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## Functional outcome of adhesive capsulitis treated by manipulation

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### Abstract

An absolute indication of Manipulation under Anesthesia (MUA) for frozen shoulder is not extracted from literature. Though advanced medical sciences now have an option for arthroscopic release of soft tissue of shoulder, the results are variable in literature and recurrence recorded in literature varies up to 30 to 40 percent. We adopted a non invasive approach for 40 cases of frozen shoulder. A functional outcome of patients treated with MUA and intra-articular injection with Methylprednisolone with Lignocaine (MP) was evaluated. Patients with frozen shoulder including those with diabetes were analyzed clinically, radiologically and SPADI score prior and post procedure done. The percentage of recovery noted. We noticed favorable and positive outcome in 67% despite strictly restricting our follow up for 3 months. A reminder here is the natural course of history which is generally self limiting and varies from 16 to 24 months. In view of possible recovery time, range of motions would further improve with recovery from pain. More than 4 studies were comparable, in this study we found external and internal rotation of shoulder joint not fully recovering, but reaching a range of motion for activities of daily living. Our results were comparable to other studies and conclude that MUA with injection of steroid speeds up recovery in range of movements and provides relief of pain.

**Keywords:** Frozen shoulder, Manipulation under Anaesthesia, Intra Articular, Methylprednisolone, Lignocaine 2%, SPADI SCORE.

### 1. Introduction

Peri Arthritis capulae humeralae was the term used by Duplay in 1872. For painful shoulder with restriction of movements. Over the years aetiopathogenesis evolved with newer terms. 1934 Codman coined the condition Frozen shoulder, and Neviasser 1945 coined the term Adhesive Capsulitis [1]. And other surgeons brought light and charted theoretically the stages of frozen shoulder currently also known as Adhesive Capsulitis. The incidence varies from 2-4% and in some general population 3-7% [1, 2, 3].

Clinically diagnosed as Adhesive Capsulitis, this is a condition where spontaneous adhesion of ligaments, capsule and fibrosis occurs. There are two claims, one suggest synovial inflammation and other a condition similar to Dupuytren's Contracture [2, 4, 11]. Contractures along the long head of Biceps, Infraspinatus, and Supraspinatus.

Treatment varies from NSAIDs, moist heat, physical therapy, oral steroids, IA Injections, hydro dilation, nerve blocks, Manipulation, open and arthroscopic soft tissue release. Literature supports more incidences in Diabetic patients, females, non dominant hand with bilateral involvement in 12-16% in same individual [1, 2, 3, 4]. Our study was to do noninvasive therapy that is Manipulation under Anaesthesia (MUA) with intra articular injection of 80 mg of Methylprednisolone with 1ml of Lignocaine; which is economical, needs no highly skilled expertise and can be done with standard aseptic procedure even in a District hospital.

### 2. Materials and methods

To determine the outcome of patients, after we assessed patients for pain, disability and Range of Movements (ROM). The study prospectively recorded the functional outcome of treatment after MUA. We analyzed 40 consecutive patients and outcomes were assessed clinically by SPADI Score. The Shoulder Pain and Disability Index is the sum total of pain scale and

Disability scale and total score is divided by 130 and multiplied by 100 to calculate percentage. Pain is measured by 0-10 with 5 questions. Disability is assessed by 8 questions, score 0-10. Where 0 means no pain and 10 means worst unbearable pain.

Activities of daily living were checked were 0 means no difficulty and 10 means severe difficulty. Higher scales on the subscale will indicate greater pain and disability. Prospective study of 40 patients was conducted in tertiary care Institution of Medical sciences. The study was between May 2019 and May 2020. 40 consecutive patients with painful loss of shoulder movements with limitations in their activities of daily living.

**2.1. Inclusion criteria:** we included all patients, who have painful and stiff shoulders, with restricted active and passive motion, with normal glenohumeral joint radiologically.

**2.2. Exclusion criteria:** Any calcific tendinitis, arthritis, traumatic conditions or any other surgeries around the shoulder.

Our study included 40 patients including those with diabetes. All patients gave detail history and evaluation of pain scale and disability done using SPADI score. Clinical Examination and their record of shoulder movements and strength of muscle power were recorded. Only a single X ray in Anteroposterior (AP) view was taken. No patient underwent ultrasound or MRI.

40 patients were hospitalized, and physiotherapy started and all patients were educated for self-mobilization of shoulder. With strict emphasis on avoiding shrugging.

Wall climbing exercise, Pendulum, and other exercises were taught to the patients.

All patients underwent MUA within 5 days and at the same sitting injection 80 mg of Methylprednisolone (MP) mixed with 1 ml of Xyclocaine given anteriorly into gleno humeral joint.

Patient was supine, scapula fixed and pressed with thoracic cage and border of scapula. With help of an assistant. Holding the short lever arm gradual abduction, external rotation adduction and lastly internally rotation movement were done sequentially until audible click was heard.

We had no prior knowledge of pathological thickness of Corocohumeral ligaments, thickness of the capsule, and extent of pathological contractures. Irrespective of the duration we treated all patients with a standard protocol, so intervention rate could be accessed based on outcome at end of 3 months. Out of 40 patients, there were 18 male and 22 females. Out of

40 patients 27 patients were diabetic. 19 patients had right shoulder involvement and 21 left.

The average duration of symptoms like pain and disability was 2.5 months; least duration was 1 month and maximum 7 months. 31 patients after MUA and Inj MP of 80 mg underwent physiotherapy which was supervised for 1 week. 9 patients did not attend supervised physiotherapy at the hospital.

All patients underwent clinical examination at time of MUA, immediately after MUA, after 1<sup>st</sup> month, 2<sup>th</sup> month and 3<sup>rd</sup> month. SPADI score was calculated before procedure immediately after procedure and for each month. The percentage of recovery calculated to merely reflect functional outcome.

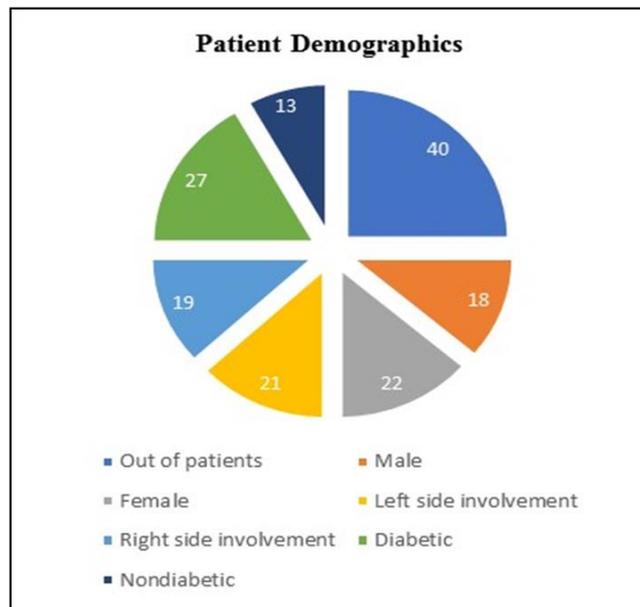


Fig 1: Patient Demographics

Table 1: Patient Demographics

Out of patients	40
Male	18
Female	22
Left side involvement	21
Right side involvement	19
Diabetic	27
Nondiabetic	13

### 3. Results

Our work sheet tabulated the results in our study with average range of shoulder motions as follows: Abduction 60\*, External Rotation (ER) 31°, Internal Rotation 30 (IR), and Flexion 66\* at first examination.

We had one patient 55/F who had stiffness and pain who did not respond to treatment, not diabetic, her duration of symptoms was only for 3 months and was of left side. Our hypothesis that it would be like pathogenesis like Duptruyen Contracture in this particular case [4]. Immediately after MUA and injection MP Abduction (Abd) improved to 109.5 EXT rotation (ER) 59.6 Internal rotation (IR) 51° and flexion (FI) 106\*

Table 2: Range of motion of shoulder at 3 months

S. No.	Abduction (Deg.)	External rotation	Internal rotation	Flexion (Deg.)
1 <sup>st</sup> month	Abd 125.2°	ER 65.25°	IR 56.5°	FL 123°
2 <sup>nd</sup> month	Abd 132.7°	ER 67.5°	IR 60.2°	FL 130°
3 <sup>rd</sup> month	Abd 135°	ER 68.2°	IR 61°	FL 134°

In our study by using SPADI score for pain and disability we calculated prior to SPADI, Post MUA, and at end of 3 months. In span of 3 months post MUA with injection the range of movements doubled.

The percentage of recovery calculated and averages taken, Preop SPADI Score was

70.7 and Post op 21.45 and the percentage of 67.1%. The predominant range of motions of external and internal rotations were quite resistant to MUA and the underlying pathology of shoulder rotators, their anatomy and pathological changes around them, probably is resistant to MUA.

### 3.1. Paired test was done to compare the statistical significance

Statistical Analysis with paired groups were done with comparison before and after MUA of shoulder.

**Table 3:** Statistical Analysis paired test of Range of Movements

Rom			Mean	N	STD Deviation	t	P value
Abd	Pair 1 Before	VAR00001	110.7692	39	28.50527	7.332	0.000
	After MUA	VAR00005	135.1282	39	31.10862		
ER	Pair 2 Before	VAR00002	59.6250	40	19.36119	4.573	0.000
	After MUA	VAR00006	68.2500	40	20.4923		
IR	Pair 3 Before	VAR00003	51.2500	40	19.50509	6.811	0.000
	After MUA	VAR00007	60.5000	40	18.80398		
FL	Pair 4 Before	VAR00004	106.2500	40	29.23709	7.890	0.000
	After MUA	VAR00008	134.0000	40	28.62669		

Statistical Analysis with 95% confidence of Pre and Post MUA outcome measures, based on means, standard deviation, t-score and P-value.

#### 4. Discussion

The Frozen shoulder is a condition where in, there is slowly progressive loss of movements of shoulder both active and passive, associated with pain and restriction of activities of daily living. The Natural History of Adhesive Capsulitis is that it is self-limiting. Recovery can take from 24-26 months [1, 2, 3, 4].

However Literature quotes various Surgeons who currently contradict this statement [6], several authors claim pain and loss of range of movements with disability of shoulder. Treatment varies from simple NSAID with moist heat, physiotherapy, oral steroids, intrarticular injections with steroid, hydrodilatation, nerve blocks, manipulation, open surgical release and arthroscopic release. Contractures in shoulder may be responsible for ineffectiveness of any treatment. We don't know whether synovial inflammation is the cause or 'Dupuytren's type' of capsule of shoulder.

We compared our results with Heidi Vastamaki, and Marti Vasatamaki' study [7].

In their study prior to MUA, Abduction was 75° (ABD), External Rotation 21° (ER), Internal Rotation level of buttock (IR), and Flexion 99° (FL), in our result prior to MUA Abduction was 60°, External was 31°, IR 30° and FL 66°.

End of 8.8 months Vastamaki's study [7] showed in their patients Abduction 167°,

ER 51°, IR level L5 and Flexion 156°. In Our study we obtained at 3<sup>rd</sup> month on follow up ABD 135°, ER 68°, IR 61° and FI 134°.

Comparing with Thomas<sup>[8]</sup> et al ABD was 62°, ER 17° IR 17°, FI 165° (pre MUA)

Post MUA at one year follow up was ABD 168°, ER 65°, IR 65°, FL 169°. In our study

ABD 135°, ER 68°, IR 61° and FI 134° at end of 3<sup>rd</sup> month.

Studies by various authors showed good recovery but they assumed that elderly patients have restricted movements, we stand to contradict to their statements that 90% improvement in pain and range of movements.

Jenkins *et al.*, in their retrospectively had analyzed that 36% had unsatisfactory outcomes [8], in our study it was 33%. The natural history claimed to be self-limiting, can take prolonged duration of time between 14-32 months. Adhesive capsulitis of shoulder with pain and disability would require medication and pose risk of drug induced Nephropathy.

Though optimal time suggested by Vastamaki, and Vajonen is between 6-9 months for MUA, clinical outcome was questionable by many authors. Dodenoff, Levy, Wilson and Copeland in one series, and Janada and Hawins [9] proved that

pain and disability can be reduced after MUA. This shortens the time interval of patients to resume work, disease itself cannot be evaluated merely on duration of months and prevailing changes for staging purpose cannot be guessed. Clinical importance of outcome can be questioned and hence its variable. To achieve necessary functional activities there has to be range of motion which is free.

#### 4.1. Protocol

Hence irrespective of duration of symptoms all patients were hospitalized and for 5 days physiotherapy given and then taken up for MUA and Injection MP 80 mg with 1ml of 2% Xyclocaine into the joint.

To enable eating approximately 60-100 of abduction, horizontal abduction about

40-70 degrees. Rotations about lessor range. For reaching perineum 40-60 of abduction and 90 of Internal rotation. Similarly, for combing hair, tucking shirt, or putting on pants, etc.

A range of movements which are not full and free but can able patients do activities of daily living which are pain free [8, 9, 17].

Pain and Disability prior to MUA on Average score was 70.7 (SPADI) after MUA at 12 weeks the score was 21.45. Post SPADI score of 21.45 denotes some residual pain and disability, but with useful functional outcome.

There was no complication in our cases. Grant *et al.* [10] compared MUA with arthroscopically done surgical release and reported that there was not much difference [10]. Arthroscopically done release has risks like chondrolysis due to thermal heat, risk of infection, risk of accidental axillary nerve damage. Open Release with manipulation offers no advantage on the contrary it reduces the speed of recovery. Also risk of infection introduced into the joint.

Rotator Cuff was analysed by Atoun et al with ultrasound before and after MUA and found cuff undamaged [12].

Sasanuma *et al.* [13] found no rotator cuff tears on MRI after Manipulation.

#### 4.2. Comparative Studies

In a Retrospective study of 51 patients' frozen shoulders done by Wang *et al.* [14] after MUA reported 89% of cases had good results. In our series 67% had good results.

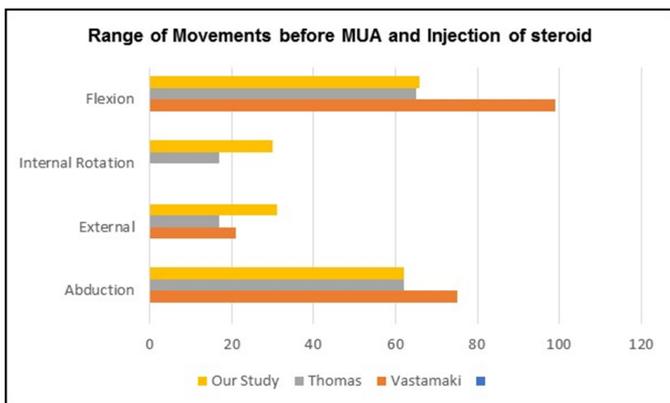
The difference of 22% in the outcome was because all patients were followed up to 3 months strictly. Whereas Wang followed up to 1 year. In their study patients were immediately mobilized, in our study all patients were given rest post of period for 24 hours, to enable them recover from pain.

Another probable cause is 9 patients dropping out of supervised physiotherapy at OPD for 5 days. One patient had

absolutely no recovery, few others had a slow start, our follow up was limited strictly till 12 weeks. We assume out of 22% of cases if given more time recovery rate would improve.

**Table 4:** showing Range of Movements before MUA and Injection of steroid

Study done	Abduction	External Rotation	Internal Rotation	Flexion
Vastamaki	75	21	Buttock	99
Thomas	62	17	17	65
Our Study	62	31	30	66

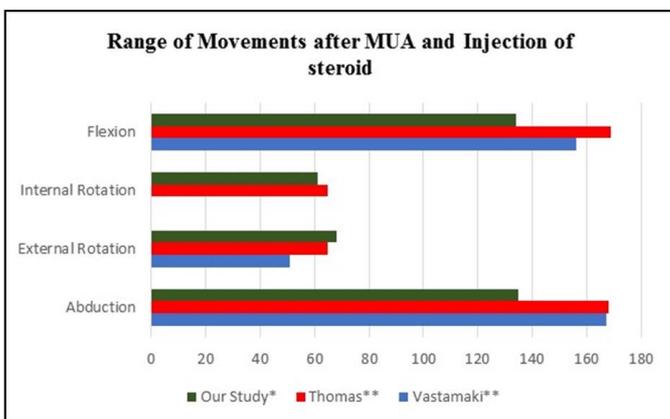


**Fig 2:** showing Range of Movements before MUA and Injection of steroid

**Table 5:** showing Range of Movements after MUA and Injection of steroid

Study Done	Abduction	External Rotation	Internal Rotation	Flexion
Vastamaki**	167	51	L 5 vertbrae	156
Thomas**	168	65	65	169
Our Study*	135	68	61	134

\*\* follow up 1yr or more.



**Fig 3:** ROM after MUA and Injection of steroid

The study shows functional outcomes is improved after MUA and after Intra articular Inj of MP. Recovery of External rotation and Internal Rotation takes a longer time and their range of movements is again dependent on retraction of capsule and narrowing of clear space around ligaments. Non reversible pathological changes like fibrosis and capsular thickening with adhesions of glenohumeral ligaments. Farrell *et al.* [15] their study of 19 shoulders after MUA, followed up for 7 years. They obtained Abduction 155°, External Rotation 76°, Internal Rotation 73° and Flexion 159°. In our study we obtained 135° of abduction, 68° of External

Rotation, 61° of Internal Rotation and 134° of Flexion at 3<sup>rd</sup> month which is beneficial to be patient.

**4.3. Limitations**

Our study follows up limited up to 3 months. It is evident by MUA and inj of steroid the pain and stiffness improves, the shoulder recovers functional range of movements. However the limitations of this study: 40 patients and follow up to 3 months. No control group of patients, Non divided into 2 groups that is diabetic and non diabetic. Standard and same protocol of treatment followed. No 2 different methods of treatment. Our prospective study included both diabetic and non diabetic patients.

**5. Conclusion**

Manipulation of shoulder with injection of Steroid is a good method of treatment.

It's cost effective and speeds up recovery from pain and disability. It can be done safely as a day care procedure, and even in district Hospital. MUA carries little risk, without any need for expert technical skill. Majority of patients are happy for the range of movements recovered.

It is unnecessary to wait and observe for prolonged time or do prolonged follow up. Recurrence rate is low compared to arthroscopic surgical release and is subject to further trials and comparative studies.

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