COMPARATIVE STUDY TO FIND OUT THE EFFECTIVENESS OF MAITLAND MOBILISATION VERSUS MULLIGAN MOBILISATION WITH COMMON USE OF ULTRASOUND THERAPY IN PATIENTS WITH SHOULDER ADHESIVE CAPSULITIS- PATHOANATOMICAL STUDY

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ABSTRACT

BACKGROUND

Shoulder joint is multiaxial, ball and socket synovial joint in spheroidal head of Humerus which forms the 1/3rd of the sphere directed medially, upwards and backwards. The purpose of this study was to compare the effectiveness of Maitland Mobilisation versus Mulligan Mobilisation with common use of ultrasound therapy in management of adhesive capsulitis. Treatment duration was four weeks. Data was obtained on pain intensity levels and level of functional mobility via Shoulder Pain Disability Index (SPADI) and range of motion by goniometer.

MATERIALS AND METHODS

Study is conducted on idiopathic or primary adhesive capsulitis, age between 40 to 60 years with controlled DM for over 6 months on 30 patients. Those patients are divided into two groups, Group-A received Maitland Technique with UST and Group-B received Mulligan Technique with UST.

RESULTS

This is randomised controlled trial. The mean score of SPADI reduced from a mean of 74.54333 to 54.8046 in Group A (Maitland Mobilisation with UST), whereas in Group B (Mulligan Mobilisation with UST) the mean has been improved from 77.886 to 40.796. The pain and disability score analysis for intergroup comparisons shows significant improvement in Group B subjects as compared to Group A ($P= 6.90022 \times 10^{-06}$). The mean of abduction range improved from 75.8 to 103.533, external range of motion mean score increased from 42.8 to 61.066 in Group A (Maitland mobilisation with ultrasound therapy group), whereas in Group B (Mulligan mobilisation with UST). The mean of abduction range improved from 78.133 to 119, external range of motion mean score increased from 40.8 to 70.066. The intragroup analysis clearly depicts both intervention to be effective in range of motion improvement and in improving functional mobility. The range of motion score analysis for intergroup comparison showed the strength significantly improved in Group B subjects as compared to Group A subjects.

CONCLUSION

The result of this study demonstrates that the Mulligan method with UST is superior treatment approach compared to Maitland method with UST therapy in managing Adhesive Capsulitis.

KEYWORDS

Adhesive Capsulitis, Mulligan Method, Maitland Method, UST.

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BACKGROUND

Anatomy

Shoulder joint is multiaxial, ball and socket synovial joint in spheroidal head of Humerus which forms the 1/3rd of the sphere directed medially, upwards and backwards.

Socket is formed by the pear shaped small and shallow glenoid cavity of scapula which faces laterally, upwards and forwards. The glenoid fossa is deepened by a fibrocartilaginous rim of glenoid labrum, which is attached to its peripheral margin.

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The Shoulder Joint presents the following Ligaments-

I. **Fibrous Capsule-** forms loose envelop which permits free movement. Medially attached to the peripheral margin of the glenoid cavity outside the labrum, which includes the origin of the long head of Biceps from supraglenoid tubercle. Laterally attached with Anatomical Neck of the Humerus except to two areas (i) At the upper end of the intertubercular sulcus where the capsule is deficient for the passage of tendon of long head of biceps.

II. **Infero-**medially extend up to 1 cm below to encroach on the Surgical Neck of Humerus. Fibrous capsule supported by some short muscle in front by subscapularis, above by supraspinatus, behind by infraspinatus and teres minor. These are called rotator cuff. Lower part of capsule less supported and separated from long head of triceps and Axillary Nerve and posterior circumflex humeral vessels synovial membrane lines the capsules. Other ligaments are (ii) Glenohumeral ligament, (iii) Glenoid labrum, (IV)

Coracohumeral ligament and (V) Transverse Humeral Ligament.

The term adhesive capsulitis refers to common shoulder condition by definition it is a self-limited inflammatory process of shoulder capsule characterised by pain and global restriction in shoulder range of motion, most notably shoulder flexion, abduction, internal and external rotation. Usually absence of intrinsic shoulder disease it may be followed by the bursitis or tendinitis of the shoulder or may be associated with systemic disease, such as DM, MI or chronic pulmonary disease as a result of prolonged immobility of arm contribute to the development of Adhesive capsulitis. The capsule of the shoulder is thickened and mild chronic inflammatory cells may infiltrate and fibrosis may be present. Commonly occurs in women after 40 years. The shoulder is tender to palpation and both active and passive movement may be restricted.

Neviaser called it adhesive capsulitis. He observed under arthroscopy, the capsule around shoulder joint complex looked thickened and adhered to underlying bone.[1]

Codman first introduced the term, "Frozen shoulder." It is one among the few conditions that affect the connective tissue forming the capsule of glenohumeral joint of shoulder.[2]

Idiopathic (primary) adhesive capsulitis occurs spontaneously without a specific precipitating event. Primary adhesive capsulitis results from a chronic inflammatory response with fibroblastic proliferation, which may actually be an abnormal response from the immune system.

Secondary adhesive capsulitis occurs after a shoulder injury or surgery or may be associated with another condition such as diabetes, rotator cuff injury, cerebrovascular accident (CVA) or cardiovascular disease, which may prolong recovery and limit outcomes.

Frozen shoulder can also be confused with other clinical syndromes. It is important to have an accurate differential diagnosis to rule out other pathologies such as rotator cuff tear, bicipital tendinitis, subacromial and subdeltoid bursitis and thoracic outlet syndrome. These cause severe limitation in range of motion of shoulder.

The loss of passive external rotation is the most important finding on physical examination and helps to differentiate from rotator cuff injury. Because rotator cuff injury generally does not result in loss of passive external rotation. Pain is greater in internal rotation than external rotation in case of rotator cuff injury. In case of subacromial or subdeltoid bursitis, pain is felt between 600 - 900 range when arm is moving up and outwards. Bicipital tendinitis can affect the active shoulder movement and is diagnosed while pressing biceps tendon in bicipital groove on humerus which elicit tenderness and pain.[3]

Aims

This study was designed to compare the effects of Maitland mobilisation and Mulligan mobilisation on patients with adhesive capsulitis of shoulder with common use of ultrasound therapy**.**

Objectives

To compare the efficacy between Maitland mobilisation along with Ultrasound Therapy and Mulligan mobilisation along with ultrasound therapy on patients with adhesive capsulitis of shoulder.

Hypothesis/ Null Hypothesis

There is no significant difference between effectiveness of Maitland mobilisation and Mulligan mobilisation with common use of ultrasound therapy to improve shoulder mobility and function in patient with adhesive capsulitis of shoulder.

Alternative Hypothesis

Significant difference exists between effectiveness of Maitland mobilisation and Mulligan mobilisation with common use of ultrasound therapy in improving shoulder mobility and function in patient with adhesive capsulitis of shoulder.

MATERIALS AND METHODS

This is randomised controlled trial conducted on idiopathic or primary adhesive capsulitis, aged between 40 to 60 years, male and female with controlled DM at OPD of BILMS Burdwan, West Bengal. 30 patients fulfilling selection criteria are included in this study over 6 months. Those patients are divided in two groups- Group-A for Maitland technique with UST. Group-B for Mulligan technique with UST.

Study Design

The study was a comparative study with cross-sectional design.

Sample Size

The sample size is

$n = \frac{(Z\alpha + Z\beta)^2 \times 2 \times s^2}{d2}$

$Z\alpha$= 1.96 at 95% confidence interval

$Z\beta$= 0.84

s= SD from the previous study= 3.85

d= Expected difference of mean ROM between two groups= 4

Therefore, n = (1.96 + 0.84) 2 x 2 x (3.85) 2 = 232.41 = 14.5~15.

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Finally, sample size is 15.

Group Allocation

The patients were allocated in two groups (Group-A and Group-B) randomly using random number table.

The Statistical Method

Data were entered in MS Excel Spreadsheet and checked for accuracy. Descriptive statistical analysis was done using mean and SD.

Inferential statistical analysis was done using independent 't' test and paired 't' test. Statistical analysis was performed using statistical software SPSS 20.0.

Selection Criteria

Inclusion Criteria

- Idiopathic adhesive capsulitis.
- Age- 40 to 60 years.
- Male and Female.

- Progressive loss of passive ROM of shoulder joint relative to non-affected side in at least one direction.
- Controlled DM.

Exclusion Criteria

- Other condition involving shoulder such as rheumatoid arthritis, damage of glenohumeral cartilage, osteoporosis.
- Neurologic deficit affecting shoulder function.
- Patients with shoulder girdle fracture.
- Injection with corticosteroids in the affected shoulder in the preceding four weeks.
- Malignancy.

Maitland Mobilisation

Maitland concept of manipulative physiotherapy uses oscillatory movement to the joint within physiological range. Grade I and II of Maitland mobilisation primarily are given to reduce the pain, where Grade III and IV are primarily used to stretch to improve joint range of motion. Maitland mobilisation in treatment of adhesive capsulitis aims in improving range by breaking down the adhesion.[4,5,6]

The guides are given at the rate of 2 - 3 glides per seconds for one minute followed by 30 seconds of rest. Procedure for Maitland mobilisation are as follows-

- Glenohumeral caudal glide.
- Glenohumeral dorsal glide.
- Glenohumeral ventral glide.
- Sternoclavicular caudal glide.
- Acromioclavicular dorsal glide.
- Acromioclavicular ventral glide.

Mulligan Mobilisation

This is also known as movement with mobilisation. This technique is combined with sustained use of gliding movement with osteo-kinetic movement of respective joint which is actively performed by the patients or passively performed by the therapist. The technique is applied to correct the misalignment and to restore the pain free range of movement of shoulder.[7,8,6]

Three sets of ten repetitions applied with one minute of interval between sets; for three sessions per week over a period of four weeks. Procedure for the Mulligan Mobilisation as follows:

- MWM for shoulder distraction.
- MWM for shoulder internal and external rotation.
- MWM for shoulder flexion.
- MWM for terminal internal rotation.

Ultrasound Therapy

Therapeutic ultrasound can elevate tissue temperature. The physiologic response due to ultrasound therapy includes increased collagen tissue extensibility, pain threshold and enzymatic activity along with changes in contractile activity of skeletal muscle. This is given in both Group A and Group B. Continuous ultrasound applied at 0.8W/cm2 - 1.5W/cm2 intensity and 1 MHz frequency for 5 minutes for 6 sessions per 1 week over a period of 4 weeks.

Data Analysis 1

Comparison of pre-treatment range of motion of abduction between Group-A and Group-B, Independent 't' test

	Group A	Group B
Mean	75.8	78.133
SD	21.468	20.198
No. of Observations	15	15
d.f.	14	
p-value	0.38071	

Interpretation

Since p value is greater than 0.05 the level of significance, we accept the null hypothesis i.e. Group-A and Group-B were identical in terms of pre-treatment abduction.

Comparison of post-treatment range of motion of abduction between Group-A and Group-B, Independent 't' test

	Group A	Group B
Mean	103.533	119
SD	19.198	18.067
No. of Observations	15	15
d.f.	28	
p-value	0.03358	

Interpretation

Since p value is less than the level of significance ($p < .05$), we can reject the null hypothesis and accept the alternate hypothesis, that is the interventions given in Group B (Mulligan mobilisation and UST) were significantly better than Group A (Maitland mobilisation and UST) in improving abduction ROM.

Comparison of pre-treatment range of motion of external rotation between Group-A and Group-B, Independent 't' test

	Group A	Group B
Mean	42.8	40.8
SD	14.001	11.020
No. of Observations	15	15
d.f.	28	
p-value	0.66709	

Interpretation

Since p value is greater than 0.05 the level of significance, we accept the null hypothesis i.e. Group-A and Group-B were identical in terms of pre-treatment external rotation.

Comparison of post-treatment external rotation ROM between Group-A and Group-B, Independent 't' test

	Group A	Group B
Mean	61.06	70.06
SD	11.96	8.250
No. of Observations	15	15
d.f.	28	
p- value	0.01778	

Interpretation
Since p value is less than the level of significance ($p < .05$), we can reject the null hypothesis and accept the alternate hypothesis, that is the interventions given in Group B (Mulligan mobilisation and UST) were significantly better than Group A (Maitland mobilisation and UST) in improving abduction ROM.

Data Analysis 2
Comparison of pre-treatment SPADI score between Group-A and Group-B, Independent 't' test

	Group A	Group B
Mean	74.60	77.88
SD	6.118	6.513
No. of Observations	15	15
d.f.	28	
p-value	0.1584	

Null Hypothesis
There is no significant difference between the pre-treatment SPADI scores of Group A and Group B.

Alternative Hypothesis
Significant difference exists between the pre-treatment SPADI scores of Group A and Group B.

Interpretation
Since p value is greater than 0.05 the level of significance, we accept the null hypothesis, i.e. Group A and Group B were identical in terms of pre-treatment SPADI scores.

Comparison of post-treatment SPADI score between Group-A and Group-B, Independent 't' test

	Group A	Group B
Mean	54.80	40.79
SD	4.80	8.56
No. of Observations	15	15
d.f.	28	
p-value	0.000	

Null Hypothesis
There is no significant difference between the post-treatment SPADI scores of Group A and Group B.

Alternative Hypothesis
Significant difference exists between the post-treatment SPADI scores of Group A and Group B.

Interpretation
Since p value is less than level of significance ($p < .05$), so we can reject the null hypothesis accept the alternate hypothesis, i.e. the intervention given in Group B participants (Mulligan Method and UST) has resulted in significant reduction in SPADI better than participants in Group-A (Maitland Method and UST).

RESULTS
Thirty individuals with adhesive capsulitis participated in this study. None were lost during the course of the study. The participants were randomly divided into two groups, Group A and Group B, each group containing 15 patients. Group A patients were given Maitland mobilisation with ultrasound therapy for 4 weeks and Group B patients were given Mulligan mobilisation with ultrasound therapy for 4 weeks. The outcomes were measured by shoulder pain and disability index (SPADI) and range of motion (ROM) by universal goniometer. Both the groups were considered homogeneous with regards to outcome measures, values taken at the first day of assessment. Intragroup comparison was analysed by paired 't' test, whereas the intergroup comparison was assessed by independent 't' test. The data were analysed keeping the level of significance at 0.05.

The mean score of SPADI score reduced from a mean of 74.54 to 54.80 in Group-A (Maitland mobilisation with ultrasound therapy), whereas in Group-B (Mulligan therapy with ultrasound therapy) the mean reduced from 77.88 to 40.59. The SPADI analysis for intergroup comparison shows significant improvement in Group-B subjects as compared to Group-A ($p= 6.90022 \times 10^{-06}$), thus indicating Mulligan mobilisation with ultrasound therapy to be more effective towards pain reduction. Although, intragroup analysis clearly shows both interventions are effective in pain relief and improving functional range.

The range of motion (ROM) of flexion increased from a mean of 80.46 to 107.26; mean abduction increased from 75.8 to 103.53; mean of external rotation increased from 42.8 to 61.06 in Group-A (Maitland mobilisation with ultrasound therapy), whereas in Group-B (Mulligan mobilisation with ultrasound therapy) the mean of flexion improved from 85.13 to 123.86; mean of abduction increased from 78.13 to 119; external rotation increased from mean of 40.8 to 70.06. The intragroup analysis clearly depicts both interventions to be effective in ROM improvement and reduction in pain. The ROM score analysis for intergroup comparison showed range of motion significantly improved in Group-B subjects as compared to Group-A subjects. Thus, indicating Mulligan mobilisation with ultrasound therapy to be more effective to improve range of motion and to reduce pain.

DISCUSSION
Purpose of this study was to compare the efficacy of two manual therapies. Limited range of motion and pain around the shoulder were the main complaints of these subjects. So, intervention was focused on pain as well as improving functional mobility. The improvement of the pain and functional mobility was examined by shoulder pain disability index (SPADI) and the improvement in range of motion (abduction, external rotation) was measured by the universal goniometer. The intervention was given for a period of four weeks. The effect of both treatment techniques along with ultrasound therapy on improving functional mobility and reducing pain was positive. When the responses were compared between two groups (Group-A and Group-B), the result showed significant difference, i.e. Mulligan mobilisation along with ultrasound therapy had given a better result than Maitland mobilisation with ultrasound therapy. In this study we had UST therapy treatment for practical as well as ethical consideration, so it was difficult to judge the exact effect of the two different mobilisation techniques. Both treatment techniques were equally effective in treating adhesive capsulitis in terms of improving functional range and reducing pain. However, the response of Group-B (Mulligan mobilisation and UST) was better in improving all range of motion, especially external rotation and internal rotation.

CONCLUSION

The result of this randomised clinical trial demonstrates that Mulligan mobilisation with ultrasound therapy was found to provide a superior benefit in terms of pain reduction and improvement in functional range when compared to a treatment regimen consisting of Maitland mobilisation with ultrasound therapy over a period of four weeks in patients with adhesive capsulitis. However, both interventions appear to have a positive effect in reducing pain and increasing range of motion as a short term of treatment for adhesive capsulitis. As differences of all outcome measures were greater for Mulligan mobilisation with ultrasound therapy, it seems to be the more effective treatment choice for the patients who are suffering from adhesive capsulitis. The study also considers the pathoanatomic aspect to adhesive capsulitis and the role of ultrasound therapy. Further study is needed with investigation and long-term follow-up by MRI to examine the structural alteration that can be achieved by the therapy.

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