



ISAKOS
CONGRESS
2023



Boston
Massachusetts
June 18–June 21



**Outcomes following Broström repair with
InternalBrace ligament augmentation
versus Broström repair alone for the
treatment of anterior talofibular ligament
injury of the lateral ankle**

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Disclosures

This study was funded by Arthrex GmbH via an investigator-initiated research grant (#US20078).

SMC: None

PPD: None

GJD: None

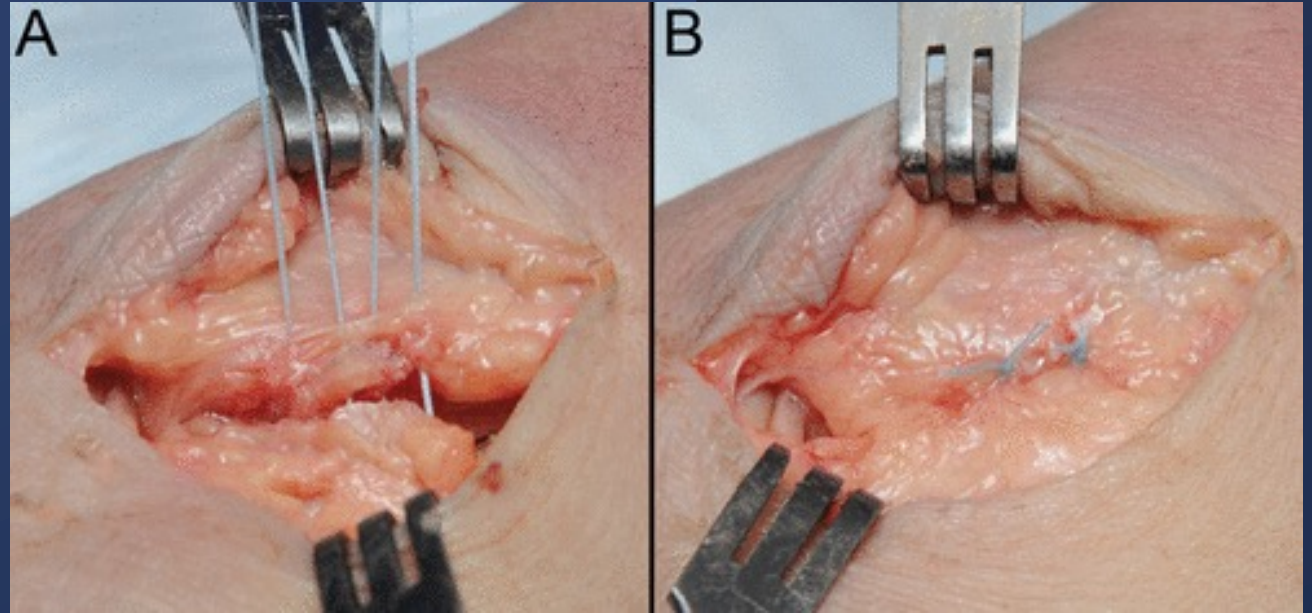
DCM: None

CTH: Paid Consultant – Arthrex, Inc.

TOC: Paid Consultant – Arthrex, Inc., Stryker, Inc., BICMD, Wright Medical Technology; Royalties – Arthrex, Inc., Stryker, Inc.; Speaker's Bureau – Arthrex, Inc., Stryker, Inc., Wright Medical Technology

Background

- Anterior talofibular ligament (ATFL) is the most commonly injured ligament with ankle sprains
- The Broström procedure is indicated for lateral ankle stability in the setting of acute and chronic ankle sprains
- One disadvantage of the Broström procedure is significantly reduced strength of repair when compared with the native ligament



Qualitative and Quantitative Anatomic Investigation of the Lateral Ankle Ligaments for Surgical Reconstruction Procedures.

Clanton TO, Campbell KJ, Wilson KJ, Michalski MP, Goldsmith MT, Wijdicks CA, LaPrade RF.

J Bone Joint Surg Am. 2014 Jun 18;96(12):e98. doi: 10.2106/JBJS.M.00798.



Anatomic suture anchor versus the Broström technique for anterior talofibular ligament repair: a biomechanical comparison.

Waldrop NE 3rd, Wijdicks CA, Jansson KS, LaPrade RF, Clanton TO.

Am J Sports Med. 2012 Nov;40(11):2590-6. doi: 10.1177/0363546512458420. Epub 2012 Sep 7.



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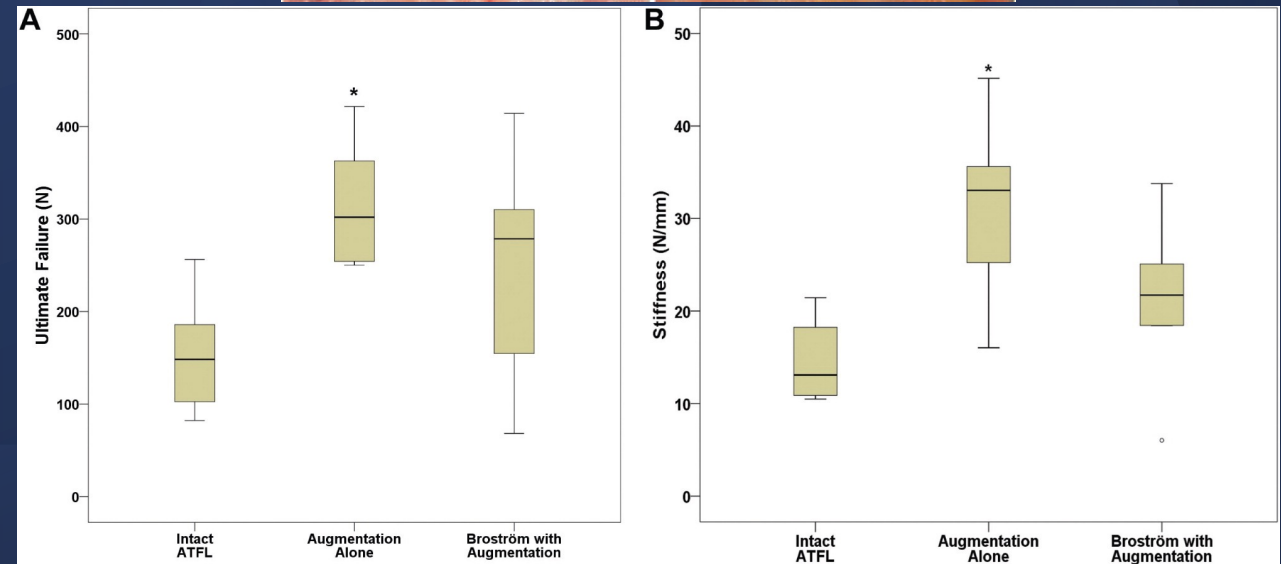
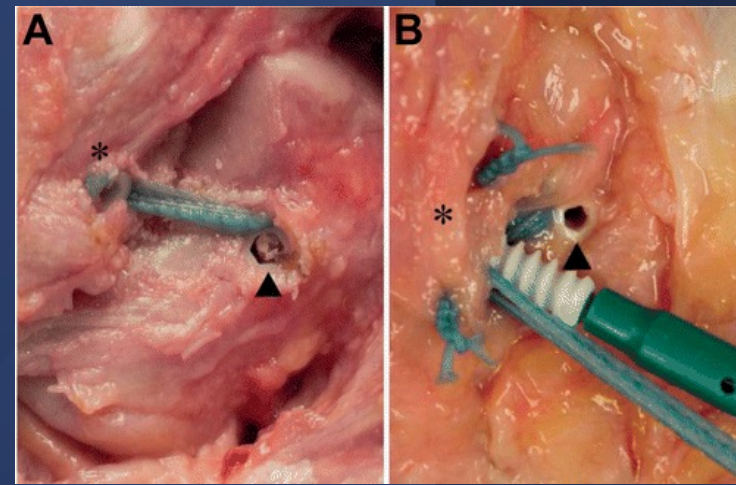
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Background

- Led to development of augmented Broström procedure with a synthetic device, such as InternalBrace™ (Arthrex, Inc., Naples, FL) referred to generically as suture tape
- Cadaveric studies have demonstrated increased strength and stiffness of repaired component with augmentation
- However, there is lack of data on functional outcomes of Broström repair with augmentation



Anterior talofibular ligament ruptures, part 1: biomechanical comparison of augmented **Broström** repair techniques with the intact anterior talofibular ligament.

Viens NA, Wijdicks CA, Campbell KJ, Laprade RF, Clanton TO.

Am J Sports Med. 2014 Feb;42(2):405-11. doi: 10.1177/0363546513510141. Epub 2013 Nov 25.



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PURPOSE:

To compare clinical outcomes following treatment of ATFL injuries with Broström repair alone versus Broström repair with suture tape augmentation



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Methods

Study Design: Retrospective cohort study

Study Period: January 2009 – December 2017

Patient Population:

- Age 18-75 at time of surgery
- Underwent surgical treatment of an ATFL injury of the lateral ankle with:
 - Broström repair alone (**BR Cohort**)
 - OR**
 - Broström repair with suture tape augmentation (**BR-ST Cohort**)
- At least 2 year postoperative status

Subjective questionnaires completed by patients at minimum 2-year follow-up including:

- Foot and Ankle Ability Measure (FAAM) – Activities of Daily Living (ADL) and Sport subscales
- Short Form-12 (SF-12)
- Tegner activity scale
- Patient satisfaction

Unadjusted group comparisons via Mann-Whitney U-test

Adjusted group comparisons via multiple regression modeling, controlling for Age, Sex, Prior Surgery, and baseline PRO score



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Results - Patient Demographics

- 91/102 eligible patients available for follow-up at median 5 years
 - BR cohort follow-up for 50/53 patients (94%) at median 7 years (range: 2-13 yrs)
 - BR-ST cohort follow-up for 41/49 patients (84%)
- No significant difference in age, sex, BMI, or follow-up time between cohorts ($p > .05$)

Demographic Data	BR (n=50)	BR-ST (n=41)	p-value
	Mean \pm SD		
Age	35 \pm 14	38 \pm 15	.49
Gender	28 F, 22 M	25 F, 16 M	.21
BMI	25.2 \pm 5.3	25.8 \pm 5.7	.60
Follow-up	6.6 \pm 3.6	4.9 \pm 1.7	.09



Results - Intraoperative Findings and Procedures

- Arthroscopic or open evaluation of the ankle joint was performed in 49/50 BR patients and 39/41 BR-ST patients
- In the BR cohort, 8 (16%) patients underwent ATFL-only repair, 40 (80%) patients underwent ATFL and calcaneofibular ligament (CFL) repair, and 2 (4%) patients underwent ATFL, CFL, and posterior talofibular ligament (PTFL) repair.
- In the BR-ST cohort, 7 (17%) patients underwent ATFL-only repair, 32 (78%) patients underwent ATFL and calcaneofibular ligament (CFL) repair, and 2 (5%) patients underwent ATFL, CFL, and PTFL repair.

Procedure Data	BR (n=50)	BR-ST (n=41)	p-value
	Mean \pm SD		
Calcaneofibular ligament repair	42	34	.89
Posterior talofibular ligament repair	2	2	.84
Peroneus longus repair	1	2	.44
Peroneus brevis repair	5	3	.65
Peroneus tenosynovectomy	8	11	.21
Microfracture	8	10	.32
Medial ankle ligament repair	2	1	.68
Medial ankle ligament reconstruction with allograft	1	0	
Excision of nonunion fragment from anterior process of calcaneus	2	0	
Excision of nonunion fragment from medial malleolus	1	0	
Excision of nonunion fragment from lateral malleolus	0	2	
Open reduction and internal fixation of medial malleolar fracture	1	0	
Fifth metatarsal osteotomy for bunionette	0	1	



Results - Complications and Subsequent Surgery

- 5 patients (4 BR, 1 BR-ST) experienced postoperative complications:
 - 2 – deep vein thrombosis
 - 3 – treatment for superficial surgical site infection
 - 1 – failure of medial malleolus osteotomy due to fall
- 8 patients required subsequent surgery (3 BR, 5 BR-ST) at median 1.1 years (range 14 days to 6.0 yrs)
 - 1 patient in the BR-ST group underwent revision for indication of recurrent lateral ankle instability after re-injury, requiring ATFL and CFL reconstruction with allograft
 - 1 patient converted to total ankle arthroplasty due to rapidly progressive post-traumatic osteoarthritis

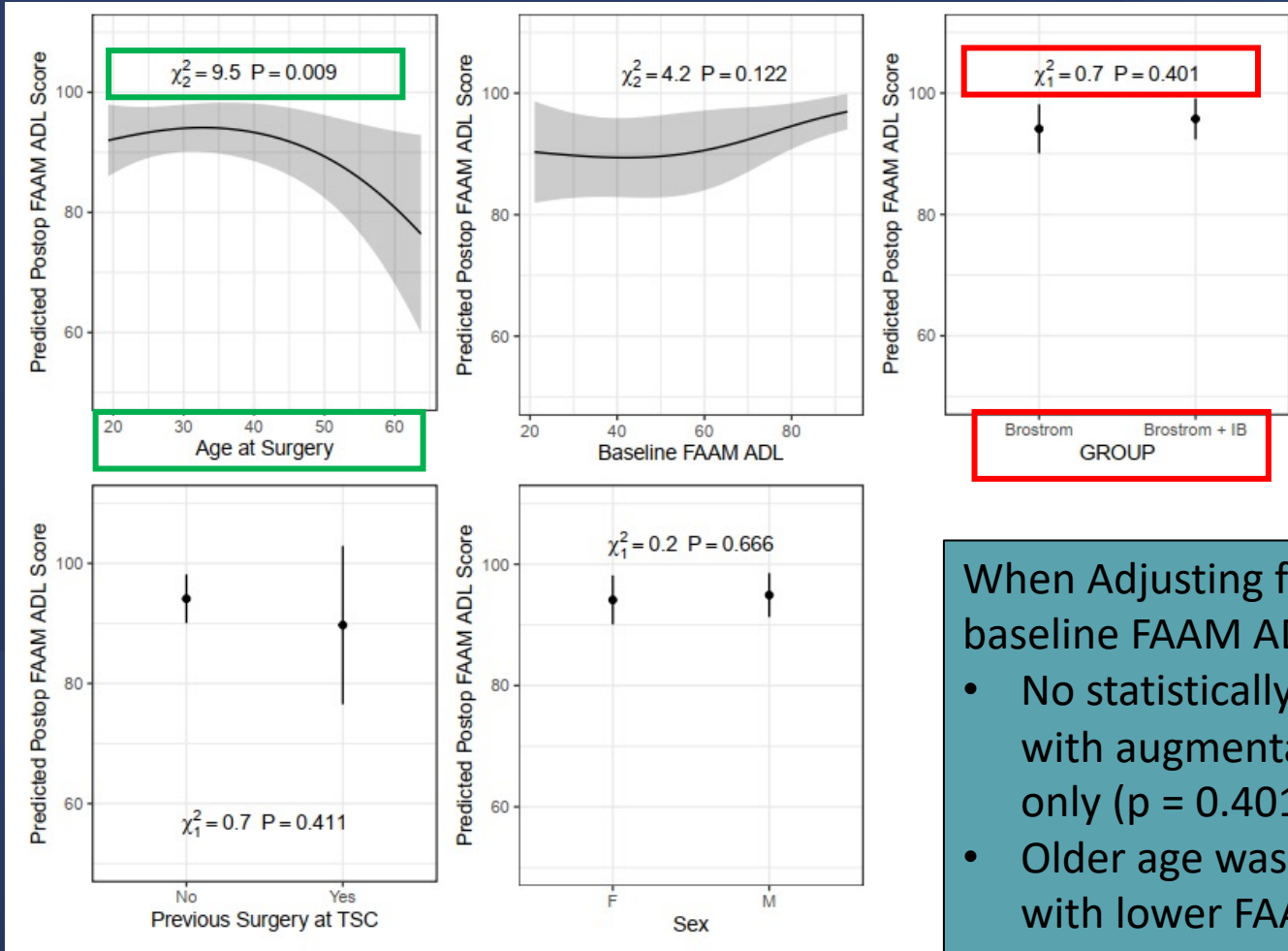
Subsequent Surgeries					
#	Age	Sex	Cohort	Time to Event	Details of Event
1	66	F	BR	6.0 years	STAR TAA
2	31	F	BR	1) 14 days 2) 2.0 years	1. Ankle scope, debridement; ORIF medial malleolar fx of prior osteotomy; revision Bio-Cartilage and BMAC graft to talar OCD 2. Ankle scope, debridement, HWR of medial malleolar screws
3	26	M	BR	1.1 years	Ankle scope, debridement, removal of loose bodies
4	20	F	BR-ST	5.5 years	Ankle scope, ATFL and CFL reconstruction with allograft tendon
5	30	F	BR-ST	10 months	Ankle scope, medial malleolus bone grafting
6	28	F	BR-ST	1.3 years	Ankle scope with excision of medial talar OCD, debridement
7	34	F	BR-ST	1.2 years	Ankle scope, debridement, tenosynovectomy of peroneal tendons
8	21	M	BR-ST	9 months	Ankle scope, debridement, talar chondroplasty
Complications					
#	Age	Sex	Cohort	Time to Event	Details of Event
1	31	F	BR	POD 3	Re-injury due to fall; Tx: ORIF of previous medial malleolus fracture
2	41	F	BR	POD 10	DVT left lower extremity; DVT ppx - Lovenox, switched to Warfarin; family hx of blood clots, no prior hx of DVT/PE
3	52	M	BR	POD 13	DVT left foot; DVT ppx - ASA 81 mg (non-compliant), switched to Lovenox then Warfarin; no family history or prior history of DVT/PE
4	26	F	BR	POD 42	Concern for suture abscess, treated with 7-day course of PO abx with resolution
5	32	M	BR	POD 42	Concern for suture abscess, treated with 10-day course of abx with resolution
6	32	M	BR-ST	POD 23	Possible cellulitis vs. superficial surgical site infection vs. reaction to sutures; placed on ppx 10-day course of PO abx with resolution

Results - Patient Reported Outcomes

PROs Data	BR (n=49)	BR-ST (n=38)	p-value
	Median [Range]		
FAAM ADL	98 [48, 100]	98 [39, 100]	.67
FAM Sport	88 [16, 100]	91 [12, 100]	.43
SF-12 PCS	55 [23, 61]	54 [23, 59]	.93
SF-12 MCS	56 [31, 68]	58 [48, 66]	.02
Tegner Activity Scale	5 [1, 10]	5 [0, 10]	.64
Satisfaction	9 [1, 10]	9 [2, 10]	.82

- At furthest follow-up, there was no significant difference in post-operative FAAM-ADL, FAAM-Sport, SF-12 PCS, Tegner activity scale, or patient satisfaction between groups
- Post-operative SF-12 MCS was **significantly higher** in patients treated with Broström repair with augmentation compared to Broström repair only

Results - Multiple Regression for Postoperative FAAM ADL Score



Marginal
Effects
Plots

When Adjusting for Age, Sex, Prior Surgery, and baseline FAAM ADL Score

- No statistically significant effect for Broström repair with augmentation compared to Broström repair only ($p = 0.401$).
- Older age was statistically significantly associated with lower FAAM ADL scores.

Method: proportional odds ordinal logistic regression with multiple imputation to address missing baseline data and allowing natural splines for nonlinear effects of age and baseline FAAM score.

Conclusion

- Patients treated for ATFL injury of the lateral ankle with Broström repair with suture tape augmentation had significantly higher postoperative SF-12 mental component score compared to those treated with Broström repair alone
- Otherwise, PROs were similar between groups at minimum 2-year follow-up even when adjusted for age, sex, prior surgery, and preoperative FAAM ADL score
- With its advantages in strength and stiffness, suture tape augmentation should be considered when treating lateral ankle instability in the setting of ligamentous injury since it allowed an earlier return to full weightbearing and a quicker rehabilitation protocol



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