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Original Article

Is Arthroscopic Release a Good Treatment Option in Adhesive Capsulitis of Shoulder Refractory to Non-Operative Treatment

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ABSTRACT

Adhesive capsulitis, causing shoulder pain and limited mobility, is effectively treated with arthroscopic release preferred for its proven efficacy, minimal complications, and enhanced accessibility to the whole joint capsule. **Objective:** To assess the outcome of arthroscopic releases in patients suffering from adhesive capsulitis in whom non-operative treatment failed. **Methods:** This retrospective study was conducted at Jinnah Hospital in Lahore from 2019 to 2021, encompassing 38 shoulders that underwent surgery. Among the total cohort, 15 cases were associated with female patients, and 23 male patients. Surgical interventions were carried out with patients positioned in a beach chair orientation. The initiation of physical therapy occurred at the earliest possible juncture, and evaluation of functional outcomes was undertaken employing the UCLA criteria. **Results:** The mean age of the individuals included in the research cohort was 51 years, exhibiting a broad age distribution ranging from 29 to 73 years. Significant improvements in the range of motion were evident, with an average augmentation of 56.71° in abduction, 38.5° in external rotation, and an additional extension of eight vertebral levels in internal rotation. As per the UCLA scoring system, the results exhibited a notably positive profile, with 16 shoulders attaining an excellent rating (42%), 16 being categorized as good (42%), and six falling within the fair or poor category (15%). Notably, five patients encountered postoperative complications. **Conclusions:** Arthroscopic release demonstrated effective results in alleviating pain and improving range of motion, establishing its efficacy as a treatment for adhesive capsulitis.

INTRODUCTION

In 1945, Neviaser introduced the term "adhesive capsulitis" to describe a condition characterized by inflammation of the shoulder joint capsule leading to stiffness and pain [1]. The main goal of its treatment to improve the extent of motion and relieve pain. In the initial phase, non-surgical options are usually explored, especially during the acute stage [2, 3]. Among the therapeutic choices available are physical therapy, corticosteroid administration, non-steroidal anti-inflammatory drugs (NSAIDs), and suprascapular nerve blocks [4-7]. If non-surgical treatments do not yield the desired results, invasive interventions are considered. The non-operative treatment duration may span from a minimum of six weeks to a maximum of 12 months, as documented in previous studies [8-13]. Invasive approaches encompass hydraulic distention of the shoulder joint, manipulation under anesthesia, and capsular release, with the latter being achievable through either open or arthroscopic surgical modalities [4, 6]. Currently, there exists a discouragement of joint manipulation under anesthesia due to the various complications associated with this procedure. Such complications encompass fractures, labral injuries, neurapraxia, persistent pain, and rotator cuff tears, as noted in previous studies [14-17]. In light of these concerns, an alternative approach in the form of open shoulder release was introduced, as initially described by Ozaki et al [18]. The seminal research underscored the substantial enhancements in patient outcomes associated with the

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surgical resection of the coracohumeral ligament and the subsequent opening of the rotator interval. However, several studies have reported positive outcomes following open shoulder release, this procedure is not devoid of inherent risks. These risks include the challenging release of the posterior shoulder capsule, heightened intraoperative bleeding, and the occurrence of postoperative pain. Furthermore, patients undergoing this procedure may necessitate movement restrictions until the subscapularis tendon has healed [4, 5, 8, 14, 19]. Recently, arthroscopic release has gained popularity for treating adhesive capsulitis due to its effectiveness in alleviating pain and significantly improving shoulder joint mobility. This method offers the advantage of direct visualization during the release, reducing the likelihood of complications by providing clear access to the entire shoulder joint capsule [19-21]. Nonetheless, it is crucial to acknowledge potential complications associated with this procedure, including iatrogenic injury to the axillary nerve, chondral lesions that may occur during instrument insertion, and the risk of thermal injury leading to chondrolysis [9, 22, 23].

In light of these considerations, the primary objective of this study was to assess the outcomes of arthroscopic releases performed in our department for patients suffering from adhesive capsulitis that had proven refractory to non-operative treatments.

METHODS

The retrospective study design was employed to conduct the study. The study included a sample of 38 participants. Sample size include the total participants present at that time. Retrospective studies frequently employed to evaluate clinical outcomes, treatment patterns, and healthcare resource utilization for rare health conditions. Therefore, retrospective studies lack a definitive method or specific formula to determine the sample size due to these diverse scenarios. The research centered on 38 patients who had undergone arthroscopic release as a therapeutic intervention for adhesive capsulitis that had not shown improvement with non-operative treatments. All surgeries were conducted by the same arthroscopic team, spanning from February 1996 to May 2012. Inclusion criteria involved patients with adhesive capsulitis lasting at least 6 months, without any other shoulder abnormalities such as osteoarthritis, fractures, malunion, or necrosis. Before undergoing surgery, the patients had received non-operative treatments for an average of 17.6 months, with individual durations ranging from 5 to 44 months. The mean duration of postoperative follow-up in this study encompassed a period of 23 months, with individual follow-up intervals ranging from 4 to 44 months. The age distribution of the patient cohort exhibited a range from 32 to 71 years, with a mean age of 51.92 years. Within the patient population, 15 individuals were female, constituting 38.5% of the sample, while 23 were male, representing 60.5% of the total participants. It was the dominant limb that underwent arthroscopic release in 22 of the cases (57.9%). The surgical procedure involved each patient being positioned in the beach chair posture. A posterior portal was used to insert the camera, while joint debridement was carried out through the anterior portal. Following this, the procedure involved the deliberate opening of the rotator interval and the release of the coracohumeral ligament. Subsequently, the portal was repositioned, and capsulotomies were performed at the posterior and inferior aspects through the posterior portal. To ensure a thorough release of the joint capsule, an additional capsulotomy was executed at the anteroinferior region through the anterior portal. In cases where a decrease in external rotation was observed, a partial tenotomy of the subscapularis muscle was executed. Following the surgical procedure, patients commenced an intensive physical therapy program on the day immediately following surgery. The assessment of functional outcomes was conducted based on the University of California at Los Angeles (UCLA) criteria, and shoulder range of motion was quantified in accordance with the criteria established by the American Academy of Orthopedic Surgeons. Ethically permission to conduct the study was taken from Ethical Review Board committee of Allama Iqbal Medical College via the reference number 270/09/06/2023/S1 ERB and date of issuance of ERB letter was 09/06/2023. Statistical analysis was carried out using SPSS version 23.0, and statistical significance was defined at a 95% confidence level ($p < 0.05$).

RESULTS

The demographic variable investigated for this study are elaborated in Table 1.

Table 1: Demographic Variables

Sr. No.	Sex	Age (Years)	Dominant side	Comorbidities	Symptoms (Months)	Pre-op Treatment (Months)
1	M	51	Y	DM I	33	11
2	F	46	Y	-	36	6
3	F	56	N	DM II, HTN	26	11
4	M	41	Y	HTN	13	8
5	M	58	N	-	16	14
6	M	65	N	HTN	15	23
7	F	44	Y	-	26	17
8	M	46	N	DM II, HTN	21	38
9	F	48	Y	HTN	12	13
10	M	42	Y	-	14	41
11	M	63	Y	HTN	18	44
12	D	44	N	Asthma	24	16
13	M	57	Y	DM I	14	23
14	F	38	N	DM II, HTN	33	29
15	M	41	Y	HTN	43	10
16	M	58	Y	DM II, HTN	22	25

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17	F	56	Y	-	23	44
18	M	53	Y	Hypothyroid	16	23
19	M	68	Y	DM II, HTN	27	22
20	F	67	N	-	23	25
21	M	58	N	HTN	31	7
22	M	54	N	HTN	4	19
23	F	55	Y	DM II	42	8
24	M	47	N	-	14	16
25	M	65	Y	DM II	35	6
26	F	45	Y	-	74	8
27	M	55	Y	-	35	19
28	F	64	N	DM I	12	16
29	F	45	Y	-	44	18
30	M	44	N	DM II, HTN	24	10
31	F	54	Y	-	12	16
32	M	64	Y	DM II, HTN	11	9
33	M	44	Y	-	14	14
34	M	54	N	DM I	22	12
35	F	46	N	DM II, HTN	27	5
36	F	32	N	-	36	7
37	M	34	Y	-	32	8
38	M	71	N	DM II, HTN	42	8

DM II: Diabetes Mellitus II, DM I: Diabetes Mellitus I, HTN: Hypertension

Significant enhancements in range of motion were observed after the arthroscopic release procedure. The average pre-operative range of motion measured at 88° for abduction, 15° for external rotation, and L5 for internal rotation (as assessed by the hand-behind-back test). After arthroscopic release, these measures significantly improved to 144° of abduction, 53° of external rotation, and T9 internal rotation ($p < 0.001$) (see Table-2). Comparing different age groups, genders, and comorbidities between diabetic and non-diabetic populations did not reveal any significant differences in results. According to the UCLA criteria, the outcomes showed that 16 shoulders achieved an excellent rating (42%), 16 were classified as good (42%), and six fell into the fair/bad category (15%). Complications were observed in five patients (13.15%), including axillary neurapraxia in one patient, one patient requiring a second operation, one patient had reflex sympathetic dystrophy, another experienced an iatrogenic rotator cuff injury, and a patient reported acromioclavicular pain.

Table 1: Results in Terms of Range of Motion & University of California at Los Angeles (UCLA) Score

Sr. No.	Range of motion						Post-op UCLA		Follow up	Complications
	Pre-op.			Post-op.			Score	Result	Months	
	Abd.	ER	IR	Abd.	ER	IR	-	-	-	
1	100°	10°	L5	150°	60°	T6	30	Good	12	-
2	90°	5°	L4	140°	50°	T10	24	Fair	10	-
3	80°	20°	Glut	145°	50°	T11	35	Good	16	-
4	65°	10°	Glut	130°	50°	T8	33	Good	14	-
5	95°	15°	L5	120°	35°	T8	30	Good	16	-
6	85°	10°	L3	150°	40°	T7	31	Good	12	-
7	80°	25°	S1	140°	40°	T12	15	Good	18	-
8	70°	0°	S1	100°	30°	S1	20	Fair/Bad	8	Rotator cuff injury
9	90°	30°	T12	135°	50°	T10	32	Good	14	-
10	95°	0°	Glut	130°	50°	T7	28	Excellent	16	-
11	90°	10°	Glut	150°	60°	L5	31	Good	14	-
12	30°	-10°	GT	90°	20°	GT	15	Fair/Bad	11	-
13	80°	10°	S1	140°	60°	L5	35	Excellent	19	-
14	90°	20°	L4	150°	80°	T5	35	Excellent	27	-
15	90°	10°	S1	150°	80°	T6	35	Excellent	10	-
16	70°	20°	L4	110°	20°	L1	15	Fair/Bad	10	Operated Twice
17	90°	40°	Glut	120°	60°	L3	30	Good	12	-
18	130°	20°	L3	150°	60°	T8	35	Excellent	9	-
19	80°	45°	Glut	130°	45°	Glut	15	Fair/Bad	17	RSD
20	85°	10°	L5	130°	70°	T12	30	Good	11	-
21	70°	0°	GT	150°	45°	T10	34	Good	11	-
22	110°	60°	L5	140°	60°	T8	32	Good	14	-
23	60°	-10°	S1	150°	60°	L4	35	Excellent	14	-
24	90°	20°	L4	150°	80°	T5	35	Excellent	17	-
25	100°	20°	L5	160°	70°	T5	35	Excellent	16	-
26	80°	10°	L3	150°	60°	T7	30	Good	4	-
27	120°	0°	L3	150°	60°	T10	35	Excellent	18	-
28	85°	10°	L3	150°	40°	T7	31	Good	12	-
29	100°	0°	L5	150°	60°	T10	35	Excellent	9	-
30	80°	20°	Glut	145°	50°	T11	35	Good	16	-
31	90°	0°	L5	140°	60°	T10	34	Excellent	9	-
32	100°	20°	L5	140°	60°	T8	35	Excellent	18	-
33	90°	20°	S1	100°	20°	L3	18	Fair/Bad	12	AC joint pain
34	130°	45°	L1	140°	60°	L1	35	Excellent	12	-
35	80°	0°	L5	150°	60°	T7	35	Excellent	13	-
36	110°	10°	L4	160°	60°	T2	35	Excellent	9	-
37	90°	20°	L4	150°	80°	T5	35	Excellent	17	-
38	80°	25°	S1	140°	40°	T12	15	Good	18	Axillary n. neurapraxia

ER: External Rotation, IR: Internal Rotation, UCLA: University of California at Los Angeles

DISCUSSION

The findings from our study show a substantial improvement in range of motion after arthroscopic release. Specifically, abduction increased to 144°, external rotation improved to 53°, and internal rotation extended to level T9. This signifies a notable augmentation of 56.71 degrees in abduction, 38.5 degrees in external rotation, and an increase of eight vertebral levels in internal rotation subsequent to the arthroscopic release procedure. A comparison of the mean postoperative abduction showed only a minor discrepancy of 3° ($p = 0.030$), demonstrating the potential for restoring range of motion in these patients. After arthroscopy, patients exhibited superior results when compared to their pre-operative condition. The final postoperative mean abduction reached 144.86° (compared to 88.15° preoperatively, $p = 0.033$), mean external rotation improved to 53.55° (from 15° preoperatively, $p = 0.000$), mean internal rotation reached level T11 (from T7 preoperatively, $p = 0.000$), and the mean postoperative UCLA score was significantly higher at 30.2 (compared to 33.4 preoperatively, $p = 0.000$). These results

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are supported by the work of Gerber et al., who reported improvements in range of motion after arthroscopic shoulder release, including a 38° increase in abduction and an 18° increase in external rotation [19]. Cohen et al., supported these results, reporting a significant improvement of 64° in flexion, 43.5° in external rotation, and an increase of eight spinal internal rotation levels after arthroscopic shoulder release [21]. Many other studies have likewise endorsed these findings by reporting improved range of motion after arthroscopic shoulder release [8, 12, 13, 20]. In term of outcomes, the current study revealed that 25 Outcome of 16 shoulders were excellent (42%), 16 were good (42%), six were fair/bad (15%). These findings are consistent with Pollock et al., who reported improvement in patient outcomes after arthroscopic release [20]. Our study found no substantial differences in outcomes when comparing age groups, gender, and comorbidities between diabetic and non-diabetic individuals. Conversely, Cinar et al., observed less favorable results in diabetic patients in comparison to their non-diabetic counterparts following arthroscopic release [24]. In the context of arthroscopic complications, the present study documented those five patients (13.15%) experienced adverse events. Specifically, one patient manifested axillary neurapraxia in the post-operative period, although complete functional recovery was achieved within four months. This incident was attributed to the potential axillary nerve traction during manipulation. Additionally, one patient reported postoperative pain in the acromioclavicular joint, while another patient developed reflex sympathetic dystrophy. A third patient incurred an iatrogenic rotator cuff injury, resulting in reduced range of motion and pain during follow-up. This condition was further confirmed by magnetic resonance imaging, which revealed the rotator cuff injury. Segmüller et al., reported four complications after orthoscopic treatment [12]. Similarly, Baums et al., reported pain in the acromioclavicular joint after arthroscopic release [13].

CONCLUSIONS

Arthroscopic release demonstrated effective results in alleviating pain and improving range of motion, establishing its efficacy as a treatment for adhesive capsulitis.

Authors Contribution

Conceptualization: UNG
Methodology: UNG, JHR, MS, AS, JK, KA
Formal analysis: UNG, JHR, MS, AS, JK, KA
Writing-review and editing: UNG
All authors have read and agreed to the published version of the manuscript.

Conflicts of Interest

The authors declare no conflict of interest.

Source of Funding

All authors have read and agreed to the published version of the manuscript.

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