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EFFECT OF GONG'S MOBILIZATION VERSUS MULLIGAN'S MOBILIZATION ON SHOULDER PAIN AND SHOULDER MEDIAL ROTATION MOBILITY IN FROZEN SHOULDER

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ABSTRACT

Background and Objective: Frozen shoulder is a painful condition with gradual restriction of all planes of movement in the shoulder joint. The purpose of the present study was to evaluate the effect of Gong's Mobilization versus Mulligan's Mobilization on Shoulder pain and Shoulder Medial Rotation mobility in subjects with Frozen shoulder.

Method: An Experimental study design, 40 subjects with unilateral frozen shoulder were selected and randomized 20 subjects into each of two groups- Gong's mobilization and Mulligan's mobilization groups respectively. Gong's group received the Gong's mobilization technique with conventional therapy while Mulligan's group received Mulligan's mobilization along with conventional therapy. The duration of intervention was 5 treatment sessions per week for two weeks. Outcome measures such as shoulder medial rotation was measured using a Goniometer and pain was measured using a VAS scale before and after two weeks of intervention.

Results: Analysis using Independent 't' test and Mann Whitney U test found that there is statistically significant difference $p < 0.000$ when pre to post interventions means were compared within the groups. When post intervention means were compared between the Gong's and Mulligan's groups there was no statistically significant difference in Active and Passive Range of Shoulder Medial Rotation but there was statistically significant difference in VAS when compared between the groups.

Conclusion: It is concluded that both Gong's mobilization with conventional therapy and Mulligan's mobilization with conventional therapy are effective in reducing pain and improving Shoulder Medial Rotation Mobility in Frozen Shoulder. However Gong's mobilization shown greater percentage of effect in reducing pain and Mulligan's Mobilization shown greater percentage in improving ROM.

Keywords: Gong's mobilization, MWM, Frozen shoulder, shoulder mobility, Pain, ROM, Conventional therapy, Internal rotation, Mulligan's mobilization.

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INTRODUCTION

“Adhesive Capsulitis” or “frozen shoulder,” is a soft tissue disorder that results in pain, stiffness, and progressive loss of active and passive range of motion (AROM and PROM) in the glenohumeral joint [1]. It affects persons older than 40 years of age more commonly, and 70% of patients presenting with a frozen shoulder are women [2]. Although early studies suggested that it is a self-limiting condition lasting for an average of 2-3 years later studies have found that up to 40% of patients have persistent symptoms and restricted movement beyond 3 years, with 15% left with permanent disability [3].

Mulligan’s mobilization-with-movement (MWM) is a manual therapy treatment technique in which a manual force, usually in the form of a joint glide, is applied to a motion segment and sustained while a previously impaired action (e.g. painful reduced movement, painful muscle contraction) is performed. The technique is indicated if, during its application the technique enables the impaired joint to move freely without pain. The direction of the applied force (translation or rotation) is typically perpendicular to the plane of movement or impaired action and in some instances it is parallel to the treatment plane. Studies have described the success of MWM in the management of various musculoskeletal conditions. It has been proposed that the MWM treatment technique produces its effects by correcting positional faults of joints that occur following injuries or strains [4]. The Mulligan’s mobilization-with-movement (MWM) end range passive over-pressure is applied by patient or assistant for shoulders with limited range of motion because of pain, it was found that there is an improvement in range of motion and pressure pain threshold [5].

Gong’s mobilization technique is end range mobilization technique in which a corrective Antero-Posterior glide is applied with the shoulder in the dynamic position followed by distraction and performing the restricted movement. Then oscillation at Maitland’s grade 3 and 4 is given with sustained stretching. Thus it incorporates both distraction as well as Maitland’s technique [6]. Gong’s mobilization is a useful treatment in clinical setting because of its immediate effects. It aims to decrease pain and improve range of motion [7,8].

Wontae Gong found that Gong’s mobilization technique is more effective than anterior to posterior gliding at improving shoulder medial rotation and it is an end range mobilization technique that keeps the shoulder in normal position, but this study was limited to know the effect comparing with other end range mobilization technique such as mobilization with movement [6].

Therefore, the present study with research question, whether the Gong’s mobilization or Mulligan’s mobilization does have a greater effect on improving pain and shoulder medial rotation for subjects with frozen shoulder? As there are no studies found in the literature on effect of Gong’s Mobilization comparing with Mulligan’s mobilization on medial rotation mobility in Frozen shoulder, hence the purpose of this study is to

compare effect of Gong’s Mobilization versus Mulligan’s Mobilization on improvement of pain and shoulder medial rotation ROM for subjects with frozen shoulder. It was null hypothesized that there will be no significant difference on improvement of pain and shoulder medial rotation range between Gong’s Mobilization and Mulligan’s mobilization in subjects with Frozen shoulder.

METHODOLOGY

An experimental study design with two groups- Gong’s group and Mulligan’s group. As this study involved human subjects the Ethical Clearance was obtained from the Ethical Committee of KTG College of Physiotherapy and K.T.G. Hospital, Bangalore as per the ethical guidelines of Bio-medical research on human subjects. This study was registered under Rajiv Gandhi University of Health Sciences for subject for registration for dissertation with registration number 09_T031_47179. Subjects included in the study were with age group between 40 – 65 years,[9] both male and female subjects,[6] Unilateral stage-II frozen shoulder,[10] history of shoulder pain and stiffness of the shoulder for more than three month,[10-13] painful restricted active range of motion (AROM) and passive range of motion (PROM) in both external rotation and glenohumeral abduction was taken to indicate diagnosis of Capsulitis,[14] pain at night causing sleep disturbance and inability to lie on the affected side,[15] normal findings on radiographs. Subjects were excluded with previous surgery in the shoulder joint,[16] rotator cuff rupture,[16] history of recent fracture or severe trauma to the shoulder,[16] ROM was restricted due to burns or postoperative scars,[6] diagnosed instability or previous history of dislocation,[16] Systemic inflammatory conditions (e.g. rheumatoid arthritis) [16].

Subjects were recruited and study was conducted at KTG Hospital, Bangalore. Subjects who meet inclusion criteria were recruited by Simple random sampling method using closed envelopes, randomly allocated subjects into two groups. Subjects who meet inclusion criteria were informed about the study and a written informed consent was taken. Total 40 Subject (n=40), 20 in each group completed the studied. Total duration of intervention was for two weeks, 5 sessions per week.

Procedure for intervention for Gong’s Group: [7,8]

In this group subjects were treated with Gong’s Mobilization and conventional exercises.

Gong’s mobilization was performed on subject in side-lying position with the involved shoulder joint upward. The subject’s shoulder was abducted at 90 degrees so that the humerus’s vertical position was maintained and the flexed elbow joint was maintained at 90 degrees. The therapist kept the subject’s elbow joint at 90 degrees with one hand, placed his elbow below the subject’s elbow joint, and pressed the humerus head from anterior to posterior with the other hand. Then, the therapist held the vertical axis of the humerus steady by maintaining the shoulder abduction and the elbow at 90 degrees and raised therapist own body while slightly pulling on the articular capsule of the shoulder joint. This slight pulling

of the articular capsule was maintained for 10–15 seconds then relaxed for 5 seconds; this technique maneuver was performed for about 2 to 3 minutes. After extending the articular capsule by slightly pulling it, the therapist used one hand to press the shoulder joint from anterior to posterior in order to prevent vertical pulling of the slightly extended articular capsule and the humerus. The therapist supported the elbow with the other hand and performed shoulder medial rotation. Then, in order to increase ROM, oscillation at Maitland's grades 3 and 4 was performed followed by sustained stretching at grade 4 for about 7 seconds.

Procedure for intervention for Mulligan's MWM Group: [17,18]

In this group subjects were treated with Mulligan's Mobilization and conventional exercises. When the patient had gross loss of rotation, the technique for gross loss of internal rotation was applied. Here the patient sits or stands and the therapist stands on the affected side of the patient and cups the hand around the upper end of the humerus. The other hand stabilizes the scapula. Now in this position the humeral head was pulled slightly down and back in the glenoid fossa. This "correction" was maintained and the patient internally rotates repeatedly. Over-pressure was given by the therapist through the hand and shoulder abduction was maintained through therapist's forearm.

When the patient hand reaches upto the sacrum, the technique which was used is as follow; the therapist stands facing the subjects affected shoulder and placed the thumb of one hand in the bend of subjects flexed elbow on the affected side. The subjects hand should be far as possible behind his back. Now by placing the web space of the other hand obliquely in patient's axilla the therapist stabilizes the scapula. Now the therapist glides the head of the humerus inferiorly (down) in the glenoid fossa using the thumb placed in the bent elbow while the other hand stabilizes the scapula upwards and inwards. As the glide was maintained the subject was instructed to internally rotate his shoulder with the help of other hand. The therapist then adducts the subjects hand with their abdomen. Glide was maintained and released after 15 sec, this was repeated 10 times [19].

Conventional exercises –Conventional Therapy was given as common intervention for both groups. It included: Codman's Pendulum exercise, Scapular stabilization exercise, Active-assisted ROM exercises, and Finger walk. All exercises were performed 3 sets with 15 repetitions per set.



Figure-1: Gong's mobilization



Figure-2: Mulligan's mobilization

Outcome Measurements:

The subject's VAS for pain were measured using a 10 cm Visual Analogue Scale[20-24] during active medial rotation of the shoulder, and Shoulder mobility such as Active and passive ROM of shoulder medial rotation was measured using standard goniometer in both the groups before intervention and after 10 session of intervention.

Procedure for measuring Range of Motion (ROM): [25-27]

- (i) Active shoulder medial rotation: Range of movement was tested using a standard 360° goniometer with scales marked in 1° increments. All testing took place with the subject in a supine position with the knees flexed to 90° to stabilize the trunk and with the arm positioned in 90° of glenohumeral abduction, elbow flexed to 90° and the forearm vertical—that is, the neutral position for rotation. The goniometer axis was aligned with the long axis of the humerus, the distal tip of the olecranon being used as the superficial landmark. The stationary arm of the goniometer was placed in a vertical position, with the moving arm aligned with the lateral aspect of the ulna. From a zero rotation position, subjects were asked to internally rotate their shoulder maximally. Stabilization of the scapulothoracic joint was provided by the therapist via a posteriorly directed force from the therapist's hand on the coracoid and anterior aspect of the acromion, to prevent scapular protraction or elevation. Once the subject had achieved end of range, the angle was recorded. This test measures the subject's active range of motion and the therapist should not apply overpressure to the forearm. All measurements were taken by a single physiotherapist.
- (ii) Passive shoulder medial rotation: The subject lies supine on the examination table with the knees flexed to 90° to stabilize the trunk. The arm is abducted and the elbow is flexed 90° respectively. The therapist stands above the subject's shoulder and stabilizes the scapula in neutral position by using the forearm to prevent protraction and the shoulder is gently moved into internal rotation by the therapist until a firm endpoint is felt or the scapula begins to elevate. At this position, the goniometer was aligned with the ulna (using the olecranon process and the ulnar styloid for reference) providing an angle between the forearm and a perpendicular plane to the examination table. Now the therapist measures and records the angle using a universal goniometer.

Statistical Methods

Descriptive statistical analysis was carried out in the present study. Out come measurements analyzed are presented as mean \pm SD. Significance is assessed at 5 % level of significance with p value was set at 0.05 less than this is considered as statistically significant difference. Paired 't' test as a parametric and Wilcoxon signed rank test as a non-parametric test have been used to analysis the variables pre-intervention to post-intervention with calculation of percentage of change. Independent 't' test as a parametric and Mann Whitney U test as a non-parametric test have been used to compare the means of variables between groups with calculation of percentage of difference between the means. The Statistical software namely SPSS 16.0, Stata 8.0, MedCalc 9.0.1 and Systat 11.0 were used for the analysis of the data and Microsoft word and Excel have been used to generate graphs, tables etc.

RESULTS

The study carried on total 40 subjects (Table-1) in Gong's Group there were 20 subjects with mean age 51.00 years and there were 9 males and 11 females were included in the study. In MWM Group there were 20 subjects with mean age 53.55 years and were 9 males and 11 females were included in the study. There is no significant difference in mean ages between the groups.

When means were analyzed within the groups from pre-intervention to post-intervention (Table-2) shows that there is a statistically significant change in means of Visual analog score and Shoulder internal rotation AROM and

PROM in degrees $p < 0.000$ with negative percentage of change showing that there is decrease in the post means. There is clinical significant improvement with large effect size in both the group.

When pre intervention means were compared (Table-3) between Gong's and MWM Group there is no statistically significant difference in means of Visual analogue score for pain and shoulder internal rotation AROM and PROM. When post intervention means were compared there is a statistically significant difference in means of Visual analogue score for pain and there is no statistically significant difference in means of shoulder internal rotation AROM and PROM. There is a no clinical significant difference in post means with small effect size.

Table 1: Basic Characteristics of the subjects studied

Basic Characteristics of the subjects d studied		Gong's Group	MWM Group	Between the groups Significance
Number of subjects studied (n)		20	20	--
Age in years (Mean \pm SD)		51.00 \pm 6.82 (41-64)	53.55 \pm 7.57 (41-65)	p= 0.226 (NS)
Gender	Males	9	9	--
	Females	11	11	
Side	Right	11	9	--
	Left	9	11	

a- Pearson Chi-Square

Graph 1: Comparison of means of VAS between

Table 2: Analysis of pain and Shoulder Range of Motion within Gong's and MWM Group (Pre to post test analysis)

	Pre intervention Mean \pm SD (min-max)	Post intervention Mean \pm SD (min-max)	Percentage of change	Z value ^b (Non parametric significance)	t value ^a (Parametric)	P value	95% Confidence interval of the difference		Effect Size (r)
							Lower	Upper	
Gong's Group									
Visual analog scale score (cm)	4.45 \pm 0.82 (3.0- 6.0)	2.38 \pm 0.75 (1.0-3.4)	-46.51%	-3.979 P <0.000**	14.521	P <0.000**	1.711	2.368	+0.796 (Large)
Shoulder IR AROM (degrees)	37.35 \pm 5.07 (28 - 45)	45.30 \pm 5.78 (35 -55)	21.28%	-3.963** P <0.000**	-33.858	P <0.000**	-8.441	-7.459	+0.590 (Large)
Shoulder IR PROM (degrees)	42.10 \pm 5.39 (33 - 50)	51.25 \pm 5.57 (42 - 59)	21.73%	-3.988** P <0.000**	-50.349	P <0.000**	-9.530	-8.770	+0.641 (Large)
MWM Group									
Visual analog scale score (cm)	4.29 \pm 1.01 (3.0 - 6.0)	1.82 \pm 0.72 (0.8 - 3.0)	-57.57%	-3.937 P <0.000**	24.253	P <0.000**	2.252	2.677	+0.815 (Large)
Shoulder IR AROM in degrees	37.05 \pm 6.21 (23- 45)	47.05 \pm 6.88 (31-56)	26.99%	-3.954 P <0.000**	-38.230	P <0.000**	-10.547	-9.456	+0.607 (Large)
Shoulder IR PROM (degrees)	42.05 \pm 6.41 (27- 50)	51.80 \pm 6.30 (37-61)	23.18%	-3.970 P <0.000**	-40.754	P <0.000**	-10.251	-9.249	+0.609 (Large)

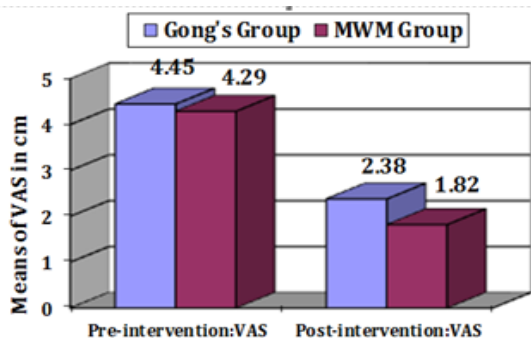
** Statistically Significant difference $p < 0.05$; NS- Not significant; a. Pared t test. b. Wilcoxon Signed Ranks Test

Table 3: Comparison of means of pain and Shoulder internal rotation ROM between Gong's Group and MWM Groups (PRE and POST INTERVENTION COMPARISION)

	Gong's Group Mean±SD (min-max)	MWM Group Mean±SD (min-max)	Percentage of difference	Z value ^b (Non parametri)	t value ^a (Parametri)	P value	95% Confidence interval of the difference		Effect Size r
							Lower	Upper	
PREINTERVENTION									
Visual analog scale score in cm	4.45± 0.82 (3.0- 6.0)	4.29± 1.01 (3.0 - 6.0)	-3.66%	Z= -.578 P=0.564	0.566	P =0.575 (NS)	-.425	.755	+0.080 (Small)
Shoulder IR AROM in degrees	37.35± 5.07 (28-45)	37.05± 6.21 (23- 45)	-0.80%	Z= -.081 P=0.935	0.167	P =0.868 (NS)	-3.330	3.930	+0.026 (Small)
Shoulder IR PROM in degrees	42.10± 5.39 (33-50)	42.05± 6.41 (27- 50)	-0.11%	Z=-.272 P=0.786	0.027	P =0.979 (NS)	-3.747	3.847	+0.004 (Small)
POST INTERVENTION									
Visual analog scale score in cm	2.38±0.75 (1.0-3.4)	1.82± 0.72 (0.8 - 3.0)	-26.66%	Z= -2.324 P=0.020	2.383	P =0.022 **	0.084	1.035	+0.367 (Medium)
Shoulder IR AROM in degrees	45.30± 5.78 (35-55)	47.05± 6.88 (31-56)	3.79%	Z=-1.030 P=0.303	-0.870	P =0.390 (NS)	-5.822	2.322	+0.136 (Small)
Shoulder IR PROM in degrees	51.25± 5.57 (42 - 59)	51.80± 6.30 (37-61)	1.06%	Z=-.325 P=0.745	-0.292	P =0.772 (NS)	-4.359	3.259	+0.046 (Small)

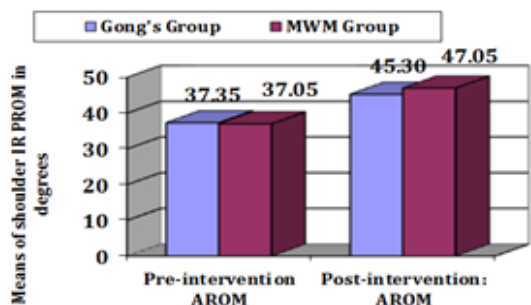
** Statistically Significant difference p<0.05; NS- Not significant a. Independent t test b. Mann-Whitney Test

Gong's Group and MWM Group (PRE AND POST INTERVENTION)



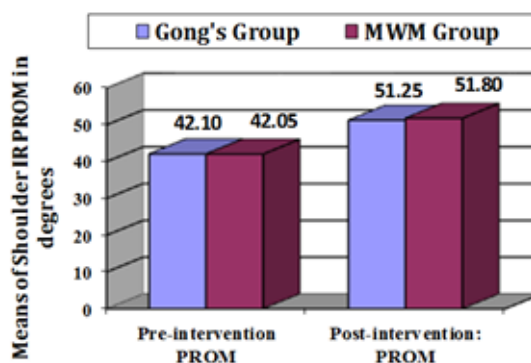
The above graph shows that when pre intervention means were compared between Gong's and MWM Group there is no statistically significant difference in means of Visual analogue score for pain. When post intervention means were compared there is a statistically significant difference in means of Visual analogue score for pain.

Graph 2: Comparison of means of shoulder internal rotation AROM Gong's Group and MWM Group (pre and post intervention)



The above graph shows that there is no statistically significant difference in means of shoulder internal rotation AROM when pre-intervention and post intervention means were compared between Gong's Group and MWM Group.

Graph 3: Comparison of means of shoulder internal rotation PROM Gong's Group and MWM Group (pre and post intervention)



The above graph shows that there is no statistically significant difference in means of shoulder internal rotation PROM when pre-intervention and post intervention means were compared between Gong's Group and MWM Group.

DISCUSSION

In this study finding from the analysis found that there is a statistically and clinically significant improvement in pain and shoulder medial rotation mobility in both Gong's and Mulligan's mobilization group after two weeks of intervention (10 sessions) for subjects with Frozen shoulder. However the difference between the groups were not statistically significant different in improving medial

rotation mobility, In Gong's group VAS improved slightly more than in the MWM group and MWM showing better results in improving ROM.

In Gong's group, the analysis of pain and shoulder mobility within the group shows that there is statistically significant change in means of VAS and ROM when analyzed from pre intervention to post intervention. Pain may be reduced because joint mobilization has both neurophysiologic and mechanical effects, rhythmic oscillatory movements which stimulate the type-2 dynamic mechanoreceptors and inhibit the type-4 nociceptive receptors and also has an effect on circulatory perfusion, hence effectively used to treat reversible painful joint with low mobility and functionally fixed joint [6-8]. The increase in shoulder medial rotation ROM was due to the fact that shoulder medial rotation was restricted by the humeral head's anterior displacement during shoulder medial rotation and now when posterior compression of the humeral head is given it puts the humeral head in a normal position. Also better results seen owing to the fact that mobilization in the end range is given which is the factor that maintained the shoulder joint in the normal position throughout the anterior to posterior gliding and provides immediate result. Therefore, Gong's mobilization technique may be performed to reduce GH joint's stiffness or improve shoulder joint ROM [6]. Wontae Gong et.al carried out a study on the effects of Gong's Mobilization applied to the shoulder joint on abduction. In their study 57 male and female subjects having shoulder abduction ROM less than 120° were selected and allocated into Gong's group and Anterior-Posterior glide group and found that the both groups were effective in improving shoulder abduction ROM but effect of Gong's mobilization was greater. [6]

In a common joint mobilization technique, aimed at increasing shoulder medial rotation ROM, anterior to posterior gliding is performed on subjects who are in the supine position. However, anterior to posterior gliding keeps the humeral head in a normal position in the static state, but it does not keep the humeral head in a normal position during active movement, therefore Gong's mobilization enables shoulder medial rotation with the humeral head in a normal position against the glenoid cavity of scapula, to improve shoulder medial rotation ROM [17].

In Mulligan's group improvement in ROM is attributed to the engagement of the proprioceptive tissue such as Golgi tendon organs activated by tendon stretch and restored the normal gleno-humeral arthrokinematics and resulted in capsular stretching [27]. Mulligan's mobilization proposes to produce effect by correcting positional faults in the joint. The biomechanical effect manifests itself when forces are directed towards resistance but within the limits of a subject's tolerance. The mechanical changes include breaking of adhesions, realigning collagen or a fibre glide when specific movements stress the specific parts of the capsule [5]. Kachingwe found that increase in active ROM with shoulder dysfunction by using MWM is a result of activation of mechano-receptors inhibition nociceptive stimuli through the gate-control mechanism through

facilitation of synovial fluid nutrition [16,19]. Teys et.al stated that clinically meaningful improvements in both ROM and pressure pain threshold occur immediately after the application of Mulligan's technique in the pain-limited shoulder [16].

Comparison of effects between both the techniques, the study found that there is no statistically significant difference between Gong's Group and MWM Group in improvement of pain and shoulder medial rotation mobility following two weeks of intervention. However, improvement of VAS was found to be slightly greater in the Gong's group and ROM improved in MWM group to a greater extent.

Conventional exercises like the Codman's Pendulum exercise, Scapular Stabilization exercise and Active assisted ROM exercises and Finger exercises were added to both the group as it is an effective strategy to stretch and strengthen the shoulder muscles affected by Capsulitis. Improvement in the outcome parameters also could be due to conventional exercises. Therefore the study lacks comparison with control group who received only conventional exercises and effect with other pain relieving methods.

Hence based on the analysis and findings, the present study found that two weeks of Gong's mobilization and MWM mobilization found statistically significant difference on improvement of pain and shoulder medial rotation mobility for subjects with frozen shoulder. Therefore the present study accepts the null hypothesis.

LIMITATIONS OF THE STUDY

Subjects with primary frozen shoulder in the II stage were considered for the study, thus results cannot be generalized. The study was carried for two weeks. Follow-up was not done therefore long term effects were not known. Only medial rotation ROM and pain were measured.

RECOMMENDATION FOR FUTURE RESEARCH

Present study is lacking with control group who received only conventional exercise so further studies with control group suggested. Study on long term effects of both mobilization techniques are needed. Study including subjects in different stages of frozen shoulder are needed. Further study is needed to compare the effect with other conventional exercises, pain- relieving methods. Further study are needed to find the effects of these techniques using other outcome measurements

CONCLUSION

The present study concludes that the 2 weeks of combined Gong's mobilization with conventional exercises and Mulligan's mobilization with conventional exercise found statistically and clinically significant effect on improving pain, Active and passive shoulder medial rotation ROM for subjects with Frozen Shoulder, however there is no significant difference between Gong's mobilization and Mulligan's mobilization. Gong's mobilization shown greater percentage of reduction in pain than MWM and MWM shown to have greater percentage of effect on improvement of ROM than Gong's mobilization.

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Conflicts of interest: None

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