

Comparison of the Efficacy of Intra-Articular Corticosteroid Injection and Phonophoresis in the Treatment of Adhesive Capsulitis

Dr. Nuzhat Nuery^{1*}, Professor Dr. Sohely Rahman², Dr. Md. Arifur Rahman Chowdhury³, Dr. Md. Aminul Alam⁴, Dr. Mohammed Kamruzzaman⁵, Dr. Jasmin Jashim Uddin⁶

¹Medical Officer, Physical Medicine and Rehabilitation Department, Shaheed Suhrawardy Medical College Hospital, Dhaka, Bangladesh

²Ex- Professor & Head, Physical medicine and Rehabilitation department, Dhaka Medical college, Dhaka, Bangladesh

³Assistant Professor, Physical Medicine and Rehabilitation Department, Rangpur Medical College, Rangpur, Bangladesh

⁴Registrar, Physical Medicine and Rehabilitation Department, National Institute of Traumatology and Orthopedic Rehabilitation, Dhaka, Bangladesh

⁵Assistant Registrar, Physical Medicine and Rehabilitation Department, Kurmitola General Hospital, Dhaka, Bangladesh

⁶Assistant Surgeon, Maheshpur Union Sub-Centre, Raipura, Narsinhdi, Bangladesh

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*Corresponding Author: Dr. Nuzhat Nuery

Medical Officer, Physical Medicine and Rehabilitation Department, Shaheed Suhrawardy Medical College Hospital, Dhaka, Bangladesh

Abstract

Background: The term ‘frozen shoulder’ should be reserved for a well-defined disorder characterized by progressive pain and stiffness of shoulder which usually resolves spontaneously after about 18 months. The objectives of treatment are to relieve pain and thus restore motion and function of shoulder. Recommended treatment approaches are physical therapy, local and systemic corticosteroid, anti-inflammatory drugs, antidepressants, nerve blocks and manipulation under anesthesia. **Objective:** Compare the efficacy of intra-articular corticosteroid injection and phonophoresis in the treatment of Adhesive Capsulitis. **Method And Material:** : This randomized clinical trial was performed in the Department of Physical Medicine and Rehabilitation, Dhaka Medical College Hospital, Dhaka, Bangladesh, over a period of six months. Study population was the patients of adhesive capsulitis disease attending the out-patient department of Physical Medicine and Rehabilitation during the study period. Meticulous history taking, clinical examination and relevant investigations were done. Eligible participants were allocated into two groups, group A-intra-articular corticosteroid injection and group B- phonophoresis by randomization with the help of lottery. **Statistical Analysis:** Statistical analysis was performed using the statistical program Statistical Package for Social Science (SPSS) version 16.0. Continuous variables (age, etc) were expressed as mean \pm SD and comparison of socio-demographic variable of both groups was measured by chi-square test and outcome variables by t-test. A “p” value <0.05 was considered as significant with 95% confidence interval. **Result:** The mean age of the patients in this study was 51.47 ± 6.30 years. Out of 74 patients 44 were female & 30 were male and the ratio female: male ratio 1.46: 1. Out of 74 patients 40.54% patients had right sided involvement and 59.45% patients had left sided involvement. Among 74 patients, service holder were 25 (33.80%), house wife 23 (31%), retired (12.16%), labour 5(6.755), teacher 4(5.41%) and others 8(10.81%). Significant difference of VAS score and DASH score between Group A and Group B was found at week 2 and Week 6 follow up ($P<0.05$). Significant difference was found at week 2 and week 6 follow up ($P<0.05$) regarding ROM (flexion, abduction, internal rotation, external rotation) in Group A than Group B. **Conclusion:** Present study shown that intra-articular corticosteroid injection was more effective to reduce pain, improve ROM and disability in adhesive capsulitis.

Keywords: Intra-Articular, Corticosteroid, Phonophoresis, Adhesive Capsulitis, Frozen Shoulder.

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INTRODUCTION

Adhesive capsulitis, also known as frozen shoulder, is a common condition involving scapulohumeral pain and loss of motion. This condition was first described by Putman [1] in 1882, termed as

“peri-arthritis scapulohumerale” by Duplay [2] in 1896. Codman, [3] in 1934, characterized the diagnosis of “frozen shoulder” as a condition characterized by pain and reduced range of motion in the affected shoulder. Neviasser, [4] in the pre-arthroscopic era, subsequently used the term “adhesive capsulitis” to describe the

findings of chronic inflammation and fibrosis of joint capsule, although arthroscopic examination would support the term “fibrotic capsulitis” with the absence of adhesions. Frozen shoulder often presents bilaterally and commonly affects contralateral side years after onset of symptoms in the first shoulder, but it does not affect the same shoulder twice. The non-dominant arm is usually involved. The condition is also more common in people with sedentary occupations. The condition has not been reported to have predilection for race [5, 6].

Adhesive capsulitis has three stages. Stage one is the painful or freezing stage, in this stage pain is severe and exacerbated by movement and lasts a few weeks or months. Stage two is adhesive or stiffening phase and generally lasts 4 to 12 months. Pain is usually minimal in this stage, although peri-articular symptoms may be developed from compensatory motion to achieve elevation of arm. Third stage is resolution or thawing phase and lasts 5 to 26 months. During this time pain eases and motion slowly improves, although some patients may improve dramatically over a short period [8].

The objectives of treatment are to relieve pain and thus restore motion and function of shoulder. Recommended treatment approaches are physical therapy, local and systemic corticosteroid, anti-inflammatory drugs, antidepressants, nerve blocks and manipulation under anesthesia. Local anesthetic and steroid injection are among the most frequently used treatments. Local corticosteroid is as effective as physical therapy in treatment of adhesive capsulitis. Combination therapy with intra-articular steroid and physical therapy is more effective than physiotherapy alone [9-11]. Intra-articular corticosteroid injection has been advocated in frozen shoulder with the belief that inflammation plays an important role in pathogenesis. Rather than intra-articular steroid injection, steroid injection can be given in subacromial bursa, biceps tendon, or tender point demonstrated in the physical examination [10]. Intra-articular corticosteroid provides rapid pain relief, mainly in the short-term period [12].

Phonophoresis can be another effective treatment in adhesive capsulitis. The transmission of drugs through intact skin using ultrasound is called phonophoresis. Phonophoresis treatment in common musculoskeletal disorders including adhesive capsulitis of shoulder. Phonophoresis is a variant of ultrasound in which biologically active substances are combined with the coupling medium in the hope that ultrasound will force the active material into tissue [13, 14]. For instance, NSAIDs gel is used in combination with coupling medium to enhance pain relief for local action. Phonophoresis is effectively used in other disease treatment, for example- in treatment of osteoarthritis knee. Phonophoresis can improve painless walking duration more successfully than ultrasound therapy in osteoarthritis knee [15].

But there are a very few studies found about phonophoresis in adhesive capsulitis. As there is scarcity of literatures regarding this issue and furthermore, scarcity of comparative assessment of intra-articular corticosteroid injection and phonophoresis in adhesive capsulitis in our country, the study was designed to compare the efficacy of intra-articular corticosteroid injection and phonophoresis in adhesive capsulitis.

OBJECTIVE

To compare the effects of intra-articular corticosteroid injection and phonophoresis in the treatment of adhesive capsulitis.

METHOD AND MATERIAL

This randomized clinical trial with a sample size of 37, was performed in the Department of Physical Medicine and Rehabilitation, Dhaka Medical College Hospital, Dhaka, Bangladesh, over a period of six months. Study population was the patients of adhesive capsulitis disease attending the out-patient department of Physical Medicine and Rehabilitation during the study period. Meticulous history taking, clinical examination and relevant investigations were done. Those who were eligible as per inclusion and exclusion criteria, they were selected as sample from a definite date till desired sample size is reached and eligible participants were allocated into two groups, group A- intra-articular corticosteroid injection and group B- phonophoresis by randomization with the help of lottery. Group A were received intra-articular methylprednisolone acetate 40mg 1ml + 1ml of 2% lidocaine once in 1st visit & group B- Phonophoresis with diclofenac gel was applied in a pulsed method at a frequency of 1 MHz and intensity of 1.5 W/cm² over affected joint for 5 mins, 10 days once daily. Oral NSAIDs, omeprazole, therapeutic exercise were common in both groups. An evaluation was made at initial visit, at 2nd week and 6th week. So, there were two follow up visits and these evaluations were performed by the same investigator. In each visit, measurement of pain intensity and disability level were performed by using visual analogue scale (VAS), range of motion (ROM) and disabilities of the arm, shoulder and hand (DASH).

Statistical Analysis

Statistical analysis was performed using the statistical program Statistical Package for Social Science (SPSS) version 16.0. Continuous variables (age, etc) were expressed as mean \pm SD and comparison of socio-demographic variable of both groups was measures by chi-square test and outcome variables by t-test. A “p” value <0.05 was considered as significant with 95% confidence interval.

RESULT

Table 1 shows the sociodemographic distribution of two groups. There was no statistical difference regarding age between two groups as the p value was 0.545. In group A majority of the participants were female 26(70.27%), but in group B majority were male 19(51.35%). There was no statistical difference regarding gender between two groups as the p value was 0.058. In group A, left sided involvement was 23(62.16%) & right sided involvement was 14(37.83%). In group B left sided involvement were 21(56.76%) & right sided involvement were 16(43.24%). There was no statistical difference regarding shoulder involvement between two groups as

the p value was 0.636 (Fig 1). Fig 2 shows the occupation between the groups. In group A, 14 patients (37.8%) were house wives whereas others were service holder (29.7%, n=11), retired person (8.1%, n=3), teacher (8.1%, n=3), labourer (5.4%, n=2). In group B, 14 patients (37.8%) were service holder whereas others were house wives (24.3%, n=9), retired person (16.2%, n=6), teacher (2.7%, n=1), labourer (8.1%, n=3). In both groups middle class were majority. There was no statistical difference regarding socio-economic class between two groups as the p value was 0.542. There was no statistical difference regarding duration of adhesive capsulitis between two groups as the p value was 0.261.

Table 1: Socio-demographic comparison between two groups

Variable	Group A (n=37)		Group B (n=37)		P value
	n	%	n	%	
Age mean \pm SD (year)	51.03 \pm 5.80		51.92 \pm 6.77		0.545
Gender					
<i>Male</i>	11	29.72	19	51.35	0.058
<i>Female</i>	26	70.27	18	48.64	
Shoulder involvement					
<i>Right</i>	14	37.84	16	43.24	0.636
<i>Left</i>	23	62.16	21	56.75	
Occupation					
<i>Housewife</i>	14	37.8	9	24.3	0.556
<i>Service holder</i>	11	29.7	14	37.8	
<i>Retired</i>	3	8.1	6	16.2	
<i>Teacher</i>	3	8.1	1	2.7	
<i>Laborer</i>	2	5.4	3	8.1	
<i>Others</i>	4	10.8	4	10.8	
Socio-economic class					
<i>Upper class</i>	2	5.40	4	10.81	0.542
<i>Middle class</i>	28	75.67	24	64.86	
<i>Lower class</i>	7	18.71	9	24.32	
Duration of adhesive capsulitis, mean \pm SD	2.52 \pm 0.18		2.47 \pm 0.21		0.261

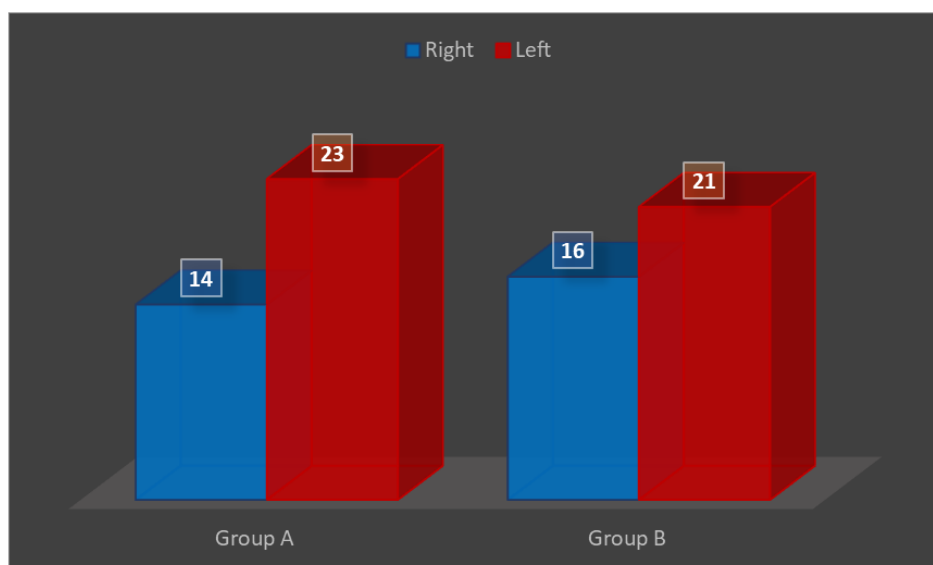


Figure 1: Comparison of shoulder involvement between two groups

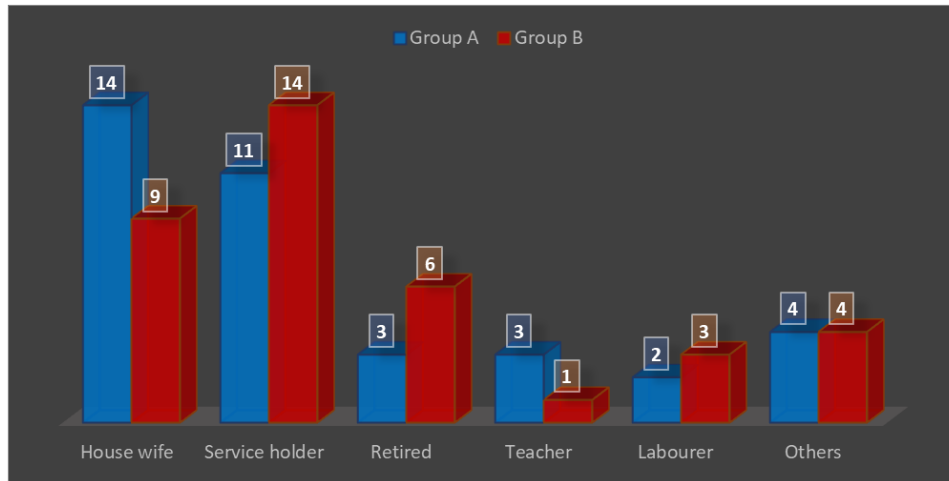


Figure 2: Comparison of occupation between two groups

Table 2 showed different measurement of pain intensity for the evaluation between the comparison group. The comparison of ROM (flexion) between two groups showed that at the initial stage there was no statistical difference between two groups regarding ROM (flexion) (as p value was >0.05). But in week 2 and 6, there was highly significant statistical difference regarding ROM (flexion) between two groups as the p value was <0.001. For the ROM (abduction) between two groups. At the initial stage there was no statistical difference between two groups regarding ROM (abduction) (as p value was >0.05). But in week 2 and 6, there was highly significant statistical difference regarding ROM (abduction) between two groups as the p value was <0.001. Comparison of ROM (internal rotation) between two groups. At the initial stage there was no statistical difference between two groups regarding ROM (internal rotation) (as p value was >0.05). But in week 2 and 6, there was highly significant statistical difference regarding ROM (internal rotation) between two groups as the p value

was <0.05. The comparison of ROM (external rotation) between two groups shoed that at the initial stage there was no statistical difference between two groups regarding ROM (external rotation) (as p value was >0.05). But in week 2 and 6, there was highly significant statistical difference regarding ROM (external rotation) between two groups as the p value was <0.001. The comparison of VAS score between two groups showed that at the initial stage there was no statistical difference between two groups regarding VAS score (as p value was >0.05). But in week 2 and 6, there was highly significant statistical difference regarding VAS score between two groups as the p value was <0.001. The comparison of DASH scores between two groups. At the initial stage there was no statistical difference between two groups regarding DASH score (as p value was >0.05). But in week 2 and 6, there was highly significant statistical difference regarding DASH score between two groups as the p value was <0.001 (obtained by t-test).

Table 2: Different measurement of pain intensity for the evaluation between the comparison group

Pain intensity	Evaluation	Group		P value
		Group A	Group B	
ROM (flexion)	Week 0	103.51±8.07	102.16±7.22	0.450
	Week 2	129.41±7.66	113.92±6.78	<0.001
	Week 6	148.24±7.66	126.93±9.93	<0.001
ROM (abduction)	Week 0	86.32±3.43	85.70±3.08	0.415
	Week 2	122.70±6.52	108.24±6.03	<0.001
	Week 6	146.84±7.28	125.41±8.77	<0.001
ROM (internal rotation)	Week 0	42.11±7.35	41.27±6.75	0.611
	Week 2	51.49±6.73	45.92±6.57	0.001
	Week 6	59.59±4.73	50.41±6.34	<0.001
ROM (external rotation)	Week 0	45.84±7.59	44.38±7.10	0.396
	Week 2	55.68±7.76	49.08±7.13	<0.001
	Week 6	67.73±7.67	55.84±8.24	<0.001
VAS score	Week 0	7.38±5.94	7.59±0.55	0.109
	Week 2	3.89±0.77	5.38±0.64	<0.001
	Week 6	1.18±0.70	3.68±0.75	<0.001
DASH score	Week 0	67.83±4.46	67.14±10.43	0.711
	Week 2	36.89±9.11	49.00±6.02	<0.001
	Week 6	17.08±4.67	31.17±6.66	<0.001

DISCUSSION

Total 74 patients of adhesive capsulitis were taken for this study. 37 patients were selected for intra-articular steroid and another 37 for phonophoresis group by randomization. Patients aged between 40 to 65 years were included in this study. Mean age of all patients was 51.47 ± 6.30 years. In a study done by Barua SK and colleagues [16] found mean age of the patient was 51.73 ± 10.01 years that is almost similar with this current study. The study done by Dogru H and colleagues [17] found mean age were 55.4 ± 7.6 and Celik D [18] found mean age were 52.1 years.

Both male and female were included in this study. Out of 74 patients 44 were female & 30 were male and the ratio female: male ratio 1.46: 1. Dogru H and colleagues [17] found female: male ratio 1.33:1. But Barua Sk and colleagues [16] found male: female ratio 1.07:1.

The current study revealed that 40.54% patients had right sided involvement and 59.45% patients had left sided involvement. But Barua SK and colleague [16] found right sided (53.3%) involvement is more than left (46.7%). Dogru H and colleagues [17] found left side is more involved than right.

In this study service holder 25 (33.80%), house wife 23 (31%), retired (12.16%), labour 5(6.755), teacher 4(5.41%) and others 8 (10.81%). Barua SK found and colleague¹⁴ 45% were house wife, 33.3% service holder, 6.7% were businessman, 1.7% teacher and 13.3% were retired person. The current study shows that middle class family was 70.27%. But Barua SK and colleagues [16] found lower class was more 53.3%. All of the patients' durations of disease is more than 2 months but less than 3 months.

In comparison between two groups there was no significant difference before treatment in improvement of ROM (flexion) ($p > 0.05$). From 2nd weeks onwards the difference between outcomes of two groups was significant ($p < 0.05$). ROM (flexion) was increased more in group A compared to group B because early reduction of pain after intra-articular steroid might enhance to increase ROM. The effect of intra-articular steroid improves ROM (flexion) found in curette S and colleagues [19] and also in Maryum M and colleague [20].

In comparison between two groups there was no significant difference before treatment in improvement of ROM (abduction) ($p > 0.05$). From 2nd weeks onwards the difference between outcomes of two groups was significant ($p < 0.05$). ROM (abduction) was increased more in group A compared to group B because early reduction of pain after intra-articular steroid might enhance to increase ROM. The effect of intra-articular steroid improves ROM (abduction) found in curette S and colleagues [19] and also in Maryum M

and colleagues [20] Barua and colleagues [16] also showed that phonophoresis improved abduction in adhesive capsulitis.

In comparison between two groups there was no significant difference in baseline data of ROM (internal rotation) ($p > 0.05$). From 2nd weeks onwards the difference between outcomes of two groups was significant ($p < 0.05$). ROM (internal rotation) was increased more in group A compared to group B because early reduction of pain after intra-articular steroid might enhance to increase ROM. Barua and colleagues [16] also showed that phonophoresis improved internal rotation in adhesive capsulitis.

In comparison between two groups there was no significant difference before treatment in improvement of ROM (external rotation) ($p > 0.05$). From 2nd weeks onwards the difference between outcomes of two groups was significant ($p < 0.05$). ROM (external rotation) was increased more in group A compared to group B because early reduction of pain after intra-articular steroid might enhance to increase ROM. The effect of intra-articular steroid improves ROM (external rotation) found in curette S and colleagues [19] and also in Maryum M and colleagues [20]. But Barua and colleagues [16] also showed that phonophoresis improved external rotation in adhesive capsulitis.

In comparison between two groups there was no significant difference regarding pain, (measured by VAS) was seen before treatment ($P > 0.05$) but after treatment there was significant difference in between two groups ($P < 0.05$) and group A showed better outcome than group B. Site of involvement and age group variations in between groups might have role to make such a difference ($p < 0.05$). Arslan S and colleagues [21] showed that intra-articular steroid improves VAS score significantly. Barua Sk and colleague [16] found that after phonophoresis VAS score improved significantly.

Functional outcome were assessed by DASH (Disabilities of the arm, shoulder and hand). In comparison between two groups there was significant difference found before treatment ($p < 0.05$) but after at the end of 6th weeks group A DASH reduced from 67.83 to 17.08, but group B DASH reduced from 67.14 to 31.17. So significant difference ($p < 0.05$) was found between two groups. DASH score was reduced more in group A compared to group B because early reduction of pain and increased ROM after intra-articular steroid injection. Site of involvement in between two groups might play a role in such a difference ($p < 0.05$).

In early painful stage (freezing stage) of adhesive capsulitis there are many inflammatory mediators present in affected shoulder. In this current study, by phonophoresis, NSAID (diclofenacgel) was

transmitted through skin in affected shoulder and intra-articular steroid was directly introduced into affected joint. Corticosteroid is more effective than NSAIDs in reducing inflammation. This study also found intra-articular corticosteroid is better in improving pain, ROM and DASH.

CONCLUSION

Overall improvement is noticed following intra-articular corticosteroid and phonophoresis. But significantly higher changes are noticed in patients who received intra-articular corticosteroid than phonophoresis as evidenced by improvement of VAS score, ROM and DASH score. As a result, it can be concluded that intra-articular corticosteroid is relatively effective technique as a treatment option of early stage of adhesive capsulitis. However, further larger studies are needed to finalize the comment.

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