

## Intra-articular Steroid in the Management of Adhesive Capsulitis of Shoulder: A Comparison of the Anterior and Posterior Approaches

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### Abstract

**Objective:** To compare the anterior and posterior blind intra-articular steroid injections approaches in the management of adhesive capsulitis of shoulder

**Design:** Randomised control trial

**Setting:** Department of PMR, Regional Institute of Medical Sciences (RIMS), Imphal, Manipur.

**Participants:** The patients having adhesive capsulitis of shoulder (n=60) attending PMR department, RIMS during the study period.

**Duration:** One year (August 2011 to July 2012).

**Intervention:** After randomisation, 60 patients were allocated in three groups (A, B and C). Group C (n=20) received physical therapy practice in the department of PMR, RIMS, Imphal. Group A (n=18) and B (n=22) received intra-articular steroid (methylprednisolone 80mg each) by anterior and posterior approaches without imaging guidance respectively in addition to physical therapy. Outcome measures: 1) Visual analogue scale (VAS) for pain, 2) Shoulder pain and disability index (SPADI) and 3) Passive range of motion of affected shoulder using goniometer.

**Results:** All the three groups showed improvement with statistically significant ( $p < 0.005$ ) findings in all the outcome variables except in shoulder flexion range ( $p = 0.085$ ). Improvement in outcomes namely VAS, SPADI, shoulder rotation and abduction range were more marked in group A when compared with group B which was found statistically significant ( $p < 0.05$ ).

**Conclusion:** The intra-articular steroid injection when combined with physical therapy is effective in the management of adhesive capsulitis of shoulder. The blind anterior approach intra-articular steroid injection is more effective than posterior approach in improving shoulder rotation and abduction range of movements, reducing shoulder pain and disability in patient having less than 3 months duration adhesive capsulitis of shoulder.

**Key words:** Gutter crutch, adhesive capsulitis, intra-articular steroid, visual analogue scale, shoulder pain and disability index, passive range of motion.

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### Introduction:

Adhesive capsulitis is one of the common causes for shoulder dysfunction. It is defined as “a painful restriction in shoulder range of motion in a patient with normal radiograph”<sup>1</sup>. It is usually an idiopathic self limiting condition, but it can be associated with other secondary pathological conditions<sup>2</sup>. The loss of passive range of movement, particularly related to external rotation, has remained pivotal to the diagnosis of adhesive capsulitis of shoulder. The treatment options documented in the literature include supervised physical rehabilitation<sup>3-6</sup>, non-steroidal anti-inflammatory medications<sup>7,8</sup>, oral corticosteroid<sup>9</sup>, intra-articular corticosteroid injection<sup>4,10-12</sup>, distension arthrography<sup>13</sup>,

closed manipulation<sup>13-17</sup>, open surgical release, and arthroscopic capsular release<sup>17-20</sup>.

Intra-articular (glenohumeral joint) steroid injection is effective during early stage of the adhesive capsulitis. The rationale for corticosteroid injection is to reduce synovial inflammation, decrease capsular fibrosis and allow improvement of motion with a decreased time to functional recovery<sup>21</sup>. The intra-articular injection of shoulder joint can be performed either anterior (Fig 1) or posterior approaches (Fig 2) with or without imaging guidance. In our state, because of its ease and low cost, the blind glenohumeral injection is performed commonly for the management of adhesive capsulitis of shoulder. We hypothesised that the anterior approach intra-articular steroid injection is more effective than posterior one in the management of early stage adhesive capsulitis of shoulder.

### Aims and Objects:

To see the effectiveness of intra-articular steroid in the management of adhesive capsulitis of shoulder.

To compare the effects of anterior and posterior approaches blind intra-articular steroid injection in early stage adhesive capsulitis of shoulder.

### Materials and Methods:

It is a randomised controlled trial. Setting conducted in the Department of Physical Medicine and Rehabilitation (PMR), Regional Institute of Medical Sciences (RIMS), Imphal, Manipur with study period of 1 year (August 2011 to July 2012). All the patients having adhesive capsulitis of shoulder attending PMR department, RIMS, during the study period and fulfilling the inclusion criteria were included in the sample size.

#### Inclusion criteria:

1. Patient having unilateral adhesive capsulitis of shoulder with duration less than 3 months.
2. Not received any intra-articular injection earlier.
3. Age between 35 and 70 years.

#### Exclusion criteria:

1. Patient unable to or not willing to give consent. Bilateral involvement.
2. Non-cooperative patients.
3. Recent trauma or fracture around the shoulder.
4. Recent history of any operative interventions.
5. Having comorbid conditions like uncontrolled diabetes, chronic renal failure, thyroid diseases, coronary artery disease, stroke, connective tissue disorders etc.

**Study groups:** Altogether 60 patients attended during the study period. Subjects (n=60) were randomly allocated into three groups namely A(n=18), B(n=22) and C(n=20) by using simple randomisation by lottery method.

### Interventions:

All the groups received physical therapy for adhesive capsulitis practised in the department of PMR, RIMS, Imphal. It included 1) Passive range of motion exercise, 2) moist heat therapy and 3) stretching exercises. The above physical therapy was given 10 sessions per day for 4 weeks. Groups A and B received intra-articular methylprednisolone (depomedrol) 80mg by blind method in addition to physical therapy. Drug was deposited in the shoulder joint through anterior approach in group A and posterior approach in group B under strict aseptic precautions. The anterior approach involved inserting the needle tip a fingerbreadth lateral to and just below the coracoid process and directing the needle posteriorly and slightly laterally while the patient was in supine with arm externally rotated<sup>22,23</sup>. For the posterior approach, the patient was put in sitting position and the needle was inserted two fingerbreadths inferior and medial to the posterolateral corner of the acromion and directed anteromedially towards the coracoid process<sup>24-27</sup>.

#### Groupwise intervention:

- Group A - Intra-articular steroid (methylprednisolone 80mg) shoulder joint, anterior approach and physical therapy.
- Group B - Intra-articular steroid (methylprednisolone 80mg) shoulder joint, posterior approach and physical therapy.
- Group C - Physical therapy.

**Follow-up:** Follow-up was done 1st at one week and lastly at one month.

**Outcome measures:** The following outcome measures were taken before intervention and during subsequent follow-up;

1. Visual analogue scale (VAS) for pain
2. Shoulder pain and disability index (SPDI)
3. Passive range of motion of affected shoulder using goniometer.

**Data analysis:** ANOVA was used for the comparison between the groups. A significant level of 0.05 was used for all comparisons.

**Ethics:** All the participants were informed about of the nature of the study and those agreed to participate were asked to sign the informed consent form.



**Fig 1-** Anterior Approach



**Fig 2-** Posterior Approach

Participants were assured that they could withdraw from the project at any time. The approval of the institutional ethics committee, RIMS, Imphal, Manipur, was taken.

**Results:**

Sixty subjects (45% male, 55% female) were recruited and randomly assigned to three groups. Eighteen subjects were enrolled in group A (steroid injection; anterior approach and physical therapy), 22 in group B (steroid injection; posterior approach and physical therapy), and 20 in group C (physical therapy). Three subjects did not return for all follow-up visits; two in group B and one in group C.

No disparity was found between the baseline characteristics of each group including age, duration of symptoms, shoulder range of motion, VAS and SPADI (Table 1). The non-dominant side was affected in less than half of the cases ( $n = 60$ ; 40%). Compliance with physiotherapy was good with 90% completing all sessions in study period. At 1st follow-up, there were

improvement in all the outcome measures in all the three groups and statistically significant ( $p < 0.005$ ) improvement were found for VAS, SPADI and abduction shoulder range (Table 2). At last follow-up, there was improvement in all the three groups with statistically significant finding ( $p < 0.005$ ) in all the outcome variables except in shoulder flexion range ( $p = 0.085$ ). Improvement in outcomes namely VAS, SPADI, shoulder rotation range were more marked in group A when compared with group B and differences were found significant statistically ( $p < 0.05$ ), as evidenced by ANOVA Post Hoc Test (Tables 3 and 4).

**Discussion:**

The present study showed that improvement in overall shoulder disability and pain both at 1 week and 1 month which were better in subjects treated with corticosteroid injection and physical therapy than those treated with physical therapy alone. These results support the findings of previous studies suggesting improvement in early outcome after corticosteroid injection in adhesive

**Table 1:** Baseline Clinical Characteristics among the Groups

Variables	Group A (Mean ± SD)	Group-B (Mean ± SD)	Group-C (Mean ± SD)	F value	p-value	
Age	52.00 ± 1.26	51.90 ± 9.00	46.00 ± 6.90 SD	2.851	0.066	
Duration	1.70 ± 0.80	1.70 ± 0.55	2.20 ± 0.70 SD	3.270	0.142	
VAS	6.20 ± 1.20	6.50 ± 1.05	6.40 ± 1.00	0.212	0.809	
SPADI	59.70 ± 8.70	64.50 ± 8.90	85.80 ± 9.80	1.150	0.321	
Passive ROM	Abduction	88.80 ± 2.30	98.10 ± 2.70	90.50 ± 2.70	0.735	0.484
	Flexion	105.28 ± 1.80	112.20 ± 2.30	107.20 ± 2.30	0.533	0.589
	External rotation	32.20 ± 1.90	30.60 ± 1.60	27.20 ± 2.00	0.359	0.700
	Internal rotation	27.70 ± 2.00	33.80 ± 2.20	34.00 ± 2.10	0.500	0.609

**Table 2:** Difference in Outcomes between the Groups at 1 Week

Variables		Group A (Mean ± SD)	Group-B (Mean ± SD)	Group-C (Mean ± SD)	F value	p-value
VAS		0.94 ± 0.63	3.20 ± 1.70	3.90 ± 0.82	30.71	0.000
SPADI		23.20 ± 2.08	34.30 ± 1.20	54.90 ± 4.62	48.60	0.000
Passive ROM	Abduction	141.30 ± 39.80	124.50 ± 27.60	69.20 ± 40.10	21.45	0.000
	Flexion	152.70 ± 2.90	130.40 ± 2.60	124.70 ± 2.50	5.490	0.007
	External rotation	57.50 ± 2.60	39.50 ± 1.80	48.15 ± 1.40	3.976	0.024
	Internal rotation	61.10 ± 2.70	45.00 ± 1.90	45.70 ± 9.90	4.060	0.022

**Table 3:** Difference in Outcomes between the Groups at 1 Month

Variables		Group A (Mean ± SD)	Group-B (Mean ± SD)	Group-C (Mean ± SD)	F value	p-value
VAS		0.55 ± 0.50	1.80 ± 1.30	2.75 ± 1.20	18.50	0.000
SPADI		1.80 ± 2.70	14.10 ± 8.60	28.30 ± 9.60	54.76	0.000
Passive ROM	Abduction	174.40 ± 1.90	148.60 ± 2.60	77.50 ± 3.90	54.72	0.000
	Flexion	174.40 ± 1.50	137.70 ± 3.70	159.10 ± 2.30	2.57	0.085
	External rotation	89.40 ± 2.30	56.10 ± 2.10	40.90 ± 1.10	52.22	0.000
	Internal rotation	69.40 ± 2.40	60.00 ± 1.90	39.00 ± 1.40	57.91	0.000

**Table 4:** Comparison in Outcomes between Group A and B at 1 Month

Variables Between Group A & B	Mean Difference (A - B)	Standard Error	Significant	95% confidence interval	
				Lower value	Upper value
VAS	-1.308	0.354	0.001	-2.160	-0.455
SPADI	-12.247	2.475	0.000	-18.205	-6.290
Flexion	-53.282	72.385	0.743	-227.472	120.906
Abduction	25.808	9.504	0.023	2.935	48.680
External rotation	33.308	4.729	0.000	21.928	44.688
Internal rotation	29.444	4.591	0.000	18.395	40.493

capsulitis capsulitis of shoulder<sup>28,29</sup>. Reasons for choosing methylprednisolone (depomedrol) in our study are it is intermediate acting partially soluble steroid having sustained anti-inflammatory action because of its depot form, has very minimal mineral corticoid action and less side-effect.

The improvement in the shoulder range of motions (rotation and abduction) and pain was significantly better at 1 month in subjects receiving physical therapy and intra-articular steroid by anterior approach when compared with those receiving physical therapy with intrarticular steroid by posterior approach. The rotation (external and internal) and abduction motions are thought to be the first movements to be affected in the adhesive capsulitis of shoulder<sup>30</sup>. The possible pathology may be due to adhesion of dependent part of inferior capsule,

contracture of coracohumeral ligament and anterior capsule. Direct deposition of sustained acting steroid in and around the anterior capsule may help in prevention of early pathological process occurring in adhesive capsulitis of shoulder. A cadaveric study conducted by Paul *et al*<sup>31</sup> showed that the anterior glenohumeral injection is 80% likely to be accurately placed in contrast to a 50% accuracy rate when the injection is placed posteriorly. Another study<sup>32</sup> on ultrasound guided suggested that the needle placement using the anterior technique was accurate in 96% of cases while that of the posterior technique was only accurate in 41%. So, the needle placement in the glenohumeral joint using anterior approach is more accurate than the posterior approach. This can also be the possibility why the anterior approach gives better outcome results in the present study.

## Conclusion:

The intra-articular steroid injection when combined with physical therapy is effective in reducing shoulder disability and pain in patient having 3 months duration adhesive capsulitis of shoulder. The anterior approach blind intra-articular steroid injection is more effective than posterior approach in improving shoulder range of motion (rotation and abduction), reducing shoulder pain and disability in early stage adhesive capsulitis of shoulder.

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