Early Active Range of Motion versus Conservative Initial Immobilization following Reverse Total Shoulder Arthroplasty

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INTRODUCTION:
Reverse total shoulder arthroplasty (RSA) has revolutionized the treatment of rotator cuff arthropathy since its inception allowing overall medialization of the shoulder center of rotation and allowing the deltoid to power the shoulder postoperatively rather than relying on an intact rotator cuff as in anatomic total shoulder arthroplasty. There is a dearth of data regarding PT protocols regarding timing of cessation of sling immobilization and initiating active range of motion postoperatively. A range of protocols exist with some surgeons allowing active range of motion at the one week mark with cessation of immobilization and others opting for sling immobilization for a longer period of time up to 6 weeks with passive ROM maneuvers until formal therapy at the 6 week mark. The purpose of this study was to compare two different rehabilitation protocols with respect to their allowance of early active range of motion following RSA. It was hypothesized that an early active range of motion group would at the very least be non-inferior to a more conservative postoperative protocol following RSA.
METHODS: Patients underwent RSA by one of four different fellowship-trained orthopaedic surgeons for the indication of rotator cuff arthropathy and glenohumeral arthritis. RSA for fracture, revision arthroplasty, and AVN patients were excluded. Patients were placed in the early active (EA) or conservative (CON) cohort, depending on their surgeon's preferred protocol. CON patients were immobilized in an abduction sling for 6 weeks postoperatively with formal therapy starting at 6 weeks. EA patients were in an immobilizer sling for 1 week with therapy starting at 1 week. Patient-Reported Outcomes Measurement Information System (PROMIS) Upper Extremity (-UE), Pain (-PI), Depression (-D), visual analog scale (VAS) pain score, range of motion (ROM), American Shoulder and Elbow Surgeons (ASES) score, and complications were recorded preoperatively and at 6-week, 3-month, 6-month, and 12-month time periods.
RESULTS: A total of 95 patients were included with 58 patients in the EA group and 37 in the CON group. Significant differences were seen active forward flexion favoring the EA group, 117 vs. 86 degrees at 6 weeks ($P < 0.001$), 132 vs. 110 degrees at 3 months ($P < 0.001$), 138 vs. 117 degrees at 6 months ($P = 0.029$), and 158 vs. 120 degrees at 12 months ($P = 0.001$). Similarly, statistically significant differences were observed in active abduction favoring the EA group, at 104 vs. 75 degrees at 6 weeks ($P = 0.001$), 120 vs. 96 degrees 3 months ($P = 0.001$), 129 vs. 99 degrees at 6 months ($P = 0.001$), and 152 vs. 114 degrees at 12 months ($P = 0.004$). At 6 weeks postoperatively, the EA group reported higher VAS pain scores (2.8 vs. 1.3; $P = 0.02$) compared to the CON group. No difference was seen in VAS at the 3-month mark and beyond. PROMIS-UE favored the early active ROM group at both the six-week ($P = 0.003$) and 12-month ($P = 0.005$) time periods. No significant differences were observed between the two groups at any timepoint with regards to PROMIS-PI, PROMIS-D, and complications rates.
DISCUSSION AND CONCLUSION:
Early active range of motion is safe and demonstrates improved ROM in flexion and abduction compared to conservative postoperative management as well as improved shoulder function patient-reported outcomes at early and one year timepoints. There was no increase in long-term pain associated with early active motion. Additionally, there was no increased risk of complications with early active motion. This study is affected by limitations of prospective cohort studies as well as the limitation that variations in ROM data which may be influenced by surgeon preference in measurement (i.e., goniometer versus estimation, etc.).

Table 1. Visual Analog Scale Pain Score

Visual Analog Pain Scale	EA Cohort	CON Cohort	*P* - value
6-week PO	2.79	1.30	**0.02***
3-month PO	1.95	0.94	0.08
6-month PO	2.11	1.84	0.74
12-month PO	1.00	0.86	0.84

Abbreviations: EA = early active range of motion group; CON = conservative active range of motion group; PO = postoperative.
* indicates $P < 0.05$.
Data is reported as mean.

Table 2a. Range of Motion Active Forward Elevation

Forward Elevation (active)	EA Cohort (degrees)	CON Cohort (degrees)	*P* - value
6-week PO	117	86	**< 0.001***
3-month PO	132	110	**< 0.001***
6-month PO	138	117	**0.029***
12-month PO	158	120	**0.001***

Abbreviations: EA = early active range of motion group; CON = conservative active range of motion group; PO = postoperative.
* indicates $P < 0.05$.
Data is reported as mean.

Table 2b. Range of Motion Active Abduction

Abduction (active)	EA Cohort (degrees)	CON Cohort (degrees)	*P* - value
6-week PO	104	75	**0.001***
3-month PO	120	96	**0.001***
6-month PO	129	99	**0.001***
12-month PO	152	114	**0.004***

Abbreviations: EA = early active range of motion group; CON = conservative active range of motion group; PO = postoperative.
* indicates $P < 0.05$.
Data is reported as mean.

Table 3. PROMIS-UE

PROMIS-UE	EA Cohort	CON Cohort	*P* - value
6-week PO	32.0	26.9	**0.003***
3-month PO	35.4	31.6	0.06
6-month PO	37.1	35.5	0.52
12-month PO	41.3	34.3	**0.005***

Abbreviations: EA = early active range of motion group; CON = conservative active range of motion group; PO = postoperative; PROMIS = Patient Reported Outcomes Measurement Information System; UE = upper extremity.
* indicates $P < 0.05$.
Data is reported as mean.