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Effect of Mulligan mobilization along with conventional physiotherapy regime on pain and functional disability using visual analogue scale and disability of the arm, shoulder, and hand scale in diabetic frozen shoulder with high tissue irritability level

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ABSTRACT

Background: Frozen shoulder in individuals with diabetes mellitus, particularly with high tissue irritability, presents a significant clinical challenge due to severe pain and restricted motion.

Objectives: To assess the effect of Mulligan mobilization on pain and functional disability using the visual analogue scale and the disability of the arm, shoulder, and hand scale in diabetic frozen shoulder with a high tissue irritability level. To assess the effect of conventional physiotherapy regime on diabetic frozen shoulder with high tissue irritability level.

Materials and Methods: A total of 60 participants diagnosed with diabetic frozen shoulder and high tissue irritability (VAS >7, DASH >35) were randomly divided and assigned into group A and group B with 30 individuals in each by using SPSS software. Group A received conventional physiotherapy (hot moist packs, therapeutic ultrasound, and shoulder exercises), while Group B received conventional physiotherapy along with Mulligan Mobilization With Movement (MWM). Interventions were administered four days per week for six weeks. Outcomes were assessed pre- and post-treatment using the Visual Analogue Scale (VAS) and Disability of the Arm, Shoulder, and Hand (DASH) scale. **Results:** Group B demonstrated significantly greater improvement in pain (VAS reduction: 4.42 ± 0.11 vs. 2.11 ± 0.10) and functional ability (DASH reduction: 39.47 ± 0.54 vs. 23.38 ± 0.37) compared to Group A ($p < 0.0001$). **Conclusion**: Incorporating Mulligan mobilization into conventional physiotherapy significantly enhances pain relief and functional recovery in diabetic frozen shoulder patients with high tissue irritability..

Keyword: *Mulligan Mobilization, Frozen Shoulder, Diabetes, Functional Disability*..

1. INTRODUCTION

Frozen shoulder, or adhesive capsulitis, is a disabling condition characterized by pain, stiffness, and progressive restriction in shoulder motion. The condition is particularly common in individuals with diabetes mellitus, affecting 10–20% of diabetics compared to 2–5% in the general population.[1,2,3] Chronic hyperglycemia contributes significantly to its pathophysiology, promoting non-enzymatic glycation of collagen, capsular fibrosis, and vascular compromise, which exacerbate inflammation and tissue stiffness.[4,5,6]

Patients with high tissue irritability experience severe pain (VAS > 7), consistent night/resting pain, and substantial functional disability (high DASH scores), which significantly reduce quality of life and participation in daily activities.[7,8,9] Standard management involves conventional physiotherapy, including hot moist packs (HMP), therapeutic ultrasound, and range-of-motion exercises.[10,11,2] However, in high-irritability cases, these interventions may provide limited relief.[13,14]

Mulligan Mobilization with Movement (MWM) has emerged as a promising manual therapy technique for addressing mechanical dysfunction and nociceptive pain. It integrates sustained accessory mobilization with active or passive joint movements to realign positional faults, reduce pain, and restore function.[15,16,17] Previous studies have shown that MWM significantly improves pain and functional outcomes in shoulder conditions.[18,19,20] However, its specific effectiveness in high-irritability diabetic frozen shoulder is underexplored.

This study evaluates the effect of Mulligan mobilization along with a conventional physiotherapy regime on pain and

functional disability using a visual analogue scale and the disability of the arm, shoulder, and hand scale in diabetic frozen shoulder with a high tissue irritability level, hypothesizing superior outcomes compared to conventional therapy alone.

2. METHODOLOGY

Sixty diabetic patients diagnosed with high tissue irritability frozen shoulder were assigned into group A and group B with 30 individuals in each by using SPSS software. Group A (Conventional Therapy) and Group B (Mulligan Mobilization + Conventional Therapy).

Inclusion criteria were patents with diabetic frozen shoulder of all genders, age group of 45-60 years, pain severity (VAS >7), moderate functional disability (DASH >35), and restriction in active and passive ROM with pain at the extreme range. Exclusion criteria were any shoulder surgery or trauma and high and low tissue irritability levels.

Group A (Conventional Therapy):

Patients in the conventional treatment group received 10 minutes of hot moist packs (HMP) and continuous therapeutic ultrasound at 1.5 W/cm² for 10 minutes, followed by exercises such as wand exercises, pulley exercises, finger wall ladder, and capsular stretching.

Group B (Mulligan Mobilization along with Conventional Therapy):

Group B received Maitland Grade II joint mobilizations (3 sets) at the affected shoulder joint combined with the conventional protocol.

Procedure

The research was approved by the ethical committee of Krishna Vishwa Vidyapeeth, Karad. Before the patients were included in the study, their informed consent was obtained, and then they were split into two groups randomly. Group A received conventional physiotherapy, while Group B received conventional physiotherapy plus the Maitland mobilization approach for 4 days a week for six weeks. The VAS (Visual Analogue Scale) and DASH (Disability of the Arm, Shoulder, and Hand) DASH scale were used as outcomes before and after the treatment.

Statistical Analysis

The data was analyzed statistically by paired t-tests to compare pre- and post-treatment values within each group and independent t-tests to compare outcomes between groups. The threshold for statistical significance was $p < 0.05$. The mean of VAS , DASH, and standard deviation (SD) for VAS and DASH scores was calculated for both pre- and post-intervention periods.

Statistical Analysis

Data were analyzed using SPSS version 16.0. Pre- and post-intervention scores were compared within groups using paired t-tests, and inter-group differences were analyzed using independent t-tests. Statistical significance was set at $p < 0.05$.

Result analysis :

Table 1 :Demographic Profile of Participants:

Demographic Parameter	Group A (n = 30)	Group B (n = 30)
Age (mean ± SD)	53.2 ± 4.1 yrs	52.8 ± 3.9 yrs
Age Range	45–60 yrs	45–60 yrs
Gender (Male/Female)	14 / 16	13 / 17

Interpretation : Table 1 represents demographic profile of participants. Both intervention groups' participant demographics were evenly distributed. Participants in Group A (Conventional Therapy) were 53.2 ± 4.1 years old on average, whereas those in Group B (MWM + Conventional Therapy) were 52.8 ± 3.9 years old on average. This suggests that each group's age profile is uniform, falling between 45 and 60 years of age.

There were 13 men and 17 females in Group B, whereas there were 14 males and 16 females in Group A. This nearly equal distribution of genders reduces the impact of gender-related confounding on results. The findings can be applied to both male and female diabetes patients with adhesive capsulitis and significant tissue irritation because both sexes are represented.

Table 2: Pre and post VAS and DASH scores :

Outcome Measure	Group A (Conventional Therapy)	Group B (MWM + Conventional Therapy)	Pre-Intervention Mean ± SD	Post-Intervention Mean ± SD	t-value	p-value
VAS	Conventional Group	MWM + Conventional Group	8.02 ± 0.29	5.85 ± 0.24	-59.89	< 0.0001
VAS Change (Mean ± SD)	2.11 ± 0.10	4.42 ± 0.11				
DASH	Conventional Group	MWM + Conventional Group	70.79 ± 2.29	48.53 ± 2.17	-95.42	< 0.0001
DASH Change (Mean ± SD)	23.38 ± 0.37	39.47 ± 0.54				

Interpretation: Table 2 represents Pre and post VAS and DASH scores of subjects.

VAS (Visual Analogue Scale for Pain)

- Pre-Intervention: Group A had an initial mean VAS score of 8.02 ± 0.29, and Group B had 8.0 ± 0.30.
- Post-Intervention: Group A showed a post-intervention mean of 5.85 ± 0.24, while Group B showed a significant reduction to 3.58 ± 0.37.
- Change in VAS: Group B (4.42 ± 0.11) experienced a significantly higher pain reduction compared to Group A (2.11 ± 0.10), with a p-value of < 0.0001, indicating that Group B improvement is statistically significant.

DASH (Disability of the Arm, Shoulder, and Hand) Scale

- Pre-Intervention: Group A had a mean DASH score of 70.79 ± 2.29, and Group B had 71.5 ± 2.5.
- Post-Intervention: Group A's post-intervention score was 48.53 ± 2.17, while Group B showed a much greater improvement to 31.4 ± 2.1.
- Change in DASH: Group B showed a more substantial improvement (39.47 ± 0.54) compared to Group A (23.38 ± 0.37), with a p-value of < 0.0001, indicating a statistically significant improvement in functional outcomes for Group B.

Both VAS and DASH scores show significant improvements, with the combined MWM + Conventional Therapy proving to be more effective than conventional therapy alone.

3. DISCUSSION

The study results demonstrate the effectiveness of combining Mulligan MWM with conventional physiotherapy in managing diabetic frozen shoulder with high tissue irritability. The experimental group (Group B) exhibited significantly greater reductions in pain (VAS) and improvements in functional outcomes (DASH) compared to the control group (Group A).

Both the groups' demographic profiles were similar. The gender distribution was almost equal, and the average age varied from 52.8 to 53.2 years. By reducing demographic bias, this homogeneity makes it possible to more definitely ascribe observed variations in outcomes to the interventions used rather than to differences in age or gender.

Pain Reduction

Group B showed a mean VAS reduction of 4.4 points, compared to 2.1 points in Group A. This aligns with prior studies, such as Shah et al. (2021), which reported significant pain relief ($p < 0.0001$) with MWM in frozen shoulder patients.[1,2,15] MWM achieves pain reduction by addressing positional joint faults and reducing nociceptive input, as supported by Mhaske et al. (2017) and Meena et al. (2020).[3,4,16]

Functional Improvement

Functional recovery, measured by DASH scores, improved by 39.8 points in Group B versus 23.8 points in Group A. These findings are consistent with existing literature highlighting MWM's ability to enhance functional capacity and range of motion.[5,6,19] MWM facilitates pain-free movement, enabling patients to participate more effectively in rehabilitation exercises, thus accelerating recovery.[7,8,20]

MWM's efficacy stems from its dual-action mechanism: mechanical correction and neurophysiological modulation. It realigns joint surfaces, reduces capsular tension, and improves kinematics. Additionally, MWM's hypoalgesic effects address central sensitization, making it particularly effective in high-irritability cases.[9,10,11]

Clinical Implications

The integration of MWM into standard physiotherapy protocols for high-irritability diabetic frozen shoulder represents a significant advancement. The combined approach addresses both inflammatory and mechanical dysfunctions, resulting in faster recovery and improved quality of life.[12,13,21] Given its immediate pain-relief effects, MWM is especially beneficial in the early stages of rehabilitation.[14,15]

Limitations

Despite the positive findings, this study has limitations. The small sample size (n = 30) and short follow-up duration (six weeks) restrict generalizability. Additionally, glycemic control, which can influence musculoskeletal outcomes, was not accounted for. Future studies should incorporate larger cohorts, longer follow-ups, and stratification by glycemic status.

4. CONCLUSION

The study demonstrates that Mulligan MWM, when integrated with conventional physiotherapy, provides significant advantages in managing high-irritability diabetic frozen shoulder. This combined protocol should be considered for routine clinical practice

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