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Physiotherapy Management of Adhesive Capsulitis in an Elderly Patient with Diabetes: A Case Report

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Abstract

Background: Adhesive capsulitis, commonly known as frozen shoulder, is characterized by progressive shoulder pain and restricted range of motion, leading to functional limitations, particularly in older adults with comorbidities such as diabetes mellitus.

Objective: This study aimed to evaluate the clinical outcomes of a multimodal physiotherapy intervention combining electro-physical agents and structured exercise therapy in an elderly patient with adhesive capsulitis.

Methods: This case report presents a 75-year-old male with diabetes mellitus and chronic left shoulder pain (Numeric Rating Scale [NRS] 8/10) for eight months. The intervention was administered twice weekly for three weeks and included infrared therapy and transcutaneous electrical nerve stimulation (TENS), combined with muscle activation and stretching exercises performed in 2 sets of 6–8 repetitions per session. Outcomes included NRS, range of motion (ROM), Manual Muscle Testing (MMT), Shoulder Pain and Disability Index (SPADI), and Quick Disabilities of the Arm, Shoulder, and Hand (QuickDASH).

Results: Pain during movement decreased from 8 to 6 **(**25.0% reduction**).** Shoulder flexion improved from 90° to 110° (+22.2%) and abduction from 90° to 94° (+4.4%). SPADI improved from 59.2% to 42.0% (−29.1%**),** and QuickDASH from 59.1% to 40.0% (−32.3%). These changes exceeded commonly reported minimal clinically important difference thresholds. No adverse events were reported.

Conclusion: This case highlights that multimodal physiotherapy may provide clinically meaningful improvements in pain and functional outcomes in elderly patients with adhesive capsulitis. However, findings should be interpreted cautiously due to the single-case design.

Keywords
Adhesive Capsulitis; Diabetes Mellitus; Physical Therapy Modalities; Transcutaneous Electrical Nerve Stimulation; Exercise Therapy

Introduction

Adhesive capsulitis, commonly referred to as frozen shoulder, is a disabling musculoskeletal condition characterized by progressive shoulder pain and marked restriction in both active and passive glenohumeral range of motion. The underlying pathology involves chronic synovial inflammation followed by capsular fibrosis and contracture, ultimately leading to decreased joint volume and functional impairment.[1]

Epidemiologically, adhesive capsulitis affects approximately 2–5% of the general population, with a higher incidence observed in individuals aged over 40 years.[2] The burden of this condition is substantially higher in individuals with metabolic disorders, particularly diabetes mellitus, which has been identified as one of the strongest risk factors.[3] Previous studies report that the prevalence of adhesive capsulitis in patients with diabetes ranges from 10% to 30%, indicating a markedly increased risk compared to non-diabetic populations.[3]

From a pathophysiological perspective, the association between diabetes and adhesive capsulitis is primarily linked to the accumulation of advanced glycation end-products (AGEs), which promote abnormal collagen cross-linking, reduce tissue elasticity, and increase capsular stiffness.[3] This mechanism contributes to reduced responsiveness to stretching and rehabilitation, making management in diabetic patients more challenging.

Clinically, adhesive capsulitis leads to substantial limitations in activities of daily living (ADL), particularly in elderly populations where independence is closely linked to upper extremity function. Functional impairments such as difficulty in dressing, reaching, and personal care are commonly reported, often resulting in decreased quality of life and increased dependency. These limitations are further exacerbated in individuals with physically demanding occupations, where shoulder mobility is essential for maintaining functional independence.

Current clinical evidence supports a multimodal rehabilitation approach for adhesive capsulitis, integrating electro-physical agents with therapeutic exercise. Electro-physical modalities such as infrared therapy and transcutaneous electrical nerve stimulation (TENS) are commonly used to modulate pain through thermal and neurophysiological mechanisms, while exercise therapy remains the cornerstone intervention for restoring range of motion and functional capacity.[1,3,4] Recent systematic reviews have demonstrated that structured exercise therapy is effective in improving pain, ROM, and functional outcomes, particularly when combined with adjunct modalities.[3,4]

However, despite the growing body of evidence, most studies focus on general adult populations, with limited attention to elderly individuals with comorbid diabetes and high functional demands. In addition, previous reports often lack detailed documentation of functional outcomes using validated instruments such as SPADI and QuickDASH, reducing their applicability in clinical decision-making.

Furthermore, evidence regarding short-term, clinically meaningful improvements in geriatric patients with adhesive capsulitis remains limited, particularly in real-world clinical settings where adherence to home exercise programs plays a critical role.

Therefore, this case is considered clinically relevant due to the combination of advanced age, diabetes mellitus, and high functional demands, which together represent a subgroup with potentially poorer prognosis and greater rehabilitation challenges.

This case report aims to evaluate the effects of a multimodal physiotherapy intervention combining infrared therapy, TENS, and structured exercise on pain intensity, range of motion, and functional disability in an elderly patient with adhesive capsulitis and diabetes mellitus.

Methods

This study was conducted as a single-patient case report in accordance with the CARE (CAse REport) guidelines, aiming to ensure transparency and reproducibility in clinical reporting. The level of evidence corresponds to Level V (descriptive clinical evidence). The participant was a 75-year-old male farmer who presented to the Rehabilitation Medicine Department of RSUD Pandan Arang Boyolali with an eight-month history of progressive left shoulder pain and stiffness. The patient reported severe movement-related pain (Numeric Rating Scale [NRS] 8/10), accompanied by substantial limitations in activities of daily living, including dressing, bathing, and occupational tasks. The patient had a history of diabetes mellitus; however, glycemic control parameters such as HbA1c and body mass index (BMI) were not available and are acknowledged as study limitations.

The selection of this case was based on its clinical relevance, namely the coexistence of advanced age, diabetes mellitus, and high functional demands as a farmer, which collectively represent a subgroup with potentially poorer prognosis and greater rehabilitation challenges.

Clinical examination at baseline revealed a capsular pattern of restriction, with limited active and passive range of motion (ROM) in flexion, abduction, and external rotation. Palpation identified muscle spasm in the upper trapezius and rotator cuff muscles. The clinical presentation was consistent with the freezing–frozen phase of adhesive capsulitis based on symptom duration and ROM limitation pattern, although formal staging was not quantified using a standardized classification system.

Functional disability was assessed using the Shoulder Pain and Disability Index (SPADI) and the Quick Disabilities of the Arm, Shoulder, and Hand (QuickDASH), yielding baseline scores of 59.2% and 59.1%, respectively. The diagnosis of adhesive capsulitis was established based on clinical findings, including restricted capsular pattern and a positive Apley scratch test. Imaging modalities such as X-ray or MRI were not performed due to clinical and resource considerations. Differential diagnoses, including rotator cuff tear and glenohumeral osteoarthritis, were considered clinically but not confirmed through imaging.

To provide a clear overview of the patient's clinical progression, the timeline of assessment, intervention, and outcomes is presented in Table 1.

Table 1. Chronological Clinical Timeline of the Patient

Time Point	Clinical Status	Intervention	Outcomes
Week 0 (Baseline)	Severe movement pain (NRS 8/10); limited ROM; muscle spasm; SPADI 59.2%; QuickDASH 59.1%	No intervention prior to assessment	Baseline established
Week 1	Persistent pain and limited mobility	Physiotherapy sessions 1–2: IR (12 min), TENS (12 min), exercise therapy; education and HEP initiation	Early adaptation to treatment
Week 2	Gradual symptom improvement	Physiotherapy sessions 3–4; continuation of HEP	Improved tolerance to movement
Week 3 (Post-intervention)	Reduced pain and improved function	Physiotherapy sessions 5–6 completed	NRS 6/10; flexion 110°; abduction 94°; SPADI 42%; QuickDASH 40%

The physiotherapy intervention was administered twice weekly for three consecutive weeks (total of six sessions) and was complemented by a structured home exercise program performed daily. Each session began with electro-physical modalities followed by therapeutic exercise. Infrared therapy was applied at a distance of approximately 30–45 cm for 12 minutes to induce superficial heating and promote vasodilation.

Transcutaneous Electrical Nerve Stimulation (TENS) was administered for 12 minutes using a conventional mode; however, specific stimulation parameters such as frequency (Hz) and pulse width were not recorded, which limits reproducibility and is acknowledged as a methodological limitation.

Therapeutic exercise consisted of a combination of muscle activation and stretching techniques aimed at improving joint mobility and neuromuscular control. The exercise program included pendulum exercises, finger walk, Apley stretch, and cross-body reach. Each exercise was performed in 2 sets of 6–8 repetitions with rest intervals of approximately 30–60 seconds, and progression was based on patient tolerance and pain response rather than a predefined protocol. The intervention was delivered by a licensed physiotherapist; however, detailed documentation of therapist experience and competency level was not recorded.

The patient was instructed to perform the same exercises daily as part of a home exercise program, with adherence estimated at approximately 80% based on self-report. Outcome measures were selected based on their clinical relevance and established validity in shoulder disorders. Pain intensity was measured using the Numeric Rating Scale (NRS). Range of motion was assessed using a universal goniometer. Muscle strength was evaluated using Manual Muscle Testing (MMT) on a 0–5 ordinal scale. Functional disability was assessed using SPADI and QuickDASH, both of which are validated instruments for evaluating shoulder-related disability and upper extremity function.[2–4]

Although these instruments have established validity and reliability, specific measurement properties based on COSMIN standards were not systematically evaluated in this study. Data collection was conducted at baseline (pre-intervention) and after completion of six treatment sessions (post-intervention). Given the single-case design, data analysis was performed descriptively by comparing pre- and post-intervention values. Percentage change was calculated to provide a quantitative estimate of improvement.

Clinical interpretation of outcomes considered commonly reported minimal clinically important difference (MCID) values for SPADI and QuickDASH; however, formal statistical testing, confidence intervals, and effect size calculations were not performed. No long-term follow-up assessment was conducted beyond the three-week intervention period, which limits the evaluation of sustainability of treatment effects. This case report used data derived from routine clinical care and did not require formal ethical approval according to institutional policy. Written informed consent was obtained from the patient for participation and publication of anonymized clinical data. All identifying information was removed to ensure confidentiality.

Results

Baseline assessment identified marked functional impairment, characterized by severe movement-related pain, restricted shoulder range of motion (ROM), reduced muscle strength, and high disability scores. To provide a structured overview of the patient's initial clinical status, baseline findings are summarized in Table 2.

Table 2. Baseline Clinical Characteristics

Parameter	Findings
Pain (NRS)	Rest: 0; Palpation: 4; Movement: 8
Muscle Strength (MMT)	Flexion: 3; Abduction: 3; Extension: 3; Adduction: 3
Active ROM	Flexion: 90°; Abduction: 90°; External Rotation: 60°
Functional Disability	SPADI: 59.2%; QuickDASH: 59.1%

Following six physiotherapy sessions over three weeks, measurable changes were observed across all outcome parameters. To facilitate a clear comparison between pre- and post-intervention values, the results are presented in Table 3.

Table 3. Changes in Clinical Outcomes (Pre- vs Post-Intervention)

Parameter	Baseline	Post-intervention	Absolute Change	% Change
Pain (NRS – Movement)	8	6	−2	−25.0%
Muscle Strength (MMT)	3	4	+1 grade	—
ROM – Flexion	90°	110°	+20°	+22.2%
ROM – Abduction	90°	94°	+4°	+4.4%
SPADI	59.2%	42.0%	−17.2%	−29.1%
QuickDASH	59.1%	40.0%	−19.1%	−32.3%

Pain intensity during movement decreased from 8 to 6 on the Numeric Rating Scale, corresponding to a 25.0% reduction. Muscle strength improved from grade 3 to grade 4 across assessed muscle groups. Active shoulder flexion increased by 20° (+22.2%), while abduction improved by 4° (+4.4%). Functional outcomes demonstrated reductions in disability scores, with SPADI decreasing by 17.2 percentage points (−29.1%) and QuickDASH decreasing by 19.1 percentage points (−32.3%). When compared with commonly reported minimal clinically important difference (MCID) values (SPADI: approximately 8–13 points; QuickDASH: approximately 8–15 points), the observed changes exceeded these thresholds.

No adverse events or treatment-related complications were reported during the intervention period. The patient demonstrated high adherence to the prescribed home exercise program (approximately 80%), and all scheduled physiotherapy sessions were completed. Due to the single-case design, measures of variability such as standard deviation or confidence intervals were not applicable and therefore not reported. No long-term follow-up data were available beyond the three-week intervention period.

Discussion

This case report demonstrates that a short-term multimodal physiotherapy program combining electro-physical modalities and structured exercise was associated with improvements in pain, range of motion (ROM), muscle strength, and functional disability in an elderly patient with adhesive capsulitis. These findings are consistent with previous systematic reviews indicating that combined therapeutic approaches may produce superior outcomes compared to single-modality interventions.[1,3,4]

The observed reduction in movement-related pain (25%) may be explained by the synergistic effects of infrared therapy and transcutaneous electrical nerve stimulation (TENS). Infrared therapy promotes superficial heating and vasodilation, which can reduce muscle spasm and improve tissue extensibility, while TENS modulates nociceptive transmission through the gate control mechanism.[1] This combination likely facilitated early pain reduction, enabling the patient to participate more effectively in active rehabilitation. However, it is important to note that the absence of standardized TENS parameters in this case limits reproducibility and comparability with existing studies.

Improvements in ROM, particularly in shoulder flexion (+22.2%), support the role of structured stretching in addressing capsular stiffness. Previous systematic reviews have demonstrated that exercise therapy is effective in improving ROM and reducing pain in patients with adhesive capsulitis.[3,4] The relatively smaller improvement in abduction (+4.4%) suggests persistent capsular restriction, which may reflect the influence of diabetes-related connective tissue changes. Chronic hyperglycemia is associated with the accumulation of advanced glycation end-products (AGEs), leading to increased collagen cross-linking and reduced tissue elasticity, thereby limiting responsiveness to stretching interventions.[3]

Functional outcomes showed substantial improvement, with SPADI and QuickDASH scores decreasing by 29.1% and 32.3%, respectively. Importantly, these changes exceeded commonly reported minimal clinically important difference (MCID) thresholds, suggesting that the observed improvements are not only statistically observable but also clinically meaningful. However, given the absence of inferential statistical analysis and the single-case design, these findings should be interpreted with caution.

The natural history of adhesive capsulitis, which may involve gradual spontaneous improvement over time, should also be considered when interpreting the results.[5] Therefore, it is not possible to attribute the observed improvements solely to the intervention, as factors such as natural recovery, placebo effects, and patient adherence may have contributed.

From a clinical reasoning perspective, the effectiveness of the intervention may also be attributed to the high level of patient adherence (approximately 80%) to the home exercise program. Adherence is a critical determinant of rehabilitation outcomes, particularly in chronic musculoskeletal conditions where sustained mechanical loading is required to induce tissue adaptation. In this case, the integration of patient education, postural correction, and daily exercise likely contributed to the observed improvements in functional capacity.

Despite these positive findings, several limitations must be acknowledged. First, the single-case design limits generalizability and precludes causal inference. Second, the absence of imaging reduces diagnostic certainty and does not fully exclude alternative pathologies. Third, the use of Manual Muscle Testing (MMT), an ordinal scale, may limit sensitivity in detecting subtle strength changes. Fourth, the lack of standardized intervention parameters, particularly for TENS, limits reproducibility. Fifth, incomplete clinical data, including BMI and glycemic control (HbA1c), restrict comprehensive interpretation. Finally, the absence of long-term follow-up limits evaluation of sustained treatment effects.

From a clinical perspective, this case highlights that multimodal physiotherapy combining electro-physical modalities and structured exercise may be beneficial in elderly patients with adhesive capsulitis, particularly when supported by high adherence to

home exercise programs. However, clinicians should consider patient-specific factors such as age, comorbidities, and tissue adaptability when designing rehabilitation strategies.

Future research should focus on controlled studies with larger sample sizes, standardized intervention protocols, inclusion of clinically meaningful outcome thresholds (e.g., MCID), and long-term follow-up to confirm the effectiveness and generalizability of multimodal physiotherapy in this population.

Conclusion

This case report indicates that a multimodal physiotherapy approach combining infrared therapy, transcutaneous electrical nerve stimulation (TENS), and structured exercise was associated with improvements in pain, range of motion, muscle strength, and functional disability in an elderly patient with adhesive capsulitis and diabetes mellitus. This case highlights that integrating electro-physical modalities with individualized exercise programs and consistent home exercise adherence may provide clinically meaningful functional improvements in geriatric patients.

However, these findings should be interpreted cautiously due to the single-case design, absence of long-term follow-up, and limited clinical data. Further research using controlled study designs, standardized intervention protocols, and larger sample sizes is required to confirm the effectiveness and generalizability of this approach.

Author Contribution

Sasi Kirana: Conceptualization, Data Curation, Formal Analysis, Methodology, Investigation, Writing of the Original Draft, Visualization.
Dwi Rosella Komala Sari: Conceptualization, Methodology, Supervision, Writing, Review and Editing, Validation.
Pradana: Investigation, Clinical Assessment, Data Curation, Writing, Review and Editing.
All authors: Final approval of the manuscript and accountability for all aspects of the work.

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Conflict of Interest Statement

The author declares no conflict of interest.

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Ethics Statement

This study was conducted in accordance with the principles of the Declaration of Helsinki. As this is a single-patient case report based on routine clinical care, formal ethical approval was not required according to institutional policy. Written informed consent was obtained from the patient for participation and publication of anonymized clinical data. All identifying information was removed to ensure patient confidentiality.

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