

## Optimizing Rehabilitation Protocols after Reverse Total Shoulder Arthroplasty: A Mini-Review and Clinical Commentary on “A Randomized Single-Blinded Trial of Early Rehabilitation vs. Immobilization after Reverse Total Shoulder Arthroplasty”

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### BACKGROUND

Despite the increased use of reverse total shoulder arthroplasty (RTSA) as a way to manage patients with rotator cuff tear arthropathy amongst other indications, there is significant heterogeneity in post-operative rehabilitation protocols [1]. Protocols may vary from immediate range of motion (ROM), to restricting some motions such as behind the lower back (combined adduction, internal rotation, and extension), to delayed ROM beyond six weeks [2-5]. As one of the feared complications of RTSA is dislocation, which typically occurs within the first three months post-operatively, many do restrict ROM of the operative shoulder in a shoulder immobilizer to theoretically mitigate the risk of dislocation and subsequent revision procedures [6,7]. However, early immobilization still may not eliminate the risk of early instability after RTSA [8].

Immobilization is also not without its own risks and can be significantly disabling, particularly in the elderly patients who typically undergo RTSA. A recent critical analysis review on anatomic total shoulder arthroplasty (ATSA) and RTSA highlights this paucity of higher level of evidence literature on postoperative rehabilitation after shoulder arthroplasty [1]. There is heterogeneity even in the types of immobilization used [1]. In addition to inconsistent evidence on the best type of immobilization, studies comparing outcomes on the length of time to begin passive and active motion are limited. There is limited prospective comparative data on timing of range of motion and therapy and the effects of different rehabilitation protocols on final ROM and patient-reported outcomes, and if early motion does increase the risk of dislocation.

### THE STUDY

Therefore, we developed a single-blinded, single-institution randomized controlled trial of patients of three surgeons to evaluate outcomes after allowing early vs. late motion after RTSA [9]. Our hypothesis was that we would see no differences in outcomes between the two protocols. Outcomes assessed

included ROM parameters, American Shoulder and Elbow Surgeons (ASES) scores, and dislocation rate and additional complications.

Patients randomized to the delayed ROM group were immobilized in a sling for six weeks, while those in the early rehabilitation group started immediate physical therapy for passive and active ROM, though resisted ROM was limited until six weeks post-operatively. Pre-operative analysis demonstrated no differences in the majority of data, including age, gender, BMI, symptom duration, affected arm, smoking status, and narcotic use. However, as the baseline active external rotation (ER) and ASES function score favored the immediate therapy group (ER  $37.9 \pm 20.0$  vs.  $27.5 \pm 22.9$ ,  $p=0.028$ ; ASES function  $17.6 \pm 11.3$  vs.  $12.3 \pm 7.2$ ,  $p=0.016$ ) we utilized the change in motion and ASES score for analysis for differences between groups.

### RESULTS

Within-group analysis for ROM demonstrated statistically and clinically significant (greater than 12 degrees) [10] improvements relative to baseline in forward flexion and abduction by 3 months post-operatively. By one-year, active forward flexion and abduction improved by average over 40 degrees and these results were maintained at two years ( $p<0.05$ ). On the other hand, there were no long-term statistical or clinical changes in ER or cross body adduction. Between-group analysis demonstrated no differences in forward flexion, abduction, ER at zero degrees abduction, or cross body adduction at any post-operative time point.

Both groups had statistically and clinically significant improvements (clinically significant:  $>6-15$ -point change) [11,12] in ASES scores by six weeks with  $>9$  points change, aside from the function component score, which did not demonstrate a statistical improvement until 3 months post-operatively in each group. There was a between-group difference noted at six months with change in ASES pain scores favoring the delayed

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group (pain scores:  $26.3 \pm 16.3$  delayed  $16.7 \pm 11.6$  immediate,  $p=0.008$ ; composite scores:  $40.2 \pm 20.1$  vs.  $30.0 \pm 18.8$ ,  $p=0.038$ ). However, there were no differences between groups in changes in scores at any other time point. By one year post-operatively, there was overall greater than 30-point improvement in ASES scores and this was maintained at two years.

#### DISCUSSION AND FUTURE DIRECTIONS

The results of our trial support the safety of early initiation of post-operative rehabilitation with similar and significant improvement in ROM and ASES scores [9]. Early immobilization may help avoid the limitations of prolonged immobilization in elderly patients who commonly undergo RTSA. Prior to this trial, it was standard for our surgeons to immobilize patients for six weeks in a shoulder immobilizer, and we now allow for earlier ROM following RTSA. However, one limitation of the study is that it was powered for improvements of forward flexion, and the numbers may have been too small to detect differences in dislocation rates.

It is critical to continue to assess the impact of timing and types of post-operative rehabilitation after orthopedic surgical procedures to understand the impact on clinical and patient-reported outcomes. With respect to both ATSA and RTSA, surgical considerations have thus far been more extensively evaluated than rehabilitative factors with regards to outcomes and complications. Suggested areas of further research in postoperative rehabilitation after shoulder arthroplasty may include: varying types of slings for immobilization and assessing their effects on patient-reported and clinical outcomes; further evaluation on timing of passive and active ROM, particularly with larger patient numbers powered to detect dislocations; comparing the initiation of and types of strengthening protocols. Furthermore, studies should also compare the influence of different rehabilitation protocols for varying surgical indications, such as for fractures or in revision cases, as the type of optimal rehabilitation may differ from that for the more typical patient undergoing RTSA with cuff tear arthropathy.

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