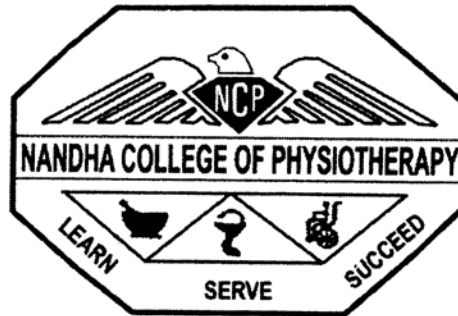


**A COMPARATIVE STUDY TO FIND OUT THE EFFECTS OF
CAPSULAR STRETCHING OVER MUSCLE ENERGY TECHNIQUE
IN THE MANAGEMENT OF FROZEN SHOULDER**

A Dissertation Submitted to
THE TAMILNADU Dr. M.G.R. MEDICAL UNIVERSITY
CHENNAI
in partial fulfillment of the requirements
for the award of the

MASTER OF PHYSIOTHERAPY
(ADVANCED PHYSIOTHERAPY IN ORTHOPAEDICS)
DEGREE

Submitted by
Reg. No.27092002



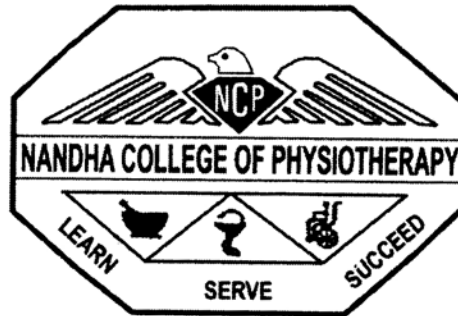
NANDHA COLLEGE OF PHYSIOTHERAPY
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INTRODUCTION

The expression “**If you don’t use it you loose it**” applies perfectly to diseases of the shoulder because any voluntary or involuntary guarding of the shoulder may result in loss of mobility.¹The shoulder is the most movable but unstable joint in the body because of the range of motion it allows. It is easily to subject to injury because the ball of the upper arm is larger than the socket that holds it. To remain stable, its muscles, tendons and ligaments must anchor the shoulder.

Shoulder pain and stiffness are common presenting symptoms in patients who seek evaluation from musculoskeletal physicians. A common quandary with this set of complaints exists in determining the cause and effect cycle of the symptoms. It is often difficult to establish which came first and whether pain results from stiffness or produces it. To answer these important questions thorough understanding of the differential diagnosis and pathophysiology of shoulder stiffness is necessary.

Shoulder stiffness is a poorly understood disorder of the glenohumeral joint and this poor understanding is partly due to the use of confusing terminology. Over the years, the stiff shoulder was labeled initially **periarthrits** by Duplay in 1872, then **frozen shoulder** by Codman in 1934 and later **adhesive capsulitis** by Neviaser in 1945.³Codman described the disorder known as frozen shoulder as a “condition difficult to define, difficult to treat and difficult to explain from the point of view of

pathology. Neviasser was the first to recognize “a chronic inflammatory process” that resulted in capsularfibrosis, or thickening and contracture of the capsule.²

Some of the more common terms that are synonyms for frozen shoulder are adhesive capsulitis, peri arthritis, stiff and painful shoulder, periarticular adhesions, Duplay’s disease, scapulohumeral peri arthritis, tendinitis of the short rotators, adherent subacromial bursitis, painful stiff shoulder, bicipital tenosynovitis, subdeltoid bursitis, humeroscapular fibrositis, shoulder portion of the shoulder of the shoulder hand syndrome, bursitis calcarea, supraspinatus tendinitis, periarthrosis humeroscapularis, and a host of foreign language terms.³

Frozen shoulder is a pathology of often unknown aetiology characterized by painful and gradually progressive restriction of active and passive glenohumeral joint motion (Baslund et al,1990;Pearsall and Speer,1998).Approximately 2-3% of adults aged between 40 and 70 years develop frozen shoulder with a greater occurrence in women (Anton,1993;Connolly,1998;Stam,1994). Full or partial restoration of motion may occur over months or years with or without medical intervention (Ogilvie-Harris et al, 1995).

In this study the treatment for frozen shoulder mainly consists of **Capsular stretching** and **Muscle energy technique**.

CAPSULAR STRETCHING : The glenohumeral joint capsule has a significant degree of inherent laxity with a surface area that is twice that of the humeral head.

MUSCLE ENERGY TECHNIQUE : Is a direct hands-on therapy originally developed by Dr.Fred Mitchell, Sr. Osteopathic physician, and continued by Dr.Fred

Mitchell,Jr

It utilizes the patient's own gentle muscle contractions and body positioning to normalize joint motion. It is a non-invasive technique that can be used to lengthen a shortened contracted or spastic muscle; to strengthen a physiologically weakened muscle or group of muscles; to reduce localized oedema to relieve passive congestion and to mobilize an articulation with restricted mobility. Muscle energy technique targets the soft tissues primarily, but it also makes a major contribution towards joint mobilization. According to Bourdillon much of the joint restriction is a result of muscular tightness and shortening.

NEED FOR THE STUDY

The treatment of patients with frozen shoulder remains controversial. Many studies have been reported in the orthopaedic and rheumatology literature during the last 30 years. Treatment options documented in the literature include: benign neglect¹⁹, supervised physical rehabilitation^{20,21}, nonsteroidal antiinflammatory medications, oral corticosteroid, intraarticular injections, distension arthrography, closed manipulation²², open surgical release, and more recently, arthroscopic capsular release.²³ It is difficult to compare the results reported in these studies because of the lack of documentation of the stage of frozen shoulder being treated. Shoulder pain and stiffness are common presenting symptoms in patients with frozen shoulder.

AIMS AND OBJECTIVES OF THE STUDY

AIM:

To Study the effects of Capsular stretching and Muscle energy technique in

the management of frozen shoulder.

Objectives :

1. To find out the effectiveness of capsular stretching on frozen shoulder.
2. To find out the effectiveness of muscle energy technique on frozen shoulder.
3. To compare the effectiveness of capsular stretching exercises over muscle energy technique in the management of frozen shoulder.

HYPOTHESIS

Experimental Hypothesis:

There may be a significant difference between Capsular stretching and Muscle Energy Technique in improving ROM and function in frozen shoulder. There may not be a significant difference between Capsular stretching and Muscle Energy Technique in improving ROM and function in frozen shoulder.

Null Hypotheses:

There may not be a significant difference between Capsular stretching and Muscle Energy Technique in improving ROM and function in frozen shoulder.

REVIEW OF LITERATURE

M.A.Harrast, Anita G.Rao (2004), have mentioned the use of a typical exercise program of active and passive stretching with the goal of maintaining and regaining range of motion in frozen shoulder. The basis of this program is four-quadrant stretching of shoulder joint capsule which includes forward flexion, internal rotation, external rotation and cross-body adduction.

Fusun Guler et al (2004) mentioned that nonsteroidal anti-inflammatory drugs, local anaesthetic and corticosteroid injections into the glenohumeral joint, calcitonin and antidepressants, distension arthrography, closed manipulation, physical therapy modalities and stretching exercises are the most common non-surgical approaches to treatment in frozen shoulder.

P.W.McClure et.al (2004) used the University of Pennsylvania Shoulder Scale, which has subscales for pain, satisfaction, and functional activities. The combined total of the subscale scores may be used to determine a composite score based on 100 points, with higher score being better. This scale has documented psychometric characteristics, including test-retest reliability (ICC=0.94), responsiveness (standardized response mean=8.6, 90% confidence interval (CI), and a minimal detectable change score of 12.1(90%CI).

Captain Eric Wilson et al (2003) reported that MET combined with supervised neuromuscular re-education and resistance exercises alone for decreasing disability and improving function in patients with low back pain.

Sarah Jackins (2000) has used capsular stretching in the non-operative treatment of rotator cuff injuries, where she recommended her patients to perform the capsular stretching of the shoulder 5 times a day.

Mantone et al (2000) have documented the importance of stretching exercises for the anterior, posterior and inferior shoulder capsule as a part of the motion programme to improve the joint range of motion in stiff shoulder.

Griggs et al (2000) reported that following a physical therapy programme consisting of passive stretching exercises (forward elevation, external rotation, horizontal adduction and internal rotation) at a mean follow-up of 22 months, patients demonstrated a reduction in pain score from 1-57 to 1-16 in a range from one to five points, improvements in active range of motion, and 64 patients (90%) reported a 'satisfactory outcome.

Hannafin and Chiaia (2000) have mentioned that low load; prolonged stretch produces plastic elongation of tissues as opposed to high tensile resistance seen in high load, brief stretch. Heat may be used to promote muscle relaxation before stretching and cryotherapy may be used to reduce discomfort after stretching.

BenzaminA.Goldberg et.al (1999) the majority of patients with frozen shoulder can be successfully treated with a strictly home based physiotherapy program consisting of 5 repetitions of each exercise 5 times every day with gentle stretching as tolerated against directions of stiffness

Levit K (1999) states 'The usual mobilization and manipulation techniques are useless in dealing with the shoulder joint itself'. This highlights the critical importance of soft tissue evaluation and treatment in shoulder joint in particular.

Frances Cuomo (1999) mentioned that non-operative treatment is indicated for those primary or secondary frozen shoulders with stiffness of less than 6 months and or no previous treatment. Each patient should begin an active-assisted range of motion exercise program complying with gentle, passive, stretching exercises. These exercises should be performed four to five times daily, including forward elevation, internal and external rotation, and cross body adduction.

Benzamin A. Goldberg et al (1999) anterior capsule tightens during external rotation and the posterior capsule tightens with internal rotation and cross body adduction.

Harryman DT (1998) reported that in 226 frozen shoulders treated with stretching exercises alone, Watson-Jones found that only 5% of patients did not regain satisfactory motion with 6 months. However, Rizk et al (1998) noted that 60% of patients treated with physical therapy achieved the ability to sleep pain free after 5 months duration.

Helen Owens (1997) has mentioned the use of cryotherapy in frozen shoulder. Cryotherapy, like heat application, produces increased circulation and vasodilatation to the area. There is however, an initial vasoconstriction with cold application. Ice can prove beneficial in reducing any post exercise soreness.

Mao et al (1997) reported statistically significant improvements in glenohumeral active range of motion, and reappearance of the axillary recess (via arthrography) in subjects managed with 12 to 18 sessions of physical therapy including moist heat, ultrasound, passive joint mobilizations, and flexibility and strengthening exercises.

MATERIAL & METHODOLOGY

Sample selection:

Sampling : Simple random sampling.

Source of data: Out Patient Department ,Nandha College of Physiotherapy , Government District Head quarters Hospital, Erode and L.K.M. Orthopaedic Hospital, Erode.

Sampling Procedure: -A total number of 110 subjects were screened out of which 60 Subjects were selected for the study.

Then the selected patients who were willing to participate were randomly divided into two groups of 30 each in Group A and Group B. The details and the purpose of the study were explained to all the patients and informed consent was obtained (Refer Annexure 10.3) and demographic data (Refer Annexure 10.2) were collected from each patient.

Study design: - Experimental study

Criteria for selection:

Inclusion Criteria

- Patients with stage 2 or stage 3 frozen shoulder of any age group.

Exclusion Criteria

- .Patients who have undergone a surgical procedure of the shoulder less than 4 weeks prior to study enrolment.
- Patients who have undergone total shoulder arthroplasty.

- Patients with reflex sympathetic dystrophy.
- Patients with rheumatoid arthritis.
- Patients with glenohumeral arthritis.
- Patients with neoplasms in and around the shoulder joint.
- Patients with cervical pathology.

Materials used

1. Treatment couch
2. Towels
3. Moist pack
4. Universal double arm (360°) goniometer
5. Cold pack
6. University of Pennsylvania Shoulder Score (1st sub set).

STATSITICAL TOOLS

$$\text{STANDARD DERIVATION} = \sqrt{\frac{\sum(X - \bar{X})^2}{n-1}}$$

$$\text{MEAN DERIVATION} = \sum \frac{|X - \bar{X}|}{n}$$

PAIRED – T- TEST

$$t = \frac{\bar{d}}{s} \sqrt{n}$$

UN PAIRED T-TEST

$$t = \frac{|X_1 - X_2|}{s \sqrt{\frac{1}{n_1} + \frac{1}{n_2}}}$$

ANOVA

- i. Total S.S. = $\Sigma x^2 - \frac{(\Sigma X)^2}{N}$
- ii. Between S.S. = $\frac{(\Sigma x_1)^2}{n_1} + \frac{(\Sigma x_2)^2}{n_2} + \frac{(\Sigma x_3)^2}{n_3} - \frac{(\Sigma x)^2}{N}$
- iii. Within S.S. = Total S.S. – Between S.S.

n = total number

x = no. of observation

$$\bar{d} = \frac{\Sigma d}{n}$$

d= different between pre-post

$$s = \frac{\sqrt{\Sigma(d - \bar{d})^2}}{n-1}$$

$$\bar{X}_1 = \frac{\Sigma x_1}{n_1}$$

$$\bar{X}_2 = \frac{\Sigma x_2}{n_2}$$

$$S = \frac{\sqrt{(n_1-1)s_1^2 + (n_2-1)s_2^2}}{n_1+n_2-2}$$

| |
|-----------------------|
| S: S = sum of squares |
|-----------------------|

Procedure

The range of motion of the affected shoulders was assessed actively with a universal double-armed transparent goniometer by placing the subjects in supine lying position. The measurements were taken for shoulder flexion, extension, abduction, internal rotation and external rotation.

Group A: Subjects received treatment with moist pack for 10 minutes followed by capsular stretching for the anterior, inferior and posterior capsules of the shoulder. To stretch the anterior capsule the subject was positioned either in side lying with the affected arm upwards or in high sitting and the shoulder and arms were brought backwards into extension and this stretch was maintained for a minimum of 30 seconds and maximum duration up to the point of pain experienced by the patient.¹⁵ Posterior capsule stretching was performed with the subject in supine position and therapist performing cross body adduction.¹⁵ Antero- inferior capsule was stretched with the subject in supine position. To stretch the antero inferior capsule the affected arm is taken towards the extreme of attainable elevation and counter pressure is maintained at the patient's sternum to prevent spinal extension. Each stress is gentle but firm and not released until pain rather than discomfort is experienced.¹³ Group A received capsular stretching of 5 repetitions per set, 5 sets per session, 1 session per day and 5 days a week for 2 weeks. Capsular stretching was followed by 10 minutes of icing to prevent post exercise muscle soreness.

Group B: Subjects received treatment with moist pack for 10 minutes followed by MET for abduction, flexion, extension, and rotation restriction which were again followed by icing for 10 minutes. ZSubjects were positioned in the lateral recumbent position with the involved upper extremity upper most. Direct the patient to extend the elbow against your equal counterforce. Maintain the forces for 3-5 seconds, allow the patient to relax for 2 seconds, take up the slack and then repeat.

Group B received muscle energy techniques for the shoulder joint of 5 repetitions per set, 5 sets per session, 1 session per day, 5 days a week for 2 weeks with each repetition maintained for duration of 7 – 10 seconds.

DATA PRESENTATION AND ANALYSIS

TABLE 5.1 Mean and Standard deviation of ROM of Group A.

| Range | Duration | Mean | Standard deviation |
|-------------------|---------------|--------|--------------------|
| Flexion | Pre-Rx | 91.30 | 22.79 |
| | After 1 week | 112.43 | 20.12 |
| | After 2 weeks | 128.26 | 18.94 |
| Extension | Pre-Rx | 32.03 | 8.01 |
| | After 1 week | 42.26 | 9.66 |
| | After 2 weeks | 50.93 | 9.24 |
| Abduction | Pre-Rx | 54.66 | 14.78 |
| | After 1 week | 71.76 | 14.91 |
| | After 2 weeks | 91.73 | 14.99 |
| Internal rotation | Pre-Rx | 43.10 | 11.25 |
| | After 1 week | 57.20 | 11.47 |
| | After 2 weeks | 70.26 | 8.29 |
| External rotation | Pre-Rx | 31.13 | 7.17 |
| | After 1 week | 48.00 | 9.18 |
| | After 2 weeks | 64.03 | 8.15 |

Table 5.1

The mean and standard deviation of ROM of affected shoulder of Group A measured before the treatment(Pre-Rx),after1 week of treatment and at the end of the treatment (after2 weeks). The mean of base line of flexion is 91.30 and after 2 weeks the mean is 128.26. 50.93, for abduction base line mean is 54.66 and after 2 weeks it is 91. 73. For internal rotation base line mean is 43.10 and after 2 weeks it is 64.03, for external rotation the base line means is 31.13 and after 2 weeks it is 64.03 it shows that there is improvement in range of motion head the end of 2 weeks of treatment when compared to the first day in all the ranges. For extension base line mean is 32.03 and after 2 weeks

TABLE 5.2 Mean and Standard deviation of ROM of Group B.

| Range | Duration | Mean | Standard deviation |
|-------------------|-----------------|-------------|---------------------------|
| Flexion | Pre-Rx | 94.80 | 26.38 |
| | After 1 week | 100.36 | 25.42 |
| | After 2 weeks | 113.13 | 26.21 |
| Extension | Pre-Rx | 29.56 | 10.87 |
| | After 1 week | 35.30 | 10.57 |
| | After 2 weeks | 42.16 | 10.32 |
| Abduction | Pre-Rx | 52.00 | 12.70 |
| | After 1 week | 59.20 | 16.35 |
| | After 2 weeks | 72.43 | 17.13 |
| Internal rotation | Pre-Rx | 40.46 | 14.71 |
| | After 1 week | 45.13 | 14.63 |
| | After 2 weeks | 51.70 | 13.78 |
| External rotation | Pre-Rx] | 27.13 | 6.61 |
| | After 1 week | 26.70 | 11.15 |
| | After 2 weeks | 35.66 | 10.70 |

Table 5.2 The mean and standard deviation of ROM of affected shoulder of Group B measured before the treatment(Pre-Rx),after1 week of treatment and at the end of the treatment (after2 weeks). The mean of base line of flexion is 94.80 and after 2 weeks of treatment it is 113.13, the base line mean of extension is 29.56 and after 2 weeks it is 42.16. The base line mean of abduction is 52.00, and after 2 weeks it is 72.43. The base line mean for internal rotation is 40.46 and after 2 weeks it is 51.70, the base line mean for external rotation is 27.13 and after 2 weeks is 35.66. It shows that there is improvement in range of motion at the end of 2 weeks treatment in all the ranges when compare to the first day (that is before treatment).

TABLE 5.3 Inter-group comparison of ROM of Group A and B obtained by Independent t-Test

| Range | Duration | Mean Diff. | t | p |
|-------------------|-----------------|-------------------|----------|------------|
| Flexion | Pre-Rx | 3.5 | 0.550 | 0.585 * |
| | After 1 wk | 12.06 | 2.038 | 0.046 ** |
| | After 2 wks | 15.13 | 2.562 | 0.013 ** |
| Extension | Pre-Rx | 2.466 | 1.000 | 0.321 * |
| | After 1 wk | 6.966 | 2.664 | 0.010 ** |
| | After 2 wks | 8.766 | 3.465 | 0.001 *** |
| Abduction | Pre-Rx | 2.666 | 0.749 | 0.457 * |
| | After 1 wk | 12.566 | 3.111 | 0.003 *** |
| | After 2 wks | 19.30 | 4.643 | 0.000 **** |
| Internal rotation | Pre-Rx | 2.633 | 0.779 | 0.439 * |
| | After 1 wk | 12.066 | 3.554 | 0.001 *** |
| | After 2 wks | 18.566 | 6.319 | 0.000 **** |
| External rotation | Pre-Rx | 4.000 | 2.245 | 0.029 ** |
| | After 1 wk | 21.30 | 8.074 | 0.000 **** |
| | After 2 wks | 28.36 | 11.544 | 0.000 **** |

**** = very highly significant, ***= highly significant, **= significant, *= not significant.

Table 5.3 shows the 'p' value is .000 at the end of 2 weeks for abduction, internal rotation and external rotation which means that there is very high significant changes in these ranges at the end of 2 weeks of treatment. p=.001 for extension and p=.013 for flexion at the end of 2 weeks of treatment which is also significant.

TABLE 5.4 One way ANOVA for overall changes in range of motion of GroupA.

| Range | Source | Sum of Squares | Mean Square | F | p |
|-------------------|---------------|-----------------------|--------------------|----------|------------|
| Flexion | Between wks | 20638.467 | 10319.233 | 24.112 | 0.000 **** |
| | Within week | 37233.533 | 427.972 | | |
| | Total | 57872.000 | | | |
| Extension | Between wks | 2387.822 | 1193.911 | 10.643 | 0.000 **** |
| | Within week | 9759.833 | 112.182 | | |
| | Total | 12147.656 | | | |
| Abduction | Between wks | 20650.156 | 10325.078 | 46.539 | 0.000 **** |
| | Within week | 19301.900 | 221.861 | | |
| | Total | 39952.056 | | | |
| Internal rotation | Between wks | 11075.756 | 5537.878 | 50.804 | 0.000 **** |
| | Within week | 9483.367 | 109.004 | | |
| | Total | 20559.122 | | | |
| External rotation | Between wks | 16239.622 | 8119.811 | 120.418 | 0.000 **** |
| | Within week | 5886.433 | 67.430 | | |
| | Total | 22106.056 | | | |

****= very highly significant.

Table 5.4 shows the overall changes in range of motion of Group A following treatment with Capsular stretching in frozen shoulder between the weeks and within the weeks of treatment. $p = .000$ which means that very high significant difference in ROM between the weeks and within the weeks following treatment with capsular stretching.

TABLE 5.5 One way ANOVA for overall changes in range of motion in Group B.

| Range | Source | Sum of Squares | Mean Square | F | p |
|-------------------|-------------|----------------|-------------|--------|------------|
| Flexion | Between wks | 5300.867 | 2650.433 | 3.917 | 0.024 ** |
| | Within week | 58871.233 | 676.681 | | |
| | Total | 64172.100 | | | |
| Extension | Between wks | 5370.422 | 2685.211 | 33.133 | 0.000 **** |
| | Within week | 7050.700 | 81.043 | | |
| | Total | 12421.122 | | | |
| Abduction | Between wks | 6444.822 | 3222.411 | 13.386 | 0.000 **** |
| | Within week | 20944.167 | 240.738 | | |
| | Total | 27388.989 | | | |
| Internal rotation | Between wks | 1910.867 | 955.433 | 4.617 | 0.012 ** |
| | Within week | 18003.233 | 206.934 | | |
| | Total | 19914.100 | | | |
| External rotation | Between wks | 1534.067 | 767.033 | 8.136 | 0.001 *** |
| | Within week | 8202.433 | 94.281 | | |
| | Total | 9736.500 | | | |

= significant, *= highly significant, ****=very highly significant.

Table 5.5 shows the overall changes in range of motion of Group B following treatment with Muscle energy technique in frozen shoulder between the weeks and within the weeks of treatment. $p=0.000$ for extension and abduction, 0.001 for external rotation, 0.024 and 0.012 for flexion and internal rotation which means that there is a significant difference in ROM of all the ranges but extension and abduction showed more improvement when compare to the other ranges.

TABLE 5.6: Multiple Scheffe for week wise comparison of Range Of Motion of Group A.

| ROM | Week | Mean Difference | Standard error | p |
|-------------------|-------------|-----------------|----------------|------------|
| Flexion | Pre-Rx-1wk | -21.1333 | 5.34148 | 0.001*** |
| | 1wk-2wks | -15.8333 | 5.34148 | 0.015 ** |
| | Pre-Rx-2wks | -36.9667 | 5.34148 | 0.000 **** |
| Extension | Pre-Rx-1wk | -6.4667 | 2.54109 | 0.044 ** |
| | 1wk-2wks | -8.6667 | 2.54109 | 0.004 *** |
| | Pre-Rx-2wks | -15.1333 | 2.54109 | 0.000 **** |
| Abduction | Pre-Rx-1wk | -17.1000 | 3.84587 | 0.000 **** |
| | 1wk-2wks | -19.9667 | 3.84587 | 0.000 **** |
| | Pre-Rx-2wks | -37.0667 | 3.84587 | 0.000 **** |
| Internal rotation | Pre-Rx-1wk | -14.1000 | 2.69573 | 0.000 **** |
| | 1wk-2wks | -13.0667 | 2.69573 | 0.000 **** |
| | Pre-Rx-2wks | -27.1667 | 2.69573 | 0.000 **** |
| External rotation | Pre-Rx-1wk | -16.8667 | 2.12022 | 0.000 **** |
| | 1wk-2wks | -16.0333 | 2.12022 | 0.000 **** |
| | Pre-Rx-2wks | -32.9000 | 2.12022 | 0.000 **** |

=significant, *=highly significant, ****=very highly significant.

Table 5.6 there are significant changes in ROM after 2 weeks of treatment in Group A per all the ranges but abduction, internal and external rotation showed significant difference in ROM through out the treatment.

TABLE 5.7 Multiple Scheffe for week wise comparison of ROM of Group B

| Range | Duration | Mean Diff. | p |
|-------------------|-----------------|-------------------|------------|
| Flexion | Pre-Rx-1 wk | -5.5667 | 0.710 * |
| | 1 wk-2wks | -12.7667 | 0.170 * |
| | Pre-Rx-2wks | -18.3333 | 0.028 ** |
| Extension | Pre-Rx-1 wk | -10.2333 | 0.000 **** |
| | 1 wk-2wks | -8.667 | 0.002 *** |
| | Pre-Rx-2wks | -18.900 | 0.000 **** |
| Abduction | Pre-Rx-1 wk | -7.2000 | 0.205 * |
| | 1 wk-2wks | -13.23 | 0.006 *** |
| | Pre-Rx-2wks | -20.43 | 0.000 **** |
| Internal rotation | Pre-Rx-1 wk | -4.666 | 0.457 * |
| | 1 wk-2wks | -6.566 | 0.215 * |
| | Pre-Rx-2wks | -11.233 | 0.013 ** |
| External rotation | Pre-Rx-1 wk | -0.4333 | 0.985 * |
| | 1 wk-2wks | -8.9667 | 0.003 *** |
| | Pre-Rx-2wks | -8.533 | 0.004 *** |

*=not significant, **=significant, ***=highly significant, ****=very highly significant.

Table 5.7 there are significant changes in ROM after 2 weeks of treatment in Group B for all the ranges but very highly significant difference in ROM for extension and abduction.

Table.5.8 University of Pennsylvania Shoulder Score (1st subset) values of Group A and Group B obtained by Friedman test.

| Group | Z | p |
|-------|-------|------------|
| A | 60.00 | 0.000 **** |
| B | 60.00 | 0.000 **** |

****=very highly significant

Table 5.8 shows that both the groups A and B showed significant improvement in pain and function over a period of 2 weeks.

TABLE 5.9 Week wise comparison of University of Pennsylvania Shoulder Score (Ist subset) values of Group A and B obtained by Wilcoxon test.

| Group | Duration | Z | p |
|-------|-------------------------------|--------|------------|
| A | Pre Rx – 1 week st | -4.782 | 0.000 **** |
| | 1 week – 2 week nd | -4.782 | 0.000 **** |
| | Pre Rx – 2 week nd | -4.782 | 0.000 **** |
| B | Pre Rx – 1 week st | -4.783 | 0.003 *** |
| | 1 week – 2 week nd | -4.782 | 0.000 **** |
| | Pre Rx – 2 week nd | -4.783 | 0.000 **** |

=highly significant, *=very highly significant

Table 5.9 shows there is significant improvement in pain and function in Group A and B throughout 2 weeks of treatment except for the first week in Group B where ‘p’ is less significant.

TABLE 5.10 Intergroup comparison of University of Pennsylvania Shoulder Score(1st subset) values of Group A and B obtained by Mann-Whitney U test.

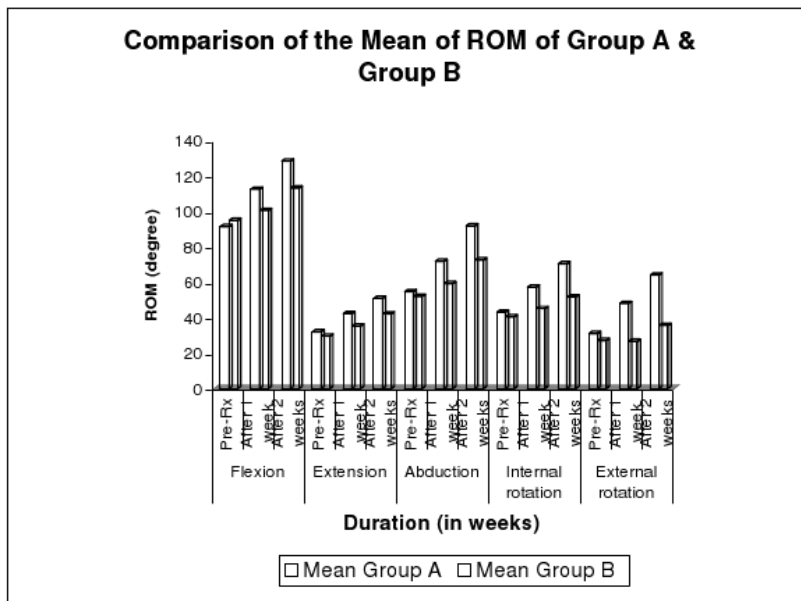
| Duration | U | P |
|-----------------|----------|-------------|
| Pre Rx | 417.50 | 0.631 * |
| After 1 week | 263.00 | 0.006 *** |
| After 2 weeks | 159.00 | 0..000 **** |

*=not significant, ***=highly significant, ****=very highly significant.

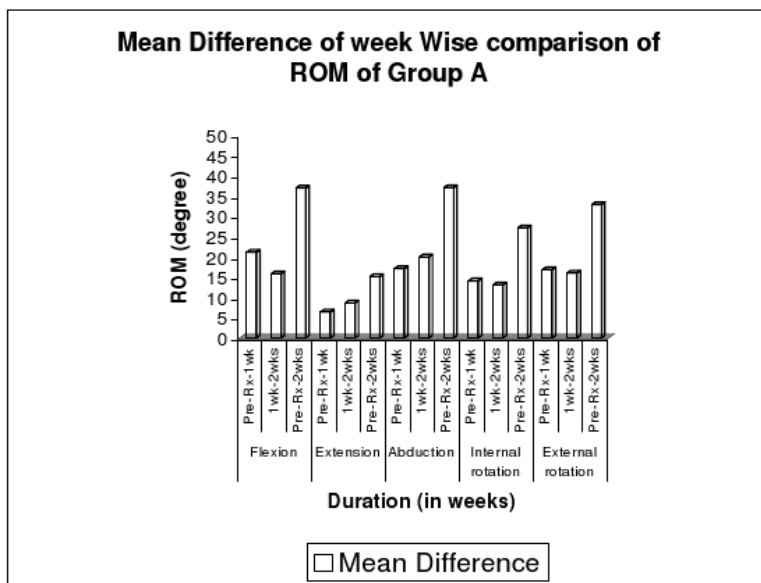
| Group | Duration | Mean Rank |
|--------------|-----------------|------------------|
| A | Pre Rx | 31.58 |
| | After 1 week | 36.73 |
| | After 2 weeks | 40.20 |
| B | Pre Rx | 29.42 |
| | After 1 week | 24.27 |
| | After 2 weeks | 20.80 |

Table 5.10 when comparing both groups **A and B** ‘p’ is significant after 1st and 2nd week of treatment but is highly significant after 2 weeks of treatment. When we compare the mean ranks, **Group A** is better than **Group B**.

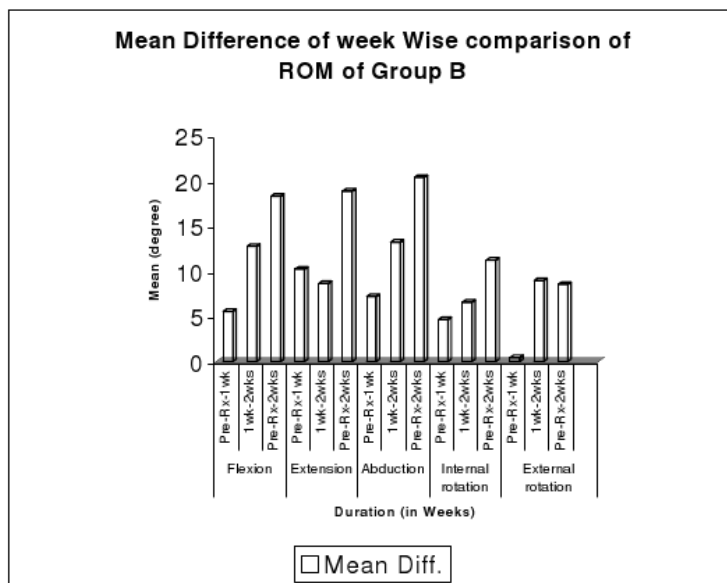
GRAPH 5.1



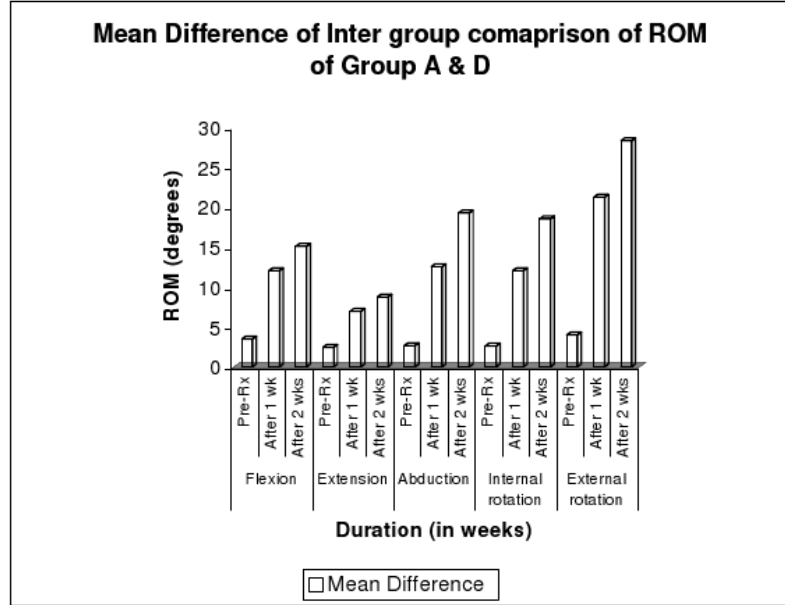
GRAPH 5.2



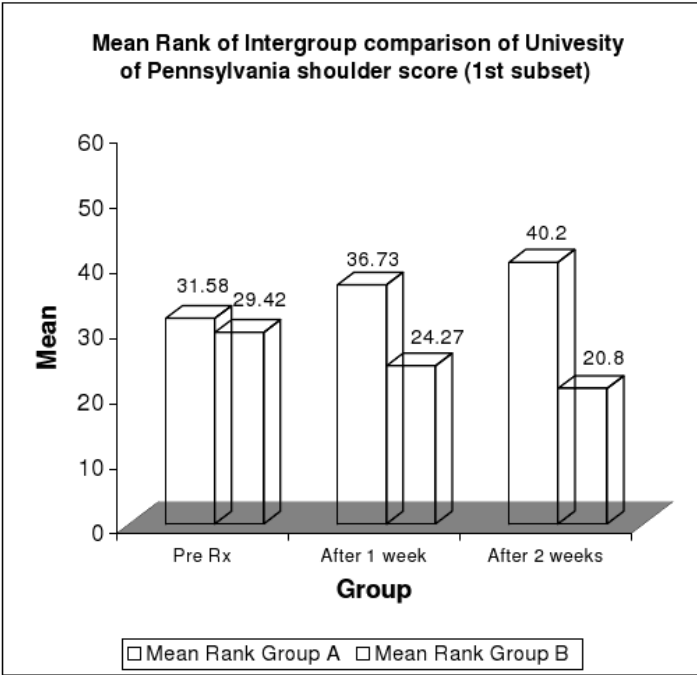
GRAPH 5.3



GRAPH -5.4



GRAPH 5.5



RESULT & DISCUSSION

Frozen Shoulder is characterized by painful stiffness of the shoulder that may persist for several years. It is a common disorder, with an estimated annual incidence of 3% to 5% in the general population (Bridgman 1972, Pal et al 1986). Advocated treatments include rest and analgesics, corticosteroid injections, acupuncture, physical therapy, manipulation under anaesthesia, and arthroscopic or open surgery. There is no general acceptance of one standard treatment (**Green et al 2000**).

The study was conducted on 60 patients with two groups of 30 each. Group A was intervened with moist heat, Capsular stretching and icing whereas Group B was intervened with moist heat, Muscle energy technique and icing. The output parameters i.e, the range of motion (taken with 360 degrees universal goniometer) and pain and function scores using University of Pennsylvania Shoulder Score (1st Sub set) was measured prior to treatment (Pre-Rx), after 1 week of treatment and at the end of two weeks of treatment.

The results of this study supported the experimental hypothesis that both Capsular stretching and Muscle energy technique are effective in improving the shoulder range of motion in patients with frozen shoulder. On further analysis it also supported the hypothesis that there is significant difference in effectiveness of both Capsular stretching and Muscle energy technique. Our results support the study of **Griggs et al (2000)**³⁵ who reported that following a physical therapy programme consisting of passive stretching exercises patients demonstrated a reduction in pain score from 1.57 to 1.16 in a range from one to five points, improvements in active range of motion, and 64 patients reported a satisfactory outcome.

The reason for MET being not so effective in improving shoulder ROM and function in frozen shoulder could be attributed to the conclusion of the study conducted by Johannes Buchmann et al. 2004³⁸ on upper cervical apophyseal joints with mobilization and manipulation before, during and after endotracheal anaesthesia.

LIMITATIONS & RECOMMENDATIONS

Limitations of the study

1. There was no control group due to ethical reasons.
2. Sample size was limited to 60.
3. There was no long-term follow-up of the patients after the study.

Recommendations for future study are

1. The same techniques applied for a longer duration say 4 weeks
2. On effectiveness of other exercise programmes.
3. The same study can be done with a longer follow-up.

SUMMARY

This study was conducted on 60 subjects at Nandha College of Physiotherapy, with an aim to find out the effectiveness of Capsular stretching over Muscle energy technique on frozen shoulder. The subjects were divided into two groups of 30 each.

Group A received Capsular stretching with 5 sets per day, 5 repetitions per set and 5 days in a week each stretch held for a minimum duration of 30 seconds and maximum duration up to the point of pain experienced by the patient with 10 minutes of moist pack application prior to and 10 minutes of ice pack application after the stretching.

Group B received Muscle energy technique with 5 repetitions per set, 5 sets per day and 5 days in a week with each contraction held for a period of 7-8 seconds followed by a brief period of relaxation.

The shoulder range of motion (ROM) and University of Pennsylvania Shoulder Score (part I) was considered as tool to measure the effectiveness of the interventions. The range of motion and University of Pennsylvania Shoulder Score were taken prior to treatment, at the end of 1 week of treatment and at the end of two weeks of treatment. The analysis led.

This proves that both can be preferred for treatment of frozen shoulder whereas the first preference can be given to Capsular stretching as it is more effective in improving shoulder range of motion and function in frozen shoulder.

CONCLUSION

Both Capsular stretching and Muscle Energy Technique are effective treatment techniques in the treatment of frozen shoulder. Further Capsular stretching is more effective in increasing the range of motion and function in frozen shoulder.

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ANNEXURE -10.1
EVALUATION TOOL

1. DEMOGRAPHIC DATA :

NAME:

AGE:

GENDER:

ADDRESS:

2. CHIEF COMPLAINTS:

3. HISTORY :

PRESENT HISTORY :

PAST HISTORY

FAMILY HISTORY

MEDICAL HISTORY : DM/HT/CARDIAC PROBLEMS / PREVIOUS SURGERIES

PERSONAL HISTORY : SMOKING/ALCOHOL/DRUGS/FOOD HABITS/PERSONALITY TYPE.

PSYCHOLOGICAL STATUS: DEPRESSED/CONFIDENT

SOCIO – ECONOMIC STATUS :

4. GENERAL EXAMINATION:

VITAL SIGNS :

1] TEMP:

2] PULSE :

3] B.P

5. ON OBSERVATION:

BUILT POOR/MODERATE/WELL

POSTURAL ATTITUDE:

OBVIOUS MUSCLE WASTING

TROPICAL CHANGES

REDNESS:

CYANOSIS:

PIGMENTATION:

LOSS OF HAIR

SCARS:

SWELLING:

DEFORMITIES:

EXTERNAL APPLIANCES:

6. ON PALPATION:

TENDERNESS:

WARMTH :

SPASM :

SCAR :

CREPITUS AND BONY SPUR :

7. ON EXAMINATION :

SENSORY EXAMINATION :

TOUCH :

TEMPERATURE :

PAIN :

MOTOR EXAMINATION :

MUSCLE TONE:

MMT/BREAK TEST :

RESISTED FLEXION

RESISTED EXTENSION

RESISTED ABDUCTION

RESISTED INTERNAL ROTATION

RESISTED EXTERNAL ROTATION

RANGE OF MOTION :

ACTIVE : RIGHT LEFT

FLEXION :

EXTENSION :

ABDUCTION :

INTERNAL ROTATION :

EXTERNAL ROTATION:

PASSIVE :

RIGHT LEFT

FLEXION :

EXTENSION :

ABDUCTION :

INTERNAL ROTATION :

EXTERNAL ROTATION :

END – FEEL :

CAPSULAR

SPASM (MUSCLE GUARDING) :

EMPTY:

ACCESSORY MOTIONS:

ANTERIOR GLIDE
POSTERIOR GLIDE
INFERIOR GUIDE

SPECIAL TESTS :

APLEY'S SCRATCH TEST
LOAD AND SHIFT TEST (STABILITY TESTING)
IMPINGEMENT TESTS
SUPRASPINATUS TEST
SPEED'S TEST
DROP ARM TEST

PROVISIONAL DIAGNOSIS:

| | |
|-------------------------------|--|
| ACCEPTED FOR THE STUDY | |
| REJECTED FOR THE STUDY | |

DATE:

SIGNATURE OF RESEARCHER:

SIGNATURE OF CO-GUIDE:

SIGNATURE OF GUIDE:

ANNEXURE – 10.2

DATA COLLECTION TOOL FOR FROZEN SHOULDER

SUBJECT NAME :

SUBJECT NO:

AGE :

SEX :

OCCUPATION :

ADDRESS :

CONTACT NUMBER:

GROUP A () Capsular Stretching

GROUP B () Muscle Energy Technique

TREATMENT MODE:

INSTRUMENTATION:

1. TREATMENT COUCH

2. TOWEL

3. 360° UNIVERSAL GONIOMETER

4. MOIST PACK

5. COLD PACK

6. PILLOW

7. UNIVERSITY OF PENNSYLVANIA SHOULDER SCORE (1ST SUB SET)

MEASUREMENTS

ROM of affected side measured using 360° Universal double arm goniometer.

| RANGE | PRE-TREATMENT | AFTER 1 WK OF TREATMENT | AFTER 2 WEEKS OF TREATMENT |
|-------------------|----------------------|--------------------------------|-----------------------------------|
| FLEXION | | | |
| EXTENSION | | | |
| ABDUCTION | | | |
| INTERNAL ROTATION | | | |
| EXTERNAL ROTATION | | | |

Evaluator

Guide

Co-guide

UNIVERSITY OF PENNSYLVANIA SHOULDER SCORE (1st Subset):

PART 1 : PAIN AND SATISFACTION :

Please circle the number closest to your level of pain and satisfaction.

| | 0 day (before treatment) | After 1 week of treatment | After 2 week of treatment |
|---|---------------------------------|----------------------------------|----------------------------------|
| Pain at rest with your arm by your side: 0 1 2 3 4 5 6 7 8 9 10 0 = no pain 10 = worst pain possible | 10 | 10 | 10 |
| Pain with normal activities (eating, dressing, bathing) : 0 1 2 3 4 5 6 7 8 9 10 0 = no pain 10 = worst pain possible | 10 | 10 | 10 |
| Do you have pain at night on a regular basis ? Yes No | Yes | | |
| Pain Score = | 30 | 30 | 30 |
| How satisfied are you with the current level of function of your shoulder? 0 1 2 3 4 5 6 7 8 9 10 0= Not satisfied 10 = Very satisfied | | | |
| TOTAL(30+10=40) | | | |

PART 2: FUNCTION: Please circle the number that best describes the level of difficulty you might have performing each activity.

- 3 = no difficulty
 2 = some difficulty
 1 = much difficulty
 0 = can't do at all
 X = did not do before injury

| Sl. No. | | 0 day (before treatment) | After 1 week of treatment | After 2 weeks of treat |
|---------|---|--------------------------|---------------------------|------------------------|
| 1. | Reach the small of your back to tuck in your shirt with your hand. | 3210x | 3210x | 3210x |
| 2. | Wash middle of your back /hook bra | 3210x | 3210x | 3210x |
| 3. | Perform necessary toileting activities | 3210x | 3210x | 3210x |
| 4. | Wash the back of opposite shoulder | 3210x | 3210x | 3210x |
| 5 | Comb hair | 3210x | 3210x | 3210x |
| 6 | Place hand behind head with your elbow held straight out to the side | 3210x | 3210x | 3210x |
| 7 | Dress self (including put on coat and put shirt off overhead | 3210x | 3210x | 3210x |
| 8 | Sleep on the affected side | 3210x | 3210x | 3210x |
| 9 | Open a door with affected side | 3210x | 3210x | 3210x |
| 10 | Carry a bag of groceries with affected arm | 3 2 10 x | 3210x | 3210x |
| 11 | Carry a briefcase / small suitcase with affected arm | 3210x | 3210x | 3210x |
| 12 | Place a soup can (1 -2 lbs) on shelf at shoulder level without bending elbow | 3210x | 3210x | 3210x |
| 13 | Place a one gallon container (3-10 lbs) on a shelf at | 3210x | 3210x | 3210x |

| | | | | |
|----|---|-------|-------|-------|
| | shoulder level without bending elbow | | | |
| 14 | Reach a shelf above your head without bending elbow | 3210x | 3210x | 3210x |
| 15 | Place a soup can (1-2lbs) on a shelf above your head without bending your elbow | 3210x | 3210x | 3210x |
| 16 | Place a one gallon container (8 – 10 lbs) on a shelf overhead without bending elbow | 3210x | 3210x | 3210x |
| 17 | Perform usual sport/hobby | 3210x | 3210x | 3210x |
| 18 | Perform household chores (cleaning, laundry, cooking) | 3210x | 3210x | 3210x |
| 19 | Throw overhands/swim/overhead racquet sports (circle all that apply to you) | 3210x | 3210x | 3210x |
| 20 | Work full – time at your regular job | 3210x | 3210x | 3210x |
| | TOTAL=60 | | | |
| | Overall Total of Pain & Function=100 | | | |

Evaluator

Guide

Co-guide

ANNEXURE 10.3

CONSENT FORM

TITLE OF THE PROJECT :

“Effects of Capsular Stretching and Muscle Energy Technique in the management of Frozen Shoulder”

NAME OF THE PRINCIPLE INVESTIGATOR :

PURPOSE OF THE STUDY : My aim of the study is to

1. Find out the effectiveness of Capsular stretching and Muscle Energy Technique in the management of Frozen Shoulder & to
2. Compare the effectiveness of Capsular Stretching and Muscle Energy Technique in the management of Frozen Shoulder.

PROCEDURE AND METHOD

You will be participating in the study of 2 weeks duration. (5 days/week).

Your will be categorized in either of the groups i.e Group A or Group B.

Group B.

Group A will be receiving Capsular Stretching.

Group B will receive Muscle Energy Technique.

Initial measurements will be taken before beginning the treatment regime.

Post treatment measurements will be taken at the end of each week.

RISK INHERENT

At this study is concerned, known and expected risks have been taken care of

BENEFITS

It will help us to decide a better treatment protocol for Frozen Shoulder.

CONFIDENTIALITY

Your name and identity will be kept confidential. You will be assigned a number of identification, which will be used for the research procedure.

CONSENT FROM THE PARTICIPANT

I Mr/Mrs. _____ was explained in detail about the study and the problems to be faced by me in my own language and was given freedom to withdraw at any moment during the course of the study. I have understood the information stated by the investigator and with a clear understanding I am willing to participate in the study on my own risk and my sign at the bottom of this form indicates that I am participating in the study on my own interest but not on any body's compulsions.

PARTICIPANT NAME:

SIGNATURE

DATE:

NAME OF WITNESS:

SIGNATURE

DATE:

INVESTIGATOR:

GUIDE:

SIGNATURE

DATE:

CO-GUIDE:

SIGNATURE

DATE:

**MASTER CHART OF ACTIVE SHOULDER ROM MEASUREMENT OF
GROUP A (CAPSULAR STRETCHING)**

| Sl.No. | F10 | F11 | F12 | Ex0 | Ex1 | Ex2 | Ab0 | Ab1 | Ab2 | IR0 | IR1 | IR2 | ER0 | ER1 | ER2 |
|--------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 1 | 95 | 113 | 125 | 25 | 26 | 28 | 70 | 84 | 95 | 50 | 63 | 70 | 30 | 44 | 56 |
| 2 | 103 | 122 | 135 | 50 | 52 | 58 | 67 | 83 | 95 | 55 | 66 | 73 | 25 | 39 | 52 |
| 3 | 80 | 110 | 118 | 12 | 15 | 20 | 45 | 70 | 97 | 48 | 63 | 75 | 32 | 48 | 62 |
| 4 | 100 | 125 | 150 | 30 | 36 | 40 | 50 | 68 | 93 | 24 | 38 | 62 | 28 | 45 | 60 |
| 5 | 90 | 110 | 130 | 40 | 44 | 48 | 70 | 85 | 102 | 26 | 40 | 65 | 33 | 48 | 63 |
| 6 | 72 | 100 | 109 | 17 | 18 | 22 | 25 | 38 | 51 | 45 | 61 | 72 | 19 | 33 | 56 |
| 7 | 100 | 128 | 140 | 40 | 46 | 52 | 55 | 74 | 100 | 56 | 67 | 74 | 28 | 44 | 62 |
| 8 | 85 | 100 | 118 | 20 | 25 | 32 | 48 | 60 | 72 | 38 | 52 | 65 | 40 | 59 | 71 |
| 9 | 110 | 135 | 145 | 33 | 38 | 40 | 80 | 95 | 107 | 52 | 68 | 75 | 38 | 56 | 72 |
| 10 | 135 | 150 | 172 | 30 | 40 | 55 | 49 | 65 | 90 | 42 | 55 | 71 | 44 | 63 | 72 |
| 11 | 135 | 150 | 165 | 35 | 42 | 50 | 58 | 74 | 98 | 53 | 69 | 76 | 38 | 54 | 68 |
| 12 | 90 | 120 | 135 | 20 | 30 | 45 | 40 | 58 | 70 | 60 | 72 | 80 | 36 | 48 | 70 |
| 13 | 80 | 100 | 110 | 15 | 20 | 30 | 51 | 64 | 78 | 60 | 72 | 80 | 39 | 63 | 73 |
| 14 | 60 | 80 | 110 | 10 | 25 | 35 | 65 | 90 | 109 | 30 | 44 | 60 | 30 | 52 | 70 |
| 15 | 50 | 75 | 108 | 20 | 28 | 39 | 44 | 62 | 85 | 47 | 58 | 65 | 38 | 53 | 68 |
| 16 | 120 | 145 | 155 | 30 | 36 | 40 | 38 | 52 | 78 | 38 | 44 | 62 | 15 | 28 | 42 |
| 17 | 60 | 95 | 110 | 15 | 20 | 32 | 63 | 80 | 100 | 52 | 68 | 77 | 39 | 58 | 72 |
| 18 | 50 | 90 | 118 | 30 | 38 | 45 | 42 | 56 | 75 | 20 | 38 | 51 | 25 | 41 | 59 |
| 19 | 90 | 110 | 115 | 30 | 33 | 36 | 33 | 65 | 93 | 36 | 47 | 62 | 28 | 41 | 65 |
| 20 | 90 | 115 | 130 | 35 | 38 | 42 | 75 | 93 | 110 | 23 | 35 | 52 | 30 | 49 | 68 |
| 21 | 85 | 100 | 112 | 45 | 48 | 54 | 68 | 88 | 102 | 40 | 56 | 73 | 34 | 55 | 70 |
| 22 | 92 | 115 | 135 | 26 | 32 | 40 | 50 | 65 | 84 | 38 | 53 | 73 | 26 | 41 | 60 |
| 23 | 95 | 110 | 120 | 28 | 35 | 40 | 38 | 50 | 65 | 44 | 63 | 76 | 35 | 54 | 72 |
| 24 | 72 | 95 | 110 | 35 | 44 | 52 | 45 | 67 | 90 | 48 | 69 | 79 | 23 | 38 | 57 |
| 25 | 105 | 120 | 135 | 48 | 53 | 59 | 78 | 93 | 110 | 28 | 39 | 56 | 33 | 55 | 74 |
| 26 | 75 | 90 | 108 | 20 | 28 | 35 | 55 | 69 | 93 | 41 | 60 | 74 | 23 | 37 | 51 |
| 27 | 70 | 85 | 100 | 25 | 28 | 40 | 44 | 61 | 88 | 58 | 66 | 78 | 20 | 35 | 52 |
| 28 | 120 | 135 | 150 | 38 | 44 | 50 | 70 | 89 | 112 | 46 | 64 | 78 | 28 | 43 | 65 |
| 29 | 100 | 110 | 125 | 45 | 52 | 56 | 79 | 93 | 112 | 50 | 66 | 79 | 41 | 62 | 74 |
| 30 | 130 | 140 | 155 | 40 | 45 | 50 | 45 | 62 | 98 | 45 | 60 | 75 | 36 | 52 | 65 |

**MASTER CHART OF ACTIVE SHOULDER ROM MEASUREMENT OF
GROUP B (MET)**

| Sl.No. | F10 | F11 | F12 | Ex0 | Ex1 | Ex2 | Ab0 | Ab1 | Ab2 | IR0 | IR1 | IR2 | ER0 | ER1 | ER2 |
|--------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 1 | 83 | 89 | 98 | 25 | 46 | 55 | 42 | 48 | 60 | 40 | 45 | 50 | 12 | 14 | 23 |
| 2 | 160 | 165 | 175 | 30 | 39 | 46 | 70 | 75 | 90 | 45 | 50 | 55 | 22 | 25 | 30 |
| 3 | 100 | 104 | 110 | 35 | 45 | 55 | 41 | 48 | 52 | 28 | 32 | 35 | 18 | 20 | 25 |
| 4 | 90 | 90 | 95 | 30 | 50 | 60 | 45 | 53 | 70 | 38 | 42 | 49 | 22 | 26 | 40 |
| 5 | 100 | 100 | 105 | 25 | 30 | 40 | 45 | 50 | 69 | 43 | 48 | 53 | 43 | 46 | 50 |
| 6 | 83 | 89 | 98 | 37 | 44 | 50 | 47 | 50 | 71 | 40 | 45 | 54 | 10 | 14 | 23 |
| 7 | 90 | 95 | 110 | 30 | 35 | 44 | 44 | 50 | 73 | 41 | 46 | 50 | 30 | 33 | 40 |
| 8 | 82 | 88 | 100 | 15 | 19 | 24 | 45 | 52 | 74 | 45 | 50 | 60 | 38 | 40 | 55 |
| 9 | 70 | 73 | 78 | 48 | 55 | 60 | 35 | 38 | 45 | 38 | 42 | 48 | 10 | 16 | 32 |
| 10 | 135 | 140 | 164 | 40 | 60 | 60 | 99 | 108 | 116 | 75 | 80 | 80 | 30 | 35 | 50 |
| 11 | 95 | 95 | 100 | 35 | 55 | 60 | 52 | 60 | 76 | 30 | 37 | 42 | 23 | 28 | 40 |
| 12 | 100 | 105 | 125 | 25 | 40 | 60 | 57 | 65 | 72 | 34 | 40 | 50 | 8 | 12 | 26 |
| 13 | 60 | 66 | 90 | 25 | 40 | 45 | 60 | 70 | 90 | 40 | 45 | 50 | 45 | 50 | 52 |
| 14 | 170 | 175 | 180 | 27 | 40 | 45 | 57 | 62 | 70 | 7 | 12 | 28 | 5 | 10 | 25 |
| 15 | 130 | 135 | 160 | 26 | 40 | 60 | 58 | 63 | 74 | 22 | 28 | 35 | 20 | 25 | 30 |
| 16 | 90 | 90 | 95 | 30 | 44 | 58 | 47 | 65 | 82 | 23 | 30 | 35 | 28 | 33 | 42 |
| 17 | 60 | 76 | 100 | 25 | 30 | 55 | 61 | 70 | 90 | 40 | 45 | 50 | 45 | 50 | 56 |
| 18 | 90 | 95 | 100 | 30 | 35 | 40 | 65 | 68 | 75 | 75 | 80 | 80 | 23 | 25 | 30 |
| 19 | 95 | 95 | 100 | 25 | 30 | 40 | 50 | 58 | 64 | 20 | 23 | 25 | 13 | 18 | 28 |
| 20 | 100 | 105 | 112 | 25 | 30 | 40 | 68 | 78 | 92 | 25 | 29 | 30 | 15 | 18 | 26 |
| 21 | 75 | 85 | 110 | 40 | 45 | 55 | 29 | 34 | 40 | 54 | 58 | 64 | 13 | 15 | 20 |
| 22 | 63 | 72 | 90 | 34 | 40 | 50 | 50 | 55 | 72 | 45 | 48 | 55 | 20 | 25 | 34 |
| 23 | 80 | 92 | 108 | 35 | 55 | 60 | 25 | 33 | 42 | 63 | 66 | 72 | 25 | 28 | 40 |
| 24 | 78 | 90 | 105 | 40 | 52 | 60 | 67 | 80 | 90 | 48 | 53 | 60 | 24 | 30 | 35 |
| 25 | 92 | 98 | 110 | 40 | 44 | 50 | 49 | 56 | 70 | 35 | 38 | 44 | 25 | 30 | 40 |
| 26 | 68 | 75 | 88 | 32 | 48 | 56 | 25 | 30 | 45 | 48 | 52 | 63 | 38 | 40 | 45 |
| 27 | 87 | 95 | 108 | 25 | 34 | 40 | 76 | 82 | 95 | 47 | 50 | 58 | 37 | 38 | 50 |
| 28 | 105 | 110 | 125 | 48 | 53 | 58 | 60 | 65 | 74 | 35 | 40 | 58 | 15 | 18 | 26 |
| 29 | 125 | 130 | 150 | 30 | 35 | 42 | 44 | 48 | 60 | 56 | 60 | 66 | 10 | 15 | 22 |
| 30 | 88 | 94 | 105 | 45 | 55 | 50 | 55 | 62 | 80 | 38 | 40 | 52 | 20 | 24 | 35 |

**MASTER CHART OF
UNIVERSITY OF PENNSYLVANIA SHOULDER SCORE (1st Subset)
For Group A**

| Pre – Treatment | After 1 week | After 2 weeks |
|------------------------|---------------------|----------------------|
| 35.22 | 48.44 | 60 |
| 27.88 | 41.55 | 56.55 |
| 35.25 | 53.58 | 67.71 |
| 29.35 | 45.66 | 57.87 |
| 15.44 | 24.33 | 42.22 |
| 27.88 | 33.88 | 45.11 |
| 37.55 | 56.66 | 65.33 |
| 38 | 46.33 | 56.82 |
| 37.88 | 49.66 | 59.55 |
| 24.18 | 48.51 | 56.08 |
| 65.33 | 68.44 | 71.33 |
| 24.66 | 36.55 | 49.33 |
| 55.97 | 61.07 | 66.15 |
| 24.55 | 39.22 | 57.33 |
| 30.38 | 45.76 | 58.97 |
| 47.21 | 61.86 | 68.43 |
| 41.74 | 58.2 | 64.2 |
| 30 | 45.77 | 59.71 |
| 26.17 | 36.51 | 52 |
| 26.77 | 35.44 | 46 |
| 42 | 51 | 63 |
| 37.61 | 45.71 | 60.84 |
| 31.88 | 42.22 | 49.88 |
| 33.77 | 44.44 | 53.11 |
| 24.33 | 33.99 | 46.33 |
| 41 | 47 | 55 |
| 37.94 | 48.18 | 56.59 |
| 29 | 30 | 33 |
| 26.4 | 37.22 | 45.55 |
| 46.2 | 54.77 | 62.88 |

**MASTER CHART OF UNIVERSITY OF PENNSYLVANIA SHOULDER
SCORE (1st Subset) for Group B**

| Pre – Treatment | After 1 week | After 2 weeks |
|------------------------|---------------------|----------------------|
| 20.56 | 22.97 | 24.24 |
| 33.7 | 35.54 | 43.77 |
| 25.66 | 28.44 | 30.44 |
| 21.81 | 24.81 | 25.29 |
| 32.11 | 34.88 | 40.11 |
| 27.28 | 29.41 | 32.53 |
| 24.22 | 28.22 | 31.33 |
| 50 | 53.66 | 57.11 |
| 26.55 | 30.22 | 33.88 |
| 50.83 | 55.75 | 58.21 |
| 27 | 31.99 | 35.11 |
| 22.15 | 24.25 | 30.58 |
| 38.44 | 40.22 | 45.77 |
| 44.43 | 48.43 | 53.56 |
| 34.56 | 37.28 | 42.84 |
| 14.02 | 17.12 | 20 |
| 32.11 | 37.55 | 42.55 |
| 29.44 | 33.22 | 37.44 |
| 27.44 | 30.72 | 34.33 |
| 26.72 | 30.54 | 36.92 |
| 45.55 | 50.77 | 60.11 |
| 42.18 | 45.59 | 50.48 |
| 27.3 | 29.46 | 33.66 |
| 33.51 | 37.71 | 40.87 |
| 27 | 29 | 32 |
| 43.77 | 48.77 | 50.22 |
| 56.66 | 59.77 | 62.33 |
| 31 | 35 | 39 |
| 62.13 | 65.4 | 69.97 |
| 47.82 | 50.92 | 53.13 |