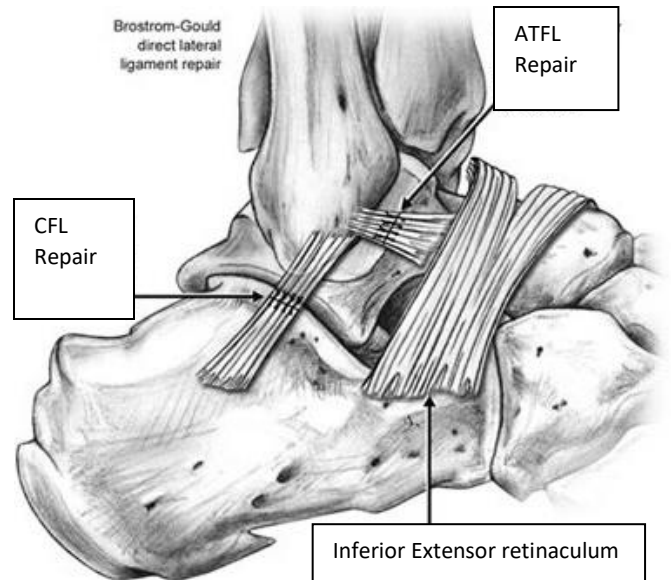


Figure 2<sub>14</sub> – ATFL and CFL repair

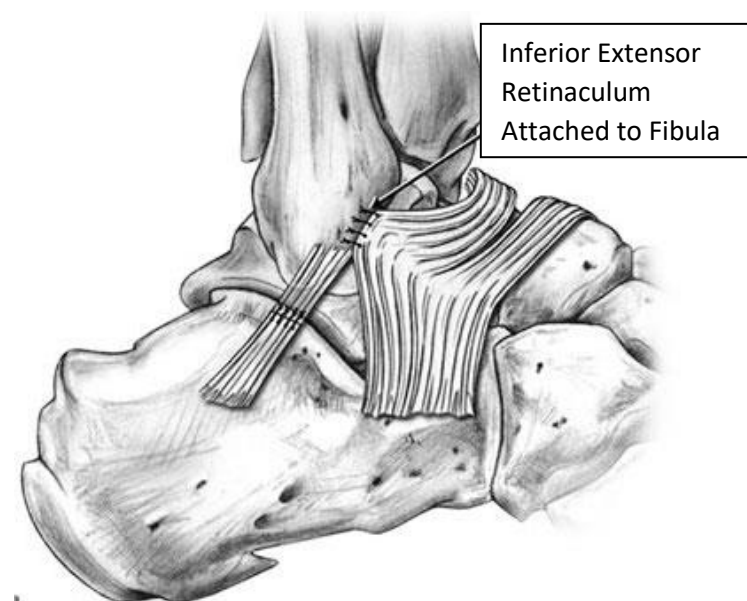


Figure 3<sub>14</sub> – Retinaculum attached to fibula

### Rehabilitation following Brostrom Repair

Patients undergoing rehabilitation following a Brostrom repair can expect 4-5 months of rehab. Rehab includes 4 phases. The goal of these phases is to provide a framework for safe progressions from daily activities, hobbies, and eventually sports. A summary and goals of each individual phase are outlined below:

- 1) Early or “protective” Phase: will include a period of 4 weeks without bearing through the foot, and 4 weeks of putting partial body weight through the foot to protect the healing repair.
- 2) Return to walking Phase: You will work to regain range of motion and strength necessary to walk.
- 3) Functional Recovery Phase: once you can walk comfortably out of a boot, you will progress through rehabilitation to normalize functional tasks (squats, lunges, step ups, etc.), gain full/symmetrical range of motion, and develop strength to within 75% of the unaffected ankle.
- 4) Return to Sport Phase: Rehabilitation focused on returning to your prior activity level (running, cutting and sport participation).

### Frequent postoperative changes observed following Brostrom repair

The following functional deficits are commonly observed and considered normal following a Brostrom repair

- Limited ankle inversion mobility compared to non-surgical side Hsu 2015
- Small to moderate ankle eversion strength deficit compared to non-surgical side Hsu 2015
- Decreased balance and ankle position sense compared to non-surgical side Han 2009, Choi 2021

### Other deficits commonly treated surgically to supplement Brostrom Repair

Chronic ankle instability is often multi-faceted, as outlined above. Your surgeon will likely address any of the following associated injuries described here as they perform the Brostrom repair.

- 1) **Osteochondral Defect (OCD):** An OCD is a tear or lesion of the cartilage covering the ankle bone (talus) or even the bone underneath the cartilage covering. Depending on the shape and size of the lesion your surgeon will have various techniques for repairing an OCD.
- 2) **Synovitis:** Synovitis is when the soft tissue lining around the ankle joint itself becomes inflamed and can cause pain and swelling. Follow up with your surgeon about treatment options for synovitis as there are both operative and non-operative treatments depending on the severity of inflammation. Lee 2011

## References

1. Clements A, Belilos E, Keeling L, Kelly M, Casscells N. *Postoperative Rehabilitation of Chronic Lateral Ankle Instability: A Systematic Review*.; 2021. [www.sportsmedarthro.com](http://www.sportsmedarthro.com)
2. Li HY, Zheng JJ, Zhang J, Hua YH, Chen SY. The Effect of Lateral Ankle Ligament Repair in Muscle Reaction Time in Patients with Mechanical Ankle Instability. *Int J Sports Med*. 2015;36(12):1027-1032. doi:10.1055/s-0035-1550046
3. Doherty C, Bleakley C, Delahunt E, Holden S. Treatment and prevention of acute and recurrent ankle sprain: an overview of systematic reviews with meta-analysis. *Br J Sports Med*. 2017;51(2):113-125. doi:10.1136/bjsports-2016-096178
4. Minoonejad H, Karimizadeh Ardakani M, Rajabi R, Wikstrom EA, Sharifnezhad A. Hop Stabilization Training Improves Neuromuscular Control in College Basketball Players With Chronic Ankle Instability: A Randomized Controlled Trial. *J Sport Rehabil*. 2019;28(6):576-583. doi:10.1123/jsr.2018-0103
5. Pearce CJ, Tourné Y, Zellers J, Terrier R, Toschi P, Silbernagel KG. Rehabilitation after anatomical ankle ligament repair or reconstruction. *Knee Surgery, Sport Traumatol Arthrosc*. 2016;24(4):1130-1139. doi:10.1007/s00167-016-4051-z
6. Petrerá M, Dwyer T, Theodoropoulos JS, Ogilvie-Harris DJ. Short- to Medium-term Outcomes After a Modified Broström Repair for Lateral Ankle Instability With Immediate Postoperative Weightbearing. *Am J Sports Med*. 2014;42(7):1542-1548. doi:10.1177/0363546514530668
7. Rosen AB, Needle AR, Ko J. Ability of Functional Performance Tests to Identify Individuals With Chronic Ankle Instability: A Systematic Review With Meta-Analysis. *Clin J Sport Med*. 2019;29(6):509-522. doi:10.1097/JSM.0000000000000535
8. Song Y, Li H, Sun C, et al. Clinical Guidelines for the Surgical Management of Chronic Lateral Ankle Instability: A Consensus Reached by Systematic Review of the Available Data. *Orthop J Sport Med*. 2019;7(9):232596711987385. doi:10.1177/2325967119873852
9. Spink MJ, Fotoohabadi MR, Menz HB. Foot and ankle strength assessment using hand-held dynamometry: reliability and age-related differences. *Gerontology*. 2010;56(6):525-532. doi:10.1159/000264655
10. Vopat ML, Tarakemeh A, Morris B, et al. Early Versus Delayed Mobilization Postoperative Protocols for Lateral Ankle Ligament Repair: A Systematic Review and Meta-analysis. *Orthop J Sport Med*. 2020;8(6). doi:10.1177/2325967120925256
11. White WJ, McCollum GA, Calder JDF. Return to sport following acute lateral ligament repair of the ankle in professional athletes. *Knee Surgery, Sport Traumatol Arthrosc*. 2016;24(4):1124-1129. doi:10.1007/s00167-015-3815-1
12. Martin RL, Davenport TE, Fraser JJ, et al. Ankle Stability and Movement Coordination Impairments: Lateral Ankle Ligament Sprains Revision 2021. *J Orthop Sports Phys Ther*. 2021;51(4):CPG1-CPG80. doi:10.2519/jospt.2021.0302
13. Brostrom repair anatomy. Fortius clinic. Peter Rosenfeld FRCS. <https://www.londonfootankle.co.uk/foot-ankle-surgeon/brostrom-repair/>. Accessed 10.3.21
14. Lateral ankle sprain anatomy. Pittman physical therapy, LLC. <https://pittmanpt.com/ankle-ligament-sprain/>. Accessed 10.3.21

These rehabilitation guidelines were developed by Samaritan Athletic Medicine Physical Rehabilitation. Please be aware the information provided is not intended to replace the care or advice given by your physician or health care provider. It is neither intended or implied to be a substitute for professional advice. Call your health care provider immediately if you think you have a medical emergency. Always seek advice from your health care provider before starting any new treatment or with any questions you may have regarding a medical condition.

## Dr. Lin's Rehab Guideline following Brostrom Repair

Phase 1 (0-8 weeks) Protective Phase	
<b>Appointments</b>	Formal rehab appointments start 2 weeks after surgery (2-3 visits per week) Patient performs home exercises daily, as determined by physical therapist Surgeon follow-up at day 1 and day 14 following surgery (suture removal at second follow up)
<b>Rehabilitation Goals</b>	<ul style="list-style-type: none"> <li>Protect repair in splint x 2 weeks and then boot for additional 4-6 weeks</li> <li>Control inflammation and pain</li> <li>Restore functional range of motion (ROM)</li> </ul>
<b>Weight Bearing</b>	<ul style="list-style-type: none"> <li>Non-weight bearing 0-4 weeks</li> <li>Partial weight bearing 5-8 weeks</li> </ul>
<b>Range of Motion</b>	Gentle and non-painful range of motion exercise starting <b>no earlier than 2 weeks (suture removal)</b> <ul style="list-style-type: none"> <li>Passive ankle pointing (plantarflexion), flexing (dorsiflexion), and tilting out away from the body (eversion)</li> <li>Active ankle pointing (plantarflexion), flexing (dorsiflexion), and tilting out away from the body (eversion)</li> <li>NO INVERSION (turning ankle inward toward other ankle) for 4 weeks</li> <li>NO CIRCUMDUCTION (turning ankle in circles) for 4 weeks</li> </ul>
<b>Therapeutic Interventions</b>	<p><u>Education</u></p> <ul style="list-style-type: none"> <li>Education on post-operative care                             <ul style="list-style-type: none"> <li>- Management of assistive device (crutches, canes)</li> <li>- Management of immobilization device (boot, cast, splint)</li> <li>- Precautions with surgical repair: NWB in boot, avoid inversion</li> <li>- Clarify points of rehab timeline</li> </ul> </li> </ul> <p><u>Ice</u></p> <ul style="list-style-type: none"> <li>Up to 6x/day or more if needed for pain. Compression and elevation</li> </ul> <p><u>Interventions</u></p> <ul style="list-style-type: none"> <li>Submaximal isometric DF/PF/Eversion</li> <li>Intrinsic foot muscle exercise</li> <li>Midfoot and forefoot joints mobilization</li> <li>UE exercise</li> <li>Proximal LE exercise</li> <li>Contralateral LE exercise</li> <li>Aerobic exercise</li> <li>Gait training during therapy without boot (<b>after week 4</b>)</li> <li>Peroneal muscle strengthening (<b>after week 4</b>)</li> <li>Proprioception exercise (<b>after week 4</b>)</li> </ul>
<b>Criteria for progression to next rehabilitation phase</b>	<ul style="list-style-type: none"> <li>Review physicians note for discharge of bracing/immobilizer at 6-8 weeks and initiate walking in a hiking boot or above ankle tennis shoe</li> <li>Ankle dorsiflexion and plantar flexion passive range of motion 75% of uninvolved ankle</li> </ul>

## Dr. Lin's Rehab Guideline following Brostrom Repair

Phase 2 (8-10 weeks) Return to Walking Phase	
<b>Appointments</b>	Rehab 2-3 visits per week, home exercises daily Surgeon follow-up at 12 weeks
<b>Rehabilitation Goals</b>	<ul style="list-style-type: none"> <li>• Progress to full weight bearing without boot</li> <li>• Restore balanced gait</li> <li>• Progress appropriate range of motion</li> <li>• Control swelling</li> <li>• Prevent scar adhesion</li> <li>• Initiate balance/body awareness training</li> </ul>
<b>Weight Bearing</b>	<ul style="list-style-type: none"> <li>• Progress to full WB (ankle brace if needed for comfort)</li> </ul>
<b>Range of Motion</b>	Active- ROM into stretch 4-6 times a day <ul style="list-style-type: none"> <li>• Progress range of motion into the following directions               <ul style="list-style-type: none"> <li>- Plantarflexion (pointing ankle)</li> <li>- Dorsiflexion (bending ankle)</li> <li>- Eversion (turning bottom of foot outward)</li> </ul> </li> <li>• Avoid Inversion (turning bottom of foot inward)</li> </ul>
<b>Therapeutic Exercises</b>	<u>Walking:</u> <ul style="list-style-type: none"> <li>• Gait training out of boot</li> </ul> <u>Interventions:</u> <ul style="list-style-type: none"> <li>• Submaximal TheraBand resistance exercise (all directions except inversion)</li> <li>• Submaximal DL (double leg) strengthening (examples: squats, heel raises, leg press, deadlifts)</li> <li>• Single leg balance and body awareness exercise</li> <li>• Quad, hamstring, and hip strength/conditioning</li> </ul> <u>Modalities:</u> As needed
<b>Criteria for Progression to Next Rehabilitation Phase</b>	<ul style="list-style-type: none"> <li>• Normalized gait without pain or external support</li> <li>• At least 10 degrees of closed chain ankle dorsiflexion</li> <li>• Tolerance to single leg balance exercise</li> </ul>

## Dr. Lin's Rehab Guideline following Brostrom Repair

Phase: 3 (10-12 weeks) Functional Recovery Phase	
<b>Appointments</b>	<u>Formal Rehab:</u> 1-2 visit per week <ul style="list-style-type: none"> <li>• Home exercises daily</li> </ul>
<b>Rehabilitation Goals</b>	<ul style="list-style-type: none"> <li>• Normalization of functional tasks</li> <li>• Continue to progress strength/neuromuscular control</li> <li>• Control post activity swelling</li> <li>• Wean off brace (if still in use)</li> </ul>
<b>Weight Bearing</b>	<ul style="list-style-type: none"> <li>• Full weight bearing without external support</li> </ul>
<b>Range of Motion</b>	<ul style="list-style-type: none"> <li>• Progress to full range of motion into DF/PF/Eversion</li> <li>• Progress AROM inversion</li> <li>• Avoid end range passive inversion</li> </ul>
<b>Therapeutic Exercises</b>	Strength: <ul style="list-style-type: none"> <li>• Resistance training with emphasis on developing maximal strength               <ul style="list-style-type: none"> <li>- Sets of 3-8 reps at <math>\geq 75\%</math> 1 rep maximum</li> <li>- Examples (Seated/standing heel raises, leg press plantar flexion, Squat, lunge, step up/down)</li> </ul> </li> <li>• Heel raises (double and single leg)</li> <li>• Multi-planar movements (front/back, side/side, rotation)</li> <li>• Proprioceptive exercise (examples: balance with eyes closed, unstable/uneven surfaces)</li> <li>• Strength testing using isometric or isokinetic strength measurement tool</li> </ul>
<b>Criteria for Progression to Next Rehabilitation Phase</b>	<ul style="list-style-type: none"> <li>• Full AROM in dorsiflexion/plantarflexion/eversion</li> <li>• Normal pain-free gait with level ground, uneven ground, and stairs</li> <li>• Strength <math>\geq 75\%</math> of unaffected limb measured with isokinetic machine, isometric dynamometer, single leg heel raise endurance test, single leg heel raise height</li> <li>• No apprehension with therapy exercises</li> </ul>

# Dr. Lin's Rehab Guideline following Brostrom Repair

Phase 4: (12+ weeks) Return to Prior Activity Level	
<b>Appointments</b>	<p><u>Formal Rehab:</u> 1 visit every 1-2 weeks</p> <ul style="list-style-type: none"> <li>• Home exercises daily</li> </ul>
<b>Rehabilitation Goals</b>	<ul style="list-style-type: none"> <li>• Return to running, jumping, cutting, sport specific activity</li> <li>• Exercise with emphasis on power production/absorption</li> <li>• Plyometric progression</li> <li>• Progress aerobic and anaerobic (sport specific) conditioning</li> <li>• Sport specific drill training</li> <li>• Successfully pass return to sport testing</li> </ul>
<b>Range of Motion</b>	<ul style="list-style-type: none"> <li>• All planes to full available ROM</li> </ul>
<b>Therapeutic Exercises</b>	<p><u>Strength</u></p> <ul style="list-style-type: none"> <li>• Resistance training with emphasis on developing max power (rate of force production)               <ul style="list-style-type: none"> <li>- Sets of 3-6 reps at 50-80% 1RM</li> <li>- Emphasis on moving load as quickly as possible</li> <li>- Examples (Seated/standing heel raises, leg press plantar flexion, Squat, lunge, step up/down)</li> </ul> </li> </ul> <p><u>Plyometric progression</u></p> <ul style="list-style-type: none"> <li>• DL Jump up → DL Jump in place → DL Landing</li> <li>• SL Jump up → SL Jump in place → SL Landing</li> <li>• Hop to stabilization exercise               <ul style="list-style-type: none"> <li>- DL → SL</li> <li>- Forward → Sideways → Zigzag → Rotational</li> <li>- Stable surface → Unstable surface</li> <li>- Performed at a rate of ~ 2Hz</li> </ul> </li> </ul> <p><u>Conditioning</u></p> <ul style="list-style-type: none"> <li>• Sport specific anaerobic/aerobic ratio</li> <li>• Sport specific work/rest ratio</li> <li>• Sport specific running and cutting drills (in conjunction with return to running program)</li> </ul>
<b>Return to Running</b>	<ul style="list-style-type: none"> <li>• Criteria to initiate return to run program               <ul style="list-style-type: none"> <li>- 15° or 80% of unaffected ankle, in closed chain (foot on ground) dorsiflexion range of motion</li> <li>- Normal walking with no pain or swelling</li> <li>- No pain, swelling, or faulty movement patterns with therapy exercises</li> <li>- Strength <math>\geq</math> 85% of unaffected limb measured with isokinetic machine, isometric dynamometer, single leg heel raise endurance test, single leg heel raise height</li> </ul> </li> <li>• Selection of return to run program based on patient, surgeon, and therapist preference</li> <li>• Return to run program should include a functional hop progression</li> </ul>
<b>Criteria for Return to Sport</b>	<ul style="list-style-type: none"> <li>• Mobility and strength symmetrical with uninvolved ankle</li> <li>• Successfully completed return to run program</li> <li>• 90%+ of uninvolved limb in the following tests:               <ul style="list-style-type: none"> <li>- Strength test: Isometric/isokinetic/heel raise endurance/heel raise height</li> <li>- SL Side hop test/SL hop for distance/SL vertical jump/SL Drop Jump</li> <li>- Star Excursion Balance Test</li> </ul> </li> <li>• No pain at rest or while performing activity</li> <li>• Physician, physical therapist, and athletic trainer clearance</li> </ul>



