



TURKISH JOURNAL OF PHYSIOTHERAPY AND REHABILITATION

TÜRK FİZYOTERAPİ VE REHABİLİTASYON DERGİSİ

İD Muhammed Üsâme TAŞ, Asst. Prof.¹

İD Günseli USGU, Assoc. Prof.²

¹Gümüşhane University, Şiran Dursun Keleş Health Services Vocational School, Department of Therapy and Rehabilitation, Physiotherapy Program, Gümüşhane, Türkiye

²Hasan Kalyoncu University Faculty of Health Sciences, Department of Physiotherapy and Rehabilitation, Gaziantep, Türkiye

Address for Correspondence/Yazışma Adresi:
Muhammed Üsâme TAŞ, Asst. Prof., Gümüşhane University, Şiran Dursun Keleş Health Services Vocational School, Department of Therapy and Rehabilitation, Physiotherapy Program, Gümüşhane, Türkiye
E-mail: fzt.muhammedusame.tas@gmail.com
ORCID: 0000-0002-5662-6737

Received: 25.06.2025 (Geliş Tarihi)

Accepted: 06.11.2025 (Kabul Tarihi)

Publication Date: 29.04.2026 (Yayınlanma Tarihi)

Cite this article as/Atıf: Taş MÜ, Usgu G.
Investigation of the effect of instrument-assisted soft tissue mobilization in individuals with lumbar disc herniation: a randomized clinical trial. Turk J Physiother Rehabil. 2026;37(1):1-10

INVESTIGATION OF THE EFFECT OF INSTRUMENT-ASSISTED SOFT TISSUE MOBILIZATION IN INDIVIDUALS WITH LUMBAR DISC HERNIATION: A RANDOMIZED CLINICAL TRIAL

ABSTRACT

Purpose: This research evaluated the effects of the instrument-assisted soft tissue mobilization (IASTM) technique in individuals with lumbar disc herniation (LDH).

Methods: Forty LDH patients were randomly assigned to a control group or an IASTM group (20 patients in each group). The IASTM group underwent a treatment protocol consisting of two IASTM sessions per week in addition to classic physiotherapy methods (hotpack, transcutaneous electrical nerve stimulation, ultrasound and exercise) over a four week period. The treatment specifically targeted the paraspinal muscles, gluteus maximus, gluteus medius and hamstring muscles. All participants were assessed before treatment, immediately after treatment and two months post-treatment using various measures, including pain intensity visual analog scale, straight leg raise (SLR) test, slump test (measuring knee extension from 90° flexion), 6-minute walking test (6-MWT), range of motion (ROM) and the Short Form-36 (SF-36) questionnaire.

Results: Both groups experienced a significant decrease in pain immediately after treatment ($p=0.002$). However, although both groups showed improvements in post-treatment SLR, slump test, 6-MWT, ROM, and SF-36 scores, no significant correlations were found ($p=0.208$). However, the IASTM group experienced greater clinical improvement across all parameters.

Conclusion: The findings suggest that incorporating IASTM techniques into physiotherapy programs for individuals with LDH can enhance rehabilitation outcomes.

Keywords: Classic physiotherapy, Exercise, Pain, Paraspinal muscles, Slump test

LOMBER DİSK HERNİSİ OLAN BİREYLERDE ENSTRÜMAN YARDIMLI YUMUŞAK DOKU MOBİLİZASYONUNUN ETKİSİNİN ARAŞTIRILMASI: RANDOMİZE KLİNİK ÇALIŞMA

ÖZ

Amaç: Bu araştırma, lomber disk herniasyonu (LDH) olan bireylerde enstrüman yardımlı yumuşak doku mobilizasyonu (IASTM) tekniğinin etkilerini değerlendirdi.

Yöntem: Kırk LDH hastası rastgele kontrol grubuna veya IASTM grubuna (her grupta 20 hasta) atandı. IASTM grubuna dört haftalık bir süre boyunca klasik fizyoterapi yöntemlerine (hotpack, transkutanöz elektriksel sinir stimülasyonu, ultrason ve egzersiz) ek olarak haftada iki IASTM seansından oluşan bir tedavi protokolü uygulandı. Tedavi özellikle paraspinal kasları, gluteus maximus, gluteus medius ve hamstring kaslarını hedef aldı. Tüm katılımcılar tedaviden önce, tedaviden hemen sonra ve tedaviden iki ay sonra ağrı yoğunluğu görsel analog skala, düz bacak kaldırma (DBK) testi, slump testi (90° fleksiyondan diz ekstansiyonunun ölçülmesi), 6-Dakika Yürüme Testi (6-DYT), hareket açıklığı ve Kısa Form-36 (KF-36) anketi dahil olmak üzere çeşitli ölçümler kullanılarak değerlendirildi.

Bulgular: Her iki grupta da tedaviden hemen sonraki ağrı değerlerinde anlamlı bir azalma ($p=0,002$) görüldü. Ancak her iki grubun tedavi sonrası DBK, slump test, 6 DYT, hareket açıklığı ve KF-36 skorlarında iyileşmeler görüldü de aralarında anlamlı ilişkiler bulunmadı ($p=0,208$). Bununla birlikte, IASTM grubu tüm parametrelerde daha fazla klinik iyileşme yaşadı.

Sonuç: Bulgular, LDH'li bireyler için IASTM tekniklerinin fizyoterapi programlarına dahil edilmesinin rehabilitasyon sonuçlarını iyileştirebileceğini göstermektedir.

Anahtar Kelimeler: Klasik fizyoterapi, Egzersiz, Ağrı, Paraspinal kaslar, Slump testi



INTRODUCTION

Low back pain is one of the leading causes of disability worldwide and significantly affects both daily life and workforce productivity, with a lifetime incidence of approximately 39% (1). It is generally characterized by pain and muscle spasm in the lumbar, vertebral, and gluteal regions, which may lead to reduced mobility, painful posture, and leg pain. Among the spinal degenerative diseases causing low back pain, lumbar disc herniation (LDH) is one of the most common conditions, often accompanied by radiculopathy (2).

LDH is defined as the outward displacement of disc material, including the nucleus pulposus or annulus fibrosus, from the intervertebral disc space. Patients typically present with initial low back pain, followed by hip and leg pain (3). Approximately 95% of LDH cases occur at the lumbar (L) 4/L5 and L5/S1 levels, which are the most mobile segments of the lumbar spine, while the risk decreases at higher levels (4,5).

Treatment approaches for LDH vary according to the severity and classification of symptoms, and include both surgical and conservative methods. While surgery aims to relieve nerve compression by removing the herniated disc, it carries the risk of trauma and additional complications. Conservative treatment, on the other hand, focuses on reducing pain, restoring neurological function, and facilitating an early return to daily activities (6). These approaches include bed rest, pharmacological treatment (e.g., non-steroidal anti-inflammatory drug and paracetamol), electrophysical modalities, hot-cold applications, mobilization, stretching, exercise therapy, and patient education. Exercise-based interventions, such as flexion, extension, stabilization, and general conditioning exercises, have been shown to play a key role not only in recovery but also in preventing recurrence of LDH (7,8). However, in some cases, conservative treatment may not be sufficient to eliminate pain and may even result in long-term complications such as drop foot (6).

In recent years, instrument-assisted soft tissue mobilization (IASTM) has gained popularity as an alternative conservative treatment. This technique induces controlled micro-trauma in the treated area, thereby stimulating the inflammatory and healing processes, enhancing fibroblast activity, promoting collagen synthesis, and preventing tissue adhesion (9). Rooted in Cyriax's manual soft tissue mobilization principles, IASTM is applied with specially designed tools (e.g., stainless steel, lucite, acrylic) to reduce pain, increase range of motion (ROM), and improve function. Its instruments, varying in material and design, target musculoskeletal conditions and associated symptoms. Compared to manual techniques, these instruments enable deeper and more specific application, while reducing

strain on the clinician's hands and providing greater mechanical advantage (10-12).

There are studies in the literature showing that IASTM reduces pain, increases ROM and improves quality of life in various musculoskeletal diseases. However, the number of studies investigating the effects of the IASTM technique on individuals with LDH is quite limited, and the physical effects of IASTM on LDH have not been comprehensively examined.

The purpose of this study is to demonstrate that a holistic approach to basic physical status, combined with clinical parameters (e.g., pain and function), yields significant clinical and practical results. Furthermore, we aim to investigate the effectiveness of the IASTM technique on pain, functional status, ROM, and quality of life in individuals diagnosed with LDH. Based on the data obtained, we aim to contribute to the literature and the treatment of individuals with LDH.

METHOD

Participants

Forty-nine patients between the ages of 20 and 60 were included in our study. Four patients were excluded from the study due to transportation difficulties, two patients did not meet the inclusion criteria, and three patients did not want to continue treatment, and the study was completed with 40 patients (14 female, 26 male). The individuals involved in our study were given comprehensive information about the purpose and method of the study and what was expected from the participant in the study. Individuals were made to sign an informed consent form in accordance with the Declaration of Helsinki and their consent was obtained. Our study was evaluated by the Hasan Kalyoncu University Non-Interventional Research Ethics Committee and was found appropriate in terms of medical ethics with the registration number 2017-10 (date: 10.10.2017).

Inclusion criteria for in the study were (1) individuals have been diagnosed with LDH, (2) their pain is three and above according to the visual analog scale (VAS), (3) they are between the ages of 20-60, (4) their clinical status is stable, (5) they are fully cooperative, (6) they do not have cognitive, cognitive and mental problems and they can express themselves and (7) they voluntarily agree to participate in the study. Criteria for exclusion from the study were (1) individuals have psychological disorders, mental disorders, cancer and severe depression, (2) primary or metastatic spinal malignancy, (3) have been diagnosed with advanced osteoporosis, (4) have recently undergone surgical intervention or acute infection, (5) cannot or do not want to perform tests or treatment exercises and (6) want to leave voluntarily (Figure 1).

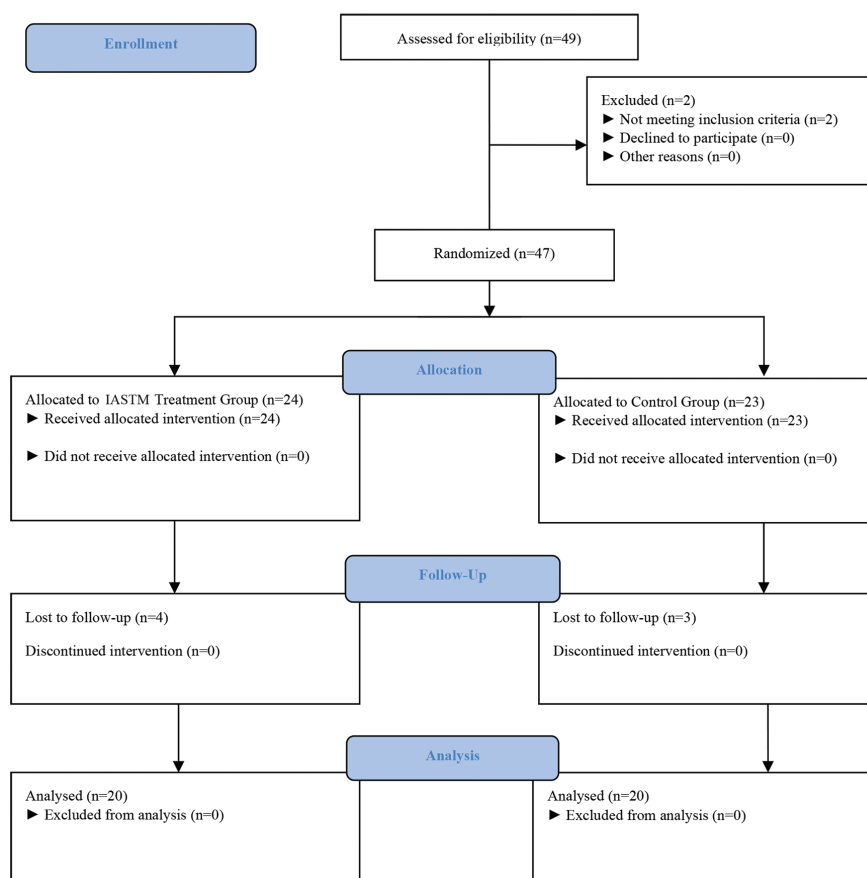


Figure 1. Consort flow diagram.

IASTM: Instrument-Assisted Soft Tissue Mobilization.

Procedures

According to the results of the power analysis, at least 19 subjects were included in each group (in the power analysis performed before starting the study, it was calculated that at least 19 subjects should be taken (13), assuming that the difference between VAS value was 1.50 units before the treatment (3.10 ± 1.80) and after the treatment (1.60 ± 1.40) in individuals with α : 0.05 and $1-\beta$ (power): 0.80. NCSS PASS 13 program was used to calculate the sample size). The patients involved in the study were randomly divided into two groups. Randomization was performed using a one-on-one instant randomization method using a sealed envelope method. To avoid affecting the statistical results and preventing bias among the participants, all patients included in the study were not informed about which treatment they would receive and in which group they would be in, thus ensuring a single-blind study.

Groups

IASTM treatment group (n=20): IASTM application for two sessions per week with classical physiotherapy [hotpack

+ transcutaneous electrical nerve stimulation (TENS) + ultrasound] for four weeks.

Control group (n=20): Only classical physiotherapy application for four weeks.

All patients included in the study were evaluated before treatment. They were then treated for four weeks. After four weeks of treatment and four weeks after the end of treatment (in the second month), they were re-evaluated (14,15). Patients were evaluated in terms of normal joint ROM, pain, quality of life and functional status [straight leg raise (SLR) test, slump test and 6-minute walking test (6-MWT)] of the muscles in the lumbar region (10,11,14).

Outcome Measures

Anamnesis

Demographic information of the patients was collected under the "Evaluation Form". In the evaluation form, the name-surname, evaluation dates, age, occupation, gender, body weight, height, body mass index (BMI), time of onset of pain, frequency of pain and SLR degree were recorded.

Evaluation of Pain

VAS was used to evaluate the pain intensity of the patients. The patients themselves marked their pain on paper and the marked point was measured in mm. VAS; it is the marking of the patient's pain intensity during rest or movement on a 10 mm long line segment. The line segment has a value of 0 at the starting point and 10 at the end point. 0 indicates that there is no pain at all, while 10 indicates that there is very severe pain. The patient marks the existing pain on the line located on the right part. The marked point is measured in mm. The VAS is more reliable than other pain scales and is also easier to administer. Therefore, the VAS has been widely used as a pain management tool, including in the post-cavity period, since 1974 (16).

Evaluation of Functional Status

In the evaluation of the functional status of the patients, SLR test, slump test and 6-MWT were used.

SLR test; L5 and S1 indicate radicular pressure. The patient lies on his back with his knees in extension. The leg, which is painful, is slowly lifted straight. If low back pain occurs between 30° and 70°, the test is positive (17). In our study, while the individuals were performing the SLR test, their hip flexion degrees were measured in degrees with a goniometer (10).

Slump test; the patient sits loosely with his hips and knees in 90° flexion. He clasps his two hands over his waist. He tilts his head forward. Meanwhile, the hip is fixed at 90° flexion, while the knee is extended at 90° flexion. Pain in the lower back is a positive result. If there is no pain, the ankle is additionally brought into a dorsiflexion position. The presence of pain makes the test positive (18). In our study, while the patient was performing the slump test, the degree of the patient's tested leg from 90° knee flexion to knee extension was measured with a goniometer (19).

6-MWT; it is a test performed by measuring how many times the patient travels a distance of 30 meters in five minutes. The distance traveled is expressed in "meters". A healthy individual walks an average of 300-325 meters at a normal speed. It tests the functionality of individuals (20). In our study, the distance individuals walked in five minutes was calculated in meters.

Evaluation of Normal Joint Range of Motion

Goniometer was used to evaluate the normal joint ROM of the patients. Normal joint ROM; it allows the measurement of active or passive normal joint ROM, whether the limited movement is capsular or not, the evaluation of the final sensation, the presence of pain and additional problems in the joints (21). In our study, the flexion, extension and right-left lateral flexion active and passive degrees of the lumbar region of the individuals were measured in degrees with a goniometer.

Evaluation of Quality of Life

Short Form-36 (SF-36) was used to evaluate the quality of life of the patients. It has a more general evaluation of health than other quality of life scales. It was developed by the Rand Corporation in 1992. It provides a wide range of measurement. The purpose of the scale is to enable self-assessment and comprehensive use of the scale. In addition, it is another purpose that it can be applied briefly and easily. On average, the scale is filled in five minutes. Scale; it shows how the health status of the person affects the living conditions positively or negatively. A maximum of 100 points and a minimum of 0 points can be given to each subheading. Finally, the total score is obtained. If the score increases, the quality of life also increases. A score of 0 indicates poor health. A score of 100 indicates good health (22). Koçyiğit et al. (23) conducted a study on the reliability and validity of the Turkish version.

Work Plan (Classical Physiotherapy Program)

Both the control group and the IASTM treatment group were treated with classical physiotherapy program. A 20-minute hotpack was applied to the lumbar area. TENS and ultrasound were applied as electrotherapy agents. The TENS application was made with the Chattanooga Intelect Advanced Combo device. Conventional TENS was applied at a frequency of 100 Hz for 20 min with a current of 100 µs. The ultrasound application was made with the Chattanooga Intelect Advanced Combo device. Lumbar area was administered at a dose of 1 MHz, 1.5 W/cm² using a five cm diameter cap for six minutes. In the first session, the physiotherapist had the patient explain the exercises (posterior pelvic tilt exercise, hip flexors stretching exercise, lumbar extensors stretching exercise, abdominal muscle strengthening exercise, SLR exercise, pelvic elevation exercise, cat-camel exercise and lumbar extensor strengthening exercise). Afterwards, patients were advised to rest for one minute between exercises, one time a day and for four weeks, five days a week.

In IASTM treatment group; warm-up, IASTM application, stretching and cold application were performed for four weeks in two sessions per week for the IASTM treatment group (14,24). Patients in the IASTM treatment group were given the classical physiotherapy program and exercises given to the control group. Warm-up was achieved by 20 minutes hotpack, TENS and six minutes ultrasound applied to the control group (9).

In our study, IASTM application was performed by a trained and experienced physiotherapist with a gua sha device made of stainless steel and at a 45° angle parallel to the muscle fibers for approximately 20 seconds. Immediately afterwards, a total of 40 seconds of treatment time was applied by treating the muscle fibers at a 45° angle with the instrument for an additional 20 seconds in a direction perpendicular to them. In other words,

for each area (paraspinal muscles, gluteus maximus and gluteus medius muscles, hamstrings), a total of two minutes was applied to the right and left sides separately for 40x3 seconds (15). Paraspinal muscles were treated from caudal to cranium, gluteal muscles from proximal to distal and hamstring muscles from popliteal fossa to gluteal line (25). Stretching was provided by exercises applied to the control group (9). After the cold application, IASTM application was made, the cold-pack was applied to each area for five minutes (14).

Exercise Programs Applied in Treatment

Participants in both groups were asked to do the exercises that the physiotherapist explained to the patients in the first session as a home exercise prescription. They were advised to follow the home exercise prescription seven days a week, three sets, ten repetitions, and for four weeks. The exercise program consisted of a standard program applied to all patients in the clinic.

Statistical Analysis

IBM SPSS Statistics 22.0 package program was used for statistical analysis of the data obtained as a result of our study. Arithmetic mean $\pm$ standard deviation was given for the variables determined by numerical measurement. For non-numeric data, the number (n) and percentage (%) were calculated. Initially, independent t-tests were used to compare demographic data between groups. Independent samples t-test was used to evaluate ROM values between groups. The normality assumption, which is one of the prerequisites of parametric tests, was checked with the “Shapiro-Wilk” test. Since it was determined that the data did not conform to normal distribution in the evaluation of the groups before treatment, after treatment and in the second month, it was decided that non-parametric conditions were met. Comparison of data was made using the “Mann-Whitney U

test”, one of the non-parametric tests. In the comparison of the differences in the evaluations of both groups before treatment, in the first month and in the second month, the “Wilcoxon signed ranks test” was used. The significance level p in all statistics was taken as $p < 0.05$.

RESULTS

Both groups included in the study were similar in terms of age ($p=0.758$) and height ($p=0.584$); however, body weight ($p=0.002$) and BMI were found to be higher in the control group than the IASTM treatment group ($p=0.003$) (Table 1).

The comparison of the pain values of the groups between the groups is indicated in Table 2. As a result of the post-treatment ($p=0.002$) and second month ($p<0.001$) evaluations, it was observed that there was a greater decrease in the pain values of the IASTM treatment group.

The comparison of the SLR values of the groups between the groups is indicated in Table 3. It was found that the amount of increase in the degree of SLR for the right ($p=0.208$; $p=0.143$) and left ($p=0.285$; $p=0.261$) lower extremities was similar between the groups.

The comparison of the slump test values of the groups between the groups is shown in Table 4. The rates of increase in the degree of the leg tested for the right ($p=0.704$; $p=0.180$) and left ($p=0.776$; $p=0.786$) lower extremities from 90° knee flexion to knee extension were found to be similar in post-treatment and second month measurements.

The comparison of the 5-MWT values of the groups between the groups is indicated in Table 5. After four weeks of treatment ($p=0.046$) and two months ($p=0.025$), it was observed that the

Table 1. Demographic characteristics of groups

Demographic characteristics	IASTM treatment group (n=20) X $\pm$ SD (min-max)	Control group (n=20) X $\pm$ SD (min-max)	t	p
Age (year)	40.50 $\pm$ 12.00 (20-57)	41.80 $\pm$ 13.50 (19-60)	0.310	0.758
Body weight (kg)	70.20 $\pm$ 9.50 (56-90)	83.50 $\pm$ 15.50 (58-120)	3.264	0.002*
Height (cm)	169.50 $\pm$ 8.10 (156-184)	168.10 $\pm$ 8.50 (153-181)	-0.552	0.584
BMI (kg/m ²)	24.60 $\pm$ 4.40 (17.10-35.20)	29.60 $\pm$ 5.40 (20.10-42.50)	3.178	0.003*

* $p < 0.05$, t-test, IASTM: Instrument-assisted Soft Tissue Mobilization, min: Minimum, max: Maximum, BMI: Body Mass Index, SD: Standard Deviation, X: Average.

Table 2. Comparison of the pain values of the groups between the groups

Pain (mm)	IASTM treatment group (n=20) X $\pm$ SD	Control group (n=20) X $\pm$ SD	Z	p
Pre-treatment	6.70 $\pm$ 1.40	6.20 $\pm$ 1.80	-0.807	0.420
Post-treatment	3.00 $\pm$ 1.20	4.30 $\pm$ 1.30	-3.027	0.002*
Second month	2.30 $\pm$ 1.00	3.90 $\pm$ 1.10	-3.984	<0.001*

* $p < 0.05$, t-test, IASTM: Instrument-assisted Soft Tissue Mobilization, VAS: Visual Analog Scale, SD: Standard Deviation, X: Average, Mann-Whitney U test.

increase in walking distance in the IASTM group was higher than in the control group.

The comparison of the lumbar region normal joint ROM values of the groups between the groups is shown in Table 6. The

amount of increase in all normal joint ROM except for all active-passive flexion, second month active-passive right lateral flexion, second month active left lateral flexion and second month active left lateral flexion and second month passive left lateral flexion movement was found to be similar between the groups.

Table 3. Intergroup comparison of the straight leg raise degree values of the groups

SLR (degree)		IASTM treatment group (n=20) X ± SD	Control group (n=20) X ± SD	Z	p
Right leg	Pre-treatment	51.10±10.00	55.50±13.60	-1.056	0.291
	Post-treatment	70.50±6.40	65.20±13.40	-1.260	0.208
	Second month	73.40±6.10	67.30±13.00	-1.463	0.143
Left leg	Pre-treatment	55.80±13.70	59.30±15.30	-0.839	0.401
	Post-treatment	71.90±8.70	66.50±13.90	-1.070	0.285
	Second month	75.10±7.50	69.10±13.70	-1.124	0.261

*p<0.05. IASTM: Instrument-assisted Soft Tissue Mobilization, SD: Standard Deviation, SLR: Straight Leg Raise, X: Average, Mann-Whitney U test.

Table 4. Intergroup comparison of the slump test (the degree of the tested leg from 90° knee flexion to knee extension) values of the groups

Slump test		IASTM treatment group (n=20) X ± SD	Control group (n=20) X ± SD	Z	p
Right leg	Pre-treatment	42.30±15.30	48.70±18.50	-0.867	0.386
	Post-treatment	57.60±10.70	57.30±14.00	-0.380	0.704
	Second month	63.00±9.00	59.90±3.80	-1.340	0.180
Left leg	Pre-treatment	48.10±17.70	55.60±26.90	-0.839	0.402
	Post-treatment	60.30±13.30	62.50±23.00	-0.284	0.776
	Second month	64.00±12.00	65.80±21.70	-0.271	0.786

*p<0.05. IASTM: Instrument-assisted Soft Tissue Mobilization, SD: Standard Deviation, X: Average, Mann-Whitney U test.

Table 5. Comparison of the 6-MWT values of the groups between the groups

6-MWT (m)	IASTM treatment group (n=20) X ± SD	Control group (n=20) X ± SD	Z	p
Pre-treatment	154.30±43.10	158.50±70.30	-0.367	0.714
Post-treatment	256.50±29.10	232.30±48.60	-1.994	0.046*
Second month	296.80±32.20	269.50±42.50	-2.248	0.025*

*p<0.05, Wilcoxon test, IASTM: Instrument-assisted Soft Tissue Mobilization, 5-MWT: 5-Minute Walking Test, SD: Standard Deviation, X: Average, Mann-Whitney U test.

Table 6. Intergroup comparison of the lumbar region normal joint range of motion values of the groups.

Normal joint range of motion (degree)		IASTM treatment group (n=20) X ± SD	Control group (n=20) X ± SD	t	p
Flexion (active)	Pre-treatment	76.81±8.65	65.43±13.00	-3.341	0.002*
	Post-treatment	83.19±4.24	69.86±8.63	-6.353	<0.001*
	Second month	84.71±4.83	76.81±9.56	-3.381	0.002*
Flexion (passive)	Pre-treatment	77.24±8.77	65.76±12.86	-3.379	0.002*
	Post-treatment	83.29±4.27	70.00±8.57	-6.361	<0.001*
	Second month	84.95±4.77	77.00±9.38	-3.463	0.001*

Table 6. Continued

Normal joint range of motion (degree)		IASTM treatment group (n=20) X ± SD	Control group (n=20) X ± SD	t	p
Extension (active)	Pre-treatment	23.14±3.26	24.00±2.49	0.958	0.344
	Post-treatment	27.19±3.15	26.86±2.82	-0.361	0.720
	Second month	28.71±3.10	28.24±3.10	-0.498	0.621
Extension (passive)	Pre-treatment	23.38±3.57	24.71±2.57	1.389	0.173
	Post-treatment	27.33±3.26	26.90±2.88	-0.451	0.654
	Second month	28.86±2.98	28.24±3.10	-0.661	0.512
Right lateral flexion (active)	Pre-treatment	25.33±3.02	25.24±3.06	-0.101	0.920
	Post-treatment	29.14±3.49	27.10±3.11	-2.009	0.051
	Second month	31.10±1.48	29.14±2.24	-3.330	0.002*
Right lateral flexion (passive)	Pre-treatment	25.76±3.39	25.52±3.27	-0.232	0.818
	Post-treatment	29.19±3.35	27.24±3.18	-1.936	0.060
	Second month	31.14±1.46	29.38±2.31	-2.953	0.005*
Left lateral flexion (active)	Pre-treatment	26.19±3.72	24.05±3.46	-1.933	0.060
	Post-treatment	29.19±2.36	27.19±3.66	-2.107	0.041*
	Second month	31.10±1.18	29.19±2.84	-2.839	0.007*
Left lateral flexion (passive)	Pre-treatment	26.57±3.65	24.33±3.50	-2.027	0.049*
	Post-treatment	29.33±2.41	27.38±3.75	-2.007	0.052
	Second month	31.14±1.19	29.38±2.84	-2.623	0.012*

*p<0.05, t-test, IASTM: Instrument-assisted Soft Tissue Mobilization, SD: Standard Deviation, X: Average, Independent Samples test.

Table 7. Intergroup comparison of the quality of life values of the groups

SF-36 Sub parameters		IASTM treatment group (n=20) X ± SD	Control group (n=20) X ± SD	Z	p
Physical function	Pre-treatment	38.80±17.70	40.50±23.10	-0.027	0.978
	Post-treatment	56.50±10.90	51.30±18.30	-1.748	0.080
	Second month	59.50±8.90	55.00±15.50	-2.015	0.044*
Physical role difficulty	Pre-treatment	22.50±24.20	25.00±30.30	0.000	1.000
	Post-treatment	55.00±22.40	48.80±27.50	-0.992	0.321
	Second month	60.00±17.00	52.50±29.10	-0.962	0.336
Emotional role difficulty	Pre-treatment	20.00±27.30	21.70±27.10	-0.272	0.786
	Post-treatment	55.00±24.80	51.60±22.90	-0.406	0.685
	Second month	56.60±24.40	53.30±22.70	-0.416	0.677
Energy/vitality	Pre-treatment	41.80±15.50	44.00±13.10	-0.370	0.711
	Post-treatment	53.50±5.60	50.80±8.80	-0.808	0.419
	Second month	55.00±4.00	52.80±6.60	-0.932	0.352
Mental health	Pre-treatment	47.00±12.60	48.60±12.90	-0.220	0.826
	Post-treatment	53.20±13.40	51.20±12.10	-0.662	0.508
	Second month	56.00±8.80	53.60±8.50	-0.811	0.417
Social function	Pre-treatment	42.50±19.20	45.60±18.30	-0.540	0.589
	Post-treatment	55.00±13.10	50.00±15.20	-0.992	0.321
	Second month	58.80±12.20	52.50±13.80	-1.470	0.142
Pain	Pre-treatment	30.50±17.50	33.30±15.70	-0.470	0.638
	Post-treatment	43.80±7.50	37.50±14.00	-1.370	0.171
	Second month	45.00±6.50	39.00±11.70	-1.646	0.100
General health perception	Pre-treatment	37.00±14.90	40.30±15.40	-0.671	0.502
	Post-treatment	52.30±10.80	48.30±12.00	-1.046	0.296
	Second month	54.50±8.10	51.50±9.70	-0.774	0.439

*p<0.05, t-test, IASTM: Instrument-assisted Soft Tissue Mobilization, SF-36: Short Form-36, SD: Standard Deviation, X: Average, Mann-Whitney U test.

The comparison of the quality of life values of the groups between the groups is shown in Table 7. As a result of the evaluation of the physical function score, which is the sub-parameter of SF-36, at the second month, a higher increase was observed in the IASTM-treatment group than in the control group ($p=0.044$), while the amount of increase in all other parameters was found to be similar between the groups.

DISCUSSION

The present study evaluated the effects of IASTM in combination with classical physiotherapy methods on individuals with LDH. The results demonstrated significant improvements across all outcome parameters in both the control and IASTM groups after four weeks of treatment and at the two-month follow-up. Notably, the addition of IASTM produced greater reductions in pain intensity and greater increases in walking distance, as reflected in the physical function subscale of the SF-36, compared with classical physiotherapy alone. These findings suggest that IASTM may provide additional clinical benefits when incorporated into conventional physiotherapy protocols for LDH.

The mechanisms underlying pain reduction following IASTM are not yet fully clarified; however, several hypotheses have been proposed. One possible explanation is the modulation of inflammatory processes. Crane et al. (26) demonstrated that soft tissue mobilization attenuates exercise-induced inflammation, although their protocol did not involve IASTM specifically. Another mechanism may involve increased local blood flow. Enhanced perfusion may facilitate the clearance of nociceptive metabolites and reduce peritendinous edema (27). Consistent with this, Loghmani and Warden (11) reported improved perfusion with IASTM, while Portillo-Soto et al. (28) observed increased blood circulation. These physiological mechanisms may collectively explain the analgesic effects observed in the present study.

In addition to pain reduction, improvements in ROM were observed. Adequate ROM is a prerequisite for optimal musculoskeletal function and exercise performance (29,30). IASTM has been proposed to enhance ROM by mobilizing restricted soft tissue and increasing tissue extensibility (31). Previous studies support these effects: Miners and Bougie (14) highlighted improvements in soft tissue function, while Schaefer and Sandrey (31) demonstrated significant gains in joint ROM. The underlying physiological rationale may include reduced tissue viscosity and increased pliability due to the friction-induced heat generated by the instrument (32,33). In our study, participants in the IASTM group exhibited greater improvements in joint ROM, which we attribute to these mechanisms.

Quality of life outcomes are of particular importance in chronic musculoskeletal conditions such as LDH. While the existing literature lacks studies specifically examining IASTM's impact on quality of life in LDH, Narin et al. (34) reported that classical physiotherapy improved quality of life in patients with chronic low back pain across multiple SF-36 domains. In alignment with these findings, our study demonstrated significant improvements in quality of life scores, suggesting that IASTM may further enhance functional recovery and patient well-being.

Functional outcomes, including the SLR, 5-MWT, and slump test, were also evaluated in the present study. To date, there is limited evidence directly addressing the impact of IASTM on these parameters in individuals with LDH; however, research in different populations provides useful insights. Baker et al. (10) demonstrated that the application of IASTM to the hamstring and triceps surae muscles improved flexibility and resulted in a significant increase in SLR values in individuals with lower extremity pain. Similarly, Park et al. (35) investigated patients with Achilles tendinitis and reported that a three-week intervention of IASTM, applied three times per week, led to significant improvements in walking distance, indicating the positive effect of IASTM on lower extremity functional capacity. In addition, White (19) described a clinical case of a long-distance runner with hamstring tendinopathy, where IASTM converted a previously positive slump test to negative, suggesting that the technique may positively influence neural tension and pain-related functional limitations.

Consistent with these reports, our study demonstrated improvements in SLR, 5-MWT, and slump test performance in both the IASTM and control groups. The greater improvements observed in the IASTM group may be attributed to multiple mechanisms, including enhanced soft tissue extensibility, increased local circulation, and a reduction in pain perception, which together facilitate functional recovery. The reduction of pain likely allowed participants to perform functional tests more efficiently, while the mobilizing effect of IASTM may have contributed to increased ROM and improved neural mobility. Taken together, these results support the notion that IASTM, when added to conventional physiotherapy, can provide superior benefits in functional outcomes compared with classical physiotherapy alone.

Limitations

When examining the limitations of our study, it was observed that the total treatment duration was short. In addition to the 8-week treatment period, individuals could have had a longer treatment duration such as 6 or 12 months. Our study was single-blind, but it could have been double-blind or triple-blind. Furthermore, muscle activity was not measured.

Therefore, further studies are needed to investigate changes in back muscle activity after IASTM.

CONCLUSION

Considering the results, new randomized controlled trials are needed that include muscle activity measurements and investigate the effects of the IASTM technique on individuals with LDH over longer follow-up periods. In conclusion, we believe that the application of the IASTM technique in conjunction with physiotherapy programs by physiotherapists in the treatment of individuals with LDH may lead to positive responses to rehabilitation.

Ethics: Our study was evaluated by the Hasan Kalyoncu University Non-Interventional Research Ethics Committee and was found appropriate in terms of medical ethics with the registration number 2017-10 (date: 10.10.2017).

Informed Consent: Individuals were made to sign an informed consent form in accordance with the Declaration of Helsinki and their consent was obtained.

Sources of Support: The authors received no financial support for this study.

Conflict of Interest: The authors declare that they have no conflict of interest.

Author Contributions: Concept- MÜT, GU; Design- MÜT, GU; Supervision- MÜT, GU; Resources and Financial Support- MÜT, GU; Materials- MÜT, GU; Data Collection and/or Processing- MÜT, GU; Analysis and/or Interpretation- MÜT, GU; Literature Search- MÜT, GU; Writing Manuscript- MÜT, GU; Critical Review- MÜT, GU.

Explanations: None.

Acknowledgments: None.

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