Repairing the Irreparable: a Cost-Effectiveness Analysis of Surgical Treatment Options for Irreparable Rotator Cuff Tear

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INTRODUCTION: Massive irreparable rotator cuff tears (MRCTs) are increasingly common in the aging population, affecting up to 30% of individuals over age 60. In this demographic, treatment selection is complicated by the need to balance cost, expected functional improvement, and long-term durability. Treatment options such as partial repair, lower trapezius tendon transfer (LTTT), balloon arthroplasty, tuberoplasty, superior capsular reconstruction (SCR), and reverse total shoulder arthroplasty (rTSA) vary widely in complexity, outcomes, and cost. As value-based care becomes a priority, there is a pressing need to identify interventions that offer the greatest benefit relative to cost. This study evaluates the cost-effectiveness of commonly used surgical treatments for MRCTs using quality-adjusted life years (QALYs) and incremental cost-effectiveness ratios (ICERs) to guide patient-centered decision-making in older adults.

METHODS: A Markov Chain Monte Carlo simulation model was used to model 1000 patients, 60 years of age with isolated irreparable rotator cuff tears. Treatment strategies included partial repair (base case), partial repair with graft augmentation, lower trapezius tendon transfer (LTTT), balloon arthroplasty, tuberoplasty, SCR, and rTSA. The model incorporated procedure-specific reoperation rates and accounted for failure pathways, including conversion to rTSA for failed tendon procedures and rTSA revision where applicable. Cost and utility inputs were derived from published literature. Outcomes were evaluated over a 2, 5, 10, and 15-year horizon, with primary endpoints including total cost, QALYs, and ICERs.

RESULTS: Expected costs for balloon arthroplasty, SCR, LTTT, tuberoplasty, rTSA, partial repair with and without graft augmentation were $12358, $25150, $19611, $4774, $20459, $9272, and $20982, respectively. Health utility was determined to be 0.574, 0.799, 0.742, 0.333, 0.777, 0.516, and 0.713 respectively. Over a 10-year horizon, QALYs were calculated to be 5.025, 6.993, 6.493, 2.917, 6.803, 4.518, and 6.238, respectively. Across all time periods, tuberoplasty showed to be the most cost-effective treatment with the lowest ICER-- followed by rTSA. Simulation studies showed tuberoplasty as the most cost-effective approach. SCR and rTSA were cost-effective and conferred the most significant improvement in quality of life, becoming the preferred treatment method as willingness to pay threshold increased past $10,000.

DISCUSSION AND CONCLUSION: Tuberoplasty offers the most cost-effective solution for MRCT in patients with limited willingness to pay or lower functional demands. Conversely, reverse total shoulder arthroplasty (rTSA) provides greater functional benefit and higher QALYs, supporting their use in patients who prioritize improved outcomes and are appropriate surgical candidates. These findings underscore the need for a tailored, value-based approach that aligns treatment selection with patient-specific goals, functional expectations, and healthcare resource utilization.