

# Effects of Subscapularis Neuro Muscular Reduction (NMR) in Adhesive Capsulitis

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## Abstract

**Background:** To determine the effects of Subscapularis Neuromuscular Reduction (NMR) in Adhesive Capsulitis patients on pain, Range of Motion (ROM) and Quality of life.

**Methods:** In this randomized controlled trial patients with freezing and frozen stage of Adhesive capsulitis and limited range of movement were included. Patients were randomly divided into control (Group A) and experimental group (Group B). The patients of Group A were treated with conventional physical therapy treatment protocol and patients of group B were treated with subscapularis neuromuscular reduction along with conventional physical therapy. The patient outcome measures were assessed using numeric pain rating scale (NPRS), SPADI (shoulder pain and disability index) and ranges via goniometry. Data was analyzed by SPSS 21.

**Results:** Both group showed significant improvement, but the end value comparison showed significant difference. NMR (Neuromuscular Reduction) on Subscapularis muscles improved the pain, ROM and Patient functional status more as compared to the conventional physical therapy group. The NPRS mean value for control group was  $2.90 \pm 1.09$  and mean value for experimental group was  $2.05 \pm 1.10$  with p value of 0.021 while the mean value of SPADI for control group was  $33.52 \pm 9.96$  and for experimental group was  $26.72 \pm 8.00$  with p value of 0.026.

**Conclusion:** Treatment groups showed improvement by reducing pain, improving range of motion and functional status but neuromuscular reduction of subscapularis muscles was found to be more effective.

**Key Words:** Adhesive Capsulitis, Neuromuscular Reduction, Subscapularis Muscle

## Introduction

Adhesive Capsulitis (AC) is a condition of uncertain etiology characterized by significant restriction of both active and passive shoulder motion that occurs in the absence of a known shoulder disorder.<sup>1</sup> AC was recently defined as range of motion (ROM) loss of >25 % in at least two movement planes, together with at least 50 % loss of passive external rotation in comparison to the uninvolved shoulder.<sup>2</sup> It causes remarkable disability due to pain and lack of movement that limits ADLs, work and recreational activities. AC has an incidence of 3-5% in the general population and up to 20% in those with diabetes.<sup>3-7</sup> The typical patient that develops AC is a female in her 5th to 7th decade of life.<sup>8,9</sup> There are 4 stages of AC. First stage is "painful phase" which is demonstrated by gradual onset of symptoms and mild decrease in ROM, symptoms last for < 3 months. Second stage is "freezing stage". It is characterized by symptoms for 3-9 months after onset with high prevalence of nocturnal pain and loss of active as well as passive ROM. Third stage is "Frozen stage" symptoms remain prevalent from 9-14 months with pain at end ROM and significant shoulder stiffness. Fourth stage is "Thawing stage" occurs from 15 to 24 months and with minimal pain with progressive improvement in range of movement.<sup>10</sup> According to studies it is reported that almost 50% of external rotation is limited in affected shoulder as compared to unaffected one.<sup>11</sup> Physiotherapy is considered as treatment method for the management of AC. Therapeutic exercises are more beneficial in different pathological conditions of shoulder than other methods of intervention.<sup>12</sup> Neuromuscular Reduction (NMR) is referred as a vigorous technique which mainly emphasizes the treatment of soft tissues. NMR is a combined technique that uses deep pressure along with muscle origin and insertion with active movement of target area.<sup>13</sup>

## Patients and Methods

This Randomized Controlled Trail (RCT) was conducted at Pakistan Railway General Hospital (PRH) Rawalpindi. The duration of the study was six months i.e. From February 2017 to July 2017. A total of 44 patients using convenience sampling were recruited into the study after screening as per inclusion criteria. The inclusion criteria were freezing and frozen stage of AC, age ranging between 30-70 years with limited ROM. Patients who had frozen shoulder secondary to cervical spondylosis, limited shoulder ROM due to trauma and patients with diagnosed osteoporosis were excluded from the study. Informed consent was taken from patients prior to enrollment in the study to ensure their willingness. The patients were randomly divided into two groups, i.e. Group A (Control group) and Group B (Experimental group) via simple lottery method. A total of 8 treatment sessions were planned over 2 weeks; 4 sessions per week. From selected 44 patients; n=22 were allocated to each group, 39 patients completed the study. 5 dropouts were reported. Out of 39 patients (n=21) belonged to Group A and n=18 were in Group B. Shoulder Pain and Disability Index (SPADI), Numeric Pain Rating Scale (NPRS) and Range of Motion (ROM) were used as assessment tools in the study. Treatment protocol for Group A included Ultrasound, Traction, Joint mobilization, Shoulder Wheel, Codman exercises, Shoulder pulley, Pendulum exercises and home plan comprising self-stretching and strengthening exercises for the rotator cuff muscles. Treatment protocol for Group B was same as above with addition of Subscapularis Neuromuscular reduction. Data was analyzed through SPSS 21 version. Normality of data was checked.

## Results

Mean age of all participant was 51.53±5.71 years. Majority (82.1%) were house wives. The affected shoulder of patients was 51.3% right and 48.7% left shoulder. Majority (53.8%) gave history of pain from last 9 to 12 months. The aggravating factor was predominantly activity (56.4%) (Table 1). Base line comparison between control and experimental group on the ranges of external rotation were control group 30.23°±10.18° and for experimental group was 31.11°±7.96° with p value of 0.77. The mean values for the range of Abduction for control group was 60.23°±27.31° and for experimental group was 58.05°±18.07° with the p value of 0.774 (Table 2). The pre mean value for external rotation was 30.23°±10.18° and post mean was 50.38°±11.66° with the mean difference

of 20.15° ±1.48°. The p value for external rotation was <0.05. The pre mean for abduction was 60.23°±27.31° and post mean was 101.66°±23.25° with the mean difference of 41.43°±4.06° (Table 3).

**Table 1: Demographic data**

Variables	Overall	Control	Experimental
Age	51.53±5.71	51.47±5.63	51.6±59.7
Occupation			
1. House wife	82.1%	90.5%	72.2%
2. Office worker	5.1%	4.8%	5.6%
3. Teacher	12.8%	4.8%	22.2%
Referral			
1. Self	28.2%	38.1%	22.2%
2. GP	5.1%	4.8%	0%
3. Ortho	66.7%	57.1%	77.8%
Affected Side			
1. Right	51.3%	52.4%	50%
2. Left	48.7%	47.6%	50%
Onset of pain			
1. < 6 months	23.1%	28.6%	16.7%
2. 6 to 9 months	53.8%	47.6%	61.1%
3. >1 year	23.1%	23.8%	22.2%
Aggravating Factors			
1. Activity	56.4%	66.7%	44.4%
2. Pain with movement	25.6%	14.3%	38.9%
3. Sleeping	17.9%	19%	16.7%
Relieving Factors			
1. Rest	41%	47.6%	33.3%
2. Medications	59%	52.4%	66.7%

**Table 2: Comparison between groups**

Variables	Groups	Mean Value	P Value
ER(ROM)	Control	30.23°±10.18°	0.77
	Experimental	31.11°±7.96°	
Abd(ROM)	Control	60.23°±27.31°	0.774
	Experimental	58.05° ±18.07°	
IR(ROM)	Control	7.61°±12.80°	0.395
	Experimental	24.44 °±9.68°	
NPRS	Control	5.66 ±1.01	0.395
	Experimental	5.72 ± 1.07	
SPADI	Control	65.33 ±10.59	0.472
	Experimental	67.77 ±10.32	

The pre mean for external rotation was 31.11°±7.96° and post mean was 60.55°±8.89° with mean difference of 29.44°±0.93°. The p value was 0.033. The pre mean for abduction was 58.05°±18.07° and post mean was 121.94°±14.76° with mean difference of 63.89°±3.31° (Table 4). After interventions of two weeks the mean value of External rotation for control was 50.38°±11.66° and for experimental group was

60.55°±8.89° with the p value of 0.05. The mean value of abduction for control group was 101.66°±23.25° whereas for experimental group 121.96°±14.76° with p value of 0.003. Internal rotation for control group mean value of 41.90°±14.27° while for the experimental group it was 50.27°±7.75° showed p value of 0.033 (Table 5).

**Table 3: Within group comparison of control group**

Variables	Pre Mean	Post Mean	Mean difference	P Value
ER(ROM)	30.23°±10.18°	50.38°±11.66°	20.15° 1.48°	P<0.05
Abd(ROM)	60.23°±27.31°	101.66°±23.25°	41.43°±4.06°	P<0.05
IR(ROM)	27.61°±12.08°	41.90°±14.27°	14.29°±2.19°	P<0.05
NPRS	5.66±1.01	2.90±1.09	2.76±0.08	P<0.05
SPADI	65.33±10.59	33.5±9.96	31.83±0.63	P<0.05

**Table 4: Within group comparison of experimental group**

Variables	Pre Mean	Post Mean	Mean difference	P Value
ER(ROM)	31.11°±7.96°	60.55°±8.89°	29.44°±0.93°	.337
Abd(ROM)	58.05°±18.07°	121.94°±14.76°	63.89°±3.31°	P<0.05
IR(ROM)	24.44°±9.68°	50.27°±7.75°	25.83°±1.93°	P<0.05
NPRS	5.722±1.074	2.055±1.109	3.667±0.035	P<0.05
SPADI	67.77±10.34	26.72±8.00	41.05±2.23	0.01

**Table 5: Between groups comparison after after 2 weeks**

Variables	Groups	Mean Values	P Values
ER(ROM)	Control	50.38°±11.66°	0.05
	Experimental	60.55°±8.89°	
Abd(ROM)	Control	101.66°±23.25°	0.003
	Experimental	121.96°±14.76°	
IR(ROM)	Control	41.90°±14.27°	0.033
	Experimental	50.27°±7.75°	
NPRS	Control	2.90±1.09	0.021
	Experimental	2.05±1.10	
SPADI	Control	33.52±9.96	0.026
	Experimental	26.72±8.00	

## Discussion

In the present study the effects of conventional therapy with addition of neuromuscular reduction of subscapularis muscle in adhesive capsulitis patients on pain, ROM and functional status were assessed. Both groups showed improvements but experimental group showed significant difference in terms of reducing pain, improving ROM and functional status. A case report was done by Pakistani researchers at Shalamar Hospital Lahore in June 2017. They concluded that the combined physiotherapy including TENS, Short Wave Diathermy, and therapeutic ultrasound, manual therapy which includes joint mobilizations and other therapeutic exercise have significant results in terms of reducing pain and improving ROM.<sup>14</sup> A study,

conducted at Dow University Karachi in 2014, showed that therapeutic exercises alone in treating adhesive capsulitis. Intra group comparison did not show any significant difference. At the end, results showed that therapeutic exercises alone and manual therapy with therapeutic exercises have same efficacy in the management of AC.<sup>15</sup> Current study also showed improvements after manual therapy. A study of similar kind was done on the effectiveness of muscle energy technique and Maitland mobilization in management of AC. They found that at initial level both techniques were effective. But after several treatment sessions they concluded that Maitland mobilization techniques were more effective in improving ROM but when pain is acute or chronic then muscle energy techniques are more beneficial.<sup>16</sup> A randomized controlled trial was conducted in 2015, the purpose of the study was to look for importance of electrotherapy combined with manual therapy in treating Adhesive capsulitis. By comparing the moist heat and stretching with Interferential therapy and end range mobilization, it showed the significant positive results in reducing pain, improving range of motion and disability but end range mobilizations had more significant results.<sup>17</sup> A comparative study was done in 2010 they checked the efficacy of anterior joint mobilization and posterior mobilization in improving the internal range of motion. After 3 weeks of physiotherapy sessions they concluded that the anterior humeral glide were more effective in improving internal rotation in shoulder joint along with therapeutic ultrasound and traditional therapeutic interventions.<sup>18</sup> A randomized controlled trial was conducted to evaluate the importance of rotator cuff strengthening in the management of AC patients. It concluded that the addition of rotator cuff strengthening in management of AC show significant results in terms of decreasing pain and disability.<sup>19</sup>

## Conclusion

Both treatment groups showed improvement in reducing pain, range of movement and functional status, but Neuromuscular reduction of subscapularis muscle was found more effective in the management of AC as compared to the conventional physical therapy alone.

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**Key for Contribution of Authors :**

A=Conception/ Study/ Designing /Planning;  
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C=Analysis/Interpretation/ Discussion;  
D= Manuscript writing;E= Critical review;  
F= Facilitated for reagents/Material/Analysis