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Clinical Decision Making in Open vs Arthroscopic Rotator Cuff Repair: Evidence for Preoperative Decision Making

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Abstract

Objective: To further understand what factors should be considered when deciding to do mini-open versus arthroscopic rotator cuff repair. **Methods:** A systematic literature search on the computer was done with the help of the PubMed database. Of the articles searched through, three have been chosen to specifically address topics of interest concerning the factors affecting arthroscopic vs mini-open RCR surgical approaches. **Discussion:** As we continue to progress down the line of factors impacting a clinician's decision making, we begin to see how postoperative management is unchanged. Tear severity lacks sufficient evidence to base a decision on, but financial, educational, and logistical factors are proven to play a significant role in this decision. **Conclusion:** As of right now it seems that mini-open RCR is the most cost and time efficient method, especially amongst non-fellowship trained surgeons or ones with lower volume of shoulder scopes. However, further studies should be done to examine cost and efficiency in Sport Medicine fellowship trained orthopedic surgeons to validate these findings.

Keywords

Rotator Cuff Repair, Shoulder Arthroscopy, Mini-Open Rotator Cuff Repair, Arthroscopic Rotator Cuff Repair

1. Introduction

Rotator cuff repairs are one of the most common surgical procedures done by an orthopedic surgeon, especially in the older population. Nearly 21% of the general population will have a rotator cuff injury, from traumatic or degenerative causes, in their lifetime [1]. Rotator cuff tears do not always end up with surgical inter-

vention, although the tear will never heal itself, there are alternative methods to decrease pain and improve functionality in patients. Common practice for the treatment of rotator cuff tears includes but is not limited to: physical therapy, corticosteroid injections, open surgical repair and arthroscopic surgical repair. Eight of ten individuals with partial tears to the rotator cuff get better clinically with non-surgical treatment [2]. Tears in the rotator cuff occur due to a multi-factorial array of risk. Activities such as athletics, physically intensive jobs, previous trauma, smoking and old age all play a part in the accumulation of wear and tear on the tendons stabilizing the glenohumeral joint.

Surgical repair of this injury has been split into two main approaches, mini-open repair and arthroscopic. The decision of whether to take the open or minimally invasive approach has been historically determined by surgeon preference. As the number of rotator cuff repairs (RCR) increased from the mid 1990's to the mid 2000's, a trend of open repairs in patients younger than 45 years old also increased [3]. As ambulatory surgery centers began to develop and gain traction due to the ability to keep patients out of the hospital, so has the evolution of arthroscopic surgery. As the United States population has aged, sports fellowship trained orthopedic surgeons have pushed the envelope in treatment. Taking patients to surgery for arthroscopic repairs which would not have been possible if the mini-open method was the only method available due to accessibility of the joint space [3]. The advantages of the arthroscopic approach carry less impact on the integrity of the deltoid muscle, improved joint space access and visualization, decreased postoperative pain, and widened the limitation of tear sizes that are operable [3].

With all the advantages noted concerning the evolution of arthroscopy RCR, some decisions must be made concerning the potential drawbacks to performing surgery this way. Considerations concerning variables like physician training, patient post-operative recovery, time in surgery and cost, are all factors that should be accounted for before deciding which approach to take with your patients. This paper looks to examine multiple studies investigating different factors that should be involved in open vs arthroscopic RCR decision making. As the evolution of surgical treatment progresses new limitations and indications for minimally invasive approaches matures as well.

2. Methods

A systematic literature search on the computer was done with the help of the PubMed database. The search was executed using specific headers such as: Arthroscopic Rotator Cuff Repair, Mini-Open Rotator Cuff Repair, and Surgical Rotator Cuff Repair. Articles were considered regardless of date of publication. Articles found in English were preferred.

Of the article searched through, three have been chosen to specifically address topics of interest concerning the factors affecting arthroscopic vs mini-open RCR surgical approaches. These articles and others allowed for data extraction

and information usage to further the knowledge behind clinical decision making in what has become a provider preference decision.

3. Total Cost and Operating Room Time Comparison of Rotator Cuff Repair Techniques at Low, Intermediate, and High-Volume Centers: Mini-Open versus All Arthroscopic [4]

This study set out to determine the cost and operating time differences between arthroscopic RCR and mini-open RCR in surgical centers of various volumes of pathology. The study used the New York State Ambulatory Surgery Database to identify all outpatient procedures performed in hospital affiliated and freestanding surgical centers (over 10 million patients alone in 2006). Patients that had arthroscopic acromioplasty and either open or arthroscopic RCR were considered, accounting for 5224 patients. The two groups: Mini-Open Repair had 1334 patients, Arthroscopic Repair had 3890 patients, both were further divided into low, intermediate, and high-volume centers, each performing > 75/75-199/200+ RCR's a year respectively.

This study found that operating time was significantly shorter in the Mini-Open Repair group, 103 minutes compared to 113 minutes in the arthroscopic group ($p < 0.00001$). This also correlated with less surgically oriented charges in the Mini-Open Repair group ($7841) versus the Arthroscopic Repair group ($8985) ($p < 0.00001$). The study also showed the high-volume surgical centers were the most expensive of the three groups regardless of approach ($p < 0.00001$).

While improvements in surgical technique continue to evolve, the financial aspect should be considered for a practice, a hospital, a surgeon, and a patient.

4. Arthroscopic versus Open Rotator Cuff Repair: Fellowship-Trained Orthopedic Surgeons Prefer Arthroscopy and Self-Report a Lower Complication Rate [5]

This study's main purpose was to evaluate the effect of practice preferences and complications rates among Part II examinees of the American Board of Orthopedic Surgery (ABOS) for RCR from 2007-2017. In 10 years, this study had 31,907 RCR's reported. The average age of the patient population was 56.8 years old. The study compared the usage of Open Repair (OR) vs Arthroscopic Repair (AR) amongst different specialty trained orthopedic providers. Sports Medicine trained surgeons performed 92.5% AR and 7.5% OR, Shoulder and Elbow trained surgeons performed 91.3% AR and 8.7% OR, Hand and Upper Extremity trained surgeons performed 69.6% AR and 30.4% OR ($p < 0.05$).

Total complication rates were also considered during this study. The surgeons fellowship specialty and complication rates were as follows: Sports Medicine (11.5%), Shoulder and Elbow (13.5%), and Hand and Upper Extremity (13.4%). Surgeons completing a fellowship in Sports Medicine, Shoulder and Elbow or Hand and Upper Extremity all had lower complication rates using the AR ap-

proach in comparison to the OR ($p < 0.001$).

According to this study physician fellowship training affects both surgical approach decision making, but also complication rates. Sports Medicine trained surgeons used the AR approach more than any other type of surgeon and had the lowest complication rates, possibly related to the amount of training these physicians acquire during fellowship training.

5. No Difference in Long-Term Outcome between Open and Arthroscopic Rotator Cuff Repair: A Prospective, Randomized Study [6]

In this study, 40 patients with magnetic resonance imaging (MRI) documented, symptomatic rotator cuff tears were randomized to undergo either Arthroscopic Repair (AR) or Open Repair (OR). Follow up of these patients' post-surgical treatment was done at six weeks, three months, one year, two years and >10 years post operatively. Patients were assessed based on active range of motion (AROM), visual analog scale score for pain, functional scoring according to the Constant-Murley score (CS), and assessment of the subjective shoulder value.

The patients were split into their respective surgical groups and had a mean age of 60 years old in the AR group and 55 years old in the OR group. The mean follow up years were 13.8 years in the AR group and 13.1 in the OR group. In the measures that were laid out for the two groups, no significant differences were accounted for clinically between the surgical approaches. MRI showed a retear rate of 30% equally distributed between the two groups and no evidence of lesser deltoid infiltration was found between the groups.

6. Discussion

The three studies evaluated in this review show that there is not sufficient data suggesting the clinical superiority of open-mini RCR in comparison to arthroscopic RCR. Whether its post operative active range of motion, or "days to zero pain", post operative measure have not yielded significant and reproducible data to support one method over the other surgically [7].

If post operative function cannot be used to assess which approach to take with your patients, then we must start to look at other factors. A study involving the University of California Los Angeles, evaluated 76 patients with full thickness tears of the rotator cuff [8]. Their study yielded no significant difference in outcome for patients with medium to large full thickness repairs undergoing arthroscopic intervention in comparison to those which were first arthroscopic, but then converted to a mini-open repair technique [8].

As we continue to progress down the line of factors impacting a clinician's decision making, we begin to see how postoperative management is unchanged between groups. Tear severity lacks sufficient evidence to base a decision on, but financial, educational, and logistical factors are proven to play a significant role in this decision. Churchill et al, concerning the New York ambulatory surgical

centers, showed significant decrease in overall surgical time and cost of surgery [4]. While the surgical time could vary based on many factors, it is important to keep in mind that arthroscopic RCR surgical time tends to significantly decrease as the surgeon gains more experience with the surgical technique [9]. In addition one study found that the mean follow up years were 13.8 years in the AR group and 13.1 in the OR group [6]. This caveat leads into the final aspect of this decision, is the surgeon fellowship trained in a relevant subspecialty? This paper has shown that the Upper Extremity and Sports Medicine focused fellowship trained doctors do more arthroscopic repairs and have less complications with the arthroscopic approach. The results of one study showed that the surgeons fellowship specialty and complication rates were as follows: Sports Medicine (11.5%), Shoulder and Elbow (13.5%), and Hand and Upper Extremity (13.4%). Surgeons completing a fellowship in Sports Medicine, Shoulder and Elbow or Hand and Upper Extremity all had lower complication rates using the AR approach in comparison to the OR ($p < 0.001$) [5]. Since their comfort is based on the training and volume they participate in, one could infer that additional studies should be done on the efficiency of open versus arthroscopic repair in surgeons of this caliber of training. This presumed increase in efficiency could affect overall cost and further develop fellowship trained orthopedic surgeons decision making when it comes to RCR's.

7. Conclusion

With the data in this paper and the papers that have been analyzed, it is logical to presume that: degree of tearing in the cuff, post-operative pain, postoperative function and long-term outcomes in general should not be taken into account when deciding whether to take an arthroscopic or mini-open approach to RCR's. Rather, when deciding on the approach, aspects of the surgeon's training, comfort with arthroscopic shoulder joint surgery and cost should factor more into the decision-making process. Currently, the data suggests that mini-open RCR is the most cost and time efficient method, especially amongst non-fellowship trained surgeons or ones with lower volume of shoulder scopes. However, further studies should be done to examine cost and efficiency in Sport Medicine fellowship trained orthopedic surgeons to validate these findings.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

References

[1] Sakha, S., Erdogan, S., Shanmugaraj, A., Betsch, M., Leroux, T. and Khan, M. (2021) Update on All-Arthroscopic vs. Mini-Open Rotator Cuff Repair: A Systematic Review and Meta-Analysis. *Journal of Orthopaedics*, **24**, 254-263. https://doi.org/10.1016/j.jor.2021.03.009

[2] Rotator Cuff Tears: Causes, Symptoms & Treatment. Cleveland Clinic.

https://my.clevelandclinic.org/health/diseases/8291-rotator-cuff-tears-overview#:~:text=Rotator%20cuff%20tears%20do%20not,mean%20a%20surgery%20is%20needed

[3] Colvin, A.C., Egorova, N., Harrison, A.K., Moskowitz, A. and Flatow, E.L. (2012) National Trends in Rotator Cuff Repair. *The Journal of Bone & Joint Surgery*, **94**, 227-233. https://doi.org/10.2106/JBJS.J.00739

[4] Churchill, R.S. and Ghorai, J.K. (2010) Total Cost and Operating Room Time Comparison of Rotator Cuff Repair Techniques at Low, Intermediate, and High Volume Centers: Mini-Open versus All-Arthroscopic. *Journal of Shoulder and Elbow Surgery*, **19**, 716-721. https://doi.org/10.1016/j.jse.2009.10.011

[5] Kelly, B.C., Constantinescu, D.S., Pavlis, W. and Vap, A.R. (2021) Arthroscopic versus Open Rotator Cuff Repair: Fellowship-Trained Orthopaedic Surgeons Prefer Arthroscopy and Self-Report a Lower Complication Rate. *Arthroscopy, Sports Medicine, and Rehabilitation*, **3**, e1865-e1871. https://doi.org/10.1016/j.asmr.2021.09.001

[6] Hasler, A., Beeler, S., Götschi, T., Catanzaro, S., Jost, B. and Gerber, C. (2020) No Difference in Long-Term Outcome between Open and Arthroscopic Rotator Cuff Repair: A Prospective, Randomized Study. *JSES International*, **4**, 818-825. https://doi.org/10.1016/j.jseint.2020.08.005

[7] Williams Jr., G., Kraeutler, M.J., Zmistowski, B. and Fenlin Jr., J.M. (2014) No Difference in Postoperative Pain after Arthroscopic versus Open Rotator Cuff Repair. *Clinical Orthopaedics and Related Research*, **472**, 2759-65. https://doi.org/10.1007/s11999-014-3715-6

[8] Kim, S.H., Ha, K.I., Park, J.H., Kang, J.S., Oh, S.K. and Oh, I. (2003) Arthroscopic versus Mini-Open Salvage Repair of the Rotator Cuff Tear: Outcome Analysis at 2 to 6 Years' Follow-Up. *Arthroscopy*, **19**, 746-754. https://doi.org/10.1016/S0749-8063(03)00395-5

[9] Guttmann, D., Graham, R.D., MacLennan, M.J. and Lubowitz, J.H. (2005) Arthroscopic Rotator Cuff Repair: The Learning Curve. *Arthroscopy*, **21**, 394-400. https://doi.org/10.1016/j.arthro.2004.12.006