

Acute Ankle Diastasis Injuries Treated with Dynamic, Static Fixation versus Anatomical Repair: A Meta-analysis and Systematic Review of Randomized Controlled Trials

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INTRODUCTION: Acute ankle diastasis injuries are complex and debilitating. These injuries occur when the syndesmotic complex becomes compromised. Treatments for acute syndesmotic injuries include static fixation with screws, dynamic fixation with an elastic device, or anatomical repair of the damaged ligament. However, there is disagreement over which method is most effective.

METHODS: A systematic literature search was conducted on EMBASE and PubMed. Randomized controlled studies that compared at least two groups with relevant AOFAS, VAS, reoperation rate, and complications (implant failure, implant irritation, and infection) data were analyzed. Statistical analysis for this study was performed using Review Manager 5.4, with a standard p-value of ≤ 0.05 for statistical significance.

RESULTS SECTION: A total of 19 RCTs including a total of 1,059 patients (452 Dynamic, 529 Static, and 78 Anatomic) were included for analysis. Dynamic fixation had significantly higher mean AOFAS scores at 3 months post-operation by 5.12 points (95% CI 0.29 to 9.96, $p=0.04$) as well as at 1-year post-op by 4.64 points (95% CI 1.74 to 7.55, $p=0.002$) than Static fixation. Anatomic Repair had significantly higher AOFAS scores at 6 months post-op by 3.20 points (95% CI 1.06 to 5.34, $p=0.003$) and 1-year post-op by 1.86 points (95% CI 0.59 to 3.14, $p=0.004$) than Static Fixation. Dynamic Fixation had significantly higher AOFAS scores at 6 months post-op by 2.81 points (95% CI 0.76 to 4.86, $p=0.007$), 12 months post-op by 3.17 points (95% CI 0.76 to 5.58, $p=0.01$), and at 2 years post-op by 5.56 points (95% CI 3.80 to 7.32, $p<0.00001$) than Anatomic Repair. Dynamic fixation also had a lower VAS score average (favorable), only significant at 12 months post-op, than Static Fixation by 0.7 points (95% CI -0.99 to -0.40, $p<0.00001$). Anatomic Repair did not have significant difference in VAS scores compared to Static Fixation. Anatomic Repair had significantly lower VAS scores at 12 months post-op by 0.32 points (95% CI -0.59 to -0.05, $p=0.02$) than Dynamic Fixation. Dynamic Fixation had significantly less implant failures (OR=0.13, 95% CI 0.05 to 0.32, $p<0.0001$) than Static Fixation. Anatomic Repair was not significantly different from Static Fixation in the complication metrics. Dynamic Fixation and Anatomic Repair were not significantly different in the complication metrics either. Dynamic Fixation had a significantly less reoperation rate than Static Fixation (OR=0.23, 95% CI 0.09 to 0.54, $p=0.0009$). Anatomic Repair did not have a significantly different reoperation rate to Static Fixation. However, Dynamic Fixation had a significantly less reoperation rate than Anatomic Repair (OR=4.65, 95% CI 1.10 to 19.76, $p=0.04$).

DISCUSSION: The data indicates that Dynamic Fixation exhibits superior early clinical outcomes, but these advantages tend to level off in the long term when compared to alternative options. Furthermore, Dynamic Fixation is associated with a reduced risk of complications, particularly evident in the noteworthy decrease in implant failures. This method also boasts a significantly diminished reoperation rate when contrasted with the other treatment approaches. Conversely, aside from demonstrating improved early clinical outcomes in comparison to Static Fixation, Anatomic Repair did not exhibit significant distinctions in other metrics, including complications or reoperation rate. One limitation of the analysis pertained to the scarcity of comparative studies investigating Anatomic Repair, which resulted in a considerably smaller sample size compared to the other two groups.

SIGNIFICANCE/CLINICAL RELEVANCE: Acute Ankle Diastasis injuries are considerably severe and often necessitate comprehensive medical intervention along with a significant period for rehabilitation. Analyzing various aspects of the available treatment options can provide us with insights into which method is the most effective for patient recovery, the most cost-effective, and which inflicts the fewest number of risks or failures.