The Egyptian Journal of Hospital Medicine (October 2024) Vol. 97, Page 3704-3715

Outcomes of Arthroscopic Coracohumeral Ligament Release in Patients with Frozen Shoulder

Aly Aly Ibrahim Attia Alaswad
Department of Orthopedics, Al Ahrar Teaching Hospital and Banha University Hospitals, Egypt
Email: aliattia90@gmail.com, **Phone:** +201092220420

ABSTRACT

Background: Frozen shoulder is a condition characterized by pain and limited range of motion (ROM), often persisting despite conservative treatments. Arthroscopic coracohumeral ligament (CHL) release is an emerging surgical option. This study evaluates the outcomes of CHL release in patients with frozen shoulder, focusing on pain, function, and ROM improvements. **Patients and Methods:** A prospective study was conducted with 20 adult patients with unilateral frozen shoulder, unresponsive to conservative management. All patients underwent arthroscopic CHL release and L-shaped incision of the rotator interval. Preoperative and postoperative assessments included pain scores, function scores, and ROM measurements (external and internal rotation, forward flexion, abduction) at 1, 3, and 6 months. Data were analyzed using SPSS version 20, with a significance level set at $P < 0.05$. **Results:** Significant improvements were observed in pain (76.09%) and function scores (94.07%) at 1 month postoperatively ($P < 0.05$). ROM, including forward flexion (60.33%) and abduction (60.29%), showed marked improvements. At 3 months, external rotation improved by 31.55% ($P < 0.05$), while internal rotation increased significantly by 19.11%. By 6 months, pain and function showed minor gains, but internal rotation achieved a significant improvement of 16.64% ($P < 0.05$). No significant differences in the UCLA score were observed between the 3- and 6-month follow-ups. **Conclusion:** Arthroscopic CHL release is effective for improving pain, function, and ROM in patients with frozen shoulders, particularly within the first three months post-surgery. Long-term benefits in internal rotation warrant further study.

Keywords: Frozen shoulder, Arthroscopic CHL release, Range of motion, Shoulder pain, Orthopedic surgery.

INTRODUCTION

Shoulder joints are the most movable joints in the body. Because of their mobility, the upper limb may rotate internally and externally as well as adduct, abduct, flex, extend, and complete a full 360 degrees of circumduction in the sagittal plane. Additionally, scapular protraction, elevation, retraction, and depression can all be expressed via the shoulder [1].

This extensive range of motion (ROM) also contributes to the shoulder joint instability, which is mitigated by the glenoid labrum, ligaments, tendons, and rotator cuff muscles [1].

Among general population, the frozen shoulder prevalence is 3–5 percent, whereas it can reach up to 20 percent in those with diabetes. While some have characterised frozen shoulder as a self-limiting disease that recovers in one to three years, other studies have reported that 20–50 percent of individuals having frozen shoulder experience long-term ROM impairments that may exist for up to ten years [2].

Females in their 50s and 60s make up the majority of patients with frozen shoulder. It has been observed that up to 40–50 percent of individuals have it consecutively bilaterally. The most common condition that occurs alongside is diabetes mellitus, with a frequency range from 10 to 36 percent [2].

The classification of frozen shoulder is as follows: Primary, which is idiopathic, and insidious and secondary, which is typically the result of trauma or subsequent immobilisation. Primary frozen shoulder is often characterised by a slow start and development of symptoms, with no identifiable inciting incident [3].

The appearance of frozen shoulder is often separated into three different phases. The initial stage is characterised by a painful or cold sensation. Due to their conviction that the pain will ultimately dissipate if they self-treat, patients may not present at this stage. The patient's discomfort intensifies and their passive and active ROM become increasingly restricted as the symptoms persist, ultimately leading to a medical appointment. The acute glenohumeral joint synovitis is the distinguishing feature of this phase, which typically lasts about three to nine months [4]. The second stage, which is known as the transitional or frozen state, will be reached by the majority of patients. The discomfort in the shoulder does not necessarily intensify throughout this period. The frozen stage might endure for a period of 4 to 12 months [4].

The third stage starts with the improvement of ROM. The thawing stage is the name given to the third stage. This period is characterised by a gradual resumption of shoulder movement and can continue anywhere from 12 to 42 months [4].

The ROM of shoulder may be further restricted by the pain associated with a frozen shoulder. Numerous unfavourable pathological features, such as fibro-fatty infiltration into the capsular recess and ligament atrophy, have been demonstrated to result in reduced stress absorption when a joint is immobilised for an extended period [4].

Anti-inflammatory medications, corticosteroids, and physical therapy are frequently implemented to alleviate frozen shoulder. In an effort to alleviate symptoms, non-steroidal anti-inflammatory medications (NSAIDs) can be utilized throughout any phase. There is a lack of well-conducted research to suggest that NSAIDs alter the frozen shoulder normal course. NSAIDS are not just anti-inflammatory medicines, but also analgesics, making them an acceptable first-line therapy [4].

Received:16/5/2024
Accepted:16/7/2024

Reports have been made on treatments for capsular distention with injections therapeutic approach for patients who are administered local anaesthesia. By injecting local anaesthetic into the joint to its full capacity, the capsule is intended to be stretched. Due to the absence of sedation for the whole shoulder, the intra-articular injection usually induces pain that is poorly tolerated throughout the treatment [5].

Manipulation under anaesthesia has been recommended as a treatment option. This method enables the ROM return in the operating room. This procedure enables the initiation of immediate physical therapy postoperatively [5].

Only when a concerted effort to implement conservative treatment has been unsuccessful, a frozen shoulder may be treated surgically. There is no specific timetable for operation. In general, patients should have demonstrated no improvement and have engaged in some sort of therapy on a regular basis for at least three months. In order to continue with surgical surgery, patients must have substantial discomfort, limits in their work, recreation, daily activities, or sleep, and their sense of not making improvement [5].

The arthroscopic coracohumeral ligament (CHL) release is a highly effective strategy for treating frozen shoulder and has gained widespread acceptance as a treatment option. The fundamental lesion is the constricted capsule, which encompasses the axillary pouch, as well as the tightened CHL and rotator interval (RI). These structures can be addressed with arthroscopic release. The structures that have been contracted are then freed to enable ROM to return with any required manipulations [6].

The CHL is derived from the coracoid process base and horizontal limb. At the RI, a thickened CHL is recognised as one of the most particular diseases of frozen shoulder. Nevertheless, the surgical release of thicker CHL that covers the supraspinatus and subscapularis leads to the limitation of internal rotation (IR), ultimately improving external rotation (ER) and IR in patients having frozen shoulder [7].

This study aimed to estimate the effects and outcomes of arthroscopic CHL with L-shaped incision of RI in patients having frozen shoulder.

PATIENTS AND METHODS

Twenty adult patients were included in this prospective study. All patients had unilateral frozen shoulders with no bilateral cases. They were diagnosed as frozen shoulder and managed arthroscopically.

Inclusion criteria were painful stiff shoulder, limitation of movement especially ER and abduction, and failure of previous management and physiotherapy 3 months before surgery. The patients included were chosen from the outpatient clinics of Al Ahrar Teaching Hospital and Banha University Hospitals.

All cases were performed in the Department of Orthopedics of Al Ahrar Teaching Hospital and Banha University Hospitals. This work was performed between October 2019 to March 2021.

Exclusion criteria were rheumatoid arthritis, acute infection, and post-traumatic stiffness.

A comprehensive history was obtained for each patient, which encompassed their personal background (sex, age, the dominant side, occupation, and special habits of medical importance), present disease history, adverse effects, prior therapy, medical comorbidities, and past history UCLA's rating system for pain and function **(Table 1)**.

Table 1: University of California at Los-Anglos scoring system (UCLA). [8,9]

UCLA Score		
finding	**score**	**Patient score**
Pain		**10**
Constant, unbearable ± strong medication frequently	**1**	
Constant, bearable ± strong medication occasionally	**2**	
None or little at rest: occur with light activities	**4**	
With heavy activity	**5**	
Occasional and slight	**8**	
No pain	**10**	
Function		**10**
Unable to use arm	**1**	
Very light activities only	**2**	
Light house work and most daily living activities	**4**	
Most housework, wash hair, driving	**5**	
Slight restriction only, able to work above shoulder level	**8**	
Normal activities	**10**	
Muscle power and motion		**10**
Ankylosis with deformity	**1**	
Ankylosis with good functional position	**2**	
Muscle power poor to fair, FF 60º, IR 45º	**4**	
Muscle power Fair to good, FF 90º, IR 90º	**5**	
Muscle power good or normal, FF 140º, ER 20º	**8**	
Normal muscle power / near normal motion	**10**	
Total score		**30**

Examination included inspection (presence of any scare, wasting of shoulder muscles, swelling, any sign of inflammation redness) and palpation (for any tenderness).

ROM:

In supine position, preoperatively we measured passive motion with scapular fixation of both shoulders and in diseased side after operation by one month; three months and six months postoperatively. ER, abduction (ABD), IR, and forward flexion (FF) were measured by android mobile application **(Fig. 1).**

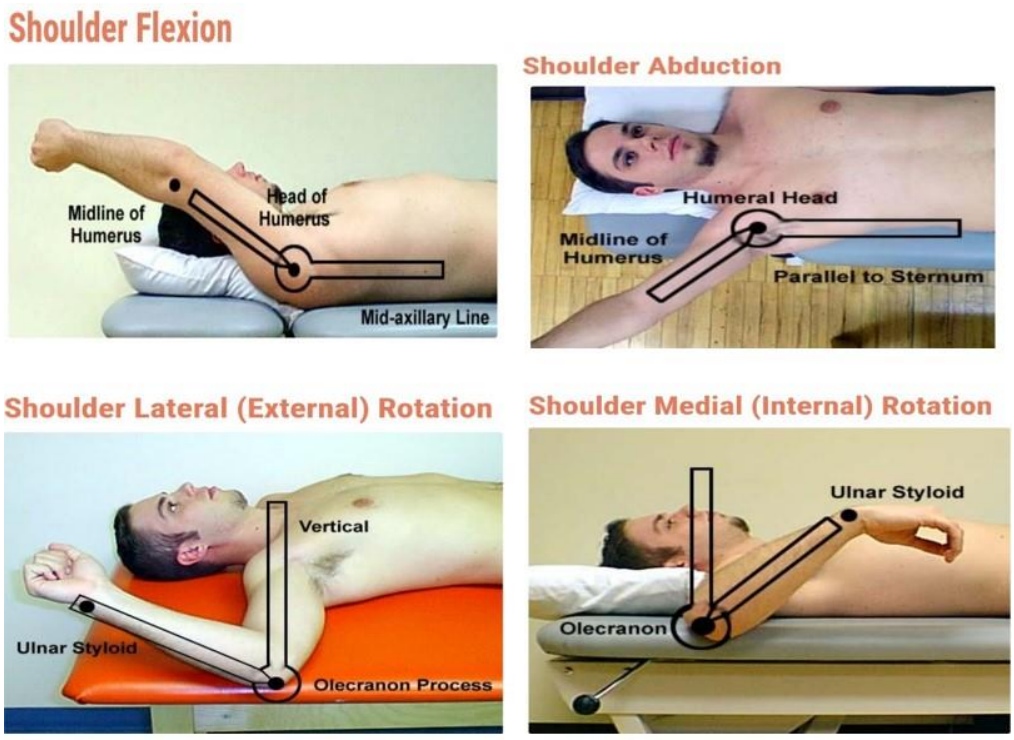

Fig. 1: Measuring the shoulder ROM.

Then we summarized the ROM into motion score according to UCLA score system.

Radiological evaluation was performed by X ray using antero-posterior view and MRI.

Patient Preparation
In the Department.
The patient has to be thoroughly washed using an antiseptic skin purifying fluid, making sure to focus on the area that will be operated on (the nails, hand, and armpit) [10].

Patient Positioning

It is conducted under interscalene block and general anesthesia. Surgeon choice is the deciding factor when it comes to patient placement, since both the lateral decubitus and beach chair positions have been shown to be safe and effective [11].

Enables the surgeon to modify the arm's location during the operation. Convert to an open process with ease if needed. There is less chance of harm coming from traction. Both options include securing the skull and padding any bony protrusions to avoid neuropraxias and pressure ulcers [12].

Problems may arise in either of the positions employed. Padding or patient positioning are frequent occurrences in both positions. The most common complications associated with the beach chair position are stroke, cardiac, and hypotensive events, while brachial plexus neuropathy is the most common complication of lateral decubitus [13].

Identification of Surface Landmarks
Surface landmarks, such as the clavicle, coracoid, acromion, scapular spine, and acromioclavicular joint, are identified and marked following preparing and draping. The acromion posterolateral extremity is always palpable, even in shoulders that are surrounded with a significant soft tissue **(Fig. 2)** [14].

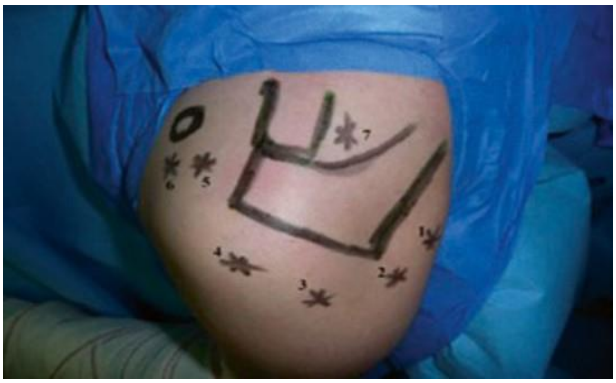

Fig. 2: Beach chair position. Superior view of the left shoulder with the scapular spine, acromion, acromioclavicular joint, clavicle, and coracoid process outlined. The asterisk (*) represents potential portal sites: (1) posterior, (2) 7 o'clock portal, (3) lateral, (4) 5 o'clock portal, (5) anterior, (6) anteroinferior, and (7) Neviaser (Supraspinatus) [14].

Beach-Chair Position

The patient's exposure to the numerous landmarks is facilitated by placing them in a position called "beach-chair". Its adaptability facilitates a seamless and effortless arthroscopic to open surgical phase transition.

The majority of the patient's weight in this position is the responsibility of the gluteal region. When positioning a patient on an operating table, it is important to place their gluteal area just above the table's fulcrum point. In a Trendelenburg orientation, the table is tilted. Raising the backrest allows the user to sit at a 90-degree angle.

To prevent the musculo-tendinous and neurovascular structures from experiencing excessive tension, a wedge cushion or a flat, folded-inside pillow is put under the knees of patients. To prevent the rear of the foot from experiencing excessive pressure, the operative table's end is inclined. In order to prevent pressure ulcers, a silicone pad is positioned beneath the heels. The thighs of patients are fastened to the table by a strap that is placed on a gel mattress. The treated limb is left unrestricted in an arm brace.

The surgeon gains a significant advantage by not requiring the arm to be tractioned, as the normal anatomy is preserved and the various ligamentous, tendinous, and capsular structures are not subjected to strain. The brachial plexus risk of injury is significantly diminished in the absence of traction. Additionally, the limb can be effortlessly adjusted to the desired position with the assistance of an assistant.

Silk tape is used to attach the patient's head to their forehead, and their head is inclined slightly away from the surgery region while being supported by a specialized headrest that can be altered in height and extension. The thorax is stabilized by the use of two lateral dorsal supports. A thermal drape is used to envelop the patient from the torso down. To provide a barrier between the anesthesiologist's position and the surgical field, a sterile drape is draped at a 45° angle over the patient's head.

Preparing the Surgical Field

The patient's hemothorax, shoulder, and arm are cleansed by the scrub nurse using iodopovidone. The patient commences the use of sterile betadine to disinfect the skin of the patient, initially aided by the scrub nurse who stabilizes the arm of patient throughout the cleansing of the forearm and hand [10].

Operative intervention:

Portal Position

Standard anterior and posterior ports are employed in the majority of instances, with introducing the scope through the posterior portal and tools utilized anteriorly. In cases when significant joint contracture obstructs the arthroscope insertion via the posterior portal, a straightforward closed elevation procedure may aid in the arthroscope's implantation. It may be difficult to access the joint via the posterior portal. In cases with very rigid shoulders, firstly, we access the joint through the RI utilizing the anterior portal [11].

Portal Placement

The standard posterior portal

Placing it in the infraspinatus raphe's "soft area" is ideal. The exact location may vary from patient to patient, however it is typically 2 cm inferior and 2 cm medial to the posterolateral margin of the acromion. It involves inserting a blunt trocar into the joint and directing it towards the coracoid until it breaches the posterior capsule. Nerve injury may arise if the portal is positioned too medially, resulting in harm to the suprascapular nerve; conversely, the improper portal placement, too inferiorly or laterally may compromise the axillary nerve [15].

Anterior Portals

The precise anterior portal position is contingent upon the specific technique being performed. These portals are often created with an “outside-in” approach, wherein a spinal needle is introduced under direct arthroscopic visualization to ascertain the precise placement of the portal [15].

The lateral portal

Located three centimetres laterally to the lateral edge of the acromion, it passes through the deltoid muscle. The subacromial area is the primary surgical target. Pay close attention to the axillary nerve, which is situated 5 cm away from the side edge of the acromion [15].

Procedure

Initial exposure:

After the blunt trocar is removed and the arthroscopy sleeve is inserted into the space between the teres minor and infraspinatus, the camera is inserted into the joint with its lens facing perpendicular to the floor. With the camera positioned such that it can see the biceps tendon's intra-articular section, anatomical orientation may be shown on the screen.

The situation of anterior portal is laterally to the midpoint between the anterolateral tip of the acromion and the coracoid process. This portal facilitates the completion of the shoulder diagnostic evaluation.

The posterior portal is used to create this portal via and can be constructed using an antegrade technique, employing a spinal needle from the exterior, viewed with the arthroscope.

The subscapularis tendon and RI are enveloped in dense fibrous tissue, accompanied by synovitis and the creation of blood vessels. The biceps long head and the superomedial capsule are typically fused due to synovitis, resulting in less sliding motion. The anterior, middle, and inferior glenohumeral ligaments have a dark yellow coloration in the presence of synovitis, similar to the RI.

The RI, along with the CHL, is released through the anterior portal. This procedure is executed with an ablation wand. The RI is sometimes rather thick, rendering it difficult to distinguish specific components.

The release commences at the glenoid level and extends to the 6 o'clock position utilizing the RF device. When the infraspinatus muscle's posterior fibres are exposed, the posterior capsule is finally released using a shaver to remove any remaining debris.

Alongside the previously mentioned longitudinal release, starting at the beginning of the longitudinal limb, the RF ablation device is used to accomplish a transverse release. The transverse limb of the release is executed incrementally, progressing laterally while terminating before to the rotator cuff to prevent any cuff injury. At this time, the superior glenohumeral ligament and a piece of the CHL are removed. Using forceps and a shaver or radiofrequency (RF) device, the residual CHL under the coracoid process to the subscapularis tendon or muscle, and from the base of the coracoid process to the supraspinatus tendon, as well as adhesions between the subscapularis and conjoint tendon or glenoid neck, are meticulously dissected. Upon executing the L-shaped capsular discharge, the dimensions of the aperture significantly increase.

The full release of the CHL and RI is guaranteed by the entire excision of the gap to show the lateral coracoid. The subscapularis tendon is not compromised by the following severance of the middle glenohumeral ligament (MGHL). The superior capsule is dissected posteriorly to the extent feasible, often reaching the 9-o'clock position on the right shoulder. Subsequently, the remaining middle and anterior inferior glenohumeral ligaments are excised using forceps or radiofrequency along the glenoid border, extending as inferiorly as feasible, often at the 6-o'clock position (right shoulder), while maintaining a clear view of the subscapularis muscle.

In certain instances, it is simpler to release the MGHL before to the RI structures. The inferior glenohumeral ligament's anterior portion is incised toward the axillary recess, terminating between the 5 and 6 o'clock positions, after the issue of MGHL.

Each patient underwent lateral portal subacromial decompression and bursectomy.

Structure at risk

When conducting inferior capsular release, it is crucial to exercise caution to prevent the axillary nerve from being damaged during the dissection process. At the halfway point between its humeral and glenoid implantation sites, the nerve is most intimately situated to the capsule. In the position of beach chair, it is situated closer to the glenoid. The risk of axillary nerve injury can be reduced by performing an inferior capsulotomy near the glenoid margin [6].

Postoperative Care

In order to alleviate discomfort, a postoperative splint is implemented. The rehabilitation regimen included immediate active and passive assisted exercises postoperatively, then strengthening exercises were started.

Postoperative evaluation:

A six-month follow-up was conducted for all patients and the postoperative results, that were evaluated by shoulder scoring system which was designed to measure the effectiveness of management in different shoulder conditions. We used The University of California at Los Anglos scoring system (UCLA) (1969) which is based on three items (pain, motion and function).

Assessment of complication:

Intraoperative, early postoperative, and complication during period of follow up were reported.

Ethical considerations:

The study was done after being accepted by the Research Ethics Committee, Al Ahrar Teaching Hospital and Banha University Hospitals. All patients provided written informed consents prior to their enrolment. The consent form explicitly outlined their agreement to participate in the study and for the publication of data, ensuring protection of their confidentiality and privacy. This work has been carried out in accordance with The Code of Ethics of the World Medical Association (Declaration of Helsinki) for studies involving humans.

Statistical analysis

The clinical data were documented on a report form. We used SPSS (Statistical Package for the Social Sciences) software, version 20 to assemble and evaluate the data. Descriptive statistics, specifically the mean, the standard deviation, and the range, were computed for the quantitative data and were compared by Student's t-test. Qualitative data were presented as frequency and percentage. All analyses regarded a P value < 0.01 as highly significant. We regarded a P value < 0.05 to be statistically significant, and a P value >0.05 to be statistically insignificant.

RESULTS

Table 1 shows demographics, side of injury, dominant side, previous management, co-morbidities and presenting symptoms of the studied patients.

Table 1: Demographics, side of injury, dominant side, previous management, co-morbidities and presenting symptoms (pain, function, range of forward flexion, abduction, external rotation, internal rotation, motion score, and UCLA score) of the studied patients

		Number of patients	Percentage
Age group	**42-50**	7	35 %
	50-60	11	55 %
	> 60	2	10 %
Sex	**Male**	7	35 %
	Female	13	65 %
Side of injury	**Right**	14	70 %
	Left	6	30 %
Affected side	**Dominant**	18	90 %
	Non-dominant	2	10 %
Types of previous management	**Physiotherapy**	17	85%
	intra-articular injection by corticosteroids and physiotherapy	3	15 %
Types of risk factors	**Free**	8	40%
	Diabetic	12	60%
Pain score	**1**	5	25%
	2	10	50%
	4	4	20%
	5	1	5 %
Function score.	**1**	9	45%
	2	6	30%
	4	5	25%
Range of FF	**80° – 89°**	8	40%
	90° – 99°	7	35%
	>99°	5	25%
Range of abduction	**40° – 44°**	7	35%
	45° – 50°	11	55%
	>50°	2	10%
Range of external rotation	**5° – 8°**	11	55%
	9° – 12°	5	25%
	13° – 17°	4	20%
Range of internal rotation	**25° – 29°**	1	5%
	30° – 35°	14	70%
	36° – 40°	5	25%
Motion score	**4**	20	100%
UCLA score	**6-7**	9	45%
	8-9	6	30%
	10-13	5	25%

Data are presented as mean ± SD or frequency (%). FF: Forward flexion, UCLA: University of California at Los Anglos scoring system

After one month of operation, the average of pain score, function score, forward flexion, abduction, external rotation, internal rotation, motion score, and UCLA score was significantly improved in relation to the preoperative scores.
After three months of follow up, the average of forward flexion, abduction, external rotation, internal rotation, motion score was significantly improved.
After six months follow up, the average of internal rotation was significantly improved **(Table 2)**.
At the end of follow-up, the pain, function, motion, and UCLA scores were highly significantly improved in relation to the preoperative scores by 94%, 106.7%, 93.02%, and 98.24% respectively. The abduction, external rotation, forward flexion, and internal rotation, were significantly improved in relation to preoperative score by 80%, 85.43%, 92.5%, and 87.66% respectively.

Table 2: The progress of pain score, function score, forward flexion, abduction, external rotation, internal rotation, motion score, and UCLA score during the study

		Average	Improvement	%	P. value	Significance
Pain score	**1 months**	7.55	5.25	76.09%	<0.05	significant
	3 months	8.25	0.7	10.14%	>0.05	Not
	6 months	8.8	0.55	7.9%	>0.05	Not
Function score	**1 months**	7.6	5.55	94.07%	<0.05	significant
	3 months	8.2	0.6	10.16%	>0.05	Not
	6 months	8.35	0.15	2.5%	>0.05	Not
Forward flexion	**1 months**	125°	36.5	60.33%	<0.05	significant
	3 months	139.5°	14.5	23.96%	<0.05	significant
	6 months	144.5°	5	8.26%	>0.05	Not
Abduction	**1 months**	96°	51.25	60.29%	<0.05	significant
	3 months	122.75°	26.75	31.47%	<0.05	significant
	6 months	124.75°	2	2.35%	>0.05	Not
External rotation	**1 months**	36.25°	27.55	44.58%	<0.05	significant
	3 months	55.75°	19.5	31.55%	<0.05	significant
	6 months	61.5°	5.75	9.3%	>0.05	Not
Internal rotation	**1 months**	55.5°	21.05	51.91%	<0.05	significant
	3 months	63.25°	7.75	19.11%	<0.05	significant
	6 months	70°	6.75	16.64%	<0.05	significant
Motion score	**1 months**	6.35	2.35	54.65%	<0.05	significant
	3 months	8	1.65	38.37%	<0.05	significant
	6 months	8	0	0%	--------	Not
UCLA score	**1 months**	21.5	13.15	76.9%	<0.05	significant
	3 months	24.45	2.95	17.25%	>0.05	Not
	6 months	25.15	0.7	4.09%	>0.05	Not

UCLA: University of California at Los Anglos scoring system

Table 3 shows the progress of all parameter through all the study. In the first month, we found that the function and the pain scores showed the most improvement while the internal and external rotations showed the least improvement. In the third month, we found that the motion score and external rotation showed the most improvement while the function and the pain scores showed the least improvement. In the sixth month, we revealed that the internal and external rotations showed the most improvement while the function score and abduction showed the least improvement. The most improvement occurred in the first month to all parameter and the improvement decrease gradually by time.

Table 3: The progress of all parameter through all the study

	Pain score	Function score	FF	Abduction	Ext. rotation	Int. rotation	Motion score	UCLA score
1 month	76.09%	94.07%	60.33%	60.29%	44.58%	51.9%	54.65%	76.9%
3months	10.14%	10.16%	23.9%	31.47%	31.5%	19.1%	38.37%	17.25%
6 months	7.9%	2.5%	8.2%	2.35%	9.3%	16.6%	0%	4.09%

FF: Forward flexion, UCLA: University of California at Los Anglos scoring system

Postoperative complications: three patients (15%) had wound infection. it was superficial and controlled by antibiotic in period of 2-3 weeks.

CASE 2

History:

Age: 45, Sex: male, Side: right, Dominant or not: dominant, Complaint: pain and limitation of all shoulder movement, Duration of
complaint: 1 year, Co-morbidities: diabetic (15 years).

Examination:

Unaffected side: (Fig. 3 and table 4)

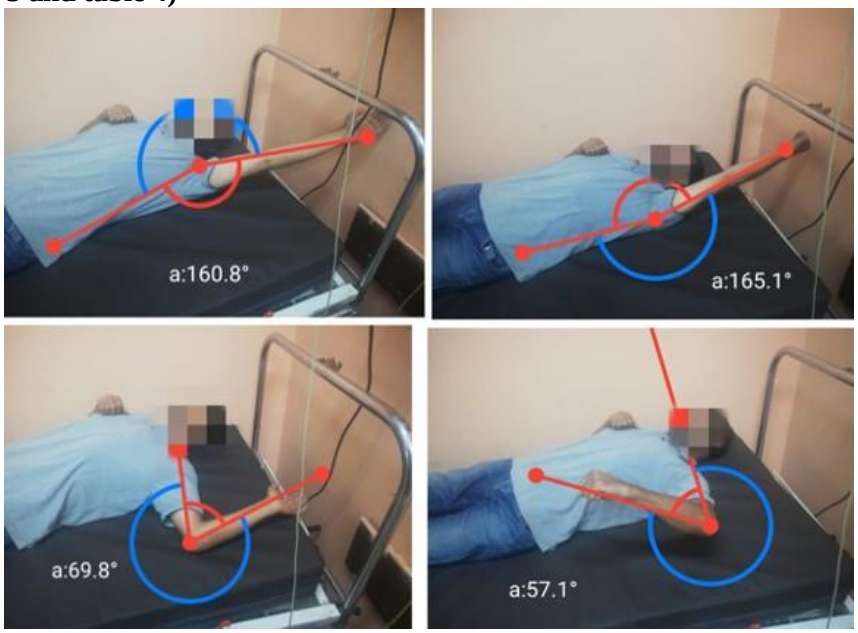

Fig. 3: ROM of unaffected side of case 2.

Table 4: Evaluation of unaffected side case 2

Pain score	Function score	ROM				Motion score	UCLA score
		FF	ABD	ER	IR		
8	10	165.1	160.8	69.8	57.1	10	28

ER: external rotation, ABD: Abduction, IR: Internal rotation, FF: Forward flexion, UCLA: University of California at Los Anglos scoring system.

Affected side: (Fig. 4 and table 5)

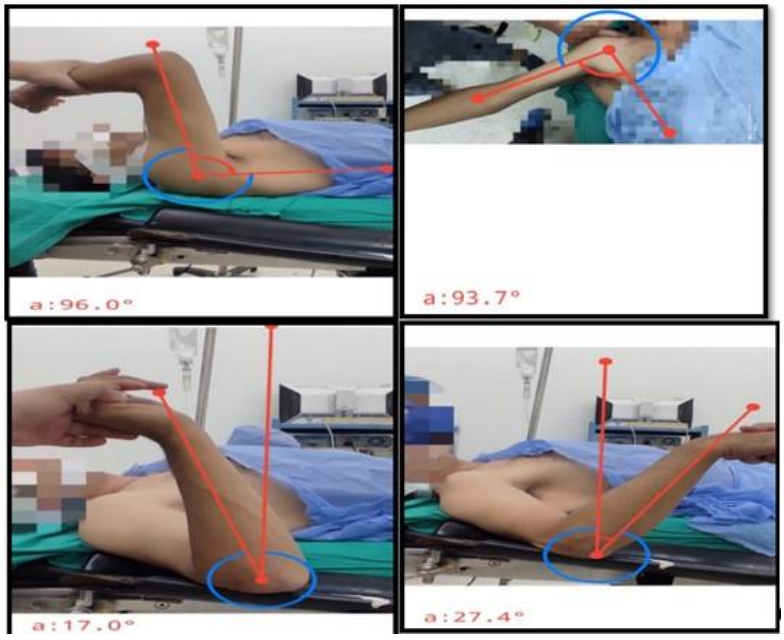

Fig. 4: Preoperative evaluation of ROM of affected side of case 2

Table 5: Preoperative evaluation of affected side case 2.

Pain score	Function score	ROM				Motion score	UCLA score
		FF	ABD	ER	IR		
2	2	96	93.7	17	27.4	4	8

ER: external rotation, ABD: Abduction, IR: Internal rotation, FF: Forward flexion, ROM: Range of motion. UCLA: University of California at Los Anglos scoring system.

Investigation:

MRI Showed thicken CHL and RI no other pathology **(Fig. 5)**

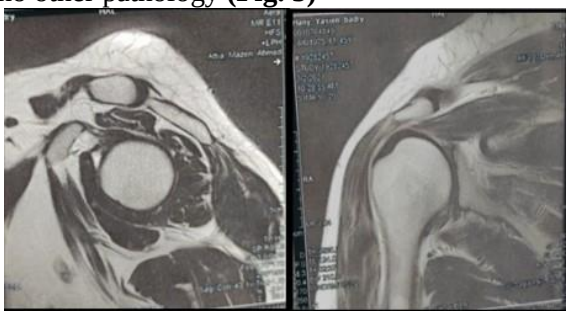

Fig. 5: MRI of case 2

Operation: (Fig. 6)

Arthroscopic CHL release and L shaped release of RI and subacromial decompression.

Fig. 6: Operative treatment of case 2.

Postoperative follow up: (Fig. 7 and 8 and table 6).

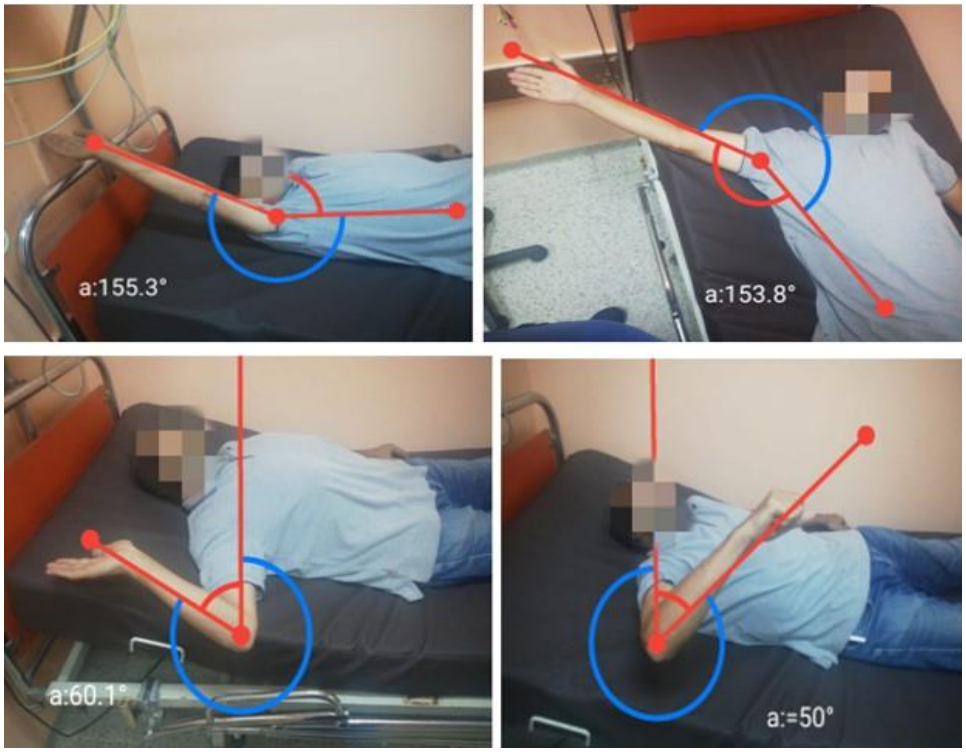

Fig. 7: After 3 months evaluation of ROM of affected side of case 2.

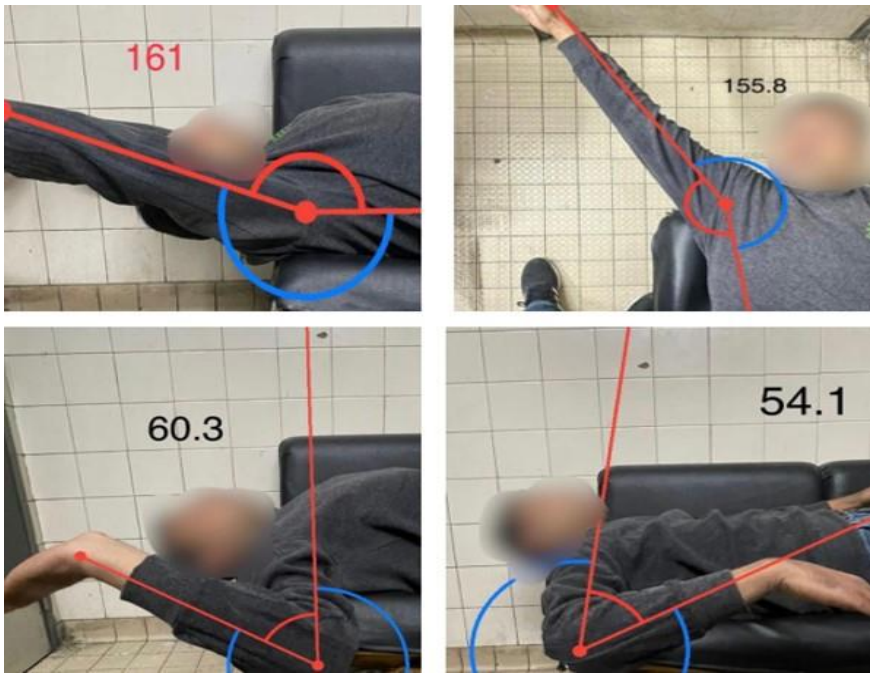

Fig. 8: After 6 months evaluation of ROM of affected side of case 2.

Table 6: Postoperative evaluation of ROM of affected side case 2.

	Pain score	Function score	ROM				Motion score	UCLA score
			FF	ABD	ER	IR		
1 month	5	5	122.7	110.7	48	45	5	15
3 months	8	8	155.3	153.8	60.1	50	8	24
6 months	8	8	161	155.8	60.3	54.1	8	24

IR: Internal rotation, FF: Forward flexion, ER: External rotation, ABD: Abduction, UCLA: University of California at Los Anglos scoring system, ROM: Range of motion.

DISCUSSION

The frequency of frozen shoulder is 3–5% among general population and may reach 20% in those having diabetes. While some characterize frozen shoulder as a self-limiting condition that cures after 1 to 3 years, other research suggests that 20–50% of patients may have ROM impairments for at least a decade [16].

Women in their 50s and 60s make up the majority of patients with frozen shoulder. with reports indicating that it can occur consecutively and bilaterally in up to 40–50% of cases. The predominant co-morbid condition is diabetes mellitus, with a frequency ranging from 10% to 36% [12].

The frozen shoulder management typically involves anti-inflammatory medications, NSAIDs, corticosteroids, or physiotherapy. NSAIDs may be utilized at any stage to alleviate discomfort. No rigorous investigations demonstrate that NSAIDs alter the normal progression of frozen shoulder. There is a scarcity of literature supporting the NSAIDs use for this condition. NSAIDs serve not just as anti-inflammatory medicines but also as analgesics, making them a prudent initial therapeutic option [17].

Surgical intervention for frozen shoulder should only be considered when exhaustive conservative care has proven ineffective. There is no specific schedule for undergoing surgery. Patients should have engaged in therapy for a minimum of 3 months without demonstrating any progress. Patients must have a lack of development, accompanied by considerable discomfort and restrictions in daily activities, work, recreation, or sleep, to warrant surgical intervention [5].

Arthroscopic CHL release is a valuable adjunctive procedure for managing frozen shoulder and has gained widespread acceptance in its treatment. A contracted capsule, comprising the axillary pouch, and a constricted CHL and RI constitute the principal lesion. It is possible to address these structures with arthroscopic release. The liberation of these contracted structures is done to let ROM to resume with manipulation if required [6].

The coracoid process's horizontal portion and base are the origins of the CHL. The main restriction to external rotation is a thickening of the CHL at the RI, which is considered a very accurate diagnostic of frozen shoulder. A thickening CHL enveloping the subscapularis and supraspinatus restricts internal rotation (IR), and its surgical removal enhances both ER and IR in individuals with frozen shoulder [7].

In this study, 35% of patients were the males while the females were 65%. However, in **Dattani *et al.*** [18] study, the male patients were (40%) and the female were (60%). **Lamplot *et al.*** [19] study showed the male

patients were (42%) and the female were (58%). From these studies, the female patients constituted the bulk of the cohort.

Regarding our results, the percentage of diabetic patient was (85%). However, **Dattani *et al.*** [18] showed in their study that the diabetic patients were (30%). Also, **Lamplot *et al.*** [19] showed in their study that the diabetic patients were 65%. **Kanbe** [20] performed his study with 55% diabetic patients. So, we concluded from previous studies, that diabetes was the most common co-morbidity with frozen shoulder.

In this study, the decision was taken by doing arthroscopic CHL and RI L-shaped incision after 3 months of failure of well-performed physiotherapy and medical treatment. While **Arce *et al.*** [21] did ACR after 6 months of well-performed rehabilitation program failure, after three or more steroid injections failure during 6-months interval, and less invasive treatments failure such as MUA or joint distension. In **Cinar *et al.*** [22] study, the patients chosen for surgery had failed to show improvement using non-invasive methods for a minimum of six months. Conservative treatment included localized injections, both topical and systemic NSAIDs, home exercise regimens, and physiotherapy interventions. Also, **Kanbe** [20] conducted his study following preoperative therapies for frozen shoulder, which encompassed rehabilitation, hyaluronic acid, steroid injections, or oral NSAIDs, prior to arthroscopic capsular release conducted after a minimum of six months.

From the previous studies, all patients complaining from FS should undergo medical treatment and well programmed physiotherapy for at least 3 months and if there was no improvement the arthroscopic treatment will be a good choice.

In the present study, we did arthroscopic CHL release and L-shaped incision of RI with subacromial decompression to all patients. The results revealed that improvement was found in function, motion, and pain scores. Additionally, the normal and the diseased side after operation showed an insignificant difference. **Hagiwara *et al.*** [23,24] did two studies of comparing the results of pancapsular release with CHL release alone and another group without CHL release. The results of these studies showed that there was ROM increase especially in ER and ABD in patients who had done CHL release after 12 months follow up.

In **Morsy *et al.*** [25] study, they stated that in the L-shaped group, the internal rotation ROM increased in a statistically significant way. There was no degradation of functionality as time progressed. Additionally, neither group experienced any axillary nerve injury, instability, or infections. The internal rotation ROM is considerably enhanced postoperatively in primary frozen shoulder patients by the L-shaped arthroscopic release of the posterior capsule.

In our study, the patient had a 6-month follow-up and the ROM, pain, function, and motion scores was measured. In **Dattani *et al.*** [18], the functional outcome was assessed 6 months postoperatively ROM was clinically evaluated by visual estimation by an independent observer or a clinician.

In **Hagiwara *et al.*** [24] study, participants were patients with a follow-up period of at least 12 months, and the UCLA scoring system's shoulder rating scale and ROM were assessed. However, after 12 months follow up there was non-significant differences between this study and their study in ROM, pain, function, motion scores. **Surendran *et al.*** [26] did a study and found that after an average of eighteen months , the ROM was significantly improved. Also, in **Snow *et al.*** [11] study, 5 months was the average period of patients follow-up.

From these studies, the period of follow up depends on the aim of study. If the aim was to detect the ROM and function, the follow up is preferred to be a short-term one of less than one year. However, if the aim of study was detection of complication, the preferred period is long-term follow up more than 2 years.

After 6 months of follow up, the patients' UCLA score with an average of 25.15. However, **Cinar *et al.*** [22] showed that the UCLA score of the patients with an average of 29 after 48 months follow up. Moreover, **Ebrahimzadeh *et al.*** [27], showed that the average UCLA score of the patients was 29.5 after follow-up for 60 months. Also, **Miyazaki *et al.*** [28] showed a UCLA score of the patients with an average of 25 after 60 months follow up.

That means that there is no significant rise in the UCLA score after follow-up for 6 months.

Hagiwara *et al.* [24] showed that the patients' pain score had an average of 9.2 after 12 months follow up. **Puah *et al.*** [29] showed in their study that the pain score of the patients was an average of 9 after 44 months follow up. In addition, **Cinar *et al.*** [22] showed a pain score of the patients of an average of 10 after 48 months follow up.

That means that there is no significant increase in pain score after 6 months of follow up. In the current study, the patients' average pain score was 8.8 after follow-up for 6 months.

Lim *et al.* [30] showed that the average motion score of the patients was 8 after follow-up for 12 months. **Hagiwara *et al.*** [24] showed that the motion score of the patients with an average of 8 after 12 months follow up. Moreover, in **Cinar *et al.*** [22] study, the motion score of the patients was an average of 8 after 48 months follow up.

That means that there is no significant increase in motion score after 6 months of follow up. This study, showed that the average of motion score after 6 months was 8.

Hagiwara *et al.* [24] showed that the function score of the patients was an average of 8.5 after 12 months follow up. **Puah *et al.*** [29] showed that the function score of the patients was an average of 9 after 44 months follow up. Also, **Cinar *et al.*** [22] study reported that the

function score of the patients was an average of 10 after 48 months follow up.

That means that there is no significant increase in motion score after 6 months of follow up. This study showed that the average of function score after 6 months was 8.35.

Limitations: The study's small sample size of 20 patients may limit the generalizability of the findings to the broader population. Additionally, the follow-up period of six months may not fully capture long-term outcomes and potential late complications. The absence of a control group makes it challenging to distinguish the specific effects of arthroscopic CHL release from the natural progression of frozen shoulder or other interventions. Further studies with larger cohorts and extended follow-up periods are needed to validate these findings and assess the durability of the improvements observed.

CONCLUSIONS

In the treatment of locked shoulder, arthroscopic release is a highly effective instrument and has become widely accepted. The essential lesion is the contracted capsule, which encompasses the axillary pouch, and the tightened CHL and RI. These structures were treated through arthroscopic CHL release and an L-shaped incision of the RI. Structures that have been contracted are released, enabling the restoration of normal ROM.

Financial support and sponsorship: Nil.
Conflict of Interest: Nil.

REFERENCES

1. Hadley G (2007): Essential clinical anatomy. J Anat., 211:413.
2. Buschbacher M (2003): Essentials of Musculoskeletal Care, 2nd Edition. American Journal of Physical Medicine & Rehabilitation, 82:369.
3. Sandor R (2000): Adhesive capsulitis: optimal treatment of 'frozen shoulder'. Phys Sportsmed, 28:23-9.
4. Goldman J (2012): American Academy of Orthopaedic Surgeons Rotator Cuff Clinical Practice Guideline. Arthroscopy, 28(8):1049
5. Dodenhoff R, Levy O, Wilson A *et al.* (2000): Manipulation under anesthesia for primary frozen shoulder: effect on early recovery and return to activity. J Shoulder Elbow Surg., 9:23-6.
6. Park J, Chung S, Hassan Z *et al.* (2014): Effect of capsular release in the treatment of shoulder stiffness concomitant with rotator cuff repair: diabetes as a predisposing factor associated with treatment outcome. Am J Sports Med., 42:840-50.
7. Arai R, Nimura A, Yamaguchi K *et al.* (2014): The anatomy of the coracohumeral ligament and its relation to the subscapularis muscle. J Shoulder Elbow Surg., 23:1575-81.
8. Wright R, Baumgarten K (2010): Shoulder outcomes measures. J Am Acad Orthop Surg., 18:436-44.
9. Amstutz H (1981): Shoulder Outcome Measures, Orthopaedic Coding 1981. [Available from: https://www.eorif.com/shoulder-outcome-measures#Anchor-Shoulder-11481.
10. Pavlik A, Ang K, Bell S (2002): Contralateral brachial plexus neuropathy after arthroscopic shoulder surgery. Arthroscopy, 18:658-9.
11. Snow M, Boutros I, Funk L (2009): Posterior arthroscopic capsular release in frozen shoulder. Arthroscopy, 25:19-23.
12. Mannava S, Jinnah A, Plate J *et al.* (2016): Basic shoulder arthroscopy: Beach chair patient positioning. Arthrosc Tech., 5:e731-e5.
13. Canbulat N, Eren I, Atalar A *et al.* (2015): Nonoperative treatment of frozen shoulder: oral glucocorticoids. Int Orthop., 39:249-54.
14. Li X, Eichinger J, Hartshorn T *et al.* (2015): A comparison of the lateral decubitus and beach-chair positions for shoulder surgery: advantages and complications. J Am Acad Orthop Surg., 23:18-28.
15. Paxton E, Backus J, Keener J *et al.* (2013): Shoulder arthroscopy: basic principles of positioning, anesthesia, and portal anatomy. J Am Acad Orthop Surg., 21:332-42.
16. Page M, Green S, Kramer S *et al.* (2014): Manual therapy and exercise for adhesive capsulitis (frozen shoulder). Cochrane Database Syst Rev., 2014:Cd011275.
17. Harris G, Bou-Haidar P, Harris C (2013): Adhesive capsulitis: review of imaging and treatment. J Med Imaging Radiat Oncol., 57:633-43.
18. Dattani R, Ramasamy V, Parker R *et al.* (2013): Improvement in quality of life after arthroscopic capsular release for contracture of the shoulder. Bone Joint J., 95-b:942-6.
19. Lamplot J, Lillegraven O, Brophy R (2018): Outcomes from conservative treatment of shoulder idiopathic adhesive capsulitis and factors associated with developing contralateral disease. Orthop J Sports Med., 6:2325967118785169.
20. Kanbe K (2018): Clinical outcome of arthroscopic capsular release for frozen shoulder: essential technical points in 255 patients. J Orthop Surg Res., 13:56.
21. Arce G (2015): Primary frozen shoulder syndrome: Arthroscopic capsular release. Arthrosc Tech., 4:e717-20.
22. Cinar M, Akpinar S, Derincek A *et al.* (2010): Comparison of arthroscopic capsular release in diabetic and idiopathic frozen shoulder patients. Arch Orthop Trauma Surg., 130:401-6.
23. Hagiwara Y, Sekiguchi T, Ando A *et al.* (2018): Effects of arthroscopic coracohumeral ligament release on range of motion for patients with frozen shoulder. Open Orthop J., 12:373-9.
24. Hagiwara Y, Kanazawa K, Ando A *et al.* (2020): Clinical outcomes of arthroscopic pan-capsular release with or without entire coracohumeral ligament release for patients with frozen shoulder. JSES Int., 4:826-32.
25. Morsy G, Waly A, Ashraf M *et al.* (2021): L-shaped arthroscopic posterior capsular release in frozen shoulder. Video Journal of Sports Medicine, 1:26350254211000065.
26. Surendran S, Patinharayil G, Karuppal R *et al.* (2020): Arthroscopic capsular release and continuous upper arm brachial block in frozen shoulder - A midterm outcome analysis. J Orthop., 21:459-64.
27. Ebrahimzadeh M, Moradi A, Pour M *et al.* (2014): Clinical outcomes after arthroscopic release for recalcitrant frozen shoulder. Arch Bone Jt Surg., 2:220-4.
28. Miyazaki A, Santos P, Silva L *et al.* (2017): Clinical evaluation of arthroscopic treatment of shoulder adhesive capsulitis. Rev Bras Ortop., 52:61-8.
29. Puah K, Salieh M, Yeo W *et al.* (2018): Outcomes of arthroscopic capsular release for the diabetic frozen shoulder in Asian patients. J Orthop Surg (Hong Kong), 26:2309499018757572.
30. Lim W, Lie D, Mitra A *et al.* (2021): What is the optimal surgical intervention for patients with frozen shoulder and a concomitant partial-thickness rotator cuff tear? JSES Int., 5:93-7.