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ORIGINAL RESEARCH PAIN MANAGEMENT

Effect of instrument-assisted soft tissue mobilization versus myofascial release therapy for pain, mobility, and disability in chronic low backache patients: a quasi-experimental study

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ABSTRACT

Background & objective: Low back pain (LBP) is a common musculoskeletal disorder in the general population. The most common etiological factors are overuse syndromes, postural issues, and bad working environment. The conservative management using physical agents can be more satisfactory and beneficial before the interventional techniques. We aimed to compare manual myofascial release and instrument-assisted soft tissue mobilization (IASTM) techniques for improving pain, lumber mobility, and functional index in patients with chronic LBP.

Methodology: This non-randomized trial was conducted on 40 chronic low back pain patients and data was collected from Chaudhry Akram Research and Teaching Hospital, Lahore, Pakistan. We included patients with LBP for more than 3 months, ages 22-45 y. Group A received manual myofascial release (MFR), and Group B received instrument-assisted soft tissue mobilization (IASTM). The outcomes assessed were pain, low back functional index, and lumber range of motion. The data was analyzed using SPSS V.23. Repeated measurement ANOVA was used for within group comparison. While an Independent sample t-test was applied for inter-group comparison at a significance level of $P < 0.05$.

Results: There were 26 males and 14 females in the study. The study comprised of 20 participants in each group with mean ages of 33.17 ± 7.46 and 33.45 ± 7.63 y respectively. The results showed that pain improvement was more in group B compared to group A. While the disability and range of motion, including flexion, extension, and lumber right-side flexion, showed a statistically significant improvement ($P < 0.05$). Mean difference was 1.75 for pain, 8.65 for disability index and -5.15 for lumber flexion, -1.25 for extension, and 1.30 for right side flexion, but no statistical differences ($P > 0.05$) were found for left lumber flexion ($P > 0.05$) in both groups.

Conclusion: The results of our study show that chronic low back pain can be managed by myofascial release techniques but better effects can be achieved using instrument-assisted soft tissue mobilization technique.

Keywords: Chronic Low Back Pain; IASTM; Low Back Disability Index; Manual Myofascial Release; Pain; Range of motion; Well-being

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1. INTRODUCTION

Low back pain (LBP) is a disabling disease that could take a chronic course, when it continues for at least 12 weeks and makes the life difficult regarding physical mobility. It affects different age groups, between the costal margin and the gluteal folds.[1] LBP is common in office workers, household females, professionals, and students in Pakistan. It is 52.4% prevalent in bankers of Pakistan,[2] and 26.3% of the pregnant females in Lahore, Pakistan, in the last trimester.[2,3] Lower backache was reported by 71% of Pakistani women in reproductive age,[4] and 65% of the dentists in Rawalpindi, Pakistan, reported low backache.[5] Some short studies have focused on combination of myofascial release techniques. Instrument-assisted soft tissue mobilization (IASTM) is based on tools, which can prevent the extra force being applied by the practitioners and offers early rehabilitation compared to manual therapy. It is a new version of treatment for muscular pain and disability. It is dependent on tools, as described by Cyriax in 1982. It is based on the concept of applying pressure with specific shaped tools for tight muscles, tendons, and contracting structures. These tools are adaptive to different anatomical shapes of the structures where pressure is to be applied.[6] These are beneficial at the cellular level due to fibroblasts proliferation in response to pressure applied with the tools, and help to improve vascularity and collagen matrix remolding[7] Myofascial release alone, and as adjunct therapy, can reduce pain and disability and improve flexibility in backache.[8-10] It helps to improve mobility, relaxes contracted muscles and improves circulation and venous and lymphatic drainage. It is a stretching technique that is interactive and dependent upon feedback from the patient for direction, duration, and force of stretch.[11] A more recent study based on IASTM and general exercise resulted in pain relief and increased range of motion (ROM); however, the IASTM group showed a significantly more decrease in VAS scores and ROM than the control group.[12] But Crothers and colleagues stated that during LBP management IASTM, spinal manipulation, and placebo therapy were equally effective in terms of pain and functional index.[13] Manual pressure technique can be used for releasing the trigger points and 12 sessions for LBP management were effective.[14]

The IASTM application in combination with exercise, can be a more effective approach. But along with the reduced force compared to manual myofascial release (MMR) techniques, it is energy efficient for practitioners.[15] Another study stated that beneficial effects can be achieved without any interference to the neural and mechanical properties of the muscles.[16] It has similar effects compared to kinesiotaping and conventional exercises but this study consists of non-homogenous techniques.[17] We aimed to compare these two techniques for improving pain, lumber mobility, and functional index of patients having chronic LBP.

2. METHODOLOGY

This non-randomized trial was conducted on 40 chronic LBP patients after ethical approval from the Azra Naheed Center of Research and Development (ANCRD), Lahore, Pakistan. The data was collected from the Department of Physiotherapy Chaudhry Akram Research and Teaching Hospital, Lahore. The sample size was calculated at 95% CI (2-sided), using the power of study as 80%, and the ratio of group 2:1 was 1. The mean in Group 1 was 3.53 ± 1.3 and in Group 2 was 2.73 ± 0.00, the difference between the groups was 0.78 and the sample size was 21 in each Group, calculated using OpenEpi version 3. The subjects were screened based on their signs and symptoms of LBP on subjective complaints and manual palpation of adhesions over the side's spine. The considered criteria of LBP was; age 22-45 y, and LBP for more than 12 weeks, lumbar pain or postural pain due to prolonged sitting or standing, physically inactive or exercising less than one hour per week, and numeric pain rating score more than 4, while patients with neurological, infectious, or systemic diseases, pain radiating due to nerve root involvement, pain due to osteoporosis, fracture, spondylosis, spondylolisthesis tumors or patient unwilling to participant in the research, any traumatic injury in last 2-3 months affecting lumber area, hypersensitive, phobia of instruments were excluded and further contraindications to IASTM was also followed.

2.1. Conduct of study

Before start of the enrollment, patients were educated about the study and consent was taken. The outcomes used for assessment were pain measured using a visual analogue scale (VAS), low back disability index using the Oswestry disability index (ODI), and goniometry performed for measuring lumber range of motion. The numeric pain rating was rated by patients for their current pain level from 0-10. The lumber ROM was measured by using a Goniometer having inter-observer

Table: 1 Within the groups comparisons for pain, mobility and disability

Outcomes	Evaluation	Group A		Group B	
		Mean ± SD	P-value	Mean ± SD	P-value
Pain (VAS scores)	Baseline	6.05 ± 1.31	0.37	5.90 ± 1.02	0.00
	2nd week	4.55 ± 1.19		3.95 ± 1.31	
	4th week	2.70 ± 0.92		.95 ± 0.75	
Low back Disability	Baseline	30.85 ±7.40	0.03	30.25±5.86	0.01
	2nd week	25.05 ±5.24		21.50±4.75	
	4th week	17.50 ±5.80		8.85 ± 2.73	
Lumber flexion (Degrees)	Baseline	42.60±1.84	0.32	43.75±1.86	0.04
	2nd week	45.10 ±1.91		47.15±2.47	
	4th week	47.80 ±2.23		52.95±1.63	
Lumber extension (Degrees)	Baseline	13.35 ± 2.27	0.07	14.05 ±2.11	0.04
	2nd week	17.85 ± 2.49		18.55 ±1.84	
	4th week	20.35 ± 1.95		21.60 ±1.69	
Lumber left side flexion (Degrees)	Baseline	12.75 ± 1.41	0.36	12.50 ±1.00	0.60
	2nd week	16.95 ±1.70		16.90 ±1.25	
	4th week	19.45 ± 1.82		20.30 ±1.21	
Lumber right side flexion (Degrees)	Baseline	12.60 ± 1.27	0.03	12.50 ±1.46	0.00
	2nd week	16.80 ± 1.24		17.15 ±1.30	
	4th week	19.80 ± 1.47		21.10 ±1.29	

Data presented as mean ± SD; P < 0.05 considered as significant

reliability for the thoracolumbar region; r = 1.0 Shober test, r = 0.88 spinal extension, r = 0.76 right lateral spinal flexion, r = 0.91 left lateral spinal flexion. The data was collected by the blinded assessor at enrollment for baseline evaluation. The principal investigator was IASTM certified practitioner, and performed all the intervention following ethics and guidelines of IASTM practice, indications and contraindications. In both groups the warm-up sessions included arm circular movements with eight repetitions forward and eight repetitions backward, while standing on the feet the subjects were asked to stand on wide-based feet and move the right arm forward in a swing way in a circular motion, and that backward. The same protocol of warm-up exercise was continued with a circular motion in the left arm. The warm-up exercises can decrease the chance of injury and heavy load on the heart. In group A patients were laid prone and palpated using fingers and the resistance was felt and released by breaking the adhesions with an oily gel to reduce friction.

The Manual Myofascial Release (MFR) session lasted for almost 40 min. The lumber paravertebral muscles were focused using olecranon of the elbow, 3 times on each side of the spinal column. While for thoracolumbar fascia release, hands were placed on T12-L1 and sacrum, while therapist cross handed arms over the skin for 5 min. For quadratus lumborum, caudal arm was kept on thigh and cranial arm over iliac crest and lumber paravertebral muscles, while applying pressure in oblique direction over the center of column for 7 min. The psoas was transversally released 3 cm on sides of umbilicus for 15 times. Similarly, in Group B (IASTM group), after the warm up exercise, friction-free oil or gel was used to facilitate the device to move over the skin. Gua Sha tools were used. The instrument was kept at 45°, moved over the skin from cranial to caudal for 40-120 sec on the back, while patients were lying in the prone position. The mobilization with sweeping strokes followed by fanning strokes were applied over the paraspinal muscles, quadratus lumborum, thoracolumber fascia, scrolling the device on the muscle belly from the posterior fascia and sacrum (Figure 1).

During the IASTM strokes, muscle stretching exercise were also added with effort of the patient. The patient was asked to sit and stretch the muscles of the back for 10 times while leaning forward in seated position, placing hand on the chair. While alternative positions were also used for patient comfort and feasibility like seating used as an alternative position. Every session was added stretching in sitting /lying based on IASTM

application. The stretch exercises were performed lying prone; hyperextension, bridging exercise and camel exercise. The general principle for the use of this technique is six steps; examination - warm-up - IASTM - stretching - strengthening - and icing. All these sessions were performed thrice a week for 4 weeks. There were 12 sessions for each participant.

Figure: 1 Sweeping strokes paraspinal muscles

2.2. Statistical analysis

The data was collected by a blinded assessor at baseline, at 2, and 4 weeks of intervention, and then provided to the researcher. All the data was completed for the subjects having their sessions complete with follow-up (of 4 weeks) and post-intervention evaluation. The data was encoded in SPSS V.23 and tables were generated based on the data. After fulfilling the parametric assumptions including normality, homogeneity in variances, and based on continuous data for independent variables, we used one-way repeated measure ANOVA for within-the-group comparison of outcomes and an independent sample t-test for the mean differences between groups A and B, at a significance level of $P < 0.05$.

3. RESULTS

The study comprised of 20 participants in each group with mean ages of 33.17 ± 7.46 y and 33.45 ± 7.63 y respectively. While the mean BMI in group A was 24.03 ± 3.64 and B was 23.78 ± 3.57 kg/m^2 respectively. Most participants belonged to the middle class and married.

The within-group comparison shows that pain was reduced from baseline to 4th week of the intervention. Significant, but equal effects were found for disability index in both groups ($P < 0.05$). Regarding ROM, IASTM was superior over MFR for improving Lumber flexion, extension, and right-side flexion but left-side flexion effects were non-significant for both techniques. (Table 1) Across comparison showed that IASTM had improved pain, disability, and range of motion including flexion, extension, and lumber right-side flexion but no statistical differences were found for lumber flexion ($P > 0.05$) (Table 2).

4. DISCUSSION

The non-randomized trial was conducted on 40 chronic LBP patients to compare both techniques for improving pain, mobility, and functional index. Group A received Manual and Group B received IASTM. The IASTM improved pain, disability, and range of motion including flexion, extension, and lumber right-side flexion but no statistical differences were found for lumber left-side flexion ($P > 0.05$)**.** The study concluded that chronic LBP can be managed by myofascial release techniques. In the current study, IASTM had improved pain, disability, and range of motion as the dominant technique as compared to manual release. Similar to a study by Romy and colleagues that used Gua Sha tools for LBP named Gua Sha therapy, the results showed a significant reduction in neck and chronic LBP ($P < .005$).[18] More recently, a randomized controlled trial demonstrated the effectiveness of IASTM on pain and ROM for patients with chronic LBP, results demonstrate that the Graston technique based on IASTM and general exercise resulted in pain relief and increased ROM. However, the Graston group showed a significant decrease in VAS rating and ROM more than the control group. In chronic LBP, as studied by Lee et al., same method was used by Laudner and the application of pressure was on the posterior fascia, sacrum, hamstrings, and lateral hip rotators for the treatment of chronic lumbar pain.[12]

The basic aim was to establish the evidence that IASTM is an alternative maneuver that can be used for removing adhesions and restrictions that are used to inhibit the movements and as a result affect the functions of the lumber spine. The evidence states that when there is any mechanical stress on the body structure of soft tissue type like a muscle or fascia, intrafascial mechanoreceptors are stimulated. The pressure applied by strokes of the instrument changes the input signals of proprioception to the nervous system and this leads to tension in motor units of tissue where the pressure is applied. These reviews of different studies show that we can generalize the results, but we have seen that there is a limitation in studies by Markovic, Kim Launder, and claimed by Vardiamn that a single session is not effective and cannot change the range of motion.[18,19] However, the type of instruments, type of material, and application protocol used indicate that these conflicting study results may be attributed to differences in subject characteristics, material and application protocol of the IASTM instrument, and ROM measurement positions as well.[21] While we have used Gua Sha tools and used them for breaking adhesions results were quite beneficial ,[1] in that IASTM strokes are meaningful for improving pain and disability that is decreased due to these fascial

Table 2: Between-group comparison of pain, mobility and disability

Outcomes	Evaluation	Groups	N	Mean differences	P-value
Pain	Baseline	Group A	20	0.15	0.69
		Group B	20		
	2nd week	Group A	20	0.60	0.13
		Group B	20		
	4th week	Group A	20	1.75	0.00
		Group B	20		
Low back disability	Baseline	Group A	20	0.60	0.77
		Group B	20		
	2nd week	Group A	20	3.55	0.03
		Group B	20		
	4th week	Group A	20	8.65	0.00
		Group B	20		
Lumber flexion (Degrees)	Baseline	Group A	20	-1.15	0.05
		Group B	20		
	2nd week	Group A	20	-2.05	0.00
		Group B	20		
	4th week	Group A	20	-5.15	0.00
		Group B	20		
Lumber extension (Degrees)	Baseline	Group A	20	-0.70	0.32
		Group B	20		
	2nd week	Group A	20	0.70	0.32
		Group B	20		
	4th week	Group A	20	-1.25	0.03
		Group B	20		
Lumber left side flexion (Degrees)	Baseline	Group A	20	0.25	0.52
		Group B	20		
	2nd week	Group A	20	0.05	0.91
		Group B	20		
	4th week	Group A	20	-0.85	0.09
		Group B	20		
Lumber right side flexion (Degrees)	Baseline	Group A	20	0.10	0.81
		Group B	20		
	2nd week	Group A	20	-0.35	0.39
		Group B	20		
	4th week	Group A	20	-1.30	0.00
		Group B	20		

P < 0.05 considered as significant

restrictions. Soft tissue stimulation was found effective in musculoskeletal dysfunctions to facilitate the process of healing as well and weakness of muscles can be improved.[22-24] Improvement in circulation with the use of device-assisted mobilization was also stated by Portiollio in 2014 with a description of massage for musculoskeletal soft tissue involvement.[25]

In within-group comparison, the pain was reduced but for the disability index, both techniques were equally effective. This can be understood that fascial restriction should be released by any of the methods; manual or instrument-assisted. Another study has compared IASTM and kinesiotaping in patients with chronic LBP along with general exercises. Both techniques were equally effective in improving pain, disability, and functions. This study suggested that IASTM has beneficial effects that can be inducted in the clinical management of LBP.[25]

5. LIMITATIONS

The study was non-randomized and limited to a single center population which can affect the external validity of the study.

6. CONCLUSION

The study concludes that chronic low back pain, mobility, and disability index can be managed by myofascial release techniques, but better effects can be achieved using instrument-assisted soft tissue mobilization technique. Further large trials with randomization and different settings can be more beneficial for the generalization of the study findings.

7. Data availability

The numerical data generated during this research is available with the authors.

8. Acknowledgement

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9. Conflict of interest

The study utilized the hospital resources only, and no external or industry funding was involved.

10. Ethical considerations

All ethical considerations, including patients' consent, confidentiality of data, and identity of the patients enrolled, were ensured.

11. Authors' contribution

TM: Concept and design, Collection and assembly of data

AA: Analysis and interpretation of the data, Drafting of the article, Collection and assembly of data, Final approval and guarantor of the article

AM: Analysis and interpretation of the data, Critical revision of the article for important intellectual content, Statistical analysis

WM: Literature search, assembly of data, Drafting of the article:

FB: Critical revision of the article for important intellectual content: Statistical analysis

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