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CASE REPORT

Rebalancing the Spine: A Novel Approach to Managing Quadratus Lumborum Dysfunction and Improving Spinal Mobility- A Case Report

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ABSTRACT

Low back pain is a prevalent global health issue affecting millions of people, causing significant disability and economic burden. This condition encompasses nociceptive, neuropathic, and nociplastic pain, and compensatory patterns sometimes often resulting from modern lifestyle factors such as prolonged sitting and reduced physical activity. Particularly in sitting professionals, musculoskeletal issues like quadratus lumborum (QL) muscle dysfunction can contribute to chronic lower back discomfort. A 31-year-old male software professional presenting with right-sided lower back pain underwent a comprehensive treatment protocol. The intervention included pain management, muscle energy techniques (MET), and a tailored seven-day exercise program focusing on the quadratus lumborum and iliopsoas muscles and deep segment muscles. Outcome measures included Visual Analogue Scale (VAS), Oswestry Disability Index (ODI), and Modified Schober's Test. Post-intervention assessment revealed significant improvements: VAS pain score reduced from 9 to 1, ODI score decreased from 32 to 11, and lumbar mobility (Schober's Test) increased from 12 to 20. The patient demonstrated enhanced muscular symmetry and corrected spinal alignment.

Keywords: Low back pain; Quadratus lumborum; Muscle energy technique; Myofascial release; Rehabilitation

1 INTRODUCTION

Low back pain encompasses nociceptive, neuropathic, and nociplastic pain, sometimes grouped under nonspecific low back pain which is brought on by an exaggeration of pain in the central nervous system are all included in the broad category of low back pain[1,2]. Low back pain affects millions globally and is a leading cause of disability. Chronic low back pain, defined as recurrent pain lasting more than three months, affects 5-10% of people worldwide. It impacts daily physical function and contributes significantly to economic costs, workplace absenteeism, and disability[3–6].

According to studies, up to 23% of adults globally experience chronic low back pain, and between 24% and 80% of cases reoccur within a year. Adults experience up to 84% of their lifetime with back discomfort[2]. Compared to adult patients, juvenile children experience lower rates of back discomfort. According to a Scandinavian study, the point prevalence of back discomfort was roughly 1% for children aged 12 and 5% for those aged 15. Fifty percent of girls and twenty percent of boys would have had at least one episode of back discomfort by the time they were eighteen. The lifetime prevalence of back pain in teenagers rises gradually with age, reaching adult proportions by the time they are 18 years old.[2]

This condition is often painful and can occur due to modern life style and digital revolution has transformed daily activities, with extended screen time (average 8-10 hours), prolonged sitting in non ergonomical positions puts undue stress on the lower back muscles, resulting in pain, stiffness, and fatigue[1,2,7].

As common as the condition exists, there are several procedures, and these tried and tested forms of rehabilitation have proven to provide the most effective results for the betterment of the largest number of patients[2,8]. The biopsychosocial model suggests interdisciplinary treatment strategies considering social, psychological, and biological elements. Treatment typically involves self-management techniques, medication, exercise-based therapies, and psychological interventions when suitable[2,8,9].

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The lumbar spine is designed to be incredibly strong and provide stability, protecting the highly sensitive spinal cord and spinal nerve roots. At the same time, it is highly flexible, encouraging mobility. This occurs in different planes across the body. In addition, tightness in and around the muscle decreases lumbar mobility by inactivating muscles in response to firing changes and shortening muscles [1,7].

The quadratus lumborum muscle enthesopathy and myofascial pain are two major causes of lower back pain [10]. Instability in the core region and pelvic misalignment cause lower back pressure and pain. Core instability and pelvic misalignment cause pressure and pain, with unilateral contraction causing spinal bending toward the contracting side and bilateral contraction causing extension [11]. It is a deep muscle with an optimal muscle length that regulates motion at the spine and is situated closer to the center of rotation of the spinal segment [10,12].

2 CASE DESCRIPTION

31yr male works as a software expert, right hand dominant. He complained of lower back pain/discomfort, which was localized at right Quadratus lumborum (QL) muscle which started slowly and progressed sharply. He was given medicines which gave him some relief & was then directed to physical therapy. He complained of lower back stiffness and referred pain radiating to his right lower limb after sitting for more than 15 minutes, which made it difficult for him to stand up straight instantly.

Initial clinical Examination: The therapist started the evaluation after getting the patient's signed informed consent.

On Observation: Upon initial posterior spinal examination, there was notable asymmetry characterized by a reduced ipsilateral distance between the left posterior superior iliac crest and the twelfth thoracic ribs. Visual inspection revealed dextroscoliotic deviation of the lumbar vertebrae accompanied by dextrorotation of the pelvic girdle (shown in Figure 1).

On palpation of the affected site revealed no cutaneous inflammatory changes. Thermal palpation was performed to assess local temperature variations. Deep fascial mobility testing was conducted through multidirectional manual assessment (caudal, cranial, lateral, and medial vectors), with contralateral comparison for movement quality. Systematic palpation along the quadratus lumborum muscle, extending from its costal attachment at T12 to its iliac insertion, demonstrated Grade 3 hyperalgesia in both superficial and deep tissues. Trigger points were clearly palpated in both deep and superficial fibres. Manual pressure applied to these points elicited referred pain patterns consistent with those documented by Travell and Simons [13], confirming the presence of trigger points in both the deep and superficial fibres of the quadratus lumborum.

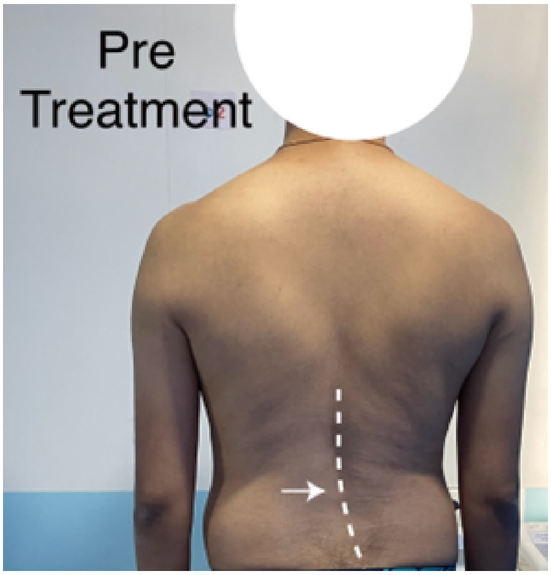


Fig. 1:

On examination: A comprehensive spinal examination with a specific focus on spinal mobility and hip flexor flexibility. Spinal range of motion was assessed utilizing the Modified Schober's Test (MST), which demonstrated decreased lumbar flexion mobility compared to normative values. The iliopsoas muscle was evaluated bilaterally using the Thomas Test, revealing a positive finding on the left side, indicative of iliopsoas muscle shortening and reduced extensibility. Manual muscle testing (MMT) was performed according to standardized protocols to assess core musculature and hip girdle strength. Results indicated no significant deficits in strength capabilities of the trunk stabilizers and hip musculature.

3 OUTCOME MEASURES

3.1 Visual analogue scale

VAS is a numerical pain rating scale used to assess pain intensity, A ruler is used to measure the distance (mm) between the patient's mark and the "no pain" anchor on the 10-cm line. This measurement yields a score between 0 and 100. Higher scores correspond to more intense pain. no pain (0–4 mm), mild pain (5–44 mm), moderate pain (45–74 mm), and severe pain (75–100 mm).

3.2 Oswestry disability index

The Oswestry Disability Index (ODI), a patient-completed questionnaire, provides a subjective percentage score of function (disability) in activities of daily life. The questionnaire has 10 questions which consists of our day-to-day activities of daily living and each question contains of 6 statements which will be scored from 0 to 5 based on the answers given by the patient and o indicates the least disability and 5 indicates more disability and overall score was calculated as a percentage and in that the 0% indicates no disability and 100% indicates the highest level of disability.

3.3 Modified Schober's test

Schober's test is classically used to determine if there is a decrease in lumbar spine range of motion (flexion). An increase of less than 9cm is a positive test and may indicate Positive Schober's Test: Less than 9cm increase in length with forward flexion: Decreased lumbar spine range of motion.

3.4 Tailored Treatment program

This novel approach was selected over the conventional treatment methods as it integrates multiple therapeutic interventions (dry needling, MET, segmental mobility and progressive loading) that specifically target the biomechanical relationship between QL and iliopsoas muscles, addressing both local and global movement systems while providing rapid pain relief and functional restoration as shown in Figure 2.

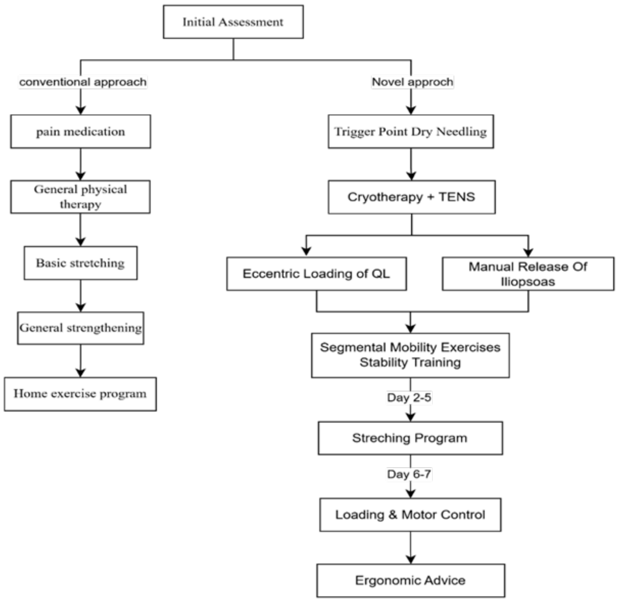


Fig. 2: Flow chart

The therapeutic intervention consisted of Initially, invasive intervention trigger point dry needling 0.25*0.75mm sterile, single-use, solid filament needles were used was performed targeting both the superficial and deep fibres of the right quadratus lumborum with a 10-15 minutes of intervention time and needle manipulation was done pistoning technique.

Immediate post-needling care, cryotherapy was administered to the treated area for 15 minutes at the right QL region, spanning from T12 to L4 vertebral levels. Subsequently, neuromuscular modulation was done using transcutaneous electrical nerve stimulation (TENS)with a frequency of 80-120Hz and pulse duration 50-100 microseconds and intensity was adjusted to patient comfort level producing visible muscle contraction with 20 minutes of duration and the quadripolar application surrounding the hypertonic quadratus lumborum.

Therapeutic exercise intervention of quadratus lumborum eccentric loading using the post-isometric relaxation (PIR) protocol in a left side lying position with initial contraction: 20% of maximum voluntary contraction and Hold duration of 7-10 seconds with Relaxation phase between 3-5 seconds and Stretch phase of 15-20 seconds for Sets 3-5 repetitions.

The left iliopsoas underwent a release protocol using manual therapy specifications patient lying in supine and hip flexed to 90 degrees with progressive pressure application with respiratory synchronization with a duration of 30-45 seconds per point and gradually progress pressure through 3 cycles and followed by the release it went to activation sequence in hook lying position with spine in neutral and 10 repetitions *3 sets with 5 seconds hold per repetition.

The tailored exercise regimen was described in detail in Table 1.

Post-intervention imaging demonstrates marked improvement in muscular symmetry and notable correction of spinal alignment shown in Figure 3.

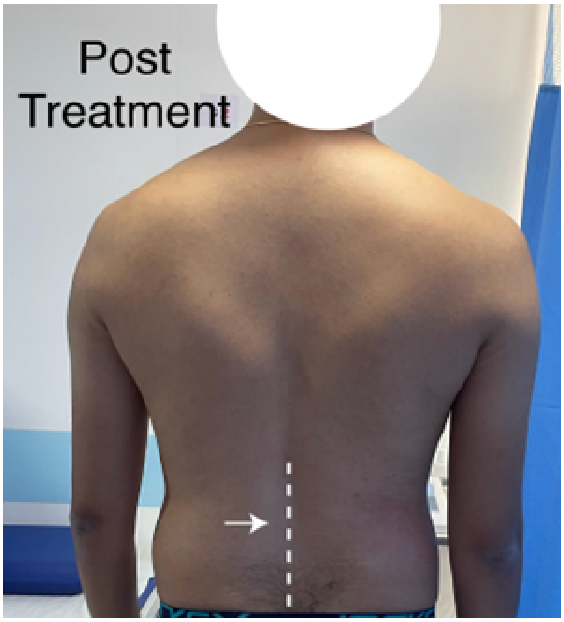


Fig. 3:

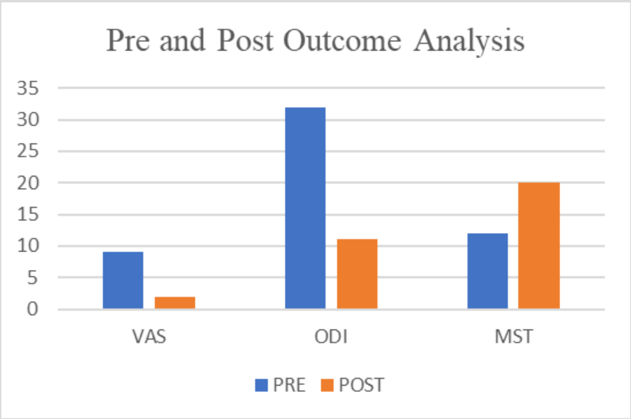
Table 1:

DAY	TREATMENT PROGRAM	EXERCISE	SETS/DURATION	REPETATIONS	FREQUENCY
Day 2	Stretching: Quadratus lumborum	side bending stretch	30 sec hold	3 reps	3x daily
		modified child's pose	30 sec hold	3 reps	3x daily
	Stretching: Iliopsoas	Half-kneeling Strech	30 sec hold	3 reps	3x daily
	Mobility: Lumbar	Cat-camel exercise	3 sets	10 reps	3x daily
Day 3	Stretching: Quadratus lumborum	side bending stretch	30 sec hold	3 reps	3x daily
		modified child's pose	30 sec hold	3 reps	3x daily
	Mobility: Lumbar	Rotation in Quadruped	3 sets	10 reps	3x daily
	Stability	Transversus Abdominis Activation	7 sec hold/2 sets	10 reps	2x daily
Day 4	Stretching: Iliopsoas	Half-kneeling Strech	30 sec hold	3 reps	3x daily
	Mobility: Lumbar	Cat-camel exercise	3 sets	10 reps	3x daily
	Stability	Transversus Abdominis Activation	7 sec hold/2 sets	10 reps	2x daily
		pelvic floor activation	3sets	10s contractions/5 sets	5 min total
Day 5	Stretching: both	All stretches	30 sec hold	3 reps	3x daily
	Mobility: lumbar	both exercises	3 sets	10 reps	3x daily
	Stability	both exercises	As Prescribed	As Prescribed	As Prescribed
Day 6	Previous exercises +	side plank progressions	3 sets	15 sec holds	60s rest
	Strength: obliques	Pall of press	3 sets	12 reps	daily
Dat 7	Previous exercises +	side lying hip abduction	3 sets	15 reps,3 sec hold	daily
	Gluteus Medius	Review all exercises	As prescribed	As Prescribed	daily

4 RESULTS

The comparison between the baseline and one-week outcome measures following manual therapy and tailored exercise programs is shown in Graph 1. The one-week assessment has shown that the MST values had improved from twelve during the first session to twenty at one week, suggesting a good amount of improvement in his ODI scores from thirty-two at the first session to eleven at one-week posttherapy session. The patient has also reported a reduction in pain score from nine to one in VAS, and also overall disability and functional limitation were also improved.

These findings suggest that there was a reduction in pain and improvement in spinal mobility, as well as disability, following the manual therapy and tailored exercise therapy program.



Graph 1:

5 DISCUSSION

Low back pain is frequently caused by the quadratus lumborum, which is often overlooked in spinal mobility and stability[11]. Muscle energy technique (MET) represents another effective intervention for QL dysfunction the physiological basis of MET's effectiveness lies on post-isometric relaxation and reciprocal inhibition principles through Golgi tendon organ activation[11,14]. The Golgi tendon organ's activation during muscle contraction with counterforce leads to improved lumbar ranges leading to autogenic inhibition and subsequent muscle relaxation. This neurophysiological response facilitates an increase in muscle length and a reduction in muscle tone, thereby addressing the underlying mechanical components of low back pain[11,14]. A study by Schenk and MacDiarmid showed significant improvement in lumbar range of motion using MET over eight weeks in participants with restricted lumbar extension. Additionally, the controlled nature of MET makes it particularly suitable for treating deep postural muscles like the QL, where precise application of force is crucial[14].

The physiological benefits of stretching extend beyond simple mechanical elongation of muscle fibres. When applied appropriately, stretching initiates several physiological responses, including enhanced blood flow, increased tissue elasticity, and improved proprioceptive feedback[6,14,15]. The mechanical deformation of muscle tissue during stretching activates mechanoreceptors that influence both local and central pain modulation mechanisms. Furthermore, regular stretching helps maintain optimal sarcomere length and prevents the development of pathological cross-bridges between actin and myosin filaments, which can contribute to muscle shortening and dysfunction. McGill's research indicates that spine stability requires balanced stiffening of the complete musculature. Keepers' study highlighted the quadratus lumborum's role in maintaining stability during lumbar sagittal movements and body compressions[15].

The case study showed significant improvement in VAS, ODI, and spine mobility (Schober's test) within a week of sessions, maintained through exercises[12,16].

There exists a significant relationship between the quadratus lumborum (QL) and iliopsoas muscles as demonstrated in this case report. The hypertonic left QL creates tension that draws the lumbar vertebrae toward the iliac crest. This mechanical force induces lateral spinal flexion to the left side, which develops as a compensatory mechanism for the right iliopsoas tension. The resultant lateral flexion elevates the left hemipelvis, and in response, the body compensates through right iliopsoas hypertonicity, which functions to restore spinal alignment toward midline and maintain pelvic stability[17–19].

QL shortening results in ipsilateral lumbar compression, subsequently diminishing intervertebral spacing. This mechanism progressively leads to pelvic rotation, increased lumbar lordosis, compensatory scoliosis, and altered hip biomechanics. The interdependence of these muscles is particularly significant due to their shared attachments to the lumbar spine and their synergistic roles in postural maintenance and movement. Dysfunction in either muscle typically affects the other, as both are integral to spinal and pelvic stability[17–20].

6 CONCLUSION

The result of the study proved that there was significant difference in improvement in pain, disability, and functional assessment to conclude the combined effect of Myofascial release, muscle energy technique of Quadratus lumborum has been shown to be effective in treatment, followed by follow-up exercises given to the patient.

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