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Superior Capsular Reconstruction in the Active Population with a Massive Irreparable Rotator Cuff Tear

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Abstract
The prevalence of rotator cuff tears is a leading cause of upper extremity functional impairment and affects people across the lifespan. The primary age groups that are diagnosed include young adults as well as the elderly population. Approximately one-fifth of rotator cuff tears (RCT) are diagnosed as “massive” and prove to be difficult for orthopedic surgeons to repair. If the massive RCT is also diagnosed as “irreparable”, surgical intervention is technically difficult and can be extremely challenging. Historically, treatment options have been limited for the young population to invasive surgical intervention or conservative measures such as physical therapy and pharmacologic measures. Surgical approaches to treatment may include a reverse shoulder arthroplasty (RSA) or a superior capsular reconstruction (SCR). The purpose of this research is to determine if a superior capsular reconstruction is a better surgical alternative than a reverse shoulder arthroplasty in the young, active population with a massive irreparable rotator cuff tear. An SCR has shown successful short-term outcomes and utilizes an anatomical approach. Each surgical option is feasible; however, the postoperative function is the substantial difference between both surgical technique. Research has proven the efficacy of the SCR versus the RSA. Although there is limited current evidence-based research in the field of longevity and its potential outcomes, the SCR is the leading surgical option for massive irreparable RCT repairs in the young, active population.

Introduction
Rotator cuff tears (RCT) are one of the most common upper extremity glenohumeral injuries seen in the orthopedic patient population. They are typically classified into four categories as either small, medium, large or massive. Historically, massive irreparable rotator cuff tears have had limited methods of treatment both conservatively and surgically. Interventions for massive irreparable rotator cuff tears generally consist of either a conservative course of physical therapy to strengthen the anterior deltoid, pharmacological treatment or a reverse shoulder arthroplasty (RSA). In the study research and evidence-based practice compare the two surgical techniques, their longevity, success, complications, and postoperative requirements. Sambundum, Khanna, Gul, & Mounassy (2015), define the rotator cuff as tendons and muscles of the shoulder that provide joint stability and strength. When torn or inflamed, patients experience pain, functional disability, and extremity weakness. When the rotator cuff is diagnosed as massively torn and irreparable, surgical intervention is necessary to re-establish shoulder functionality and strength. In massive rotator cuff tears, tendons may retract from their insertion sites and pose a challenge to reinstate the tendons back to their insertion site.

Statement of the Problem
Conflict of interest arises when a young active patient endures a massive rotator cuff repair and surgical intervention is necessary for repair. A reverse shoulder arthroplasty or superior capsular reconstruction are both effective when treating rotator cuff tears. A comparative study between surgical interventions is necessary to determine success of restoration of shoulder function and overall longevity of the repair in young active individuals.

Research Question
- Is a superior capsular reconstruction a better alternative than a reverse shoulder arthroplasty in the young, active population with a massive rotator cuff tear?
- Is a reverse shoulder arthroplasty a viable option for young, active patients with massive, irreparable rotator cuff tears?

Literature Review
Research methods include systematic reviews, randomized control trials and observational studies that were performed over the past five years and obtained from PubMed and CINAHL.

Anatomy and Physiology
- The rotator cuff is comprised of four muscles and tendons that include the supraspinatus, infraspinatus, teres minor and subscapularis.
- A RCT that exceeds five centimeters in length in either direction or involves two or more tendons is typically considered massive (Ladermann et al., 2015).

Reverse Shoulder Arthroplasty
- In a reverse shoulder arthroplasty procedure, the ball and socket of the shoulder is reversed, creating a socket that is typically larger than the humeral head. The rotator cuff is replaced with a prosthesis.

Superior Capsular Reconstruction
- The rotator cuff is significant to the restoration of strength, but when the rotator cuff is diagnosed as massively torn and irreparable, surgical intervention is necessary to re-establish shoulder functionality and strength. In massive rotator cuff tears, tendons may retract from their insertion sites and pose a challenge to reinstate the tendons back to their insertion site.

Discussion
Through extensive review and investigation, it is apparent that the superior capsular reconstruction is the optimal treatment option when compared with the reverse shoulder arthroplasty in the young active population. Although the graft that is utilized in the SCR procedure may be difficult to locate and can be expensive, the postoperative outcomes outweigh the risks. There are more disadvantages from the RSA than there are advantages and satisfaction rates. In all studies, a significant increase in shoulder range of motion was significantly marked after a superior capsular reconstruction with a decrease in overall postoperative complications.
- An RSA is considered an “end of the road” treatment option which is reserved for the elderly who are typically less active. An RSA may result in excellent pain relief for patients with a massive rotator cuff tear but may only slightly improve functional status of the shoulder (Sevivas et al., 2017).
- Thorsen & Romero (2016) the necessity of a reverse shoulder arthroplasty for older, “lower demand” patients who have pseudoparalysis and rotator cuff pathologies.
- Studies acknowledge that the high complication rate and the decline in clinical outcomes deters younger patients from the RSA procedure. Samuelsen et al. (2017).
- In a study conducted by Angelo et al. (2017) both were viable surgical approaches but the SCR showed less postoperative complications and increased range of motion.
- The SCR maintains the normal anatomy of the shoulder but reinforces it with tendon repair so that patients will regain their strength and stability (Mihata et al., 2013).
- Hiraizumi et al. (2017) compared a reverse shoulder arthroplasty with a superior capsular reconstruction and had statistical proof that the SCR has fewer risks and complications than the RSA.
- Denard et al. (2017) showed improved forward flexion with an SCR by twenty-eight degrees and improved external rotation by nine degrees postoperatively with a 70% overall success rate.
- The SCR surgery resulted in a two-fold increase in shoulder range of motion from preoperative measurements and had minimal complications (Mihata et al., 2013).

Applicability to Clinical Practice
Shoulder injuries are extremely prevalent and account for a majority of shoulder related visits. Shoulder injuries and pathologies are often pursued once all other conservative options have been exhausted due to questionable longevity (Barco et al., 2016). With recent changes in orthopedic surgical techniques, the SCR is an anatomical approach for irreparable RCT’s that has emerged. Using either autograft or allograft tissue, the superior capsular reconstruction is mimicked to the function of the deficient rotator cuff. Early studies have shown acceptable outcomes and excellent efficacy, however due to its recent introduction an SCR procedure lacks sufficient longitudinal studies.

References

Figure 1: Right shoulder s/p SCR Figure 2: Left shoulder s/p RSA

3-rays courtesy of Kevin Crawford MD, Latteback Sports Medicine (2017)