

EFFECT OF CONSERVATIVE PHYSIOTHERAPY ON PAIN AND FUNCTIONAL OUTCOMES IN INDIVIDUALS WITH ADHESIVE CAPSULITIS: A SECONDARY ANALYSIS OF A COMPARATIVE EXPERIMENTAL STUDY.

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Abstract

Background

Adhesive capsulitis, commonly known as frozen shoulder, is a painful musculoskeletal disorder characterized by progressive restriction of active and passive shoulder movements, resulting in substantial functional limitations and reduced quality of life. Conservative physiotherapy interventions remain the cornerstone of management, aiming to alleviate pain, restore joint mobility, and improve functional independence. While various physiotherapy techniques have demonstrated effectiveness, evidence describing the overall impact of conservative physiotherapy on clinical outcomes remains clinically relevant.

Objective

To evaluate the effect of conservative physiotherapy on pain intensity, shoulder range of motion, and functional disability in individuals with adhesive capsulitis through a secondary analysis of data obtained from a comparative experimental study.

Methods

A secondary analysis was conducted using data from a comparative experimental study involving 40 individuals diagnosed with adhesive capsulitis. Participants received conservative physiotherapy comprising either Mulligan Mobilization combined with Interferential Therapy or Dry Cupping therapy over a four-week intervention period. Clinical outcomes included pain intensity measured using the Visual Analogue Scale (VAS), shoulder Range of Motion (ROM), and functional disability measured using the Shoulder Pain and Disability Index (SPADI). Within-group analyses assessed changes following intervention.

Results

Both conservative physiotherapy interventions produced statistically significant improvements in all measured outcomes after four weeks of treatment. Within-group analysis demonstrated significant reductions in pain intensity and significant improvements in shoulder range of motion and functional disability in both intervention groups (all $p < 0.001$). Overall, conservative physiotherapy effectively improved pain, mobility, and shoulder function in individuals with adhesive capsulitis. The original comparative study further demonstrated comparatively greater improvement in shoulder mobility and overall functional recovery in participants treated with Mulligan Mobilization combined with Interferential Therapy than in those receiving Dry Cupping therapy. These statements reflect the findings reported in the source thesis.

Conclusion

Conservative physiotherapy is effective in reducing pain, improving shoulder mobility, and enhancing functional outcomes in individuals with adhesive capsulitis. Both treatment approaches produced clinically meaningful improvements over four weeks, supporting the important role of physiotherapy in the conservative management of this condition.

Introduction

Adhesive capsulitis, commonly referred to as frozen shoulder, is a common musculoskeletal disorder characterized by progressive pain, stiffness, and marked restriction of both active and passive shoulder movements. The condition significantly affects activities of daily living and reduces an individual's functional independence and quality of life. It most commonly affects adults between 40 and 65 years of age and is frequently associated with systemic conditions such as diabetes mellitus, thyroid disorders, prolonged immobilization, and previous shoulder trauma or surgery.

The pathophysiology of adhesive capsulitis involves chronic inflammation of the glenohumeral joint capsule, followed by capsular fibrosis, thickening, and contracture. These pathological changes lead to progressive limitation of shoulder range of motion, particularly external rotation, abduction, and flexion. Clinically, the condition typically progresses through three overlapping stages: the painful (freezing) stage, the stiff (frozen) stage, and the recovery (thawing) stage. Although many patients gradually recover, the duration of symptoms may extend over several months or years, resulting in prolonged disability.

Conservative physiotherapy is considered the primary treatment approach for most individuals with adhesive capsulitis. Physiotherapy aims to reduce pain, improve joint mobility, restore functional range of motion, and facilitate return to daily activities. Various interventions have been described, including manual therapy techniques, therapeutic exercises, electrotherapy modalities, stretching programmes, and soft tissue mobilization. Appropriate rehabilitation during the early stages may reduce pain and prevent further functional deterioration, while later rehabilitation focuses on restoring mobility and improving shoulder function.

The comparative experimental study on which the present secondary analysis is based evaluated two conservative physiotherapy approaches: Mulligan Mobilization combined with Interferential Therapy and Dry Cupping therapy. The primary study demonstrated that both interventions significantly

reduced pain, improved shoulder range of motion, and enhanced functional ability after four weeks of treatment. Furthermore, participants treated with Mulligan Mobilization combined with Interferential Therapy demonstrated comparatively greater improvements in shoulder mobility and overall functional recovery than those receiving Dry Cupping therapy. These findings support the effectiveness of conservative physiotherapy in the management of adhesive capsulitis.

While comparative studies provide valuable information regarding the relative effectiveness of specific interventions, there is also clinical value in understanding the overall impact of conservative physiotherapy irrespective of the individual treatment modality. A broader evaluation of changes in pain, shoulder mobility, and functional disability provides clinicians with evidence supporting conservative rehabilitation as a whole and reinforces its role as the first-line management strategy for adhesive capsulitis.

Therefore, the present study was undertaken as a secondary analysis of the original comparative experimental study to evaluate the overall effect of conservative physiotherapy on pain intensity, shoulder range of motion, and functional outcomes in individuals with adhesive capsulitis.

Aim

To evaluate the effect of conservative physiotherapy on pain and functional outcomes in individuals with adhesive capsulitis through a secondary analysis of a comparative experimental study.

Objectives

1. To evaluate changes in pain intensity following four weeks of conservative physiotherapy.
2. To assess improvements in shoulder range of motion after conservative physiotherapy.
3. To determine changes in functional disability using the Shoulder Pain and Disability Index (SPADI).
4. To describe the overall clinical effectiveness of conservative physiotherapy in the management of adhesive capsulitis based on the findings of the primary comparative study.

Materials and Methods

Study Design

This study was conducted as a secondary analysis of data obtained from a comparative experimental study that evaluated the effectiveness of two conservative physiotherapy interventions in individuals with adhesive capsulitis. The secondary analysis focused on the overall effect of conservative physiotherapy on pain intensity, shoulder range of motion, and functional disability rather than on direct comparison between intervention groups.

Study Setting

The study was conducted in the Department of Physiotherapy of the institution where the original research was carried out. All participants received treatment in an outpatient physiotherapy setting over a four-week intervention period, following the protocol used in the primary study.

Participants

A total of 40 participants diagnosed with adhesive capsulitis were included in the original study. Participants were allocated into two treatment groups:

- Group A: Mulligan Mobilization combined with Interferential Therapy (MMI)
- Group B: Dry Cupping (DC)

The present secondary analysis included all participants from the original dataset.

Eligibility Criteria

The eligibility criteria followed those of the original comparative experimental study. Individuals diagnosed with adhesive capsulitis who fulfilled the predefined inclusion criteria and provided informed consent were enrolled. Participants meeting any exclusion criteria specified in the original protocol were not included in the study.

Interventions

Group A: Mulligan Mobilization with

Interferential Therapy

Participants assigned to Group A received Mulligan Mobilization combined with Interferential Therapy according to the treatment protocol described in the original study. The intervention was administered by qualified physiotherapists over a period of four weeks.

Group B: Dry Cupping Therapy

Participants assigned to Group B received Dry Cupping therapy following the standardized protocol described in the original study. Treatment was provided over the same four-week period.

Outcome Measures

Clinical outcomes were assessed before the commencement of treatment (baseline) and after completion of the four-week intervention period.

Primary Outcome Measures

Pain Intensity

Pain intensity was assessed using the Visual Analogue Scale (VAS). Participants rated their perceived pain intensity on a standardized scale, with higher scores indicating greater pain.

Shoulder Range of Motion

Active shoulder range of motion (ROM) was evaluated using standard physiotherapy assessment procedures. Improvements in shoulder mobility were used to determine the effectiveness of treatment.

Functional Disability

Functional disability was measured using the Shoulder Pain and Disability Index (SPADI). SPADI evaluates both pain and disability associated with shoulder disorders, with lower scores indicating better functional status.

Data Collection

Baseline demographic and clinical information was

collected before initiation of treatment. Outcome measures were reassessed at the end of the four-week intervention period using the same standardized assessment procedures.

Statistical Analysis

Data analysis was performed using appropriate statistical software.

Descriptive statistics were used to summarize participant characteristics and clinical variables.

Within-group analysis was performed to evaluate changes in pain intensity, shoulder range of motion, and functional disability following four weeks of conservative physiotherapy.

The Mulligan Mobilization with Interferential Therapy group demonstrated statistically significant improvements in all outcome measures:

- VAS: Test statistic = 63.2, $p < 0.001$
- ROM: Test statistic = 71.7, $p < 0.001$
- SPADI: Test statistic = 70.1, $p < 0.001$

Similarly, the Dry Cupping group demonstrated statistically significant improvements:

- VAS: Test statistic = 68.1, $p < 0.001$
- ROM: Test statistic = 75.3, $p < 0.001$
- SPADI: Test statistic = 69.2, $p < 0.001$

These analyses demonstrated that conservative physiotherapy significantly improved pain intensity, shoulder mobility, and functional status over the four-week intervention period. The present manuscript reports these findings as a secondary analysis emphasizing the overall effectiveness of conservative physiotherapy rather than a direct comparison of treatment modalities.

Ethical Considerations

The secondary analysis was based on data collected during the original comparative experimental study. Ethical approval and informed consent procedures were conducted as part of the primary study in accordance with institutional requirements. The present analysis utilized

anonymized data without identifying individual participants.

Results

A total of 40 participants diagnosed with adhesive capsulitis completed the four-week intervention programme and were included in the secondary analysis. The original comparative study evaluated two conservative physiotherapy interventions: Mulligan Mobilization combined with Interferential Therapy (MMI) and Dry Cupping (DC). For the present secondary analysis, outcomes from both intervention groups were considered collectively to evaluate the overall effectiveness of conservative physiotherapy.

Effect of Conservative Physiotherapy on Pain

Pain intensity was assessed using the Visual Analogue Scale (VAS). Within-group analysis demonstrated statistically significant reductions in pain following four weeks of conservative physiotherapy in both intervention groups.

Participants treated with Mulligan Mobilization combined with Interferential Therapy showed significant improvement in pain (test statistic = 63.2, $p < 0.001$). Similarly, participants treated with Dry Cupping demonstrated significant pain reduction (test statistic = 68.1, $p < 0.001$).

These findings indicate that conservative physiotherapy was effective in reducing pain associated with adhesive capsulitis.

Effect of Conservative Physiotherapy on Shoulder Range of Motion

Shoulder range of motion (ROM) improved significantly following the intervention period in both treatment groups.

The Mulligan Mobilization with Interferential Therapy group demonstrated statistically significant improvement in ROM (test statistic = 71.7, $p < 0.001$), while the Dry Cupping group also showed significant improvement (test statistic = 75.3, $p < 0.001$).

The improvement in shoulder mobility observed across both intervention groups suggests that conservative physiotherapy contributes to restoration of glenohumeral joint function in individuals with adhesive capsulitis.

Effect of Conservative Physiotherapy on Functional Disability

Functional disability was assessed using the Shoulder Pain and Disability Index (SPADI).

Following four weeks of treatment, statistically significant improvements in functional status were observed in both intervention groups. The Mulligan Mobilization with Interferential Therapy group demonstrated significant improvement (test statistic = 70.1, $p < 0.001$), while the Dry Cupping group also showed significant improvement (test statistic = 69.2, $p < 0.001$).

These findings indicate that conservative physiotherapy effectively reduced shoulder-related disability and improved functional performance.

Overall Clinical Effectiveness

The findings of this secondary analysis demonstrate that conservative physiotherapy produced significant improvements in all evaluated clinical outcomes, including pain intensity, shoulder range of motion, and functional disability after four weeks of treatment.

Although the primary objective of the present manuscript was to evaluate the overall effectiveness of conservative physiotherapy rather than directly compare treatment modalities, the original comparative study reported that participants receiving Mulligan Mobilization combined with Interferential Therapy experienced comparatively greater improvements in shoulder mobility and overall functional recovery than those receiving Dry Cupping therapy. Nevertheless, both interventions were found to be clinically effective in the conservative management of adhesive capsulitis.

Table 1. Within-Group Changes Following Conservative Physiotherapy

Outcome Measure	Mulligan Mobilization + IFT	Dry Cupping
VAS	Test statistic = 63.2	Test statistic = 69.2
Shoulder ROM	Test statistic = 71.7	Test statistic = 70.1
SPADI	Test statistic = 70.1	Test statistic = 69.2

Summary of Findings

- Conservative physiotherapy significantly reduced pain intensity.
- Conservative physiotherapy significantly improved shoulder range of motion.
- Conservative physiotherapy significantly improved functional ability.
- Both Mulligan Mobilization with Interferential Therapy and Dry Cupping were effective interventions over the four-week treatment period.
- The original comparative study reported comparatively greater overall functional improvement in the Mulligan Mobilization with Interferential Therapy group.

Discussion

The present secondary analysis evaluated the overall effect of conservative physiotherapy on pain intensity, shoulder range of motion, and functional disability in individuals with adhesive capsulitis using data from a comparative experimental study. The findings demonstrated that conservative physiotherapy was associated with significant improvements in all measured clinical outcomes after four weeks of intervention. Significant reductions in pain intensity, improvements in shoulder range of motion, and reductions in functional disability were observed in both treatment groups, supporting the effectiveness of conservative physiotherapy in the management of adhesive capsulitis. These findings are consistent with the conclusions reported in the primary study.

Pain reduction is an important objective in the

rehabilitation of adhesive capsulitis because pain often limits shoulder movement and restricts participation in therapeutic exercise. In the present analysis, both intervention groups demonstrated statistically significant reductions in pain intensity following treatment. Decreased pain may improve patient confidence, facilitate participation in rehabilitation, and contribute to better functional recovery.

Shoulder mobility also improved significantly after the intervention period. Restoration of range of motion is a principal goal of physiotherapy because capsular tightness and joint stiffness are characteristic features of adhesive capsulitis. Improved mobility observed following conservative physiotherapy suggests that structured rehabilitation can help restore glenohumeral joint function and improve performance of daily activities.

Functional disability, assessed using the Shoulder Pain and Disability Index (SPADI), improved significantly in both intervention groups. Improvement in SPADI reflects meaningful gains in patients' ability to perform everyday activities requiring shoulder movement. As pain decreases and mobility improves, patients are able to carry out functional tasks with greater ease, thereby improving overall quality of life.

Although this secondary analysis focused on the overall effectiveness of conservative physiotherapy, the original comparative study reported comparatively greater improvements in shoulder mobility and overall functional recovery among participants treated with Mulligan Mobilization combined with Interferential Therapy than among those receiving Dry Cupping therapy. Nevertheless, both interventions produced favourable clinical outcomes, supporting their role as conservative physiotherapy options for adhesive capsulitis.

The findings of this study have important clinical implications. They support the use of conservative physiotherapy as a first-line management strategy for adhesive capsulitis and reinforce the value of structured rehabilitation programmes aimed at reducing pain, restoring mobility, and improving

functional independence. Clinicians may consider incorporating manual therapy, electrotherapy, therapeutic exercise, and adjunctive techniques according to individual patient presentation and clinical judgement.

Clinical Implications

- Conservative physiotherapy effectively improves pain, shoulder mobility, and functional ability in individuals with adhesive capsulitis.
- Early physiotherapy intervention may reduce disability and facilitate return to daily activities.
- Both Mulligan Mobilization with Interferential Therapy and Dry Cupping may be incorporated into rehabilitation programmes according to patient needs and therapist expertise.
- Individualized rehabilitation programmes remain essential for achieving optimal clinical outcomes.

Strengths

- The study evaluated multiple clinically relevant outcome measures, including pain, shoulder range of motion, and functional disability.
- Standardized outcome measures (VAS, ROM, and SPADI) were used to evaluate treatment effectiveness.
- The secondary analysis provides an overall perspective on the benefits of conservative physiotherapy beyond comparison of individual treatment techniques.

Limitations

The findings should be interpreted in light of the limitations reported in the primary study. The original investigation included a relatively small sample of 40 participants, limiting the generalizability of the findings. The intervention period was limited to four weeks, and no long-term follow-up assessment was performed to determine whether treatment benefits were sustained over time. Further studies involving larger samples, multicentre recruitment, and extended follow-up periods are recommended to strengthen the evidence regarding conservative physiotherapy for adhesive capsulitis.

Conclusion

This secondary analysis demonstrated that conservative physiotherapy is effective in improving clinical outcomes in individuals with adhesive capsulitis. Significant reductions in pain intensity, improvements in shoulder range of motion, and enhanced functional ability were observed following four weeks of physiotherapy intervention. These findings reinforce the role of conservative physiotherapy as a primary treatment strategy for adhesive capsulitis.

Both Mulligan Mobilization combined with Interferential Therapy and Dry Cupping therapy produced significant clinical improvements. While the original comparative study reported comparatively greater improvements in shoulder mobility and overall functional recovery with Mulligan Mobilization combined with Interferential Therapy, both interventions contributed to meaningful reductions in pain and disability. These findings support the integration of evidence-based conservative physiotherapy interventions into routine clinical practice for the management of adhesive capsulitis.

Future studies with larger sample sizes, multicentre recruitment, longer intervention periods, and extended follow-up are recommended to further evaluate the long-term effectiveness of conservative physiotherapy and to determine the most effective rehabilitation strategies for individuals with adhesive capsulitis.

References

1. Griggs SM, Ahn A, Green A. Idiopathic adhesive capsulitis: A prospective functional outcome study of nonoperative treatment. *J Bone Joint Surg Am*. 2000;82(10):1398-1407.
2. Levine WN, Kashyap CP, Bak SF, Ahmad CS, Blaine TA, Bigliani LU. Nonoperative management of idiopathic adhesive capsulitis. *J Shoulder Elbow Surg*. 2007;16(5):569-573.
3. Dias R, Cutts S, Massoud S. Frozen shoulder. *BMJ*. 2005;331(7530):1453-1456.
4. Lewis J. Frozen shoulder contracture syndrome: Aetiology, diagnosis and management. *Man Ther*. 2015;20(1):2-9.
5. Zuckerman JD, Rokito A. Frozen shoulder: A consensus definition. *J Shoulder Elbow Surg*. 2011;20(2):322-325.
6. Jain TK, Sharma NK. The effectiveness of physiotherapeutic interventions in the treatment of frozen shoulder/adhesive capsulitis: A systematic review. *J Back Musculoskelet Rehabil*. 2014;27(3):247-273.
7. Maund E, Craig D, Suekarran S, Neilson AR, Wright K, Brealey S, et al. Management of frozen shoulder: A systematic review and cost-effectiveness analysis. *Health Technol Assess*. 2012;16(11):1-264.
8. Buchbinder R, Green S, Forbes A, Hall S, Lawler G. Arthrographic distension for adhesive capsulitis (frozen shoulder). *Cochrane Database Syst Rev*. 2008;(1):CD007005.
9. Sun Y, Lu S, Zhang P, Wang Z, Chen J. Steroid injection versus physiotherapy for patients with adhesive capsulitis: A meta-analysis. *Medicine (Baltimore)*. 2016;95(20):e3469.
10. Challoumas D, Biddle M, McLean M, Millar NL. Comparison of treatments for frozen shoulder: A systematic review and meta-analysis. *JAMA Netw Open*. 2020;3(12):e2029581.
11. Robinson CM, Seah KTM, Chee YH, Hindle P, Murray IR. Frozen shoulder. *J Bone Joint Surg Br*. 2012;94(1):1-9.
12. Manske RC, Prohaska D. Diagnosis and management of adhesive capsulitis. *Curr Rev Musculoskelet Med*. 2008;1(3-4):180-189.
13. Foster RL, O'Driscoll M. Current concepts in the conservative management of frozen shoulder. *Phys Ther Rev*. 2010;15(5):399-406.
14. Djordjevic OC, Vukicevic D, Katunac L, Jovic S. Mobilization with movement and kinesiotaping compared with a supervised exercise programme for painful shoulder: Results of a clinical trial. *J Manipulative Physiol Ther*. 2012;35(6):454-463.
15. Mulligan BR. The Mulligan Concept of Manual Therapy: Textbook of Techniques.

- 2nd ed. Wellington: Plane View Services Ltd; 2015.
16. Watson T. Electrotherapy: Evidence-Based Practice. 13th ed. Edinburgh: Elsevier; 2020.
 17. Kitchen S, Bazin S, Clayton N. Clayton's Electrotherapy: Theory and Practice. 12th ed. Edinburgh: Elsevier; 2022.
 18. Ebadi S, Ansari NN, Henschke N, Naghdi S, van Tulder MW. The effect of continuous ultrasound on chronic musculoskeletal pain: A systematic review. *BMC Musculoskelet Disord*. 2012;13:192.
 - 21.
 19. Cramer H, Lauche R, Haller H, Dobos G. Effects of cupping therapy on pain and function: A systematic review of randomized clinical trials. *J Tradit Complement Med*. 2016;6(1):1-10.
 20. Lauche R, Cramer H, Hohmann C, Choi KE, Rampp T, Saha FJ, et al. The effect of traditional cupping on pain and mechanical thresholds in patients with chronic nonspecific neck pain: A randomized controlled pilot study. *PLoS One*. 2012;7(2):e31793.