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Original Research Article

Comparative Study of Kaltenborn Mobilisation versus Mulligan Mobilisation in Patients with Frozen Shoulder

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ABSTRACT

Aim: To compare the efficacy of Kaltenborn versus mulligan mobilisation in frozen shoulder.
Objective: To assess and compare the efficacy of Kaltenborn versus mulligan mobilisation in frozen shoulder
Methodology: A total of 40 subjects were recruited into this study. The subjects were divided randomly into two equal groups. Group A was given Kaltenborn mobilisation and Group B was given Mulligan mobilisation. The patients were informed about the procedure and a written informed consent was obtained from all the participants willing to be a part of this study. The baseline data of ROM of all movements of shoulder was obtained using universal goniometer, pain and disability data was obtained using SPADI.
Statistics & Results: Data was collected on a data sheet & encoded for computerized analysis using SPSS version 22 for Windows. The statistical analysis of post values of Group A (Kaltenborn mobilization) when compared with the post values of Group B (Mulligan mobilization) VAS (p value <0.001), ROM with shoulder flexion (p value <0.0057), shoulder abduction (p value <0.0001), external rotation (p value <0.0065), internal rotation (p value <0.0075), SPADI (p value <0.0309) showed statistical significance. Thus Mulligan mobilization showed more improvement as compared to Kaltenborn mobilisation.
Conclusions: Mulligan mobilization is more effective in improving VAS (Pain), ROM of shoulder and Shoulder pain and disability index (SPADI) than Kaltenborn mobilization.

Key words: Mulligan, Kaltenborn, manual therapy, frozen shoulder, SPADI

INTRODUCTION

Frozen shoulder is the commonly used term for adhesive capsulitis, named for thickening and contracture of the capsule, the connective tissue surrounding the bony structures of the shoulder joint. [(1)] The disorder was originally known as shoulder periarthritis or perioarthritis, because the inflammation surrounds the shoulder joint, but those terms are no longer preferred. Frozen shoulder is usually painful, but stiffness and restriction in movement are the primary characteristics resulting from capsule contracture and are often likened to the immobilization of freezing versus the loosening of thawing. [(4)]

The disorder primarily affects people past the age of 40, particularly women; certain diseases increase the incidence of frozen shoulder, especially diabetes mellitus and thyroid diseases. [(6)] The pain associated with shoulder movement is often relieved by use of ordinary anti-inflammatory drugs; in severe cases, steroids may be used temporarily. Physical therapy, based on stretching or range of motion exercises for

shoulder may hasten the improvement considerably and are the current standard therapy. [(5)] The goal of physiotherapist is to optimize function, decrease pain, maintain proper mechanics and restore joint play motion of roll, glide and joint separation.

Manual therapy has been an important part of rehabilitation and assessment of restricted joint movement. Mobilization helps in attempting to restore the normal arthrokinematics and osteokinematics of joint movement. [(2)]

Kaltenborn mobilization depends on the concave rule and gives grades of traction which are loosening, tightening and stretching the soft tissues. [(7)]

Mulligan mainly follows movement with mobilisation (MWM). In this technique correctional mobilization is sustained and several repetitions will begin to bring lasting improvements. [(3)] Manual therapy techniques are an attempt to prevent and break capsular adhesions and restore joint play, therefore in this study we have applied Kaltenborn and mulligan techniques to see their efficacy in treatment of frozen shoulder.

FROZEN SHOULDER

The term froze shoulder (FS) is used to describe a clinical condition with restricted active and passive range of motion in all directions, both flexion, abduction and rotation.

By definition given by "Lundberg" it is defined as shoulder joint elevation ≤ 135°; restriction of range of motion is localised to the glenohumeral joint; and history, clinical and radiological examination shows no other explanation. Perhaps it is wise to use the initial classification of Lundberg (1969) which is divided into primary frozen shoulder caused due to Diabetes mellitus or no other explanation and Secondary Frozen Shoulder caused due to post traumatic injury or can be idiopathic.

Different theories and speculations in aetiology started to be published. DePalma (1952) discussed the possibility of muscular inactivity to be the main course for the development of FS. Meulengracht & Schwartz (1952) found that 18% of the FS patients also suffered from Dupuytren's contracture. Nevasier (1962) described the typical decrease in joint volume using arthrography. Lundberg carefully studied FS from different aspects and published theories on change in glycosaminoglycans in the affected shoulder (1970). Several other theories were discussed, such as autoimmune mechanisms (McNab 1971), association with other shoulder problems (DeSeze 1974) and association with different neurological conditions (Bruckner & Nye 1981)

Pathoanatomically there is involvement of the capsule in the glenohumeral joint. The capsule volume is reduced and this is the cause for the restricted range of motion (Itoi & Tabata 1992)

The pathology of frozen shoulder is believed to be as follows: pain in the shoulder; neurologic, vascular, musculoskeletal or referred visceral which causes vasospasm which leads to congestion and myospasm which leads to disuse and further vascular congestion. This initiates the development of fibrous tissues that are responsible for functional disability.

The pattern in which FS usually is developed may be described as three time periods of six months each: Freezing, Frozen, and Thawing. In the freezing stage it shows an insidious onset where pain is dominating in the clinical picture. In the frozen stage it shows reduction of pain but the restricted mobility remains. The thawing includes successive re-establishment of normal or near normal range of motion.

BASIC CONCEPTS OF KALTENBORN AND MULLIGAN MOBILISATION

Kaltenborn mobilization of extremity joints consists of two passive rectilinear movements' traction/ separation and translatory gliding, called joint play, and depends on concave convex rule.

Brian Mulligan's concept of Mobilization with Movement (MWM) is a

natural continuance of the progression in the development of manual therapy from active stretching exercise to therapist applied passive physiological movement to passive accessory mobilization technique. MWM is the concurrent application of a sustained accessory mobilization applied by the therapist and an active physiological movement to end range applied by the patient. Passive end of range over pressure or stretching is then able to be delivered without pain as a barrier.

This study aims to find out which mobilization technique either Kaltenborn or Mulligan's MWM is a better option in improving the shoulder function, measured by using Shoulder Pain and Disability Index (SPADI) and Range of Motion using Universal Goniometer in subjects with Frozen Shoulder where the external rotation, abduction and internal rotation being most restricted.

MATERIALS AND METHODS

Research Approach: Prospective experimental.

Study Tool: examination table/ chair, towel, hot packs, universal goniometer, mulligan belt, SPADI, Mackintosh, paper and pen.

Inclusion Criteria:

- Subjects with restriction of external rotation, abduction and internal rotation of glenohumeral joint when compared to the opposite side.
- Subjects with history of painful shoulder for atleast 3 months and not more than 9 months.

Exclusion Criteria:

History of fracture and dislocation of shoulder, unstable joint, post traumatic shoulder stiffness, hemiplegic shoulder joint, concurrent cervical signs and symptoms, subjects with uncontrolled diabetes mellitus, post-surgical cases around shoulder, thoracic outlet syndrome.

Sample Size: 40

OUTCOME MEASURES:

- Range of motion using universal goniometer
- Pain and disability using SPADI
- Pain using VAS

Methodology

PROCEDURE:

A total of 40 subjects were recruited into this study. The subjects were divided randomly into two equal groups. Group A was given Kaltenborn mobilisation and Group B was given Mulligan mobilisation. The patients were informed about the whole procedure and a written informed consent was obtained from all the participants willing to be a part of this study. The baseline data of ROM of all movements of shoulder was obtained using universal goniometer. Pain and disability data was obtained using SPADI to check for the functional outcome on the 1st sitting before the treatment and 10th sitting after the treatment. The treatments for both groups are given for 10 sittings on alternate day's 6-10 repetitions each sitting. Moist heat was applied for 10 minutes prior to the treatment.

KALTENBORN MOBILISATION TECHNIQUE:

Patient lies supine on the table with the arm abducted approximately to 55°. The therapist stands facing the lateral side of upper arm. The scapula is fixed using a towel. The therapist's right hand holds around the patients elbow & forearm from the ventral side. Left hand holds around the humeral head with the thumb ventrally just distal to the acromion & the direction of movement is towards caudal assisted by therapists body.

MULLIGAN MOVEMENT WITH MOBILISATION TECHNIQUE:

The subject was made to sit and the therapist stands behind the patient and places the belt around both the therapist's hips and the patients shoulder. The therapist places the hand on the scapula for fixation. The patient is asked to raise the arm up from the side while the glide is applied posteriorly by the therapist over the head of the humerus by leaning back in such a way

as to glide the humeral head in the treatment plane.

VISUAL ANALOGUE SCALE:

The subject was asked to place a mark on the line at a point which corresponds to the level of intensity of pain felt. This was done pre and post manual therapy session. Distance in cms from the lower end of VAS to the patients mark was used as a numerical index of the severity of pain.

SPADI SCORE MESUREMENT:

In this each item is scored by measuring the distance from the left anchor to the mark made by the person. First, items scored within the subscale are summed. Second, this sum is divided by the summed distance possible across all the items of the subscales to which the person responded. Third, this ratio is multiplied by 100 to obtain a percentage. High scores on the sub scale indicate greater pain and greater disability.

STATISTICAL ANALYSIS & RESULTS

Data was collected on a data sheet & encoded for computerized analysis using SPSS version 22 for Windows. The statistical analysis of post values of Group A (Kaltenborn mobilization) when compared with the post values of Group B (Mulligan mobilization) VAS (p value= 0.001), ROM with shoulder flexion (p value= 0.0057), shoulder abduction (p value = 0.0001), external rotation (p value = 0.0065), internal rotation (p value = 0.0075), SPADI (p value = 0.0309) showed statistical significance. Thus, Mulligan mobilization showed more improvement as compared to Kaltenborn mobilisation.

Table 1: Pre and post values of the outcome measures when compared within the group(Kaltenborn and Mulligan)

Outcome measures	Kaltenborn				Mulligan		
		Mean	SD	P value	Mean	SD	P value
VAS	Pre	5.3	0.8645	0.0002	5.45	0.8870	0.0060
	Post	2.3	0.8645	0.0002	1.45	0.8256	0.0012
Shoulder flexion	Pre	108.35	9.126	>0.10	113.9	11.021	0.0210
	Post	136.25	12.165	0.0011	150.25	15.468	0.0049
Shoulder abduction	Pre	103.9	15.005	>0.10	106.5	13.790	>0.10
	Post	128.9	15.335	0.0052	145.35	15.852	0.10
Shoulder external rotation	Pre	41	10.498	>0.10	38	9.586	0.0059
	Post	60.5	12.232	0.0755	58.3	10.883	>0.10
Shoulder internal rotation	Pre	44.9	10.473	0.0290	44.6	8.120	>0.10
	Post	63.9	11.765	0.0388	59.1	8.914	>0.10
SPADI	Pre	74.3805	6.450	0.0168	73.386	8.325	0.0115
	Post	20.6345	4.142	0.10	14.3175	4.968	0.10

Table 2: Outcome measures when compared in between two groups.

	Kaltenborn			Mulligan		
	Mean	SD	P value	Mean	SD	P value
SPADI	53.744	6.898	0.10	59.051	8.035	0.0037
VAS	4	0.7947	0.0001	3	0.8584	0.0020
Shoulder flexion	27.9	8.404	>0.10	36.35	9.778	0.0274
Shoulder abduction	25	7.145	0.0351	38.85	7.975	0.0500
Shoulder external rotation	19.5	6.621	>0.10	20.3	4.669	>0.10
Shoulder internal rotation	14.5	4.298	0.0015	19	5.685	>0.10

DISCUSSION

The purpose of the study was to compare the efficacy of Kaltenborn mobilization and Mulligan MWM in improving range and function in patients with Frozen Shoulder. This study demonstrated that Mulligan MWM is more effective in improving range and function compared to Kaltenborn mobilization technique.

The statistical analysis of post values of Group A (Kaltenborn mobilization) when compared with the post values of Group B (Mulligan mobilization) VAS (p value <0.001), ROM with shoulder flexion (p value <0.0057), shoulder abduction (p value <0.0001), external rotation (p value

<0.0065), internal rotation (p value <0.0075), SPADI (p value <0.0309). Thus Mulligan mobilization showed more improvement as compared to Kaltenborn mobilisation.

Pain relief and ROM was better in Mulligan group as compared to Kaltenborn group because the patients in Mulligan group performed active movements which may have led to inhibition of reflex contraction about a joint than a passive manoeuvre. [(3)] The reduction in pain and ROM may be by dispersion of irritative metabolites accumulated as a result of muscle ischemia (Wyke,1976). [(2)] Reduction in pain may also be the result of a reduction in muscle tension on particular structures and myoaponeurotic peripheral afferent discharge (Grigg 1976). [(2)]

Mulligan has proposed the use of MWM for painful restriction of the shoulder. Mulligan postulates a positional fault model to explain the results gained through his concept. [(3)]

Forward translation of the humeral head painfully limits shoulder movements in adhesive capsulitis. After Mulligan mobilisation with a postero-lateral glide, this forward translation is corrected. Thus leading to increase in ROM. [(2)]

The predominant explanation provided for this rapid pain relieving effect is mechanical in nature and based on the proposed existence of bony positional faults and the ability of MWM to correct these faults. The evidence from the pain science studies that have attempted to characterize the hypoanalgesic effect has indicated that it may be non-opioid in nature as well as exhibiting features that are complex and widely distributed to other systems, such as the motor and the sympathetic nervous system. [(2)]

Alternately, inappropriate joint tracking mechanisms due to an altered instantaneous axis of rotation and neurophysiological response models have also been considered. The techniques are always applied in a pain free direction and are described as correcting joint tracking from a positional fault. The flexibility and functional adaptability of MWM makes it highly suitable for integration into any therapists favoured treatment regime. [(3)]

Thus, with this discussion Mulligan technique is more effective than Kaltenborn mobilization technique for frozen shoulder and can be incorporated into rehabilitation of patients with frozen shoulder.

CONCLUSIONS

Mulligan mobilization is more effective in improving VAS (Pain), ROM of shoulder and Shoulder pain and disability index (SPADI) than Kaltenborn mobilization.

Conflict of Interest

There were no known conflicts of interest encountered in the present research.

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