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RESEARCH ARTICLE

"GONG'S MOBILIZATION VERSUS CYRIAX MANIPULATION ON RANGE OF MOTION AND FUNCTION RECOVERY IN SUBJECT WITH FROZEN SHOULDER" – A COMPARATIVE STUDY

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ABSTRACT

Background: Adhesive Capsulitis is a clinical syndrome of pain and severely decreased joint motion. The primary goal in this condition is mainly to improve ROM, pain and decrease disability. In many physical therapy programs for the subject with frozen shoulder, mobilization and manipulation technique are an important part of the intervention.
Objective: The objective of the study is to compare the effectiveness of Gong's mobilization and Cyriax manipulation (deep friction massage) in subjects with frozen shoulder.
Method: 30 subjects were included in the study. Each subject was assigned in to two groups by convenient sampling, one group treated with Gong's mobilization and another group receives Cyriax manipulation. The duration of treatment was 2 weeks (6 sessions) in both groups. Primary outcome measure included ROM by Goniometer and SPADI for a functional deficit.
Result: Analysis using unpaired t-test and Mann-Whitney U-test found that there is no statistically significant difference ($p<0.05$) between Gong's mobilization group and Cyriax manipulation group on improving ROM and decreasing the functional deficit.
Conclusion: Gong's mobilization andCyriax manipulation is equally effective in improving shoulder abduction and decreasing the functional deficit in subjects with frozen shoulder.

INTRODUCTION

The shoulder is a complex anatomic structure that allows movement in many planes. Physicians and patients alike don't often think about the importance of the shoulder joint until its function becomes compromised (Lori, 1999). Shoulder pain is a common problem; it is the third most common musculoskeletal complaint in the general population, and account for 5% of all general practitioner musculoskeletal consultation (Herbert, 2007). Frozen shoulder is a common cause of shoulder pain affecting 2-5% of the of the general population and up to 20% in people with diabetes (Buchbinder, 2007). Frozen shoulder is a condition of uncertain etiology characterized by progressive loss of both active and passive shoulder motion (Buchbinder, 1987). Clinical symptoms include pain, a limited range of motion (ROM), and muscle weakness from disuse (Neviaser, 1987 and Reeves, 1985).

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The term "frozen shoulder" was first coined by Codman and was subsequently define as an idiopathic condition of the shoulder characterized by the spontaneous onset of pain in the shoulder with restriction of mobility at the Glenohumeral joint in every direction with normal radiographic studies, and Naviaser coined the term "Adhesive Capsulitis" theorizing that this pathology results from thickening and eventual contracture of the Glenohumeral capsule (Brotzman, 2003). Over the years the adhesive capsulitis has had many different names, including shoulder periarthritis, adherent subacromial bursitis, adhesive capsulitis, stiff and painful shoulder, periarticular adhesion. Currently adhesive capsulitis and frozen shoulder are the preferred term and may be used inter chngebly (Meulengrancht, 1952). The patients are usually women between the ages of 40 and 60 years. The non-dominant arm is involved. The condition is more common in person who has sedentary occupation than in manual laborers (Neviaser, 1987). Frozen shoulder has been divided into two types. Primary frozen shoulder, is the current term used to describe an insidious onset of painful stiffness of the Gelnohumeral joint and Secondary frozen shoulder on the other hand is associated with a known predisposing condition of the shoulder e.g.: humerus fracture, shoulder dislocation, avascular necrosis, osteoarthritis or stroke (Johnson, 2007). The exact cause frozen shoulder is not known. The autoimmune theory has been proposed, but conclusive evidence has not been found yet (Cleland, 2000). Other factors such as depression, immunologic factor, posture and occupation have been implicated in the etiology (Dudkiewicz,

2004). Shoulder pain and stiffness are accompanied by severs disability often resulting in absenteeism from work and inability to perform leisure activities and utilization of health care resources. Although generally believed to be a selflimiting condition lasting 2-3 years, some studies have reported that up to 40% of patients have persistent symptoms and stiffness beyond 3 years (Buchbinder, 2007).

The exact pathophysiology of an idiopathic frozen shoulder is poorly understood (Curette, 2003). Owens-Burkhart 1987 in her review of the subject arrives at a definition that it is a Glenohumeral stiffness resulting from capsular restrictions. Fibrosis of capsular structures and loss of inter acapsular volume accompanies a fibroblastic and histochemical change in connective tissue (Mc Innes, 1946). Neviaser surgically explored 10 cases of frozen shoulder, and found absence of the glenohumeral synovial fluid and the redundant axillary fold of the capsule, as well as thickening and contraction of the capsule, and capsule was became adherent to the humeral head, It appeared as if the humeral head and capsule were glued together and revealed reparative inflammatory change in the capsule (Neviaser, 1945). Simmonds proposed that patient with frozen shoulder exhibited inflammation in the rotator cuff, particularly in the supraspinatus tendon. Inflammation of the suraspinatus tendon is secondary to degenerative changes in the tendon caused by impaired blood supply, as the tendon repeatedly traumatized by rubbing against the acromion process and coracoacromial ligament (Simmonds, 1949). De Palma stated that the pathological process of the frozen shoulder primarily involves the fibrous capsule. The normally flexed capsule becomes nonelastic and shrunken. The mechanism responsible for these changes in idiopathic. As the condition progresses, the synovial fluid, fascial covering, rotator cuff, biceps tendon, biceps tendon sheath and subacromial bursa can all become involved (De Palma, 1983). Tightness in a joint capsule would result in a pattern of proportional motion restriction (a shoulder capsular pattern in which external rotation would be more limited than abduction, which is more limited than internal rotation) based on the absence of a significant correlation between joint space capacity and restricted shoulder ROM, contracted soft tissue around the shoulder may be related to restricted shoulder ROM. In adhesive capsulitis, capsular extensibility is decreased, and the flexibility of the biceps tendon in its sheath is reduced. As a result, the external rotation of the humeral head to pass under the acromion during abduction is severely restricted.

Restoring this mechanism is the primary goal of various treatment strategies for adhesive capsulitis (Corrigan, 1983). The pathological studies confirmed the presence of an active process of hyperplastic fibroplasia and excessive type III collagen secretion that leads to soft tissue contractures of the coracohumeral ligament, rotator cuff soft tissues, subscapularis muscle and subacromial bursae. These contractures result in the classic progressive loss of range of motion of the glenohumeral joint, which affects external rotation, abduction, flexion, extension, and adduction (Mc Innes, 1946). Frozen shoulder has four stages basis on arthroscopic studies.Stage 1-duration of symptoms less than 3 months pain with active and passive ROM (painful shoulder), stage 2-duration of symptoms 3-9 months progressive loss of ROM with chronic pain (freezing stage), stage 3-duration of symptoms 9-15 months loss of ROM with end range pain and rigid end feel (frozen stage), stage 4-duration of symptoms 15-24 months with progressive improvement in ROM (thawing phase) (Hannafin, 2000). A consisderable proportion of patients with adhesive capsulitis are treated with non-steroidal anti-inflammatory drugs, inter-articular corticosteroid injections and physical therapy (Bertoft, 1999).

Currently, no standard medical or surgical regimen is usually accepted as the most efficacious treatment for restoring motion in patients with frozen shoulder. While the physical therapy is commonly prescribed for this condition (Ekelund, 1992). Mobilization techniques have been demonstrated clinically to be an important part of the rehabilitation of restricted joint movements. Mobilization is defineds as the way of making a fixed ankylosed part movable. Mobilization is designed to improve soft tissue and joint mobility (Robert, 1997). Mobilization techniques can be performed as physiological movements or accessory movements. Physiological movements at the glenohumeral joint are movements of the humerus in the cardinal planes (e.g. flexion, extension, abduction, adduction, external rotation, internal rotation). Accessory movements that are passively induced by a therapist and consist of rolling, gliding (or sliding), spinning, and distraction within the joint (Mangus, 2002). The new mobilization technique which is an uprising to increasing shoulder ROM is Gong's mobilization. Wontae Gong is a professor at the department of physical therapy, Gumi College from republic of Korea. The result of their study showed that the shoulder abduction range of motion can be improved by mobilizing the shoulder with internal rotation. In a study they found that Gong's mobilization is comparatively better in improving shoulder abduction than anterior to posterior glide (Gong, 2011).

Similarly there are various studies done by Wontae Gong on different joint of body, and the result of study shows that Gong's mobilization is effective in improving range of motion and function efficacy in various joint of the body (Gong, 2012; Gong, 2011; Gong, 2012). Massage is a human technique with kneading, squeezing and pressing muscle, has been developed with different techniques (Swedish, tui Na, Hawaiian, and others) from different countries (Greece, China, Arabs, Swizterland, and others) for a long time. Although massage has been used for alternative therapy on musculoskeletal system a modern systematic and clinical technique called 'friction massage', was employed by Cyriax. His original massage technique was only focused on transverse movements of connective tissue by deep friction, but current friction massages are performed both longitudinally and transversely. In these days the deep friction massage, employed by James Cyriax, has been considered as one of the therapeutic modality for musculoskeletal condition in sports medicine and physical therapy in united states (Chamberlain, 1982). Friction massage seems to help the scar realignment with deep transverse pressure. It may be hypothesized that friction facilitates the removal of chemical irritants and increase the transportation of endogenous opiates resulting in a decrease in pain (James, 2001). Cyriax Friction massage is a technique used frequently by physical therapists for soft tissue injuries affecting muscle, ligament, and tendon. The existing literature make strong indication for the importance of maintaining mobility within connective tissue during the healing process from Cyriax friction massage (Chamberlain, 1982). According to FusunGuler-Uysal, and ErkanKozanoglu the Cyriax deep friction massage technique provides a faster response than the conventional physical therapy methods in the early phase of

treatment in adhesive capsulitis. The method is non-invasive, effective and requires a fewer hospital visit for a sufficient early response in the treatment of adhesive capsulitis (Guler-Uysal, 2004). Studies have shown that Gong's mobilization and Cyriax friction massage effectively increased range of motion, reduce pain and thus improving function. So far none of the studies have shown the comparison between both these techniques in improving abduction of frozen shoulder. Hence the comparative study is warranted to apply for clinical practice for faster recovery of range of motion and functional recovery in frozen shoulder.

Objective

To compare the effectiveness of Gong's mobilization and Cyriax manipulation (deep friction massage) for increasing shoulder ROM and improving shoulder function in subjects with frozen shoulder.

Hypothesis

"There will not be any significant difference between Gong's mobilization andCyriax manipulation for improving shoulder range of motion and functional recovery in subjects with frozen shoulder"

MATERIALS AND METHODS

A pre and post-experimental design study was conducted in 30 subjects suffering from frozen shoulder, who were taken from the hospital around bangalore with convenience sampling based on the inclusion and exclusion criteria. Informed consent was taken from the subjects prior to study and proper assessment was done.

Inclusion criteria

- Subjects with frozen shoulder diagnosed by Orthopaedician.
- Subject with stage II and III of frozen shoulder.
- Subjects of both the gender between the age group of 41-60 yrs.
- Subjects with restricted ROM (ROM losses of 25% or greater compared with the noninvolved shoulder).

Exclusion criteria

- Subjects with rotator cuff tears.
- Overuse injury.
- History of Rheumatoid arthritis, osteoarthritis, and malignancies in the shoulder region.
- Frozen shoulder secondary to neurological disorders.
- Unstable shoulders and recurrent dislocations.
- Post-surgical cases.

Parameters: Assessment was conducted on day and last day of treatment session by using the following parameters.

- Universal Goniometer
- Shoulder Pain and Disability Index

Duration: The duration of the treatment session is for 45 minutes per session, total 6 sessions, 3 days in a week for 2 weeks for each group.

Ultrasound parameters: continuous waveform for 8 min at setting of ($1.5w/cm^2$).[29]

Procedure

The patients who fulfilled the diagnostic criteria for frozen shoulder were assessed for following parameters before starting treatment.

- The Range of motion (abduction) using Goniometer.
- Functional deficit using SPADI (shoulder pain and disability index).

30 patients were randomly assigned and equally divided into two groups, (15 each) group A and group B. Group A received Gong's mobilization and Group B received Cyriax manipulation. Therapeutic ultrasound and shoulder mobility exercises were given as a conventional therapy for both the groups. Assessment of functional deficit was done using the SPADI and assessment of shoulder abduction ROM measurement was taken by Goniometer in supine-lying. Shoulder mobility exercises consist of shoulder wheel, overhead pulley, finger ladder exercise, active shoulder movements in all three planes and Codman's pendular exercise.

Group A: - Gong's mobilization

Subject (n=15) were given Gong's mobilization.

Ultrasound therapy and shoulder mobility exercises were given as a conventional therapy. The Subject was in sidelying position with the affected side upward on a height adjustable bed.

Fig. 1. Performing Gong's mobilization

The subject head was supported by the pillow. With one hand therapist pushes the affected side's scapula posterior to anterior from above the head. And with another hand the therapist push the humeral head anterior to posterior there by correcting the humeral head which was pushed out of the

normal position. With the subject palm medial and the back of the hand lateral the subject abduct the shoulder quickly and power fully in the coronal plane without external rotation and elbow flexion, at this time the therapist hand maintained pressure on the humeral head and aligned the palm's long axis with the humeral long axis the therapist then performed distraction while the subject abducted the shoulder and followed all the same speed. The therapist added acceleration while still pressing the humeral head with subject abduction at 90 degrees to the end range. In other word within the range at the time when the gravitational force was applied. Gong's mobilization was repeated about 10-15 times for each subject.

Group B:-Cyriax manipulation

Subject (n=15) were given Cyriax manipulation

Ultrasound and shoulder mobility exercises were given as a conventional therapy. Cyriax manipulation (Deep friction massage) was given based on Cyriax principles.

The position of the patient was sitting in arm less chair. The therapist uses his index finger reinforced by the middle finger. The therapist uses short strokes (<2 cm) to move the superficial portion of the posterior joint capsule back and forth over the deeper portion. The friction can be applied to over the posterior joint capsule by to and fro horizontal movement of the hand (index finger reinforced by middle finger) along the sagittal plane at a rate of one to two cycles per second for the duration of two minutes.

Fig. 3. Cyriax friction massage for supraspinatus

Fig. 4. Cyriax friction massage for Subscapularis

Fig. 5. Cyriax friction massage for infraspinatus

Fig. 6. Shoulder mobility exercises

Data Analysis

- Data analysis was performed by SPSS (version 17) for windows. alpha value was set as 0.05. Descriptive statistics were used to find out mean, standard deviation and range for demographic and outcome variable.Unpaired t-test was used to find out the homogeneity for baseline demographic and outcome variables.Paired t test and unpaired t test was used to find out significant differences for the shoulder ROM within and between the groups.Non-parametric Wilcoxon's test and Mann-Whitney U test was used to find out significant differences for SPADI with and in between groups.

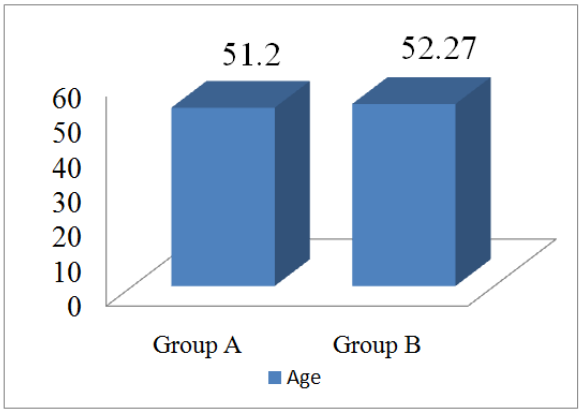
RESULT

The mean age of frozen shoulder patients treated with Gong's mobilization (group A) is 51.20 years with SD of 4.38 years. The mean age of frozen shoulder patients treated with Cyriax manipulation (group B) is 52.27 years with SD of 5.71years. Which is statistically not significant (P>0.571).

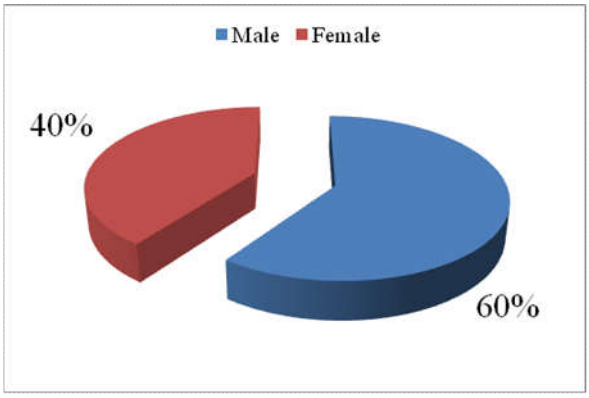
Table 1. Baseline data for demographic variable

SI.No	Variable	Group A	Group B	Þ-value
1	Age	51.20±4.38	52.27±5.71	>0.571
2	Gender (M/F)	9/6	10/5	>0.705

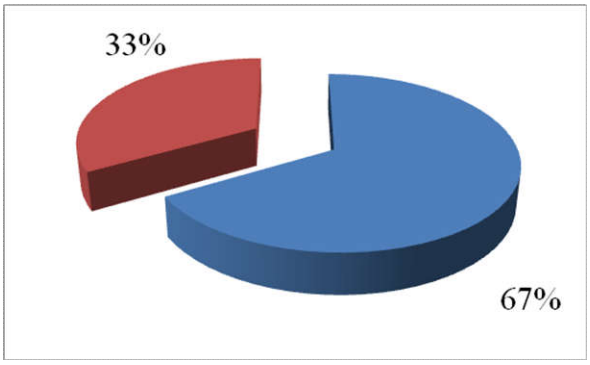
There were 9 males and 6 females in group A, where as in group B there were 10 males and 5 female. Which was statistically not significant (P>0.705)



Graph 1. Baseline data for demographic variable age



Graph 2. Gender distribution of subjects studied in group A

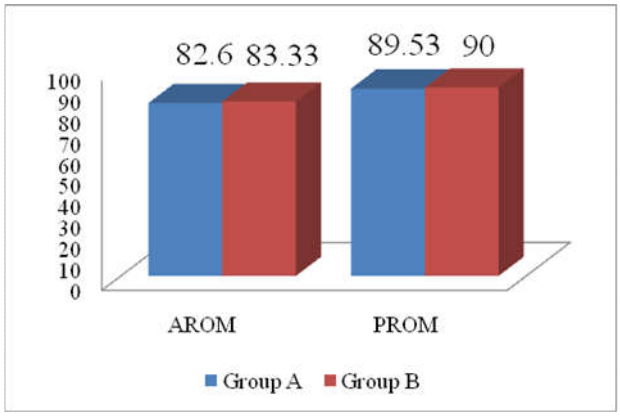


Graph 3. Gender distribution of subjects studied in group B

Table 2. Baseline data for outcome variable

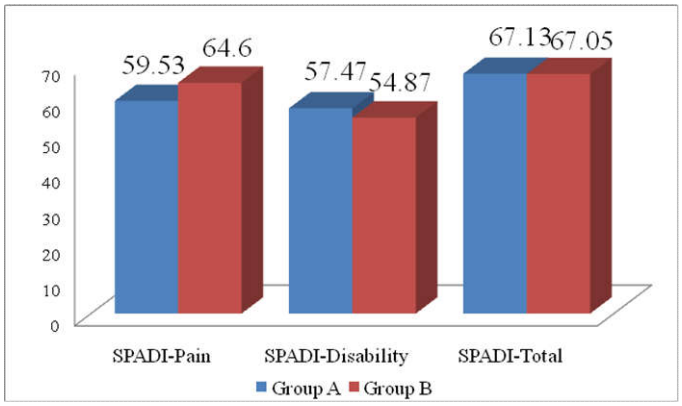
Sl.No:	Variable	Group A	Group B	Þ-value
1	AROM	82.60±16.70	83.33±17.55	>0.907
2	PROM	89.53±17.44	90.00±17.55	>0.107
3	SPADI-Pain	59.53±12.41	64.60±8.72	>0.325
4	SPADI-Disability	57.47±5.77	54.87±6.98	>0.367
5	SPADI-Total	67.13±4.80	67.05±6.71	>0.967

The mean value of pre intervention score of active abduction for group A was 82.60 degree with SD of 16.70 degrees and for group B it was 83.33 degree with SD of 17.55 degree, the difference mean of active abduction was statistically not significant (P>0.907). The mean value of pre intervention score of passive abduction for group A was 89.53 degree with SD of 17.44 degree and for group B it was 90.00 degree with SD of 17.55 degree, difference mean of passive abduction was statistically not significant (P>0.107).



Graph 4. Baseline data for outcome variable-ROM

The mean value of pre intervention score of SPADI-pain for group A was 59.53 with SD of 12.41 and for group B it was 64.60 with SD of 8.72, the difference mean of total pain score was statistically not significant (P>0.325). The mean value of pre intervention score of SPADI-disability for group A was 57.47 with SD of 5.77 and for group B was 54.87 with SD of 6.98, the difference mean of total disability score was statistically not significant (p>0.367). The mean value of pre intervention score of total SPADI for group A was 67.13 with SD of 4.80) and for group B was 67.05 with SD of 6.71, the difference of total SPADI score was statistically not significant (p>0.967).



Graph 5. Baseline data for outcome variable- SPADI score

Table 3. Pre – post difference with in group A

Sl.No:	Variable	Pre	Post	Þ-value
1	AROM	82.60±16.70	111.93±22.32	<0.0001
2	PROM	89.53±17.44	117.20±21.97	<0.0001
3	SPADI-Pain	59.53±12.41	21.47±7.01	<0.001
4	SPADI-Disability	57.47±5.77	17.60±4.01	<0.001
5	SPADI-Total	67.13±4.80	22.30±4.25	<0.001

In group A, the mean of pre intervention score of active abduction ROM was 82.60 degree with SD of 16.70 degrees, and was increased to post score of 111.93 degree with SD of 22.32 degree. The increased was observed which is statistically significant (p<0.0001). Similarly the mean of pre intervention score of passive abduction ROM of group A was 89.53 degree with SD of 17.44 degree and is increase to 117.20 degree with SD of 21.97 degree. The increased was observed which was statistically significant (p<0.0001). The mean of pre intervention score of total pain (SPADI) of group A was 59.53 (SD=12.41), and is decreased to post score 21.47 with SD of 7.01. The decreased was observed which is statistically significant (p<0.001).

The mean of pre intervention score of total disability (SPADI) of group A was 57.47 with SD of 5.77, and is decreased to post score 17.60 with SD of 4.01.The decreased was observed which is statistically significant (p<0.001). The mean of pre intervention score of total SPADI score of group A was 67.13 with SD of 4.80, and is decreased to post score 22.30 with SD of 4.25. The decreased was obtained which was statistically significant (p<0.001).

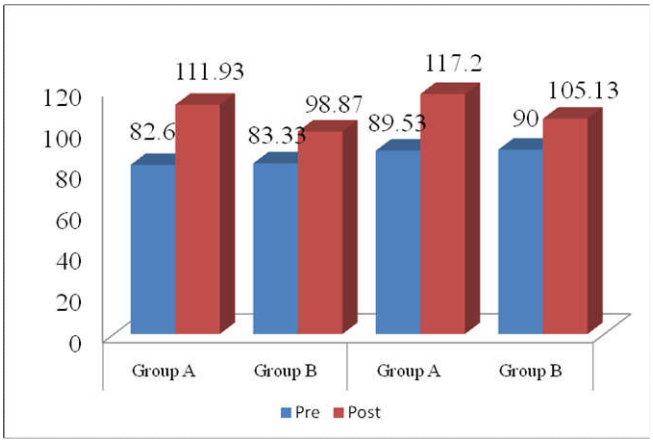


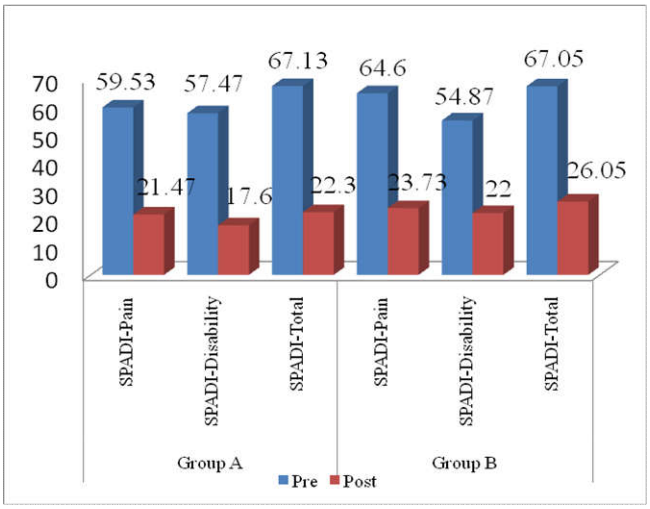
Fig. 6. Pre and post active and passive ROM in both groups

Table 4. Pre – post difference with in group B

Sl.No:	Variable	Pre	Post	Þ-value
1	Arom	83.33±17.55	98.87±20.64	<0.0001
2	Prom	90.00±17.55	105.13±20.24	<0.0001
3	Spadi-pain	64.60±8.72	23.73±6.52	<0.001
4	Spadi-disability	54.87±6.98	22.00±6.06	<0.001
5	Spadi-total	67.05±6.71	26.05±6.33	<0.001

In group B, the mean of pre intervention score of active abduction ROM was 83.33 degree with SD of 17.55 degrees, and is increased to post score 98.87 degree with SD of 20.64 degree. The increased was observed which is statistically significant (p<0.0001). Similarly the mean of pre intervention score of passive abduction ROM of group A was 90.00 degrees with SD of 17.55 degrees and is increased to 105.13 degrees with SD of 20.24 degree. The increased was observed which was statistically significant (p<0.0001). The mean of pre intervention score of total pain (SPADI) of group B was 64.40 with SD of 8.72), and is decreased to post score 23.73 with SD of 6.06. The decreased was observed which is statistically significant (p<0.001).

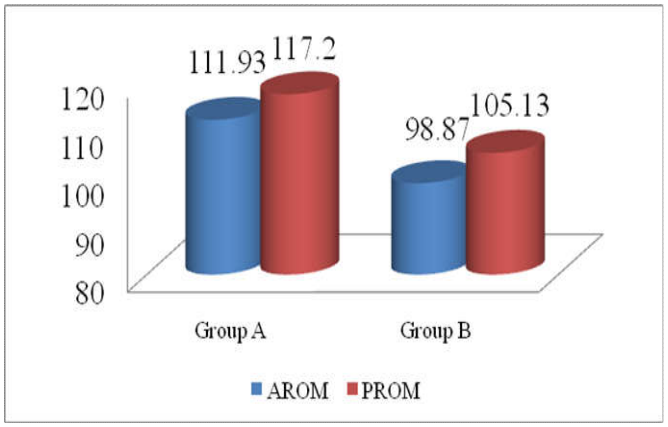
The mean of pre intervention score of total disability (SPADI) of group B was 54.87 with SD of 6.98, and is decreased to post score 22.00 with SD of 6.06.The decreased was observed which is statistically significant (p<0.001). The mean of pre intervention score of total SPADI score of group B was 67.05 with SD of 46.71, and is decreased to post score 26.05 with SD of 6.33. The decreased was obtained which was statistically significant (p<0.001). However when comparing between group the mean increase in active abduction for group A was 111.93 degreewith SD of 22.32 degree and in the group B was 98.87degree with SD of 20.64 degree which was not statistically significant, (p>0.107). Similarly when comparing passive abduction ROM for group A was 117.20degree with SD of 21.97 degree and in the group B was 105.13degree with SD of 20.24 degree which was statistically not significant (p>0.129).



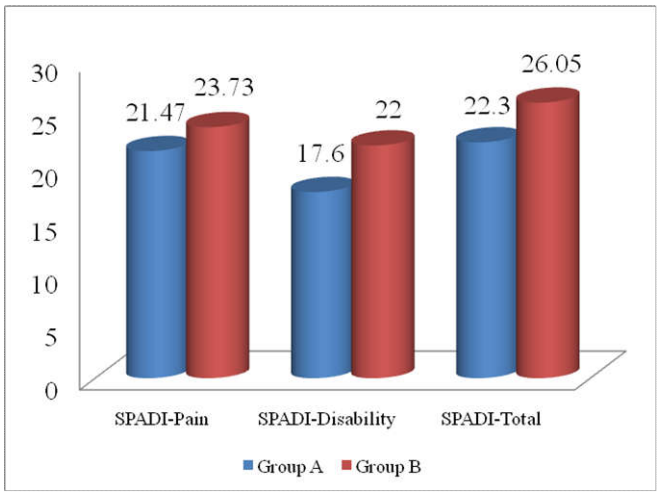
Graph 7. Pre and post SPADI score of both the groups

Table 5. Difference between groups

Sl.No:	Variable	Group A	Group B	Þ-value
1	AROM	111.93±22.32	98.87±20.64	>0.107
2	PROM	117.20±21.97	105.13±20.24	>0.129
3	SPADI-Pain	21.47±7.01	23.73±6.52	>0.367
4	SPADI-Disability	17.60±4.01	22.00±6.06	>0.05
5	SPADI-Total	22.30±4.25	26.05±6.33	>0.137



Graph 8. Evaluation of ROM between group



Graph 9. Evaluation of SPADI between group

For the group A the mean reduction in SPADI pain was 21.47 with SD of 7.01 and in group B was 23.73 with SD of 6.52 which was not statistically significant (p>0.367).

Reduction in SPADI disability for group A was 17.60 with SD of 4.01 and for group B was 22.00 with SD of 6.06 which was not statistically significant (p>0.05). Comparing between the mean reduction in total SPADI for group A was 22.30 with SD of 4.25 and in group B was 26.05 with SD of 6.33 which was not statistically significant (p>0.137). In summary both group A and group B effective in improving abduction ROM and reducing SPADI score.

DISCUSSION

The objective of the present study was to evaluate the effect of Gong's mobilization and Cyriax manipulation for increasing shoulder ROM and improving shoulder function in frozen shoulder subject, and compare the effect of both. In this comparative study, it was found that Gong's mobilization technique and Cyriax manipulation are equally effective in reducing functional disability and increasing abduction ROM in frozen shoulder subjects. The Demographic variables of the present study were homogenous in both the groups. The patients of frozen shoulder is usually between ages of 40-60 year and women are most commonly affected (Neviaser, 1987). In group A (Gong's mobilization), the analysis of shoulder adduction ROM within the group showed that there was statistically significant change in mean ROM when analyzed from pre intervention to post intervention, which is in accordance with a study "Effect of Gong's mobilization applied to shoulder joint on shoulder abduction" done by Wontae Gong at al. (2011), and they reported that after application of Gong's mobilization in patient with restricted shoulder abduction ROM there was significant increase in shoulder abduction ROM, on comparing their result with present study, it is supported that ROM increases with Gong's mobilization.

According to Robert A Donatelli, Joint mobilization techniques improve the mobility of joint and soft tissue, and also improve the normal extensibility of the shoulder capsule and stretch the tightened soft tissues (Robert A Donatelli, 1997). Joint mobilization is a manual therapy that applies passive traction and gliding motion to the articular surface to maintain the free mobility of joints or to restore the normal condition of joints. Joint mobilization can be effectively used to reduce pain and also to improve joint mobility stated by Yang J et al (2007) (Vermeulen, 2000 and Yang, 2007). Furthermore, according to Caroline Giullot mobilization techniques increase or maintain joint mobility by inducing rheologic changes in synovial fluid, an enhanced exchange between synovial fluid and cartilage matrix, and increased synovial fluid turnover (Caroline Gillot, 1998). According to Wontae Gong, in Gong's mobilization, abduction of the shoulder joint occurs when the humeral head is in normal position and the normal muscular contraction occurs with the rolling and sliding occurring at the articular surface and the tension of posterior joint capsule is reduced. And Gong's mobilization also corrects glenohumeral malalignment that can induce proper acceleration during treatment (Harsulkar Sunil, 2013). In group A (Gong's mobilization), the total SPADI score significantly reduced from pre to post score which is statistically significant. Result of this study was similar to study done by Simon Curette et al, the SPADI score significantly reduced after mobilization and standard physiotherapy, and they stated that reduction of pain and increase in ROM will reduce the functional disability (Curette, 2003).

The reduction in total pain score in the present study may be due to stimulation of mechanoreceptors by mobilization which decreases transmission of nociceptive stimulation at spinal cord and brain stem level thus closing pain gate (Meltzak, 1981), and also that mobilization maintains nutrient exchange and decrease painful effect of stasis (Wall, 1980). In this present study group B (Cyriax manipulation group) showed that there was statistically significant improvement in mean of abduction ROM when analyzed from pre intervention to post intervention. Which was in accordance with the study done by FusunUysal and Konzanoglu and they reported that application of the Cyriax approach of deep friction massage and mobilization exercise, three times a week, to patients with frozen shoulder, will decrease pain and increase ROM after two week (Guler-Uysal, 2004). On comparing with their result, it is supported that ROM increases and pain reduces after Cyriax manipulation.

The overall improvement in mean abduction ROM in Cyriax group may be due to, friction massage attempt to reduce abnormal fibrous adhesion from the affected site, and improve normal alignment of soft tissue fibers, friction massage also reduce the crystalline roughness that forms between tendons (Brosseau and Wieting, 2004). In group B (Cyriax manipulation group) there was statistically significant change in mean of total SPADI score when analyzed from pre score to post score. Both total pain score and total disability score improve significantly from pre to post. Which was in accordance with a study done by EbruTuranDolunay, he reached in a conclusion that application of transverse friction massage in patients with impingement syndrome will improve pain, ROM and activity of daily living (Dolunay, 2005). Winters (Winter, 2004), showed that a combination of exercise, massage and physical applications was less successful in reducing shoulder pain than either steroid injection or mobilization in the joints of the shoulder complex. However, specific detail of what exercise and massage carried out in this study were not provided by Winters, making it difficult to directly compare their result with present study. Pain relief in Cyriax group may be due to modulation of the nociceptive impulses at the level of spinal cord, the "gate control theory". The centripetal projection into the dorsal horn of the spinal cord the nociceptive receptor system is inhibited by the concurrent activity of the mechanoreceptors located in the same tissue.

Another mechanism by which reduction in pain may be achieved is through diffuse noxious inhibitory controls, a pain suppression mechanism that releases endogenous opiates. The latter are inhibitory neurotransmitters which diminish the intensity of the pain transmitted to higher center (Stasinopoulos, 2004). The present study showed that both Gong's mobilization and Cyriax manipulation are statistically and clinically significant in improving shoulder abduction mobility and reducing SPADI score following 2 weeks of intervention. However, when comparing between group there was no statistically significant difference in improving shoulder abduction ROM and reducing SPADI score. There was slightly better improvement in subjects who received Gong's mobilization which may be because, in Gong's mobilization abduction of shoulder takes place with humeral head in the normal position against the scapular glenoid cavity (Gong, 2011), and also the Gong's mobilization performed in side-lying position corrects glenohumeral malaligment more stably and utilizes gravity to produce more acceleration.

The main advantage of Gong's Mobilization is that it provides immediate effect and it does not require external rotation to improve abduction which can be helpful in frozen shoulder patient where marked limitation of external rotation is present (Gong, 2012). Both the groups received conventional therapy consisting of therapeutic ultrasound and mobility exercise that include codman's pendular exercise, shoulder wheel, overhead pulley, wall ladder and active exercise in all three planes. Improvement in the outcome parameters also could be due to conventional exercises. Hence based on the analysis and findings, the present study found that 2 weeks of Gong's mobilization and Cyriax manipulation are statistically not significant on improving function and mobility of shoulder in subjects with frozen shoulder. Therefore the study accepts null hypothesis.

Limitations

The study was of short-term duration and with small size**.** There was no follow up to see the long term effect of training in present study. In the present study data were collected at few outpatient hospital and clinic, limiting the generalizability of the findings. Subjects with small range group between 40 to 50 years of age were considered for the study, thus results cannot be generalized to other agegroups. Only shoulder abduction ROM was measured in present study.

Recommendations

The number of participants/subjects should be increased for a more reliable outcome. The period of study should be increased be as the disease process is long hence it may lead to better and valuable results. Further study should needed measuring effect on other outcome measurements. Future study should consist of blinded randomized control trail to find out the long term effect of Gong's mobilization over Cyriax in frozen shoulder subjects.

Conclusion

Objective of the present study was to evaluate effectiveness of Gong's mobilization and Cyriax manipulation for increasing shoulder ROM and improving shoulder function in frozen shoulder subject and compare the effect of both. It was evident from the results that 2 weeks of Gong's mobilization combined with conventional therapy and Cyriax manipulation combined with conventional therapy found statistically and clinically significant effect on improving pain, active and passive shoulder abduction ROM for subjects for frozen shoulder but when comparing between group there was no significant difference between both kind of treatments on improving pain and ROM. Hence present study suggest that Gong's mobilization and Cyriax manipulation was equally effective in management of frozen shoulder and can be used in treatment of adhesive capsulitis for better outcome.

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