

Optimum follow-up period of arthroscopic and mini-open rotator cuff repairs

Dear Editor,

Rotator cuff disorders are the most common cause of disability related to the shoulder,¹ and rotator cuff repairs—via mini-open or arthroscopic techniques—are considered in patients with refractory symptoms.² While there are multiple studies analysing short- and long-term follow-ups, there are no clear consensus regarding the minimum follow-up time, which ranges from an average of 2 years to close to 10 years.³⁻⁵ However, extended period of surveillance may lead to greater resource consumption, logistical considerations and increased clinical workload without significant clinical benefit. The aim of this study was thus to evaluate the optimal minimum follow-up period for patients who have undergone rotator cuff repairs.

The authors compared prospectively collected preoperative and 6, 12 and 24 months postoperative functional outcome scores on all patients who had either undergone a mini-open or arthroscopic isolated rotator cuff repair for partial and full thickness tears at our tertiary university hospital. These scores included the Constant Shoulder (CS) Score, American Shoulder and Elbow Surgeons (ASES) Score, 36-item Short Form Health Survey Physical Component Score (SF-36 PCS) and 36-item Short Form Health Survey Mental Component Score (SF-36 MCS). Exclusion criteria were patients with revision repairs, missing functional assessment at any follow-up point, concomitant glenohumeral arthritis, adhesive capsulitis, proximal humeral fractures, inflammatory arthritis or cervical radiculopathy. All patients underwent identical postoperative cuff repair protocols with the physiotherapist: active assisted exercises at 3 weeks post-surgery, active movement at 6 weeks and cuff-strengthening programme thereafter.

Complications were defined as any adverse event as a result of surgery and included infection, symptomatic re-tears, persistent (at least 6 months) secondary stiffness and pain post-surgery, and neurovascular injury.^{6,7}

Statistical analysis was performed using SPSS Statistics software version 23.0 (IBM Corp, Armonk, US). Paired t-test analysis was used to examine differences between the various timelines, and chi-square testing was used to analyse continuous variables. Mixed model analysis was used to compare subgroups. $P < 0.05$ was considered to be significant. Appropriate ethical and Institutional Review Board clearance (National

Healthcare Group Institutional Review Board Approval Number: 2019/00178) was obtained before patient records were accessed.

A total of 183 patients underwent either arthroscopic or open rotator cuff repair at our institution in 2011–2017. After the application of exclusion criteria, 117 patients were analysed in this study. Among them, 59 patients (50.4%) had undergone an arthroscopic repair and 58 (49.6%) a mini-open repair. There were no conversions from arthroscopic to the open procedure. Of the 117 patients, 45 (38.5%) were female, 104 (88.9%) were non-smokers and 13 (11.1%) were smokers. There were no significant differences in the arthroscopic and mini-open cohorts.

The CS scores at preoperative, 6 months, 1 year and 2 years were 55.3, 69.0, 80.6 and 82.2, respectively. There were significant differences when comparing the preoperative CS score with each of the postoperative CS scores at 6 months, 1 year and 2 years ($P < 0.01$). Similarly, there were significant differences when comparing the postoperative CS score at 6 months with the postoperative CS scores at 1 year and 2 years, respectively ($P < 0.01$). However, there was no significant difference between 1 year and 2 years postoperative CS scores ($P = 0.37$).

The ASES (total) scores at preoperative, 6 months, 1 year and 2 years were 67.4, 81.8, 89.9 and 89.4, respectively. There were significant differences when comparing the preoperative ASES (total) score with each of the postoperative ASES (total) scores at 6 months, 1 year and 2 years ($P < 0.01$). Similarly, there were significant differences when comparing the postoperative ASES (total) score at 6 months with the postoperative ASES (total) scores at 1 year and 2 years, respectively ($P < 0.01$). However, there was no significant difference between 1-year and 2-year follow-ups ($P = 0.75$).

The SF-36 PCS scores at preoperative, 6-months, 1 year and 2 years were 41.8, 47.0, 49.6 and 51.0, respectively. There were significant differences when comparing the preoperative PCS score with each of the postoperative PCS scores at 6 months, 1 year and 2 years ($P < 0.01$). Similarly, there were significant differences when comparing the postoperative PCS score at 6 months with the postoperative PCS scores at 1 year and 2 years, respectively ($P < 0.01$). However, there was no significant difference between 1-year and 2-year follow-ups ($P = 0.06$).

Table 1. Functional outcome scores of mini-open and arthroscopic groups at preoperative, 6-month, 12-month and 24-month follow-up

	Time period	Mean (95% CI)	Mini-open group			Arthroscopic group		
			P value (versus preop)	P value (vs 6 months)	P value (vs 12 months)	P value (vs preop)	P value (vs 6 months)	P value (vs 12 months)
Constant	Preop	56.07 (5.15)	NA	-	-	NA	-	-
	6 months	67.64 (4.71)	<0.01	NA	-	<0.01	NA	-
	12 months	80.40 (3.77)	<0.01	<0.01	NA	<0.01	<0.01	NA
	24 months	82.31 (3.38)	0.01	<0.01	0.45	<0.01	<0.01	0.63
ASES Score (Function)	Preop	35.24 (3.26)	NA	-	-	NA	-	-
	6 months	47.70 (2.90)	<0.01	NA	-	<0.01	NA	-
	12 months	53.95 (2.47)	<0.01	<0.01	NA	<0.01	<0.01	NA
	24 months	55.52 (1.88)	<0.01	<0.01	0.14	<0.01	<0.01	0.62
ASES Score (Strength)	Preop	14.90 (0.75)	NA	-	-	NA	-	-
	6 months	17.10 (0.73)	<0.01	NA	-	<0.01	NA	-
	12 months	18.26 (0.52)	<0.01	0.01	NA	<0.01	<0.01	NA
	24 months	19.14 (0.45)	<0.01	<0.01	0.20	<0.01	<0.01	0.80
ASES Score (Total)	Preop	67.48 (3.82)	NA	-	-	NA	-	-
	6 months	80.02 (4.26)	<0.01	NA	-	<0.01	NA	-
	12 months	88.55 (3.59)	<0.01	<0.01	NA	<0.01	<0.01	NA
	24 months	89.12 (3.17)	<0.01	<0.01	0.81	<0.01	<0.01	0.47
SF-36 PCS	Preop	41.73 (1.70)	NA	-	-	NA	-	-
	6 months	46.42 (1.82)	<0.01	NA	-	<0.01	NA	-
	12 months	49.53 (1.62)	<0.01	0.01	NA	<0.01	0.06	NA
	24 months	50.76 (1.84)	<0.01	<0.01	0.32	<0.01	<0.01	0.24
SF-36 MCS	Preop	52.64 (2.42)	NA	-	-	NA	-	-
	6 months	57.19 (1.73)	<0.01	NA	-	<0.01	NA	-
	12 months	59.51 (1.58)	<0.01	0.05	NA	<0.01	0.05	NA
	24 months	59.92 (1.20)	<0.01	0.01	0.68	<0.01	0.07	0.99

ASES: American Shoulder and Elbow Surgeons; CI: confidence interval; NA: not applicable; preop: preoperative; SF-36 MCS: 36-item Short Form Health Survey Mental Component Score; SF-36 PCS: 36-item Short Form Health Survey Physical Component Score

The SF-36 MCS scores at preoperative, 6-months, 1-year and 2 years were 52.3, 57.0, 59.4 and 59.6, respectively. Analysing the SF-36 MCS category also showed a similar trend across the follow-up scores, with statistically significant ($P<0.01$) improvements seen across all follow-up points except between those at 1-year and 2-year reviews ($P=0.76$).

A mixed model analysis between operation subtypes did not show any statistically significant variation in the functional outcome scores. Subgroup analysis showed that the results followed a similar pattern with no significant differences in functional scores between 1-year and 2-year follow-ups (Table 1). Additionally, comparisons of arthroscopic versus mini-open groups did not show any significant differences across all time periods.

In terms of complications at 6 months, 4 patients had secondary adhesive capsulitis. At 1 year postoperative, 2 more patients had secondary adhesive capsulitis, 1 patient had atraumatic, clinically symptomatic re-tears, and 2 patients had surgical site infection, of which 1 was a deep infection requiring a glenohumeral joint washout. At 2 years postoperative, 1 more patient had atraumatic, clinically symptomatic re-tears. There were no neurovascular complications at all time points. There was a significant reduction in complication found at 2 years compared to 1 year ($P=0.01$).

This study may suggest that the optimal length of follow-up post-cuff repair is 1 year, as it reached an equilibrium in all functional scores, and was significant in identifying the majority of complications.

The majority of the current literature similarly mirrors the results of our study where patients reach an equilibrium in terms of function and range of motion around the 1-year mark post-surgery.^{3,8} In terms of complications, the first 6 months post-surgery appears to be the most critical in re-tear rates.⁶ However, these studies were focused on radiological surveillance, and radiological evidence of re-tear may not result in any significant difference in clinical or functional outcomes.⁹

The identification of an optimal follow-up period is key as it has the potential benefits of economic savings from unnecessary, continued clinical follow-up and investigations. This is especially so when projected over an estimated life expectancy.¹⁰

This study is not without its limitations. Firstly, it did not analyse individual patient/surgical factors such as the size of tear or type of repair. Other limitations

include its retrospective, non-randomised nature, as well as a lack of other outcomes such as the range of motion and radiological assessment.

In summary, this study suggests that a 1-year follow-up period is sufficient in evaluating postoperative recovery and complications following arthroscopic and mini-open rotator cuff repairs.

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Harish Sivasubramanian ¹MD, Chen Xi Kasia Chua ¹MBBS, Ruben Manohara ¹FRCS, Dennis Zhaowen Ng ¹FRCS, Keng Soon Poh ¹FRCS, V Prem Kumar ¹FRCS

¹University Orthopaedics, Hand and Reconstructive Microsurgical Cluster, National University Health System, Singapore.

Correspondence: Dr Chen Xi Kasia Chua, University Orthopaedics, Hand and Reconstructive Microsurgical Cluster, National University Health System, 1E Kent Ridge Road, NUHS Tower Block, Level 11, Singapore 119228.
Email: kasiachuacx@gmail.com