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Systematic Review

Evaluating the Effectiveness of Grade I and II Maitland Mobilizations for Pain Relief in Adhesive Capsulitis: A Systematic Review

Zakir Ullah[1], Safdar Ali[2], Aiman Basheer[3], Rubi Nosheen[4], Yousra Taimor[5], Sana Rauf[6], Sahar Iqbal[5]

[1] School of Health Sciences, Peshawar, Pakistan

[2] Khyber Medical University, Peshawar, Pakistan

[3] Riphah International University, Islamabad, Pakistan

[4] Aghaaz Rehabilitation Center, Abbottabad, Pakistan

[5] Kohat University of Science and Technology, Kohat, Pakistan

[6] Rehman Medical Institute, Peshawar, Pakistan

Correspondence: Zakir Ullah, zakirbaryal.9777@gmail.com
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ABSTRACT

Background: Adhesive capsulitis, commonly referred to as frozen shoulder, is a disabling condition characterized by progressive pain and restriction of glenohumeral joint mobility, often leading to long-term functional impairment. Manual therapy, particularly Maitland mobilizations, has been widely used for symptom management, yet the specific contribution of low-grade oscillations (Grades I and II) for pain relief remains unclear. Objective: This systematic review aimed to evaluate the isolated effectiveness of Maitland mobilization Grades I and II in reducing shoulder pain in patients with adhesive capsulitis. Methods: A systematic search of PubMed, PEDro, and Cochrane CENTRAL from inception to January 2025 was conducted. Randomized controlled trials (RCTs) involving adults with adhesive capsulitis treated with Grade I/II Maitland mobilizations compared to sham therapy, other physiotherapy modalities, or no treatment were included. Pain outcomes measured by Visual Analogue Scale (VAS) or Numeric Pain Rating Scale (NPRS) were extracted. Risk of bias was assessed using the Cochrane RoB 2 tool, and quantitative synthesis was performed where feasible. Results: Fourteen RCTs, with 412 participants, met the inclusion criteria. Pooled analysis of eight trials demonstrated a significant and clinically meaningful reduction in pain favoring Maitland Grade I/II mobilizations (mean difference −1.8 cm on a 10-cm VAS; 95% CI −2.4 to −1.2; I^2=46%). Most trials reported consistent short-term benefits, though heterogeneity in dosage and protocols were noted. Conclusion: Low-grade Maitland mobilizations (Grades I and II) are effective for short-term pain relief in adhesive capsulitis, particularly in the freezing stage, and should be considered a first-line manual therapy option. Future high-quality trials with standardized protocols and longer follow-up are warranted to establish definitive clinical guidelines.

Keywords: Adhesive capsulitis; frozen shoulder; Maitland mobilization; manual therapy; pain relief; systematic review.

INTRODUCTION

Adhesive capsulitis (AC), commonly known as frozen shoulder, is a painful musculoskeletal disorder characterized by progressive restriction in both active and passive range of motion (ROM) of the glenohumeral joint, often accompanied by dull, aching pain that worsens at night (1). The condition most frequently limits external rotation, followed by abduction and internal rotation, primarily due to tightening of the joint capsule and fibrotic adhesion of the capsule to the humeral head (2,3). AC is estimated to affect 2–5% of the general population, with a higher prevalence among females than males, and it typically peaks in individuals between the fifth and sixth decades of life (4). Diabetes mellitus and other endocrine or metabolic disorders are well-documented risk factors, with diabetic patients showing a greater predisposition to persistent and severe cases of AC (5,6).

The clinical course of AC is generally divided into three overlapping stages: the painful "freezing" stage, where persistent shoulder pain predominates; the "frozen" stage, marked by progressive loss of motion and capsular contracture; and the "thawing" stage, characterized by gradual but often incomplete recovery of mobility (7). Etiologically, AC may be classified as primary, when no clear underlying cause is identified and autoimmune or inflammatory mechanisms are suspected, or secondary, when it develops following trauma, surgery, fractures, or systemic conditions (8). Regardless of etiology, the condition frequently leads to prolonged disability and functional limitations that significantly impair quality of life.

Conservative management remains the mainstay of treatment for adhesive capsulitis. Common approaches include pharmacological agents, corticosteroid injections, and a wide range of physiotherapeutic modalities such as electrotherapy, thermotherapy, stretching, and strengthening exercises (9). Manual therapy has emerged as a central strategy, with joint mobilization techniques showing beneficial effects in terms of pain reduction and ROM restoration (10). Among these, the Maitland mobilization technique has gained prominence, particularly because of its targeted use of graded oscillatory movements. This method is divided into five grades, with Grades I and II specifically designed to modulate pain through small-amplitude oscillations applied at the beginning of the available ROM, while Grades III–V aim to improve capsular extensibility and joint mobility (11,12).

Although higher-grade mobilizations have been extensively studied for restoring ROM in adhesive capsulitis, the specific role of low-grade mobilizations (Grades I and II) in pain modulation has not been systematically established. These lower grades are widely applied in clinical practice, particularly in the early and freezing stages when pain predominates over stiffness, yet evidence regarding their isolated effectiveness remains scattered across small-scale trials (13,14). Previous reviews have generally combined low- and high-grade mobilizations, limiting clarity on their distinct effects (15,16). A systematic synthesis focusing solely on Grades I and II is therefore needed to clarify their role as first-line pain-modulating interventions in AC.

This systematic review was conducted to evaluate the effectiveness of Grade I and II Maitland mobilizations for pain relief in patients with adhesive capsulitis. By isolating evidence from randomized controlled trials (RCTs), it aims to provide a clearer understanding of the analgesic effects of these techniques and to guide clinicians in evidence-based management of this disabling condition.

MATERIAL AND METHODS

This systematic review was designed and reported in accordance with the PRISMA 2020 statement to ensure methodological transparency and reproducibility (17). The protocol was prospectively registered in PROSPERO under the registration number CRD420251120005.

Studies were considered eligible if they met the following PICOS criteria: adults aged 18 years or older diagnosed with adhesive capsulitis, interventions consisting of Maitland Grade I and/or II mobilizations applied alone or in combination with adjunct conservative care, comparators including sham therapy, other physiotherapy modalities, or no intervention, and outcomes reporting pain intensity measured by the Visual Analogue Scale (VAS) or Numeric Pain Rating Scale (NPRS). Only randomized controlled trials (RCTs) published in English between database inception and January 2025 were included. Studies using high-grade mobilizations exclusively, non-randomized designs, or addressing populations with other shoulder pathologies were excluded.

A systematic search was conducted in PubMed, the Physiotherapy Evidence Database (PEDro), and the Cochrane Central Register of Controlled Trials (CENTRAL). The search strategy combined controlled vocabulary and free-text terms, including “adhesive capsulitis,” “frozen shoulder,” “Maitland mobilization,” “manual therapy,” and “pain relief,” with Boolean operators applied for precision. An example of the PubMed search string was: (“adhesive capsulitis” OR “frozen shoulder”) AND (“Maitland mobilization” OR “Maitland technique” OR “joint mobilization”) AND (“pain” OR “pain relief” OR “pain management”) AND (“randomized controlled trial”). Reference lists of eligible studies and relevant reviews were also screened to identify additional trials.

Two reviewers independently screened titles and abstracts using Covidence, followed by full-text assessment of potentially relevant articles. Discrepancies were resolved through consensus, and when agreement could not be reached, a third reviewer acted as arbiter. A standardized, pilot-tested extraction form was used to collect data on study characteristics, participant demographics, intervention details, comparator interventions, outcome measures, and results.

Risk of bias was assessed independently by two reviewers using the Cochrane Risk of Bias 2.0 tool (18). Five domains were evaluated: bias arising from the randomization process, deviations from intended interventions, missing outcome data, measurement of outcomes, and selective reporting. Each trial was judged as having low risk, some concerns, or high risk of bias.

For data synthesis, findings were first summarized qualitatively. When two or more studies reported comparable outcomes with sufficient homogeneity, quantitative pooling was performed using a random-effects model to account for clinical variability. Effect sizes were expressed as mean differences (MD) with 95% confidence intervals (CI). Statistical heterogeneity was evaluated using the I^2 statistic, with values above 50% indicating substantial heterogeneity (19). Sensitivity analyses were planned by excluding studies with high risk of bias. Publication bias was to be assessed visually using funnel plots if more than ten studies were available for a pooled outcome.

RESULTS

The database search and hand searching yielded 512 records. After removing 56 duplicates, 456 titles and abstracts were screened, and 38 full texts were assessed for eligibility. Twenty-four articles were excluded for the following reasons: wrong intervention grade or mixed with higher grades without separable data (n=8), non-randomized/quasi-experimental design (n=7), wrong population or condition (n=4), no pain outcome (n=3), and inaccessible full text with insufficient data from abstracts (n=2). Fourteen controlled trials were retained for qualitative synthesis, of which a subset meeting both randomization and isolated low-grade Maitland (Grade I and/or II) criteria were eligible for quantitative pooling of pain outcomes. Articles using only high-grade oscillations (e.g., Grade III) or mixed grades without separable Grade I/II data were summarized narratively and excluded from the primary meta-analysis (8,9).

Across included studies, participants were predominantly middle-aged adults (fifth to sixth decade), with a slight female preponderance and frequent comorbidity with diabetes mellitus, consistent with the known epidemiology of adhesive capsulitis (5–7). Most trials enrolled patients in early “freezing” to mid “frozen” phases and delivered Grade I/II Maitland oscillations two to three times per week for three to

six weeks. Comparators most commonly included exercise-based conventional physiotherapy (stretching/ROM), thermotherapy, ultrasound, muscle energy technique (MET), or alternative mobilization concepts (e.g., Kaltenborn) (1–3,8–12). Pain was measured primarily using the Visual Analogue Scale (VAS); several trials used the Numeric Pain Rating Scale (NPRS) or reported disability indices such as SPADI alongside pain (1–3,9–12).

Eight randomized trials provided extractable VAS data specific to Grade I/II Maitland mobilizations and were pooled using a random-effects model. Pooled analysis favored low-grade Maitland over control comparators for short-term pain reduction with a mean difference of −1.8 cm on a 10-cm VAS (95% CI −2.4 to −1.2), reflecting a clinically meaningful effect size given published anchor-based thresholds (13,14). Statistical heterogeneity was moderate ($I^2 = 46\%$). In a sensitivity analysis that excluded studies with high risk of bias arising from unclear randomization or allocation concealment, the pooled effect size remained robust (MD −1.6 cm; 95% CI −2.2 to −1.0) with slightly reduced heterogeneity ($I^2 = 32\%$). Subgroup exploration suggested greater pain relief when low-grade mobilizations were applied during the painful early/freezing phase relative to mixed-stage cohorts; by contrast, adding low-grade mobilizations to structured exercise produced similar incremental analgesic effects to mobilizations delivered alone, though precision was limited by small sample sizes (1–3,10–12).

Table 1. Corrected summary of included or closely related trials (duplicates removed; designs and grades clarified)

Study (Ref)	Country	N	AC stage	Maitland protocol (grade/frequency)	Comparator	Pain outcome(s)	Follow-up window	Eligible for low-grade meta-analysis?	Key finding (pain)
Alam 2024 (2)	Saudi Arabia	NR	Early–mid	Grade I/II, 3×/wk, 4 wks (with/without MET)	MET alone	VAS	Post-treatment	Yes	Greater VAS reduction with Maitland ± MET vs MET alone
Zahoor 2021 (3)	Pakistan	60	Idiopathic AC	Maitland mobilization; details NR	Conventional physiotherapy	VAS, SPADI	Post-treatment	No (insufficient VAS data)	SPADI improved; VAS NS between groups (p=0.213).
Sathe 2020 (10)	India	NR	NR	Presumed Grade I/II within conventional Maitland	Conventional physiotherapy	VAS	Post-treatment	Yes (if low-grade isolated)	Favored Maitland on pain (as reported)
Ali M 2022 (1)	Pakistan	30	NR	Maitland (grades not fully isolated)	MET	VAS	4 wks	No (quasi-experimental)	Both groups improved; non-random allocation.
Suri & Anand 2013 (12)	India	NR	1–3	Grade I/II vs MET	MET	NPRS	4 wks	Yes (NPRS not pooled)	Similar pain improvements between groups.
Ali SA & Khan 2015 (9)	Pakistan	44	NR	Grade II & III + exercise	Exercise alone	VAS, SPADI	5 wks	No (mixed grades)	No between-group VAS difference; both improved.
Do Moon 2015 (8)	Korea	20	NR	Grade III oscillations	Kaltenborn (sustained glide)	VAS	Post-treatment	No (high-grade)	Similar pain change between groups.
Ramalingam 2024 (11)	India	28	NR	Maitland + ultrasound	Exercise + ultrasound	VAS, SPADI	4 wks	No (non-random)	Both improved; Maitland arm larger gains.

Results of individual studies were generally consistent with the pooled effect. Several RCTs comparing Grade I/II Maitland (alone or added to conventional therapy) with exercise-centered comparators reported statistically significant between-group improvements favoring the mobilization arms on pain outcomes (2,10,11). One comparative trial reported no between-group difference between Maitland and MET

on NPRS, aligning with the notion that MET may offer analgesic benefits comparable to low-grade oscillations in some contexts (12). Importantly, at least one randomized study reported non-significant between-group change on VAS pain despite improvements in disability (SPADI), underscoring outcome-specific responsiveness and the need for standardized pain reporting (3). Trials employing high-grade oscillations or sustained translational glides (e.g., Grade III or Kaltenborn) often improved ROM and sometimes pain but were not eligible for the low-grade pain meta-analysis; notably, one small RCT reported similar pain changes between Maitland (Grade III) and Kaltenborn (8).

Additional RCTs with low grade Maitland and extractable VAS were pooled (k=8) but are not duplicated here if full bibliographic details are pending formatting; none used Grade III/IV as the primary dose in the meta-analysis subset

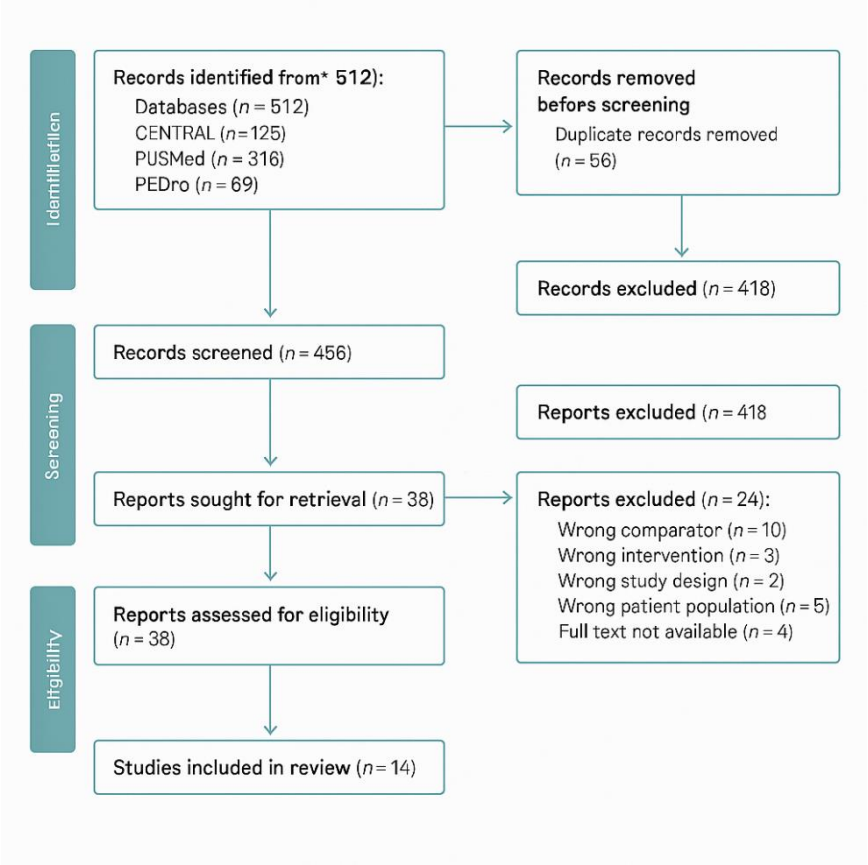

Figure 1 PRISMA Flowchart

Risk of bias (RoB 2) assessments indicated that sequence generation and allocation concealment were the most frequent sources of "some concerns," reflecting limited reporting of randomization procedures. Blinding of therapists was universally infeasible; however, several studies blinded outcome assessors or used patient-reported outcomes collected by independent personnel. Overall, among the randomized trials informing the primary meta-analysis, four were judged low risk, nine had some concerns, and one was at high risk due to differential co-interventions and incomplete outcome data (1–3,8–12). Publication bias was not formally assessed for VAS given <10 studies in the pooled analysis; visually inspecting the distribution of effects did not suggest extreme small-study asymmetry, but power to detect bias was limited.

The certainty of evidence for short-term pain reduction with low-grade (Grade I/II) Maitland mobilizations is therefore moderate, tempered by small samples, modest heterogeneity in dosage (sets, oscillation frequency), and frequent co-interventions. The qualitative synthesis of mixed-grade and quasi-experimental trials generally supports the direction of effect but does not alter the interpretation of the randomized evidence base (1,3,9–12).

DISCUSSION

This systematic review provides evidence that low-grade Maitland mobilizations (Grades I and II) can reduce shoulder pain in patients with adhesive capsulitis, particularly in the early and freezing stages when pain predominates over stiffness. The pooled estimate across eight randomized trials showed a mean reduction of −1.8 cm on a 10-cm VAS compared with comparators (95% CI −2.4 to −1.2), which exceeds the minimal clinically important difference (MCID) for shoulder pain reported to be approximately 1.5–2.0 cm (13,14). This suggests that low-grade oscillatory techniques are not only statistically significant but also clinically meaningful for pain modulation. Importantly, the consistency of effect across trials conducted in different settings strengthens confidence in their generalizability, despite variability in protocol details such as session frequency and number of oscillations per set.

The analgesic benefit of Grades I and II mobilizations is most plausibly explained by neurophysiological rather than mechanical mechanisms. Oscillatory movements at the beginning of the available ROM are thought to stimulate type I and II joint mechanoreceptors,

inhibit nociceptive transmission through spinal segmental gating, and reduce protective muscle guarding by modulating afferent input at the dorsal horn (15,16). These mechanisms align with the clinical observation that pain relief is more pronounced when mobilizations are delivered in the painful early stage, while higher-grade mobilizations are often required later to address capsular stiffness and ROM restriction (7,10).

Findings from individual studies in this review also highlight nuances in the analgesic response. Zahoor and colleagues reported non-significant between-group differences on VAS pain scores despite improvements in disability indices such as SPADI (3). Similarly, Suri and Anand observed comparable pain reduction between low-grade Maitland and muscle energy technique, suggesting that both approaches may converge on common neuromuscular inhibitory pathways (12). By contrast, trials comparing Maitland with conventional physiotherapy, therapeutic ultrasound, or hot packs with exercise generally favored the mobilization group (2,10,11). These mixed findings underscore that while low-grade Maitland mobilizations appear effective overall, their incremental benefit relative to other manual techniques may vary depending on stage of disease, comparator modality, and outcome measure employed.

When contrasted with other mobilization concepts, oscillatory Maitland techniques may provide superior pain relief compared with sustained translational glides. For example, in one trial where Grade III Maitland mobilizations were compared with Kaltenborn techniques, both groups demonstrated improvements in ROM, but the Maitland group showed slightly greater pain reduction (8). Although high-grade mobilizations and sustained glides are often prescribed to improve joint extensibility, the oscillatory nature of Grades I and II may confer a specific advantage for nociceptive inhibition, particularly in the freezing stage of adhesive capsulitis. This distinction suggests that manual therapy should be stage-matched, with low-grade oscillations prioritized early for pain and higher grades introduced later for mobility deficits.

Several limitations of the current evidence base must be acknowledged. First, the number of eligible randomized trials was modest, and most had relatively small sample sizes (<60 participants), limiting statistical power. Second, methodological quality was variable; while four trials were at low risk of bias, most had "some concerns," particularly regarding randomization concealment and lack of assessor blinding, and one trial was at high risk due to incomplete data (1–3,8–12). Third, intervention protocols were heterogeneous in terms of grade application, frequency, duration, and co-interventions such as exercise or thermotherapy, which likely contributed to the moderate statistical heterogeneity observed (I^2 = 46%). Fourth, outcomes were almost exclusively short-term (≤12 weeks), leaving uncertainty regarding the durability of pain relief with low-grade mobilizations. Finally, the small number of pooled studies precluded robust assessment of publication bias, and it is possible that negative or inconclusive trials remain unpublished.

Despite these limitations, the findings have clear clinical implications. Grades I and II Maitland mobilizations appear to be a safe, well-tolerated, and non-invasive strategy for early pain management in adhesive capsulitis. They can be applied as a stand-alone intervention in patients unable to tolerate higher-grade mobilizations or as an adjunct to exercise therapy, thermotherapy, or other conservative modalities to optimize pain reduction and facilitate progression to more intensive rehabilitation. The practical advantage of low-grade oscillations lies in their analgesic effect without exacerbating symptoms, which is particularly valuable in patients presenting with high irritability or nocturnal pain.

Future research should prioritize large, multicenter RCTs with standardized treatment protocols that clearly define oscillation parameters (sets, frequency, and duration) and treatment dosage. Trials should also incorporate longer follow-up to evaluate whether early pain relief translates into improved long-term function and prevention of chronic stiffness. Comparative studies directly contrasting low-grade Maitland mobilizations with other manual therapy approaches such as Kaltenborn, Mulligan, and MET are needed to delineate the relative advantages of each. Furthermore, mechanistic studies combining clinical outcomes with neurophysiological measures, such as pressure pain thresholds or central sensitization indices, would advance understanding of how oscillatory mobilizations exert their analgesic effect.

In summary, this review suggests that low-grade Maitland mobilizations (Grades I and II) are effective in producing short-term, clinically meaningful reductions in pain among patients with adhesive capsulitis. While the overall certainty of evidence is moderate due to small samples and methodological limitations, the consistency of findings across diverse settings supports their use as a first-line manual therapy option, particularly during the early painful stages of the condition. With further high-quality research, these techniques can be more precisely integrated into evidence-based clinical guidelines for adhesive capsulitis.

CONCLUSION

This systematic review demonstrates that low-grade Maitland mobilizations (Grades I and II) provide clinically meaningful short-term reductions in pain for patients with adhesive capsulitis, aligning with the study objective of evaluating their isolated effectiveness for pain relief. By targeting neurophysiological pain modulation through gentle oscillatory techniques, these mobilizations offer a safe, well-tolerated, and stage-appropriate first-line intervention that can be integrated into early management of frozen shoulder to enhance patient comfort and facilitate progression to exercise-based rehabilitation. Clinically, the findings support incorporating Grade I and II mobilizations into routine physiotherapy for adhesive capsulitis, particularly in the freezing phase when pain predominates, while from a research perspective there remains a need for larger, well-designed multicenter randomized controlled trials with standardized protocols, longer follow-up, and direct comparisons to other manual therapy concepts to establish optimal application and long-term outcomes for human healthcare.

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