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Case Report

Physiotherapy Section

Cognitive Behavioural Therapy for Hemiplegic Shoulder Pain in Chronic Stroke Rehabilitation: A Case Management with Biopsychosocial Perspective

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ABSTRACT

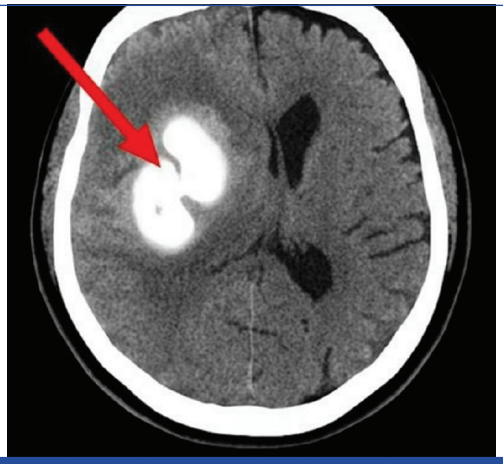
Stroke impairments can lead to various complications, including hemiplegia, sensory loss, dyspraxia, and hemianopsia. It is estimated that 16% to 84% of stroke patients experience Hemiplegic Shoulder Pain (HSP). In the present case, a 38-year-old man who had a left middle cerebral artery infarct two years prior showed good recovery of voluntary movement but continued to struggle with low self-esteem, psychological distress, mild weakness, and spasticity. He also experienced a dull ache in his right shoulder. To address these issues, a multimodal program integrating physiotherapeutic rehabilitation along with a structured Cognitive Behavioural Therapy (CBT) programme was implemented. The CBT programme consisted of 30-minute sessions held five days a week for four weeks and included three phases: educating the patient about stroke and CBT principles, focussing on cognitive restructuring and behavioural strategies, and consolidating skills learned. Depression, anxiety, and stress levels were measured using the Depression Anxiety Stress Scale (DASS) at baseline, after the intervention, and at a six-month follow-up. Significant reductions in psychological distress were noted after the CBT sessions, with sustained improvements observed at follow-up. The multimodal rehabilitation program was effective in addressing biopsychosocial factors and successfully reduced HSP in this patient with a chronic left Middle Cerebral Artery (MCA) infarct.

Keywords: Biopsychosocial model, Hemiplegic shoulder pain, Rehabilitation, Stroke

CASE REPORT

A 38-year-old male presented to the physiotherapy outpatient department with a primary complaint of persistent right shoulder pain that had gradually developed over the past two years and progressively worsened. The pain was described as, dull, and aching, localised to the antero-medial and posterolateral regions of the right shoulder. It was exacerbated by elevation and rotation, but partially relieved by therapeutic exercises and lying on his left side.

Seven years before, the patient experienced a stroke, which resulted in right-sided hemiplegia. He was admitted to a reputed private hospital, where a Computed Tomography (CT) scan confirmed an infarct. CT imaging [Table/Fig-1] of the brain revealed a subacute infarct involving the gangliocapsular region, extending to the left cerebral peduncle, tegmentum, and external capsule (shown by arrow). The infarct was associated with a significant mass effect, evidenced by a 9 mm midline shift to the right, effacement of the left lateral ventricle, and obliteration of adjacent sulci in the front-parieto-temporal region. Additionally, extensive white matter oedema was observed in the affected areas.



[Table/Fig-1]: Computed Tomography (CT) of the brain.
CT done at the time of injury, i.e., 7 years back

After acute phase management, the patient completed six weeks of inpatient rehabilitation followed by 1.5 years of daily outpatient physiotherapy, resulting in improved motor control, muscle strength, and function. By the eight-week mark, shoulder pain had decreased, along with better active range of motion and greater independence in daily activities. At the three-month follow-up, the patient maintained functional gains, reported better sleep, and continued with a home strengthening programme for over a year. However, despite two years of ongoing rehabilitation, including electrotherapy and exercises, pain persisted and intensified with arm movement, leading to a need for assistance with daily tasks and the use of a cane for walking. Psychological factors, like depression and anxiety, added to the difficulties. The patient and family expressed frustration and denial about treatment outcomes, highlighting the emotional toll of the prolonged condition.

During the clinical examination, the patient scored 28 out of 30 on the Mini-Mental State Examination (MMSE) [1], indicating preserved consciousness and full orientation to time, place, and person, though he exhibited non-fluent speech articulation. He was able to walk independently using a 3-point cane held in his left hand (see [Table/Fig-2]), displaying a circumductory gait pattern.

Musculoskeletal observations highlighted scapular protraction, thoracic kyphosis, and significant muscle atrophy in the right deltoid region. Muscle grading was performed according to the Medical Research Council (MRC) scale [Table/Fig-3] [2]. The shoulder assessment revealed a limited active range of motion, with both flexion and abduction restricted to 90 degrees due to pain and stiffness. There was mild shoulder subluxation and tenderness at the supraspinatus and bicipital groove. Neurologically, the right side showed increased muscle tone and spasticity: mild in the

[Table/Fig-2]: Standing postural analysis showing elevation of the right shoulder, adduction of the right arm with mild elbow flexion, neutral wrist alignment, slight flexion and external rotation of the right hip, full extension of both knees, and predominant weight-bearing on the left foot.

Muscle group	Side	MRC Grade	Functional observation/modifier
Shoulder abductors	Right	3/5	Movement achieved against gravity but was limited by shoulder pain and mild scapular dyskinesis.
	Left	5/5	Normal strength, full functional range without pain.
Shoulder flexors	Right	3/5	Movement achieved against gravity but limited by shoulder pain
	Left	5/5	Normal strength, full functional range without pain.
Shoulder rotators (external)	Right	3/5	Movement achieved against gravity but limited by severe shoulder pain
	Left	5/5	Normal strength, full functional range without pain.
Elbow flexors	Right	3/5	Able to flex elbow against gravity with effort; slight tremor at end range.
	Left	5/5	Normal control and full range.
Wrist extensors	Right	3/5	Active extension is possible, but limited endurance; mild synergistic flexor overflow observed.
	Left	5/5	Normal control and sustained extension.
Hip extensors	Right	3/5	Movement against gravity was possible; mild postural sway was noted during testing.
	Left	5/5	Normal strength, stable posture.
Hip abductors	Right	3/5	Able to abduct with compensatory trunk lean; limited endurance.
	Left	5/5	Normal abduction strength and control.
Knee extensors	Right	3/5	Can extend the knee against gravity but fatigues quickly; slight lag during terminal extension.
	Left	5/5	Full and strong movement.
Ankle dorsiflexors	Right	3/5	Dorsiflexion was present but incomplete range; movement was limited by fatigue.
	Left	5/5	Normal range and control.
Ankle plantar flexors	Right	3/5	Partial plantar flexion possible; cannot sustain against resistance.
	Left	5/5	Normal strength and control.

[Table/Fig-3]: Muscle strength assessment (MRC scale) revealed mild right-sided weakness (Grade 3/5) with functional limitation from pain, altered tone, and compensatory patterns.

upper limb and moderate in the lower limb, with hyperreflexia in various reflexes. Sensory evaluation indicated intact superficial sensations but impaired deep and cortical sensations on the affected side. Spasticity was graded as 1+ in the shoulder, elbow, and wrist extensors, and 2 in the knee flexors and ankle plantar flexors. The patient had difficulty with isolated foot movements and finger movements, consistent with chronic post-stroke right-sided hemiparesis, but no new neurological deficits were noted. Functionally, the patient displayed a mild decline with reduced balance confidence and slower walking, requiring assistance for daily activities and using a cane outdoors. Psychologically, he showed signs of depression, anxiety, and stress exacerbated by his chronic condition. At evaluation, he was not on any medications.

The clinical presentation confirmed a diagnosis of Hemiplegic Shoulder Pain (HSP), identified as multifactorial in origin. In accordance with the Ryerson and Levit Model, the condition is attributed to neuromuscular dysfunction, biomechanical misalignment, and psychological stressors, reflecting the complex interplay of physical and psychosocial factors in its development [Table/Fig-4] [2-7].

Outcome measures	Outcome assessed	Baseline assessment	After 24 weeks	Percentage change
Barthel Index [3]	ADL	44/100	93/100	49%
Depression Anxiety Stress Scale (DASS) [4]	Depression	17/42	8/42	21.43 %
	Anxiety	14/42	5/42	21.43 %
	Stress	27/42	17/42	23.80 %
Social Dysfunction Rating Scale (SDRS) [5]	Social needs	45/100	90/100	45 %
Pain (VAS)	At rest	6.2/10	1.4/10	48 %
	At activity	7.5/10	2.5/10	50 %
Modified Ashworth Scale (MAS) [2]	Hypertonicity Right (U/L)	1+	0	40 %
	Hypertonicity Right (L/L)	2	1	40 %
AROM – Right Shoulder Joint	Flexion (Degrees)	0-40	0-100	33.33 %
	Extension (Degrees)	0-15	0-55	66.66 %
	Abduction (Degrees)	0-10	0-80	38.89 %
	Medial rotation (Degrees)	0-60	0-70	14.28 %
	Lateral rotation (Degrees)	0-20	0-45	27.78 %
Disabilities of the Arm, Shoulder and Hand (DASH) [6]	Activity limitation	91.66	45	46.67 %

[Table/Fig-4]: Outcome Measure from baseline to 24 weeks.

The patient underwent a multimodal rehabilitation programme combining physical and psychological modalities to address chronic HSP and related functional limitations.

1. Physical Rehabilitation

Gait and balance training were implemented using Proprioceptive Neuromuscular Facilitation (PNF) and the Motor Relearning Programme (MRP). These sessions were conducted five days a week for 15 weeks, with each session lasting 20 to 30 minutes. The focus of the training was on correcting circumductory gait, enhancing trunk stability, and improving dynamic balance. Kinesio Taping (KT) was applied weekly over 18 weeks to the supraspinatus, deltoid, and teres minor muscles. The taping aimed to facilitate neuromuscular activation and provide mechanical support to the glenohumeral joint. Neuromuscular Electrical Stimulation (NMES) was administered five days a week for 15 weeks. Two-inch by two-inch electrodes were placed over the motor points of the middle deltoid and upper trapezius to enhance muscle activation, reduce subluxation, and support the recovery of voluntary movement. The NMES parameters included a symmetric waveform, a frequency of 35 Hz, a pulse duration of 300 µs, ramp-up and ramp-down times of two seconds, rest intervals of 10 seconds, and a total stimulation duration of five minutes per session. Additionally, manual therapy complemented these interventions by addressing musculoskeletal impairments, improving joint mobility, and reducing pain. This was achieved through passive and active-assisted range of motion exercises, gentle joint mobilisations, capsular stretches, and selective soft-tissue release, with 10 repetitions performed in each session.

2. Cognitive Behavioural Therapy (CBT)

The CBT was delivered in a structured 3-phase format over four weeks (30 minutes/day, 5 days/week), targeting psychological distress and maladaptive coping [Table/Fig-5].

Phase	Week-wise Sessions	Content
Introduction and education	1,2=2	1. Understanding stroke 2. Understanding CBT principles
Cognitive restructuring	3,4,5,6,7,8,15=7	3. Identifying cognitive errors 4. Self-assessment and reframing thoughts 5. Rational vs. irrational thinking 6–8. Thought tracking and evidence checking 15. Thought transformation
Behavioural interventions	9,14,16,17,18,19,20=7	9. Weekly activity planning 14. Expressing positive experiences 16. Assertive communication 17. Problem-solving 18. Engaging with authors/books 19. Coping cards 20. Conclusion sheet
Relaxation techniques	10,11,12,13=4	10. Progressive muscle relaxation 11. Breathing techniques 12. Stretching 13. Meditation

[Table/Fig-5]: Structured CBT programme.

3. Integration of Physical and Psychological Interventions

The total combined sessions [Table/Fig-6] lasted for around 65-70 min/day, conducted for 5 days a week, during the core 15-week intervention phase.

Intervention type	Modality/intervention	Duration & frequency
Gait & balance training	PNF, MRP, Exercises	5×/week × 15 weeks (20 min/session)
Electrotherapy	NMES	5×/week × 15 weeks (5 min/session)
Supportive therapy	Kinesio Taping	1×/week × 18 weeks
Manual therapy	ROM, mobilisation, stretching	5×/week × 15 weeks (10–15 min/session)
Psychological therapy	CBT	5×/week × 4 weeks (30 min/session)

[Table/Fig-6]: Structured breakdown of each multimodal approach.

At week 24, outcome measures showed significant and sustained improvements for the patient. Activities of daily living increased by 49% on the Barthel Index, while pain decreased by 48-50% on the Visual Analogue Scale (VAS). Hypertonicity was reduced by 40%, and the shoulder range of motion improved. Psychosocial outcomes also enhanced, with depression, anxiety, and stress scores dropping by 21-24% on the DASS, along with a 45% improvement in social functioning measured by the SDRS. Additionally, there was a 46% reduction in activity limitations on the DASH, underscoring the lasting therapeutic benefits and the value of continued self-directed practice [Table/Fig-4].

DISCUSSION

According to the recent Global Burden of Disease report, stroke is the third leading cause of death and disability [8]. In India, the incidence and crude prevalence of stroke are approximately 105 to 152/ 1,00,000 people and 44.29 to 559/1,00,000, respectively, on an annual basis, and it is the fourth most common cause of death [9]. Hemiplegic Shoulder Pain is the most common complication of stroke patients and has a high incidence rate of 24-64% in the inpatient rehabilitation unit [10]. One of the key issues associated with hemiplegia is the occurrence of pain around the affected shoulder girdle. This pain, known as HSP, arises from a complex interplay of factors including muscle weakness, spasticity, glenohumeral subluxation, soft tissue injury, and biomechanical misalignment. These factors can significantly impede rehabilitation efforts and diminish the overall quality of life for stroke survivors [11]. In addition to physical challenges, HSP also contributes to notable psychological and social impairments [12].

Unlike traditional stroke rehabilitation, which often treats physical and psychological domains separately, this case employed an integrated biopsychosocial model [13]. CBT sessions were scheduled immediately after physiotherapy to leverage post-exercise neurochemical priming, enhancing cognitive receptivity.

KT has emerged as an effective modality for managing HSP, especially when integrated with conventional rehabilitation strategies. Li L et al., demonstrated the efficacy of KT in reducing shoulder pain and improving function [14]. The NMES intervention showed modest positive effects on shoulder pain, though its impact on pain reduction was less pronounced than its effect on shoulder subluxation. The present case demonstrated that a structured CBT program effectively reduced HSP and psychological distress with a chronic left MCA infarct. These findings align with the single-case study by Sethy D et al., where a 57-year-old female stroke patient with CRPS-I and kinesiophobia showed notable improvements in pain, fear of movement, and upper limb function following six weeks of CBT [15]. While Sethy's study emphasised functional recovery and reduction of kinesiophobia, the current case highlights the broader biopsychosocial benefits of CBT, including sustained improvements in depression, anxiety, stress, and self-esteem. Similarly, Usman MS et al., reported significant gains in cognitive function and activities of daily living among 30 post-stroke hemiplegic patients after eight weeks of cognitive rehabilitation therapy, reinforcing the role of cognitive interventions in enhancing recovery outcomes [16].

Although the structured rehabilitation programme ended at week 18, outcomes were assessed at week 24 through regular follow-ups to evaluate the sustainability of therapeutic gains and the impact of self-directed practice. This follow-up period aligns with standard clinical protocols and allows for assessing the consolidation of gains made after the intervention. Research indicates that some neurophysiological changes, particularly those related to motor relearning and emotional regulation, may continue to develop for weeks after formal therapy concludes [17].

While this case report demonstrates promising outcomes, several aspects ought to be considered in future endeavours, as findings from a single case cannot be generalised to the broader stroke population, and long-term sustainability of improvements beyond the six-month follow-up period remains unknown. Future research should focus on randomised controlled trials to validate the effectiveness of multimodal approach and investigate optimal timing and dosage of integrated physical-psychological interventions in stroke rehabilitation.

CONCLUSION(S)

This case highlights the effectiveness of Multimodal Intervention-Physiotherapeutic approach along with CBT in addressing HSP and associated psychosocial distress in a patient with a chronic left MCA infarct. The findings emphasise that rehabilitation outcomes extend beyond motor recovery, underscoring the importance of integrating psychological interventions with structured physiotherapeutic stroke care.

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