A Systematic Review of Biomechanical Experiments on Bioresorbable Suture Anchors

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INTRODUCTION: Suture anchors function to facilitate the attachment of soft tissue to bone, such as during arthroscopic Bankart procedures. After being implanted, suture anchors undergo several cycles of tension and relaxation as the tendon heals. Historically, titanium suture anchors have been used due to their strength and light weight. However, metal suture anchors are associated with several complications, including migration and loosening that can result in joint damage.
Recently, suture anchors made from different types of bioresorbable materials, including poly(lactic-co-glycolic) acid (PLGA) and poly-L-lactic acid (PLLA), have been developed to overcome these complications and preserve bone stock. These suture anchors interdigitate with cancellous bone. According to isolated studies, bioresorbable suture anchors perform comparable with similar devices and have a relatively low risk of adverse events. However, an organized summary of the strength of various bioresorbable suture anchors is lacking in the literature. The aim of this study is to summarize literature on the strength of various types of bioresorbable suture anchors. We hypothesize that bioresorbable suture anchors will have a strength that is similar to titanium suture anchors.

METHODS: The PubMed database was searched across the last five years using relevant keywords for full-text original articles in English using clinical trials, randomized control trials, and experimental papers. Case reports and review articles were excluded. After the exclusion of irrelevant articles, five articles remained for analysis. This systematic review adhered to PRISMA guidelines.

RESULTS SECTION: The tested bioresorbable suture anchors have similar mean load to failure compared to nonbioresorbable sutures. Novel bioresorbable suture anchors made from porous iron were found to have increased mean load to failure and decreased displacement compared to an established bioresorbable PLGA suture anchor. PLGA/β-tricalcium phosphate/calcium sulfate suture anchors had a higher failure load that metal and polyether ether ketone and titanium suture anchors in one experiment. The mean displacement was also similar between nonbioresorbable and bioresorbable suture anchors. Anchor pullout and suture breakage are the most common modes of failure for bioresorbable suture anchors.

DISCUSSION: These findings align with our hypothesis that bioresorbable suture anchors are similar in strength to nonbioresorbable suture anchors. However, there is still very limited research available on the performance of suture anchors made from various bioresorbable materials. Future studies should attempt to reproduce these findings, as well as use a standardized material on which to test the suture anchors. There are several limitations associated with this study. The papers found in the last five years were significantly heterogeneous in the type of bioresorbable suture anchor tested as well as the model bone used. Additionally, not all studies reported the bone mineral density of the model bone.

SIGNIFICANCE/CLINICAL RELEVANCE: These results may be useful to orthopedic surgeons determining the best suture anchor material for their surgeries. They may also be useful to researchers trying to develop and refine new bioresorbable materials for suture anchors.

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IMAGES AND TABLES:

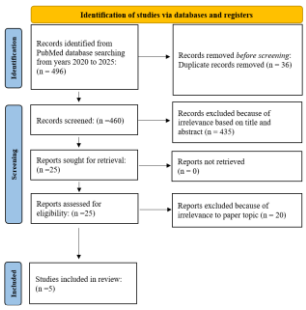

Figure 1: PRISMA Flow Diagram Outlining Literature Search Process