



Internal/Brace™ Ligament Augmentation Technique (Ankle Instability) Scientific Update



“DO YOUR LATERAL ANKLE PROCEDURES ALL DO WELL?” Multiple publications highlight that outcomes of a traditional Brostrom repair can be improved using the *Internal/Brace* ligament augmentation technique. Peer-reviewed and prospective clinical studies show significantly faster rehabilitation and better outcomes with the *Internal/Brace* technique.^{1,2} *Internal/Brace* ligament repair has been used successfully for years and has even been integrated into the treatment of elite athletes in addition to everyday active patients. Published results continue to demonstrate safety, rapid recovery, and earlier return to sport and activities of daily living.²

Kulwin R,
Watson TS,
Rigby R,
Coetzee JC,
Vora A

Top Article Highlighting the *Internal/Brace* Ligament Augmentation Technique

[Traditional Modified Broström vs Suture Tape Ligament Augmentation.](#) *Foot Ankle Int.* 2021;42(5):554-561. doi:10.1177/1071100720976071

- Multicenter prospective randomized controlled trial enrolled 119 patients who were candidates for primary lateral ligament repair for chronic lateral ankle instability with an accelerated rehab protocol (ARP)
 - Prospective comparative study
- Patients were randomly split 59-60 (modified Brostrom or modified Brostrom with *Internal/Brace* augmentation)
 - Patients and physical therapists were blinded to which procedure was performed
- Primary outcome measure was time to return to preinjury level of activity
- Return to preinjury activity level was 4.2 weeks faster in the group with *Internal/Brace* augmentation compared to the standard Brostrom group (13.3 weeks vs 17.5 weeks)
- Conclusion: *Internal/Brace* augmentation of the modified Brostrom repair for chronic ankle instability results in significantly earlier return to preinjury activity level

Martin KD,
Andres NN,
Robinson WH

[Suture tape augmented Broström procedure and early accelerated rehabilitation.](#) *Foot Ankle Int.* 2021;42(2):145-150. doi:10.1177/1071100720959015

New!

- Retrospective study of 93 consecutive patients with chronic lateral ankle instability that were treated with a Broström procedure augmented with the *Internal/Brace* technique
- Broström procedure augmented with FiberTape® suture enabled early, safe, and functional rehabilitation without subsequent failure. Data also demonstrated a sustained high level of patient satisfaction without reoccurrence within a high-demand military population
- The early accelerated rehabilitation allowed soldiers to return back to agility drills 4 weeks sooner than previous protocols



Kadakia AR,
Arthrex Research
and Development

[The collagen coating difference: early tenocyte adhesion and viability on *InternalBrace*[™] collagen-coated FiberTape[®] are superior compared to competitive suture tapes.](#)

LA1-000139-en-US_A. Naples, FL; 2021.

- Comparison of tenocyte viability and adhesion of ligament augmentation sutures including Arthrex collagen-coated FiberTape suture, Parcus Braid[™] (Parcus Medical), Ultratape (Smith & Nephew), XBraidTT (Stryker), and Hi-Fi[®] Tape (Conmed)
- Collagen-coated FiberTape suture retained the largest area of living, adhered tenocytes out of the 5 suture samples, indicating that it allows and encourages more soft-tissue repair for long-term reconstruction of damaged and/or minimal tissue as well as minimizes risk of inflammatory response
- Cell viability and relative metabolic activity of tenocytes adhered to collagen-coated FiberTape were statistically superior with a 99% confidence interval, implying that *InternalBrace* ligament augmentation may eliminate the need for autograft/allograft procedures

Coetzee JC,
Ellington JK,
Ronan JA,
Stone RM

[Functional results of open Broström ankle ligament repair augmented with a suture tape.](#)

Foot Ankle Int. 2018;39(3):304-310. doi:10.1177/1071100717742363.

- Six- to 24-month follow-up of 81 patients with a Brostrom repair augmented with the *InternalBrace* surgical technique
- *InternalBrace* ligament augmentation shows accelerated rehabilitation and mean return to sport of 12 weeks (3 months) and average time to full weightbearing of 16 days (range, 1-64 days).
- Motivated athletes were able to return to play, some as early as 8 weeks after surgery
- Comparison of ankle joint mechanics (dorsiflexion and plantar flexion) between operative and contralateral sides showed no major differences
- Highlights limitations of standard Brostrom repair where ankle is often immobilized for 6 weeks before rehabilitation starts and usually takes 4 to 6 months before athlete can return to play

Watson, T
Arthrex Research
and Development

[Arthrex *InternalBrace* ligament augmentation versus Smith & Nephew knotless constructs for lateral ankle repairs.](#) LA1-00098-EN_B. Naples, FL; 2020.

- Biomechanical comparison between Arthrex *InternalBrace* and Smith & Nephew “construct” of ligament augmentation for lateral ankle instability with matched pair cadavers
- Outcome: Arthrex *InternalBrace* ~250N; Smith & Nephew construct (Healicoil + Bioraptor anchors with Ultratape) ~ 90N
- ATFL native ligament strength is ~150N therefore S&N construct does not provide a true “augmentation” to the primary repair strength ~75N. The validity of S&N construct is significantly inferior



Maffulli N,
Del Buono A,
Maffulli GD,
et al

[Isolated anterior talofibular ligament Broström repair for chronic lateral ankle instability: 9-year follow-up.](#) *Am J Sports Med.* 2013;41(4):858-864. doi:10.1177/0363546512474967.

- “All my Brostroms do well”... or do they?
- 9-year follow-up of 42 athletes who had ankle ATFL Brostrom repair
 - 58% returned to preinjury level of activity, 16% returned to a lower level of activity, 26% abandoned athletic activity
 - In addition to 42% stepping down or abandoning activity, of the patients who had no evidence of degenerative changes preoperatively, 30% had radiographic signs of degenerative changes of the ankle at 9 years

Viens NA,
Wijdicks CA,
Campbell KJ,
LaPrade RF,
Clanton TO

[Anterior talofibular ligament ruptures, part 1: biomechanical comparison of augmented Broström repair techniques with the intact anterior talofibular ligament.](#) *Am J Sports Med.* 2014;42(2):405-411. doi:10.1177/0363546513510141.

- ATFL *Internal*/Brace ligament augmentation cadaveric biomechanical study testing ultimate load of failure at time zero
- Brostrom and *Internal*/Brace ligament augmentation = ~250 N
- ATFL repaired using Brostrom with anchors and *Internal*/Brace ligament augmentation is stronger than ATFL repaired using only Brostrom with anchors
- “Adding strength to Brostrom may be valuable in patients with generalized ligamentous laxity, in large patients or elite athletes, or when graft reconstruction is not feasible”

Boey H,
Verfaillie S,
Natsakis T,
Vander Sloten J,
Jonkers I

[Augmented ligament reconstruction partially restores hindfoot and midfoot kinematics after lateral ligament ruptures.](#) *Am J Sports Med.* 2019;47(8):1921-1930. doi:10.1177/0363546519848421.

- Five fresh-frozen cadaveric specimens were tested in a custom-built gait simulator in 5 different conditions: intact, ATFL rupture, ATFL-CFL rupture, ATFL-CFL reconstruction, and ATFL reconstruction
- The study concludes that *the Internal*/Brace ligament augmentation technique is successful in restoring hindfoot and midfoot instability
- Additionally, combined ATFL-CFL reconstruction restored motion better than isolated ATFL reconstruction after a combined ATFL-CFL rupture

Kirk KL,
Campbell JT,
Guyton GP,
Parks BG,
Schon LC

[ATFL elongation after Brostrom procedure: a biomechanical investigation.](#) *Foot Ankle Int.* 2008;29(11):1126-1130. doi:10.3113/FAI.2008.1126.

- Cadaveric study showed that unprotected motion after ATFL repair was associated with significant lengthening of ligament
- Need to protect and cast the ATFL during conservative rehab

Waldrop NE III,
Wijdicks CA,
Jansson KS,
LaPrade RF,
Clanton TO

[Anatomic suture anchor versus the Broström technique for anterior talofibular ligament repair: a biomechanical comparison.](#) *Am J Sports Med.* 2012;40(11):2590-2596. doi:10.1177/0363546512458420.

- Ultimate load to failure of the surgically repaired ATFL is only about half that of the intact native ligament: ~74 N of repaired ATFL versus ~150 N native ATFL



Mackay GM,
Blyth MJ,
Anthony I,
Hopper GP,
Ribbans MJ

[A review of ligament augmentation with the *Internal*Brace: the surgical principle is described for the lateral ankle ligament and ACL repair in particular, and a comprehensive review of other surgical applications and techniques is presented. *Surg Technol Int.* 2015;26:239-255.](#)

- Supports early mobilization of repaired ligament with minimal surgical morbidity
- Review of ligament reconstruction techniques and highlight of the application of *Internal*Brace ligament augmentation for ATFL Broström and ACL repair
- Highlights change in orthopedics from reconstruction with allograft or autograft to restoration of normal anatomy with *Internal*Brace ligament augmentation technique

Watson TS,
Lamour RJ

[Open modified Broström ankle reconstruction with internal brace augmentation: a novel approach. *Orthop Today.* 2015;35\(8\):28.](#)

- Novel surgical technique overview of Arthrex *Internal*Brace ligament augmentation repair to augment modified Brostrom reconstruction
- Discusses how “increased construct strength allows the surgeon to consider implementation of an accelerated rehabilitation program, earlier return to activity and decreased recurrent instability”

Bevilaqua NJ

[Stabilizing the lateral ankle via a Brostrom repair with suture tape augmentation. *Podiatry Today.* 2015;28\(5\).](#)

- The technique increases the strength of the repair
- Suture tape augmentation serves to protect the repair and allows for earlier rehabilitation

Haytmanek CT,
Williams BT,
James EW,
et al

[Radiographic identification of the primary lateral ankle structures. *Am J Sports Med.* 2015;43\(1\):79-87. doi:10.1177/0363546514553778.](#)

- Describes and defines the anatomic origins and insertions of the lateral ankle ligaments (ATFL and CFL)
- Supports anatomic repairs such as primary Brostrom augmented with the *Internal*Brace technique

Arthrex Research
and Development

[InternalBrace™ ligament augmentation: biomechanical testing of an anterior talofibular ligament repair, insertion order vs. swiveLock anchor size. Arthrex, Inc. LA1-0408-EN_A. Naples, FL; 2014.](#)

- ATFL *Internal*Brace ligament augmentation repair with all 4 constructs of 3.5 mm and 4.75 mm BioComposite SwiveLock® anchors tested
- All above 150 N (native strength) and range from 181-352 N

Liebler S,
Waldrop N,
Arthrex Research
and Development

[InternalBrace ligament augmentation: biomechanical testing of an anterior talofibular ligament repair as a function of SwiveLock® anchor size, drill bit diameter and bone tap size. Arthrex, Inc. LA1-00015-EN_A. Naples, FL; 2015.](#)

- Tested tensioning from talus to fibula using 3.4 mm drill for 3.5 mm SwiveLock anchor (244 N) and 4.0 mm drill for 4.75 mm SwiveLock anchor (296 N)

References

1. Viens NA, et al. *Am J Sports Med.* 2014;42(2):405-411.
2. Coetzee JC, et al. *Foot Ankle Int.* 2018;39(3):304-310.

The *Internal*Brace surgical technique is intended only to support the primary ligament repair/reconstruction and is not intended as a replacement. The *Internal*Brace surgical technique is intended only for soft tissue-to-bone fixation and is not cleared for bone-to-bone fixation.