

Broström with Augmentation Significantly Improves Ankle Stability Measured by the Cumberland Ankle Instability Tool Compared to Broström Without Augmentation

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INTRODUCTION: Limited data exist regarding whether primary Broström with internal brace augmentation bolsters ankle stability compared to Broström without augmentation. The Cumberland Ankle Instability Tool (CAIT) is a validated metric of ankle stability. Our study therefore aims to determine whether augmented Broström produces greater ankle stability measured by CAIT scores. To our knowledge, this investigation is the largest retrospective study evaluating the CAIT in non-augmented Broström vs. augmented Broström with internal brace, as well as the largest to assess the relative stability associated with internal brace augmentation as measured by preoperative CAIT scores. We hypothesized that augmented Broström would result in higher postoperative CAIT scores for patients compared to non-augmented.

METHODS: 574 patients who underwent lateral ankle ligament reconstruction at a single institution between January 2013-January 2024 were retrospectively reviewed. Two investigators independently evaluated all records. Revisions, concomitant Evans osteotomies, allografts, nonanatomic reconstructions, flexor digitorum longus transfers, progressive collapsing foot deformities, concomitant hindfoot arthrodesis, associated ankle arthroplasties, and concomitant fractures were excluded. 127 patients who had pre-operative CAIT available and who met all eligibility criteria were contacted to complete surveys assessing CAIT, self-reported ankle stability, and post-surgical activity levels. Patients were classified based on instability etiology: isolated ligamentous instability (no anatomic deformity), osteochondral defect (OCD), or deformity (varus deformity, equinus contracture). T-tests and Pearson's Chi-squared test were used for unadjusted comparisons. Analysis of covariance (ANCOVA) compared postoperative CAIT by procedure type, controlling for clinically relevant covariates, with interaction term (procedure type × preoperative CAIT) to test for differences by baseline instability. Post-hoc analyses were conducted to calculate estimated marginal means (EMM) and assess between-group differences at various preoperative CAIT percentiles.

RESULTS: In unadjusted comparisons, augmented (n=80) demonstrated superior outcomes than non-augmented (n=47), with higher postoperative CAIT (20.6 ± 8.2 vs. 16.5 ± 10.5 , $p=0.02$), greater self-reported ankle stability (88.8% vs. 72.3%, $p=0.03$), and greater number of patients reporting increased postoperative activity (80% vs. 63.8%). ANCOVA demonstrated significant main effect of augmented on postoperative CAIT after controlling for clinically-relevant cofactors including preoperative CAIT ($F(1,116)=6.39$, $p=0.01$). Augmented had significantly higher postoperative CAIT (EMM=21.3, 95% CI=19.0-23.6) compared to non-augmented (EMM=16.9, 95% CI=13.4-20.6). The benefit of augmentation varied by preoperative CAIT. At CAIT=2 (25th percentile) and CAIT=7 (50th percentile), augmented had significantly higher postoperative scores compared to non-augmented (MD=6.92, $p<0.001$ and MD=4.25, $p=0.02$, respectively); At CAIT=11 (75th percentile), difference between groups was no longer significant although augmented still resulted in higher scores (MD=2.12, $p=0.33$).

DISCUSSION AND CONCLUSION: Broström with internal brace augmentation generates significantly improved ankle stability measured by CAIT compared to non-augmented Broström to a degree that reaches the minimal clinically important difference reported in the literature for CAIT. The benefit of augmentation is most pronounced in patients with high preoperative ankle instability (lower preoperative CAIT), as differences between augmented and non-augmented in postoperative CAIT was significantly greater in patients with preoperative CAITs in 25th and 50th percentiles. Internal brace augmentation also results in more patients self-reporting ankle stability and increased activity compared to primary, non-augmented Broström.