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Biomechanical Comparison of Open versus Percutaneous Techniques for Primary Mid-Substance Achilles Tendon Repair: A Meta-Analysis

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PURPOSE: Primary repair of mid-substance Achilles tendon rupture may be performed using an open or a percutaneous technique. Previous meta-analyses of clinical data comparing the two techniques have demonstrated mostly equivalent functional outcomes and re-rupture rates. Individual cadaveric studies have also compared the biomechanical properties of the two approaches. However, the results of these studies have been heterogeneous, and there is currently no consensus as to whether one technique may be biomechanically superior. The purpose of this meta-analysis was to evaluate the biomechanical properties of open versus percutaneous Achilles tendon repair. **METHODS:** A systematic review of original research articles was performed using PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines. To qualify for study inclusion, articles were required to be published in English, utilized a cadaveric laboratory design, and had to directly compare the biomechanical properties of open Achilles repair using a Krackow or Kessler technique versus percutaneous repair using either the PARS (Arthrex) or Achillon (Integra) tendon repair systems. Evaluated outcomes included displacement (mm), load to failure (N), and stiffness (N/m). **RESULTS:** Nine studies met inclusion criteria, including 190 cadaveric specimens (open: 83, PARS: 56; Achillon: 51) that underwent primary mid-substance Achilles tendon repair. Pooled analysis demonstrated no statistically significant difference in displacement ($p = 0.418$), load to failure ($p = 0.923$), or stiffness ($p = 0.195$) between the open and percutaneous techniques. **CONCLUSION:** The results of this study suggest that both open and percutaneous techniques are biomechanically viable approaches for primary mid-substance Achilles tendon repair. These biomechanical findings must be interpreted in the context of clinical outcomes data as well as the differing complication profiles of the two techniques to best inform the surgical decision-making process for primary mid-substance Achilles tendon repair.