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REVIEW ARTICLE

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Effectiveness of Joint Mobilization Techniques in Managing Adhesive Capsulitis: A Comprehensive Review of Outcomes and Functional Improvements

Laljibhai Makwana

USA

ABSTRACT

Frozen shoulder, the name for adhesive capsulitis, is a painful, disabling condition that involves stiffness of the shoulders with decreasing range of motion (ROM) in the glenohumeral joint. Severe impacts on daily life and quality of life, as well as challenges with clinical management, also exist. Mobilization techniques are a key feature of physical therapy interventions for adhesive capsulitis and are an effective non-invasive approach for pain reduction, restoration of motion and functional improvement. Maitland and Mulligan mobilization methods are techniques, including graded manual manipulations, which target joint capsular restrictions, improve synovial fluid flow, and activate neurophysiological mechanisms. Mobilization specifically focuses on passive and active joint movements, allowing it to both address stiffness and help promote tissue remodelling and pain desensitization. Several methods have been proposed to address the problem; however, the procedures have limited indications, and evidence brings about the feasibility of improving shoulder flexion, abduction, and rotation, with consequent amplification of quality of life and patient results. Mobilization is integrated with adjunctive therapies, including therapeutic exercises and other modalities, such as heat or ultrasound, to optimize recovery.

Nevertheless, the differences in clinical protocols, patient compliance and the individual response of the patient to treatment call for personalized medicine and monitoring. In this paper, we review the literature on the effectiveness of joint mobilization for the management of adhesive capsulitis through key outcomes of pain relief, ROM recovery, and functional recovery. It synthesizes evidence-based practices highlighting the use of joint mobilization as a cornerstone of the physical therapy treatment approach for this debilitating condition and for improving patient quality of life.

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Introduction

Frozen shoulder (adhesive capsulitis) is a frequent musculoskeletal problem involving sharp pain and restriction of movement in the shoulder joint, seriously restricting the functional capabilities of an individual. This pathology that affects the glenohumeral joint is disease causing progressive stiffness, limited functional range of motion and chronic aching pain, which interferes with professional activities and basic daily routines like dressing or reaching over. Pathological thickening and tightening of the joint capsule, limiting its ability to stretch and move freely, is associated with it. Adhesive capsulitis typically progresses through three overlapping phases: The freezing phase, marked by pain and progressive stiffness; the frozen phase, in which stiffest predominates, but there is minimal improvement in symptoms; and the thawing phase, during which ROM and functionals capacity recover gradually.

Adhesive capsulitis has relied on physical therapy interventions to manage the condition, and mobilization techniques of joints have been the foundation of treatment. These techniques are based on skilled manual manipulations intended to restore motion ROM, decrease capsular tightness, facilitate synovial fluid motion, and neurophysiologic adaptation. In clinical settings, there has been much usage of the Maitland technique using oscillatory mobilizations of various grades and the Mulligan mobilization method, in which the patient actively participates. They address pain, stiffness and mobility deficits holistically and specifically, and, as a result, they improve functional recovery and quality of life.

Joint mobilization has mechanical effects of stretching capsular adhesions and increasing joint play and neurophysiological effects of activating pain-relieving pathways and improving proprioception. As such, this paper aims to evaluate different joint mobilization techniques for the management of adhesive capsulitis, evaluating the outcomes and functional improvement achieved using evidence-based outcomes. Furthermore, the review is intended to provide clinicians with an understanding of how to optimize treatment strategies better to improve patient outcomes.

Contact: Laljibhai Makwana, USA

Understanding Adhesive Capsulitis

Stiffness, pain, and loss of glenohumeral joint mobility are the major factors that severely impair shoulder function in adhesive capsulitis (or) frozen shoulder. With an even greater prevalence in individuals with diabetes mellitus, hypothyroidism and cardiovascular disease [1], it is estimated that approximately 2-5% of the population is affected. Adhesive capsulitis is frequently classified as either primary (idiopathic) or secondary (associated with trauma or systemic disease) and progresses through three clinically distinct stages: freezing, frozen and thawed.

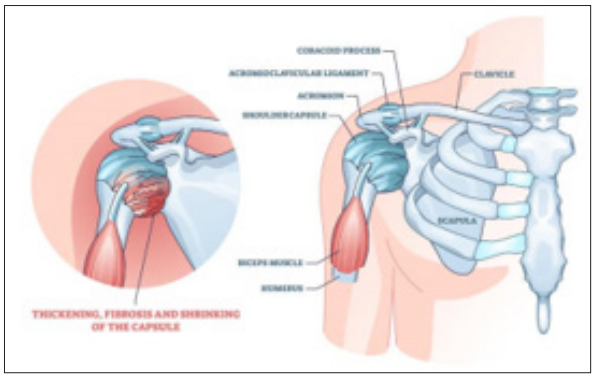

Figure 1: Anatomical changes in adhesive capsulitis

The freezing stage involves pain and stiffness that slowly starts to set in-it can last anywhere from six weeks to nine months. Then comes the frozen stage, where the pain starts to disappear, but the stiffness remains, and sometimes even the most basic arm movement will fail to function freely in this stage. The thawing stage is last and is a slow recovery with the time usually taking 12-24 months or longer for some patients [2]. The condition resulted from fibrosis, inflammation and thickening of the joint capsule with adhesions between the capsule and humeral head [3]. Besides causing mechanical pain, this pathophysiological process interferes with functional independence in daily living including dressing, grooming and overhead lifting.

The diagnostic challenges of adhesive capsulitis are made up of the shared symptoms with other shoulder disorders, including rotator cuff tears or impingement syndrome. The diagnosis is largely based upon clinical assessment of active and passive ROM, specifically external rotation being disproportionately affected in adhesive capsulitis. Other pathologies can be ruled out using imaging modalities such as MRI or ultrasound; however, capsular thickening can be confirmed [4]. Adhesive capsulitis imparts functional limitations and psychosocial burdens, such that a well-defined and effective management strategy is needed to alleviate symptoms and restore mobility and functional ability.

Effectiveness of Joint Mobilization Techniques

One of the great cornerstones of adhesive capsulitis management remains joint mobilization as an adjunct to the methods above, providing specific treatment for capsular tightness, pain, and reduction of ROM. Joint mobilization is a manual therapy technique whereby passive oscillatory or sustained movements are applied to specific joint structures. Maitland's classification uses the amplitude and range of motion involved to categorize these techniques into five grades.

Mechanisms of Action

The effectiveness of joint mobilization is explained by its biomechanical and neurophysiological mechanisms. Mobilization on a biomechanical basis stretches the joint capsule, breaks adhesions, and hikes up synovial fluid distribution, which in total facilitates motion and joint elasticity [5]. Mobilization of a joint may stimulate mechanoreceptors neurophysiologically and modulate nociceptive input and pain relief through the pain gating mechanism [6]. The effects are greatest for mobilization that is targeted to the patient's stage of adhesive capsulitis.

Clinical Outcomes

A number of studies affirm the benefit of joint mobilization for reducing pain and improving ROM and shoulder function. A review of Zhang (2019) [7]compared joint mobilization with placebo and other conservative treatments. This mobilization group saw significantly more improvements in abduction, flexion, and external rotation. Meanwhile, a meta-analysis from Nakandala (2021) [8] also highlighted the superior outcome of joint mobilization.

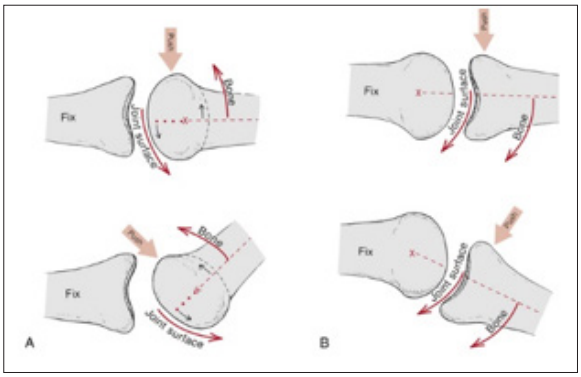

Figure 2: Joint mobilization mechanics, illustrating directional forces applied to improve joint mobility and reduce capsular restrictions

Grade (Grades I, II) mobilization is occasionally used during the freezing stage to relieve pain and improve tolerance to movement in clinical practice. Stretching of capsular restrictions and correcting kinematics is more effective in the thawing and frozen stages, utilizing high-grade mobilization (Grades III and IV), which are sustained or oscillatory forces at the end range of the joint. Further optimization of these techniques is possible with the addition of adjunct therapies[4].

Adjunct Therapies to Joint Mobilization

In complex cases of adhesive capsulitis, its therapeutic efficacy is augmented by adding mobilization to complementary treatments. The most effective adjuncts to mobility gains from mobilization are physiotherapy and active exercise programs. Important exercises are stretching exercises aimed at the posterior capsule and rotator cuff, as these stretching exercises cure muscle imbalances and improve the stability of the joint [9]. Upper extremity strengthening exercises also improve scapular mechanics, further help reduce compensatory motion patterns and promote functional independence.

Mobilization is frequently used in conjunction with corticosteroid injections, usually in the early freezing stage. Corticosteroids decrease inflammation and pain, thus allowing for a better environment for mobilization and stretching interventions. Pandey (2021) [10] used a randomized controlled trial of corticosteroid injection and joint mobilization and found that patients who received both treatments showed faster improvement in pain and ROM when compared with patients receiving only one treatment.

Management of adhesive capsulitis also includes thermal modalities, such as heat and cryotherapy. Before mobilization, heat therapy improves tissue extensibility, allowing for the stretching of the joint capsule. On the contrary, cryotherapy is associated with a decrease in post-treatment inflammation and pain, making the patient more tolerant to intensive therapies [11]. The use of the synergistic application of these modalities with mobilization optimizes outcomes [12].

Comparison with Alternative Interventions

Other non-surgical treatments, such as manipulation under anaesthesia (MUA), hydrosilation, and alternative therapies, are often compared to joint mobilization. These interventions have their place, but joint mobilization enjoys distinct advantages regarding safety, cost-effectiveness, and patient-centeredness.

An aggressive intervention, forehead shoulder manipulation under general anaesthesia (MUA), breaks adhesions and restores ROM. Nevertheless, it poses the risks of fractures, soft tissue injuries, and extended recovery periods, which is not beneficial for many patients [13]. However, joint mobilization has been proven to be a safer, as well as a gradual, means of increasing ROM without the use of anaesthesia or a hospital stay.

Hydro dilatation, which involves injecting saline or corticosteroid solution into the joint capsule to stretch it, is also used to treat adhesive capsulitis. Although it offers quick relief, it is temporary and requires repeat treatment. Additionally, it requires a specific set of equipment and expertise and is, therefore, less accessible than joint mobilization [14].

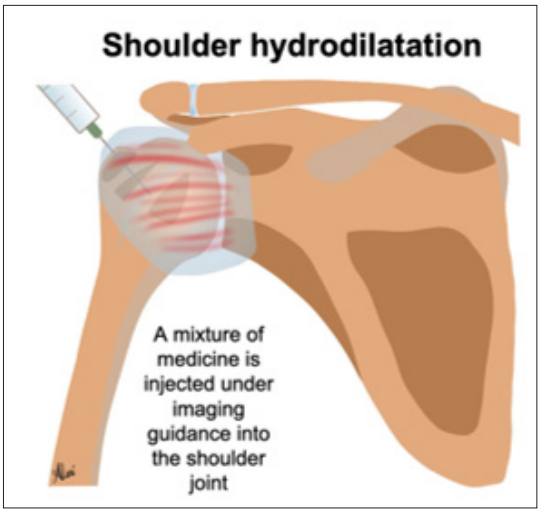

Figure 3: Illustration of shoulder hydro dilatation, showing the injection of a mixture of medicine into the shoulder joint under imaging guidance

Other therapies that have undergone the assessment include acupuncture and chiropractic care. Acupuncture uses endorphin release and neurochemical changes to modulate pain, with an inconsistent effect on ROM and function. Chiropractic adjustments also offer only short-term pain relief and don't have enough specificity to address capsular restrictions. These limitations are just reasons why joint mobilization is a comprehensive and evidence-based approach.

Challenges and Limitations of Joint Mobilization

Although proven efficacious, joint mobilization has problems. A major barrier is patient compliance, especially regarding adherence to prescribed home exercise programs and regular attendance at therapy sessions. Noncompliance can hinder progress, which in turn delays recovery and increases the likelihood of residual deficit [15].

The therapist's expertise is another important determinant of outcomes. The process of delivering joint mobilization must be precise, and the shoulder biomechanics and patient-specific factors must be well understood. If the technique is adequate or the technician needs more experience, however, results may be suboptimal or may adversely affect the patients [5].

Cost, as well as accessibility, is another barrier, typically in underserved or rural areas where there may be limited access to skilled therapists. Joint mobilization, though more cost-effective than surgical interventions, can be costly for some patients [16]. These challenges can only be addressed with a multi–disciplinary approach that incorporates patient education, financial support mechanisms and tele rehab programs so that care can be extended to those farther afield.

Conclusion

One of the most important methods of non–surgical management of adhesive capsulitis is the technique of joint mobilization. The interventions offer both the safety and effectiveness of capsule restrictions and neuromuscular deficits as an alternative to intralesional procedures. Adjunct therapies like physiotherapy, corticosteroid injections and thermal modalities are also incorporated for aiding outcomes in addition to aiding outcomes in addition to aiding outcomes. Despite persistent issues with the adherence of patients, training of therapists and access to care, joint mobilization is the foundation of the treatment of adhesive capsulitis. Future research should standardize treatments and investigate the long-term outcomes of the treatment therapies and the effectiveness of these treatment therapies in different patient populations. As the knowledge of and application of joint mobilization continues to develop, clinicians can continue to fine-tune the role of joint mobilization for the best potential patient outcome in adhesive capsulitis.

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