

Evaluating the Clinical and Economic Outcomes of Synthetic Patch Augmentation in Rotator Cuff Repair: A Systematic Review and Cost-Benefit Analysis

Abdullah Bin-Saleem Chandasir, Sai S Unnam, Vineet K Paidisetty, Garrett Flynn, Jad Jack Lawand, Benjamin Garrett Fiedler, Jeremy S Somerson, Phillip N. Williams

INTRODUCTION:

Rotator cuff (RC) tears are common musculoskeletal injuries, especially in older populations, often leading to surgical intervention. Retear rates after repair remain high, prompting interest in techniques to enhance healing and durability. Synthetic patch augmentation has emerged as a promising strategy to improve rotator cuff repair (RCR) outcomes by providing biomechanical support and facilitating tendon healing during recovery. This study aimed to evaluate the clinical effectiveness and cost-effectiveness of synthetic patch-augmented RCR compared to non-augmented repair.

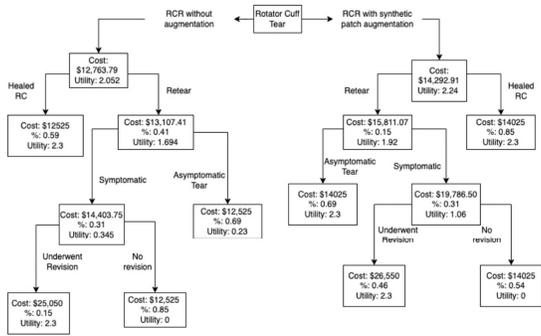
METHODS: A systematic review and meta-analysis were conducted in accordance with PRISMA guidelines using PubMed, Web of Science, Embase, and Scopus. Inclusion criteria encompassed studies reporting clinical outcomes of RCR with synthetic patch augmentation. Data was extracted on patient demographics, graft materials, surgical technique, re-tear and revision rates, and functional outcomes. A meta-analysis was performed to determine a pooled re-tear and revision rate based on all included studies. A decision-tree model was developed using this re-tear rate to assess cost-utility of augmentation of RCR with synthetic patches, incorporating probabilities of re-tear, revision, and quality-adjusted life years (QALYs) of both augmented and non-augmented repairs. An incremental cost-effectiveness ratio (ICER) was calculated and a sensitivity analysis was performed to determine the economic threshold.

RESULTS: Nineteen studies encompassing 478 augmented shoulders were included. Synthetic materials ranged from nonabsorbable (e.g., ePTFE, polyester) to bioabsorbable polymers (e.g., PLLA, poly-4-hydroxybutyrate). Most patients had large, chronic, degenerative tears treated arthroscopically or via open repair. Clinical outcomes consistently improved with augmentation: ASES and Constant-Murley scores rose significantly, there was substantial long-term pain resolution, and patient satisfaction was reported to be satisfactory. The pooled re-tear rate was determined to be 15% (95% CI: 11–21%), and among failures, 46% required revision. Cost-utility analysis showed synthetic augmentation yielded a 10-year QALY of 2.24 versus 2.052 for non-augmented RCR. The incremental cost-effectiveness ratio (ICER) was \$8,133.62—well below the accepted \$50,000/QALY threshold, indicating high cost-effectiveness. Sensitivity analysis indicated cost-effectiveness was preserved up to a patch price of \$21,896.

DISCUSSION AND CONCLUSION:

This study found that synthetic patch augmentation in RCR offers significant clinical and economic advantages. The pooled re-tear rate of 15% in augmented repairs represents a marked reduction compared to historical re-tear rates exceeding 30% in non-augmented repairs, particularly for large or degenerative tears. Functional outcomes, pain reduction, and patient satisfaction were consistently improved across studies. Importantly, the cost-utility analysis demonstrated an incremental cost-effectiveness ratio (ICER) of \$8,133.62—far below the commonly accepted \$50,000 per QALY threshold—highlighting the strong economic value of synthetic augmentation. Sensitivity analysis further reinforced that synthetic augmentation remains cost-effective even at significantly higher patch costs.

These findings suggest that synthetic augmentation not only enhances the biomechanical stability of the repair construct but also yields measurable improvements in quality-adjusted life years (QALYs) and reduces the long-term burden of revision surgeries. In contrast to biologic grafts, synthetic patches avoid immunogenic complications and provide reproducible structural reinforcement, making them an attractive option in patients with compromised tissue quality or high re-tear risk. Given the aging population and increasing demand for durable shoulder repairs, synthetic patch augmentation may represent a scalable and value-based solution in orthopedic care.



One-Way Sensitivity Analysis: ICER vs Patch Cost

