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CASE REPORT

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The Effectiveness of Personalized Manual Therapy and Rehabilitation Program in Multiple Sclerosis: A Case Report

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ABSTRACT

Purpose: This case report aims to investigate the effects of personalized manual therapy and rehabilitation programs on pain management, physical functions, quality of life, and overall well-being in patients with multiple sclerosis (MS).

Method: A 39-year-old male patient with MS participated in a 12-week treatment program, conducted twice a week for 80 minutes per session. The therapy included manual therapy, balance exercises, stretching, and strengthening exercises. Before and after treatment, spasticity was measured comprehensively with the Modified Asworth Scale, normal range of motion was assessed passively with a goniometer, motor assessment was assessed manually, balance was assessed with the Berg Balance scale and functional reach test, fatigue and pain were assessed with the Visual Analog Scale, posture was assessed with the New York Posture Rating Scale, and quality of life was assessed with the MS Quality of Life-54 questionnaire.

Results: After the 12-week program, significant improvements were observed in the patient's muscle strength, joint range of motion, and balance-coordination abilities. Pain and fatigue levels decreased, and quality-of-life scores showed a marked increase.

Discussion: This case report demonstrates the efficacy of manual therapy and individualized rehabilitation interventions in improving physical functions, reducing pain, managing fatigue, and enhancing the quality of life in individuals with MS.

Key Words: Multiple Sclerosis, Manual Therapy, Rehabilitation, Physical Function, Pain

INTRODUCTION

Multiple sclerosis (MS) is a progressive, inflammatory autoimmune disease characterized by demyelination of nerve axons throughout the brain and spinal cord, marked by periods of exacerbation and remission (1). Due to its chronic and progressive nature, individuals with MS are prone to failure in maintaining healthy behaviors due to numerous physical, emotional, social, and environmental barriers (2).

Muscle weakness affects individuals with MS, reducing health-related quality of life and daily life activities (3). The ankle joint has been reported as the most common site for contractures and weakness compared to other body regions in individuals with MS (4). White et al. (2004) revealed the effects of the strength exercise on leg strength, moving ability and self-reported fatigue and disability and showed significant improvements in knee extensor and plantar flexor muscle forces and then walking performance (5) People with multiple sclerosis frequently have limitation in joint motion because of spasticity and prolonged inactivity. Goals of flexibility exercises are to lengthen the muscles, enhance joint range of motion, reduce spasticity, and maintain good posture and balance (6).

Balance and gait deficits are among the most common

impairments in patients with MS. (7) They appear mildly early when there is no obvious disability and frequently worsen over time (8). Many studies emphasize the importance of physical therapy as a primary intervention in improving balance and gait (9).

In patients with progressive neurological diseases like MS, physical therapy and rehabilitation interventions, alongside medical treatments, are crucial for maintaining functional independence and quality of life. There is evidence in literature that 70% of patients with MS had a lifetime use of at least one alternative medicine and a percentage between 54% and 81% is directed towards massage or manipulation therapies (10) Manual therapies in MS involve various manipulations of body tissues to improve circulation, relieve fatigue, and support recovery. These have been proven to alleviate pain, strengthen muscles, and improve bowel issues with high safety and low side-effect profiles (11).

The Mulligan concept of Mulligan mobilization with movement (MWM) is a manual therapy technique (MT), involves the therapist using a manual gliding force while the patient performs an active movement. Studies have shown that the MWM offers better therapeutic results as compared to other forms of MT in the peripheral joints (12). MWMs have shown promising clinical results such as reduction of pain and improved range of motion (ROM) (13).

Existing evidence has shown that a supervised and individualized exercise program can improve physical fitness, functional capacity, quality of life and modifiable impairments in patients with MS (14).

The purpose of this case report is to examine the effects of manual therapy and treatment interventions optimized for individual needs on pain management, physical functions, and quality of life in individuals with MS. Although studies on manual therapy applications in MS patients are rare in the literature, no study using the Mulligan technique on MS patients has been found.

METHODS

Case Description

A 39-year-old male, 1.85 m tall and weighing 75 kg, participated in this case report. In 2004, he sought medical attention due to frequent falls while playing football. In 2005, he was diagnosed with MS. Following the diagnosis, he quit football and turned to music. Since 2015, he has been attending physical therapy sessions regularly. He receives Ocrelizumab every six months. Of his three definitive attacks, the first occurred in 2004, when his eyes deviated to the left and then improved. The second attack in 2010 affected his hands, but he recovered completely and resumed playing musical instruments. Right foot drop also began in 2010 and has not improved. The third attack in 2013 was characterized by dizziness and vomiting, which resolved. The patient has a history of alcohol and smoking and an additional diagnosis of ulcerative colitis. There is no family history of MS or chronic illness. He does not have respiratory or swallowing problems. When asked about the three most significant factors affecting his quality of life, he cited ulcerative colitis, hip pain, and right foot drop. He does not report sensory problems. The patient's MRI and X-ray images are given in Figure 1-A and Figure 1-B.

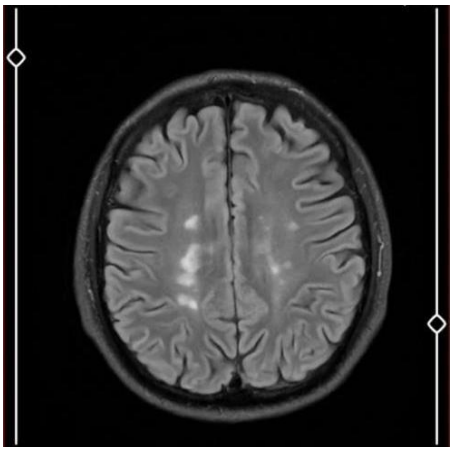

Figure 1-A. Patient Brain MRI Image**.** There are T2 hyperintense lesions in bilateral middle cerebellar peduncles and pons. Disseminated T2 hyperintense lesions were observed in both cerebral hemispheres, with periventricular localization, mostly affecting the frontoparietal lobes, but also affecting the temporal and occipital lobes.

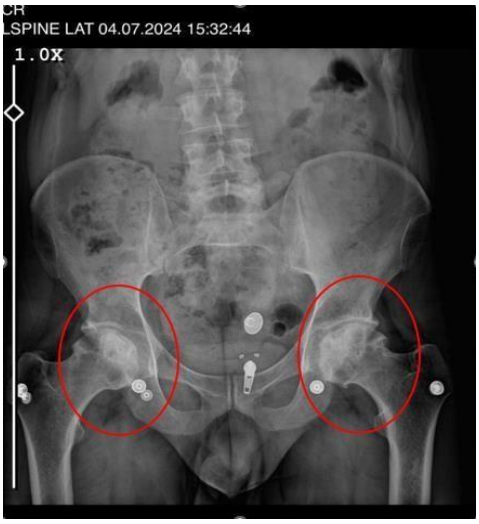

Figure1-B. Patient Hip X-Ray Image. Osteophytes were observed around the joints. Loss of smooth joint borders or deformation was observed.

Outcome Measurements

Spasticity: The Modified Ashworth Scale was used for spasticity assessment.

The patient was examined in a supine and relaxed position. The joint was moved passively, repetitively and rapidly, and the resistance was staged according to the examination findings. 0: No increase in tone, 1: There is a slight increase in tone characterized by catching and loosening at the end of the range of motion or minimal resistance, 1+: There is a slight increase in muscle tone with minimal resistance observed throughout less than half of the range of motion, 2: Muscle tone increased throughout the entire range of motion and more, but the joints can be moved easily, 3: There is a significant increase in tone that makes passive movement difficult, 4: The affected parts are rigid in flexion and extension (15).

Normal Joint Range of Motion: Measured passively with a goniometer, referencing Kendall values.

Motor Assessment: Muscle strength was evaluated by completing upper and lower extremity movements against resistance, graded as normal (5), good (4), moderate (3), weak (2), trace (1), or complete paralysis (0) (16).

Balance: The Berg Balance Scale was used for evaluation. Dynamic balance was determined using the functional reach test.

Fatigue: Assessed with a visual analog scale (VAS) (0: not tired at all, 10: very tired).

Posture: Assessed using the New York Posture Rating Scale, which evaluates postural changes in 13 areas by observing posterior and lateral aspects (17).

Quality of Life: Evaluated using the MS Quality of Life-54 questionnaire, including 54 questions related to physical function, role limitations, emotional well-being, fatigue, health perceptions, and social and cognitive functions. Higher scores indicate better quality of life (18).

Pain Assessment: Conducted using a VAS (0: no pain, 10: very painful). Pain localization was assessed using a Body Pain Diagram.

Expanded Disability Status Scale (EDSS): EDSS is the most commonly used scale in multiple sclerosis patients. EDSS is a very effective method of reflecting disability. EDSS, with a scoring system between 0 and 10, reveals the patient's morbidity. Zero points is normal neurological examination. 10 points shows the MS-related death cases. Patients with EDSS score up to 5 are fully ambulatory patients. Up to this point, the main determinant of EDSS are functional systems (FS), the ambulation status is the main determinant in the degree of disability after 5 (19).

Interventions

This case was followed between September and November 2024. The patient was informed about the case report and provided verbal consent. The patient underwent physical therapy and rehabilitation for 12 weeks, twice weekly for 80 minutes per session. In order to reduce and prevent fatigue, the session was planned as 40 minutes of physical therapy and 20 minutes of break. 2- or 3- minute small rest intervals were given throughout the session. The first 25 minutes of the session consisted of manual therapy. The next 15 minutes were stretching exercises. The second session was planned to consist of the first 15 minutes of strengthening exercises followed by balance and walking exercises. The primary goal was to reduce pain and improve quality of life through a personalized treatment program. The program included manual therapy, functional strengthening exercises, stretching exercises, balance- coordination training, and walking exercises.

Manual Therapy

Mulligan belt-assisted hip mobilization and traction were used to increase joint range of motion. Mobilizations were performed by one examiner. The patient was supine with the hip and knee flexed to 45 degrees and 135 degrees, respectively. The examiner applied the belt as close to the hip joint as possible and performed lateral distraction grade III/IV for 3 x 10 repetitions (Figure 2-A, 2-B). The examiner positioned the patient into 90/90 degrees, passively performed hip IR/ER to end range and performed grade III/IV mobilizations.

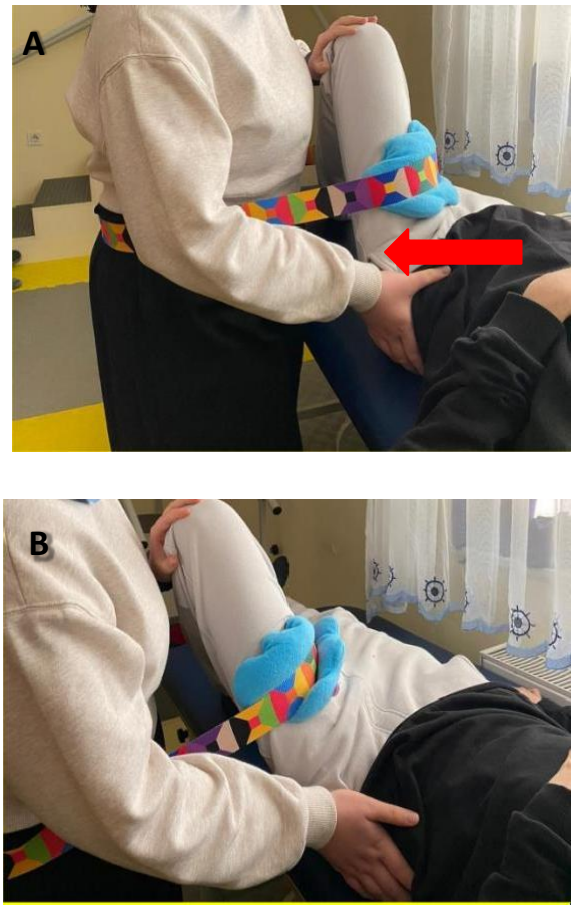

Figure 2-A, 2-B. Lateral Distraction Application

The patient is laid on the bed, the leg to be treated is extended straight onto the bed, The examiner holds the leg with both hands just above the miliolii, the leg is then brought into 30 degrees of flexion, 30 degrees of reduction and slight external rotation. While the The examiner's arms are straight, the patient's hip joint is put into traction (Figure 3).

Exercises

Lower extremity strengthening exercises were performed in

Figure 3. Traction Application

3x10 repetitions with frequent rests due to fatigue. Active-assisted stretching exercises were similarly performed in 3x10 repetitions. The balance was improved through standing on a balance board, rhythmic-dynamic stabilization, and tandem walking. Walking training aimed to help the patient walk more steadily and in a controlled manner. As the patient's condition improved, badminton was introduced, promoting better balance, coordination, and psychological well- being. Posture training was provided to alleviate pain associated with playing musical instruments. A home exercise program consisting of strengthening and stretching exercises (performed twice daily, 3x10 repetitions) was given. The patient adhered to 80% of the home program. Breathing techniques were integrated into all exercises, with an emphasis on avoiding breath-holding. Both manual techniques and exercises were performed within pain limits. The patient's pre- and post-treatment assessments are presented in Table 1. Pain area drawing before treatment is given in Figure 4. Necessary permission was obtained from the patient to use the medical information and images in the case report.

RESULTS

The patient fully participated in 12 weeks of face- to-face sessions and adhered well to the home program. Significant improvements were observed, particularly in hip-related pain. The range of motion in the hip joint was improved by increasing it from 25 to 40 in abduction, from 15 to 28 in adduction, and from 100 to 120 in flexion. Significant improvements were achieved in muscle strength, especially in foot plantar flexor by increasing it from 2 to 4 on the right

Table 1. Outcomes of Pre- and Post-treatment Evaluation

	Before Treatment	**After Treatment**
Spasticity (All joint)	0	0
Normal Joint Range of Motion		
Right	Hip abduction 25°	40°
	Hip adduction 15°	28°
	Hip flexion 100°	120°
Motor Assessment		
Hamstrings	Right 5/1 left 5/2	Right 5/3 left 5/4
Hip flexors	Right 5/2 left 5/3	Right 5/4 left 5/5
Foot dorsal flexion	Right 5/1 left 5/3	Right 5/3 left 5/4
Foot plantar flexion	Right 5/2 left 5/3	Right 5/4 left 5/4
Balance		
Berg balance scale (points)	34.00	48.00
Functional reach test (cm)	20.00	27.00
Fatigue assessment (points) (Max:10)	7.00	5.00
Posture assessment:	Minimal elevation on the right shoulder Slight kyphotic posture and lumbar lordosis	There is no postural problem.
Quality of life (MS Quality of Life-54)	Physical health 42.22 Mental health 44.34	Physical health 54.85 Mental health 59.55
Pain assessment (VAS) (points) (Max:10)		
Hip	8.00	4.00
Shoulder area	6.00	3.00
EDSS	3.00	3.00

cm: centimeters, max: maximum, VAS: Visual Analog Scale, EDSS: Expanded Disability Status Scale

side and in foot dorsal flexion from 1 to 3 on the right side, in hip circumference and foot circumference muscle strength. According to the Berg balance scale, the balance score before treatment was 34, which was increased to 48 after treatment. According to the functional reach test, it was increased from 20 centimeters (cm) before treatment to 27 cm after treatment. According to the quality of life assessment, physical health was 42.22 and mental health was 44.34 before treatment, and these scores were increased to 54.85 and 59.55 after treatment, respectively. The EDSS score was 3 before and after treatment (Mild disability: mild imbalance or mild limping while walking). The findings obtained before and after treatment are shown in Table 1. The Body Pain Diagram before treatment is shown in Figure 4.

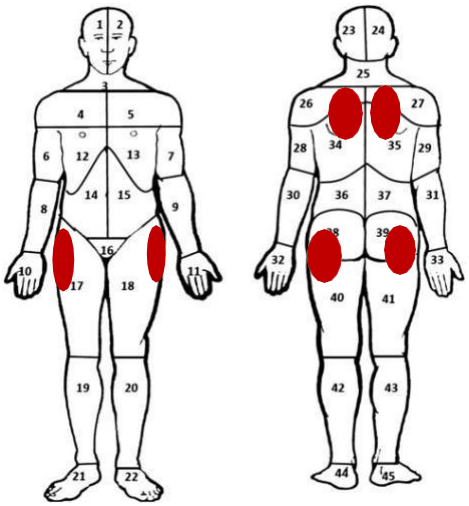

Figure 4. The Body Pain Diagram before treatment

DISCUSSION

This case report presents findings evaluating the effectiveness of personalized manual therapy and rehabilitation programs in individuals with MS. Post-treatment results clearly demonstrate the positive effects of the applied approach on both physical and quality of life aspects of the patient. Although studies on manual therapy applications in MS patients are rare in the literature, no study using the Mulligan technique on MS patients was found. This case report is the first published study in this field.

Manual therapy was shown to significantly improve muscle strength and joint mobility in individuals with MS. A meta-analysis revealed that combining manual and exercise therapy resulted in significant effects on pain and physical function in individuals with hip osteoarthritis (20). Our findings align with literature findings, showing that the combination of

manual and exercise therapy reduces pain and enhances well-being.

The patient's hip joint limitation is due to the degenerative joint disease observed in X. because the evaluation revealed that he did not have spasticity. One study demonstrated immediate pain relief, improvement in hip flexion and internal rotation, and improved physical function after a single hip mobilization session in elderly individuals with hip osteoarthritis (21). In a case report on the effect of hip joint mobilization using a mobilization belt on hip range of motion and functional outcomes, isolated immediate changes in ROM and functional outcomes were evident (22).

In this case report, significant improvements were observed in balance performance. A case report examined the effects of balance exercises in individuals with MS and found that balance rehabilitation was a valuable tool for reducing fall rates and improving balance skills (23). Motivating activities such as badminton included in this case report contributed to the patient's well-being beyond physical gains.

Post-treatment, a significant reduction in fatigue levels was observed. A study demonstrated that increased physical activity was associated with lower fatigue and disability severity (24). Another meta-analysis on the effects of exercise training on fatigue in MS supported the association of exercise training with a significant reduction in fatigue levels (25). This case report's exercise protocol, supported by breathing control techniques and frequent rest intervals, was effective in reducing fatigue levels. This finding highlights that multidisciplinary approaches focusing on exercise and breathing control can be an important strategy for managing fatigue in individuals with MS.

A significant reduction in pain levels was recorded in this case report. Similar literature findings emphasize that manual therapies improve muscle tone and reduce pain in individuals with MS. A study showed a reduction in pain intensity and improvement in functional independence in individuals with MS who received exercise training (26). A meta-analysis found that exercise significantly reduced pain in individuals with MS (27). A meta-analysis investigating the efficacy and safety of manual therapy for MS-related symptoms demonstrated its usefulness in relieving MS-related pain (28). This case report highlights the importance of implementing a personalized treatment protocol for reducing pain. Manual therapy techniques, such as soft tissue mobilizations and traction, were observed to alleviate muscle tension and joint pressure, contributing to both physical comfort and improved well-being.

This case report recorded significant improvements in the patient's quality of life. Results from the MS Quality of Life-54 questionnaire showed improvements in areas such as physical function, social participation, and overall health perception. These results underline the positive effects of personalized treatment interventions on the quality of life in individuals with MS. A study observed improvements in health-related quality of life in individuals newly diagnosed with MS who received physical activity coaching (29). This case report's findings support implementing similar treatment protocols for other individuals with MS and provide a foundation for future research.

A notable aspect of this case report is that the treatment program was optimized according to the individual needs of the patient. Including balance and coordination exercises and motivating activities such as badminton improved both physical and psychological well-being. In addition, hip mobilization supported by Mulligan techniques had noticeable positive effects on joint mobility. This is the first study to report the use of Mulligan technique on MS patients, contributing to the literature. Furthermore, the multicenter nature of the treatment was ensured by combining manual therapy, Mulligan technique and active exercises. The patient's compliance with the home program probably contributed to the positive results.

In conclusion, this case report has shown that manual therapy, Mulligan techniques and personalized treatment protocols are an effective alternative intervention in individuals with MS. The positive results obtained in the short term indicate that such approaches should be used more widely in the field of physiotherapy and rehabilitation.

CONCLUSION

This case report has demonstrated that a personalized manual therapy and rehabilitation program is effective in improving physical function, reducing pain, and enhancing the quality of life in individuals with multiple sclerosis. Notable improvements were observed in muscle strength, joint range of motion, balance, and coordination. Pain and fatigue levels decreased significantly, and quality-of-life scores showed marked increases after the 12-week intervention.

The findings highlight the importance of individualized treatment approaches tailored to the specific needs of patients. Techniques such as Mulligan mobilizations, stretching, and strengthening exercises contributed significantly to these positive outcomes. Additionally, the incorporation of balance and walking exercises, along with motivational activities like badminton, not only improved physical outcomes but also supported psychological well-being.

These results underscore the potential of manual therapy and multidisciplinary rehabilitation programs to manage symptoms and improve the overall well-being of individuals with multiple sclerosis. Future studies with larger sample sizes

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