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Effects of dry needling combined with mulligan and IASTM (Instrument Assisted Soft Tissue Mobilization) in Adhesive capsulitis: A case study

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Abstract
Background: Adhesive capsulitis is a prevalent shoulder condition characterized by pain, progressive stiffness, and restricted range of motion, particularly in abduction and external rotation. These limitations significantly affect daily activities and overall quality of life. Capsular tightness, myofascial trigger points, and altered shoulder biomechanics contribute to persistent symptoms and delayed recovery.
Objective: To evaluate the effectiveness of a combined physiotherapy approach involving dry needling, Mulligan mobilization with movement, and interferential stimulation therapy in reducing pain and improving shoulder mobility and functional ability in a patient with adhesive capsulitis.
Methodology: This single-subject case study involved a 45-year-old female diagnosed with right-sided adhesive capsulitis. The intervention was delivered over four weeks, with five sessions per week. Treatment included dry needling of selected shoulder muscle trigger points, Mulligan mobilization with movement targeting shoulder abduction and external rotation, interferential stimulation therapy for pain relief, and a structured exercise program. Outcome measures comprised the Numeric Pain Rating Scale (NPRS), goniometric assessment of shoulder range of motion, and the Shoulder Pain and Disability Index (SPADI).
Results: After four weeks of intervention, the patient showed a significant reduction in pain levels, notable improvements in shoulder abduction, external rotation, and flexion, and a marked decrease in SPADI scores, reflecting improved functional ability. Enhanced movement tolerance and increased participation in daily activities were also observed.
Conclusion: This case study suggests that the combined use of dry needling, Mulligan mobilization with movement, and interferential stimulation therapy is an effective physiotherapy intervention for adhesive capsulitis. Addressing both myofascial and capsular restrictions appears to facilitate pain reduction, improved shoulder mobility, and functional recovery.

Keywords: Adhesive capsulitis, dry needling, mulligan mobilization with movement, instrument assisted soft tissue mobilization, shoulder pain, physiotherapy rehabilitation

Introduction

Adhesive capsulitis, commonly referred to as frozen shoulder, is a painful and disabling condition characterized by progressive restriction of both active and passive shoulder movements (Kelley *et al*., 2013) [3]. The condition is typically associated with a capsular pattern of limitation, most notably affecting shoulder abduction and external rotation (Lewis, 2015) [6]. Adhesive capsulitis commonly affects individuals between 40 and 60 years of age and has a higher prevalence among females (Kelley *et al*., 2013) [3]. It significantly interferes with activities of daily living such as dressing, grooming, and overhead activities, leading to reduced functional independence and quality of life (Page *et al*., 2014)[4]. The pathophysiology of adhesive capsulitis involves chronic inflammation of the glenohumeral joint capsule, capsular fibrosis, and synovial adhesions, resulting in pain and stiffness (Lewis, 2015) [6]. In addition to capsular tightness, myofascial trigger points in peri-scapular and rotator cuff muscles further contribute to pain and movement restriction (Simons *et al*., 1999; Shah *et al*., 2015) [2, 7]. Conventional physiotherapy management often includes electrotherapy, stretching, and strengthening exercises; however, recovery is frequently prolonged and may require extended rehabilitation (Page *et al*., 2014) [4]. Dry needling is an effective technique used to deactivate myofascial trigger points, reduce pain, and improve muscle flexibility by decreasing nociceptive input and muscle tension (Simons *et al*., 1999; Shah *et al*., 2015) [2, 7]. Mulligan Mobilization with Movement (MWM) is a manual therapy approach that aims to correct joint positional faults while allowing pain-free active movement, thereby improving joint mobility and functional performance (Mulligan, 2010; Vermeulen *et al*., 2006) [1, 8]. Instrument assisted soft tissue mobilization (IASTM) is widely used for pain modulation and to facilitate early mobilization by reducing muscle spasm and promoting relaxation (Kitchen and Bazin, 2014; Watson, 2020) [5, 9].

The integration of dry needling, Mulligan mobilization, and IASTM may provide a synergistic effect by addressing both myofascial and capsular components of adhesive capsulitis, thereby enhancing pain relief, mobility, and functional recovery. This case study aims to evaluate the effectiveness of this combined physiotherapy approach in reducing pain and improving shoulder mobility and functional ability in a patient with adhesive capsulitis.

Case Presentation

A 45-year-old female patient presented to the physiotherapy department with complaints of pain and progressive stiffness in her right shoulder for the past five months. The pain had an insidious onset, gradually worsened over time, and was aggravated during overhead activities, dressing, and combing her hair.

She also reported disturbed sleep due to night pain when lying on the affected side.

There was no history of trauma, fracture, or surgical intervention to the shoulder. The patient had no known history of diabetes mellitus, thyroid disorders, or other systemic illnesses. She did not report any neurological symptoms such as numbness, tingling, or weakness.

On physical examination, the patient adopted a protective posture of the right upper limb. Palpation revealed tenderness and active myofascial trigger points over the supraspinatus, infraspinatus, and deltoid muscles. Both active and passive ranges of motion of the right shoulder were markedly restricted, showing a typical capsular pattern of limitation, with abduction and external rotation being the most restricted and painful movements.

Pain intensity was measured using the Numeric Pain Rating Scale (NPRS), and functional disability was assessed with the Shoulder Pain and Disability Index (SPADI). Baseline assessment revealed moderate to severe pain and significant functional limitations. Based on the clinical evaluation and the observed movement restriction pattern, the patient was diagnosed with adhesive capsulitis of the right shoulder.

Pain Description

The current presentation is primarily characterized by progressive shoulder stiffness with associated pain rather than acute inflammatory symptoms. The pain appears to be mechanical in nature, arising from capsular tightness, myofascial trigger points, and altered shoulder biomechanics secondary to prolonged movement restriction over the past five months. Pain intensity increases during end-range movements, overhead activities, and functional tasks such as dressing and grooming, and is also aggravated at night when lying on the affected side. With improved shoulder mobility and reduction in stiffness, a gradual decrease in pain is anticipated.

On Examination

On clinical examination, the patient demonstrated a protective posture of the right upper limb with reduced spontaneous use of the affected shoulder. Palpation revealed localized tenderness and active myofascial trigger points over the supraspinatus, infraspinatus, and deltoid muscles. Both active and passive movements of the right shoulder were markedly restricted and painful, exhibiting a typical capsular pattern in which external rotation was most limited, followed by abduction and internal rotation. Passive movements produced a firm capsular end feel, and altered scapulohumeral rhythm was observed, with early scapular elevation during attempted arm elevation.

Special tests supported the clinical diagnosis of adhesive capsulitis. The capsular pattern assessment was positive, confirming glenohumeral joint involvement. Apley's scratch test revealed significant limitation in reaching movements, particularly those requiring abduction and external rotation. A painful arc was noted during mid-range shoulder abduction, and a positive shoulder shrug sign indicated compensatory scapular movement due to joint stiffness. Neer's and Hawkins–Kennedy impingement tests elicited mild pain, likely secondary to capsular tightness rather than primary impingement. Tests for rotator cuff integrity, including the external rotation lag test, were negative. Neurological examination was normal, with no sensory or motor deficits. These findings, in conjunction with pain severity and functional limitation measured using NPRS and SPADI, were consistent with a diagnosis of right-sided adhesive capsulitis.

Special Test

The Apley's scratch test was found to be positive on the left shoulder. Although there is no consensus and set of clinically validated special tests for the diagnosis of adhesive capsulitis, the positive finding for

Apley's scratch test in this case suggests global shoulder mobility restriction, which is consistent with adhesive capsulitis (Febyan *et al*., 2024).

Clinical Finding

The patient presented with typical features of right-sided adhesive capsulitis, including shoulder pain, progressive stiffness, and restricted movement. Observation revealed a protective posture with reduced use of the affected arm. Palpation identified tenderness and active myofascial trigger points in the supraspinatus, infraspinatus, and deltoid muscles.

Both active and passive shoulder movements were markedly limited, following a classic capsular pattern, with external rotation most restricted, followed by abduction and internal rotation. A firm capsular endfeel and altered scapulohumeral rhythm with compensatory scapular elevation were noted.

Pain levels were moderate to severe, worsening at end-range movements and during daily activities. Functional assessment showed significant difficulty with overhead tasks, dressing, grooming, and sleeping on the affected side. Special tests, including Apley's scratch test and shoulder shrug sign, were positive, supporting the diagnosis of adhesive capsulitis. Neurological examination was normal.

Table 1: Pre-Intervention Clinical And Functional Assessment Of The Affected Shoulder (Left)

ROM (Left Shoulder)		
Movement	**AROM (°)**	**PROM (°)**
Flexion	0-90	0-155
Extension	0-20	0-25
Abduction	0-80	0-150
Adduction	147-0	150-0
Internal Rotation	0-30	0-50
External Rotation	0-15	0-18
Muscle Power (MMT)		
Left Shoulder	Flexors	4-/5
	Extensors	3-/5
	Abductors	4/5

	Adductors	4/5
	Internal Rotators	3+/5
	External Rotators	2-/5
Muscle Girth Measure (inches)		
Upper Limb	Right	Left
Arm	11.5	12
Forearm	9	9
Pain Score		
Pre-(NPRS)	6/10 at rest	
SPADI (%)	68%	
Post-Intervention Outcome Measures		
Outcome Measure	Post-Treatment (4 Weeks)	
Pain (NPRS)	2/10	
Shoulder Abduction ROM	175°	
External Rotation ROM	85°	
Shoulder Flexion ROM	180°	
SPADI Score	22%	
Abduction	147-0°	
Internal Rotation	0-30°	

Short-Term Goals (2–4 WEEKS)

The short-term goals are to reduce shoulder pain and inflammation, improve tolerance to movement, and initiate restoration of shoulder mobility. Specifically, the aims are to decrease pain intensity on the NPRS, reduce night pain, improve passive and active range of motion in shoulder abduction and external rotation, and enable the patient to perform basic activities of daily living such as dressing and grooming with less discomfort.

Long-Term Goals (6–12 WEEKS)

The long-term goals are to restore near-normal shoulder range of motion, improve muscle strength and scapulohumeral rhythm, and achieve functional independence. These goals include minimal or no pain during daily activities, full or functional shoulder mobility, improved SPADI scores, return to overhead activities without difficulty, and prevention of recurrence through patient education and adherence to a home exercise program.

Physiotherapy Management

Intervention	Technique/parameter	Frequency & Duration	purpose
Dry Needling	Applied to myofascial trigger points of supraspinatus, infraspinatus and deltoid muscles.	2-3 sessions/week for 4weeks	Reduce myofascial pain, muscle spasm and improve tissue extensibility
Mulligan Mobilization (MWM)	Pain free mobilization with movement for shoulder abduction and external rotation	3 sets of 10 reps/ session	Correct joint positional fault and improve ROM
IASTM	30-60 degree with light pressure. Longitudinal and cross fibre strokes. Time- 30 sec,2 min/area	2 sessions/ week	Reduce soft tissue adhesions, decrease pain, increase ROM, enhance blood circulation
Pendular Exercises	The patient bends forward and allows the affected arm to hang freely, performing gentle swinging movements in different directions.	2-3 sessions/week for 4weeks	Help reduce pain, decrease stiffness, and promote shoulder joint mobility.

Fig 1: IASTM

Fig 2: Mulligan Mobilization (MWM)

Results

Following four weeks of a combined physiotherapy intervention comprising dry needling, Mulligan mobilization with movement, interferential stimulation therapy, and therapeutic exercises, the patient demonstrated substantial improvements in pain, shoulder range of motion, and functional ability.

Pain intensity, measured using the Numeric Pain Rating Scale (NPRS), decreased markedly from 6/10 at rest pre-intervention to 2/10 post-intervention, indicating significant pain relief. Night pain and movement-related discomfort were also notably reduced.

Shoulder range of motion showed considerable improvement across all planes. Active shoulder abduction increased from 80° to 175°**,** external rotation improved from 15° to 85°, and shoulder flexion progressed from 90° to 180°, reflecting near-normal mobility by the end of the intervention period.

Functional outcomes, assessed using the Shoulder Pain and Disability Index (SPADI), demonstrated a substantial reduction from 68% pre-treatment to 22% post-treatment, indicating marked improvement in the patient's ability to perform activities of daily living such as dressing, grooming, and overhead tasks.

Additionally, improved movement quality and scapulohumeral rhythm were observed clinically, with reduced compensatory scapular elevation during arm elevation. Overall, the combined physiotherapy approach resulted in significant pain reduction, restoration of shoulder mobility, and enhanced functional performance within a relatively short rehabilitation period [16].

Discussion

This case study aimed to evaluate the effectiveness of a combined physiotherapy approach consisting of dry needling, Mulligan mobilization, and IASTM in the management of adhesive capsulitis. The results demonstrated a significant reduction in pain, improvement in shoulder range of motion, and enhancement of functional ability following a four-week intervention program.

The reduction in pain intensity, as evidenced by the improvement in NPRS scores, may be attributed to the analgesic effects of IASTM and the deactivation of myofascial trigger points through dry needling. Dry needling has been shown to reduce muscle tension and nociceptive input, thereby facilitating improved movement patterns. The presence of trigger points in rotator cuff and periscapular muscles is known to contribute to pain and movement restriction in adhesive capsulitis.

The notable improvement in shoulder range of motion, particularly abduction and external rotation, can be explained by the combined effects of Mulligan Mobilization with Movement (MWM) and therapeutic exercises. Mulligan mobilization allows pain-free active movement while correcting joint positional faults, which may improve capsular mobility and neuromuscular control. Improved tolerance to movement enabled the patient to actively participate in exercise therapy, further enhancing joint mobility.

Functional improvement, as reflected by the reduced SPADI score, suggests that the integrated intervention effectively addressed both pain and movement limitations, leading to better performance of daily activities. The combined use of manual therapy, electrotherapy, and exercise may produce a synergistic effect by targeting multiple components of the condition, including capsular stiffness, muscle tightness, and pain inhibition.

Although the findings are encouraging, this study is limited by its single-subject design and short duration. Larger randomized controlled trials are needed to generalize the results.

Nevertheless, this case study supports the clinical usefulness of combining dry needling,

Mulligan mobilization, and IASTM in the rehabilitation of patients with adhesive capsulitis.

Conclusion

This case study concludes that the combined application of dry needling, Mulligan mobilization with movement, and IASTM is an effective physiotherapy intervention for the management of adhesive capsulitis. The integrated approach resulted in a significant reduction in shoulder pain, marked improvement in range of motion, and enhanced functional ability. Addressing both myofascial trigger points and capsular restrictions, along with pain modulation, facilitated early mobilization and functional recovery. Therefore, this combined physiotherapy protocol can be considered a beneficial treatment option in clinical practice for patients with adhesive capsulitis.

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