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Research Article

Mesotherapy for Upper Trapezius Myofascial Pain Syndrome: Lidocaine versus Lidocaine and Piroxicam

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Abstract

Introduction: This study aimed to determine and compare the efficacy of two mesotherapy protocols for improving clinical symptoms in patients with trigger points in the upper trapezius muscle.

Method: This randomized, open-label clinical trial was conducted in 2026. The 62 participants were randomly assigned to Group A and Group B (n=31 each). Clinical assessments occurred at four time points: baseline, immediately post-treatment, one-month post-treatment, and three months' post-treatment. Data were collected using a checklist covering demographic information and standardized clinical scales, specifically the Shoulder Pain and Disability Index and McGill Pain Questionnaire.

Result: The results showed that piroxicam and lidocaine reduced pain frequency to a mild level (OR 1.43), whereas lidocaine monotherapy yielded an OR of 1.0. Additionally, the combination therapy reduced pain persistence, with an OR of 2.13, compared with an OR of 1.1 for lidocaine alone. Age >47 years and female gender were also identified as predictors of pain reduction. In the piroxicam-lidocaine group, these yielded ORs of 1.89 and 1.12, respectively, compared with 1.31 and 1.0 in the lidocaine group.

Conclusion: The combination of lidocaine and piroxicam provides superior short-term pain relief and functional improvement immediately post-treatment.

Keywords: Mesotherapy, Upper Trapezius Muscle, Trigger Points, Lidocaine, Piroxicam.

Introduction

Mesotherapy is a minimally invasive technique that delivers active substances into the superficial skin layers via specialized needles [1]. This approach alters the pharmacokinetics of the injected agent, prolonging its therapeutic effects at the local site. Beyond local delivery, injection stimulates cutaneous and subcutaneous receptors, triggering endorphin release through receptor activation and intradermal neural structures. Mesodermal modulation also occurs [2,3]. Although mesotherapy has been used worldwide for decades, its precise mechanisms remain elusive, and clinical standardization is needed to minimize risks associated with invasive procedures [4].

A primary advantage of mesotherapy is its ability to achieve localized therapeutic effects without high systemic concentrations, making injury to vital anatomical structures, such as nerves or vessels, negligible [5]. Studies indicate that mesotherapy is an effective, well-tolerated treatment for acute and chronic musculoskeletal pain, including myofascial trigger point pain [5,6]. This condition is highly prevalent and typically arises from chronic poor posture or repetitive strain on a muscle group [7].

A study comparing mesotherapy and extracorporeal shock wave therapy in patients with myofascial pain syndrome found that both options effectively reduce pain and improve short- and long-term quality of life [8]. Also, the results of cervical spine mesotherapy using injectable collagen and 1% lignocaine showed that mesotherapy is a safe and promising method for chronic cervical myofascial pain syndrome. The mesotherapy drug is less effective than the drug at the 3-month follow-up after taking the drug [9].

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Given that 45% to 54% of the general population experiences neck discomfort, a significant health concern that can become debilitating and impair quality of life, identifying effective management is paramount [10]. Numerous pathologies contribute to neck pain, with the upper trapezius a common site. Effective treatment of the upper trapezius must be integrated into a comprehensive physiotherapy program to mitigate severe pain, restricted range of motion, and functional impairment [11].

Although various therapeutic modalities exist for upper trapezius muscle dysfunction, a professional consensus on the optimal approach remains lacking. Mesotherapy is one such modality; however, clinical efficacy varies by injection site and pharmacological agent, and no definitive treatment protocol exists [12,13]. Mesotherapy has demonstrated superior efficacy over systemic therapy for local pain and functional limitations related to musculoskeletal disorders, yet remains limited by study heterogeneity, particularly regarding injection agents, administration techniques, co-interventions, and treatment frequency [3]. Therefore, further randomized controlled trials are warranted. This study aimed to determine and compare the efficacy of two mesotherapy protocols for improving clinical symptoms in patients with trigger points in the upper trapezius muscle.

Methods

This randomized, open-label clinical trial was conducted in 2026. The study population comprised patients diagnosed with trigger points in the upper trapezius muscle who presented to the Physical Medicine and Rehabilitation clinic affiliated with the Isfahan University of Medical Sciences in Iran (Amin Hospital, Isfahan). Participants were recruited using census sampling over six months. We enrolled 66 eligible patients and randomly assigned them to two groups. Inclusion criteria were age >18 years, a clinical diagnosis of myofascial pain syndrome in the upper trapezius due to active trigger points (defined by Travell and Simons as pain reproduced or exacerbated by digital pressure on taut muscle bands), a Visual Analog Scale (VAS) score >5, pain duration >2 months, and failure to improve after one month of standard care. Informed consent was obtained from all participants.

Exclusion criteria included: history of cervical spine fractures or related complications, prior cervical surgery, cervical myelopathy or radiculopathy, cognitive or pain-perception disorders, known myopathy or polyneuropathy, psychiatric conditions, substance addiction, pregnancy, coagulopathy, and use of oral or intravenous opioids or corticosteroids within the previous six months. Patients requiring alternative treatment due to symptom exacerbation or those lost to follow-up were withdrawn from the study. Four patients were withdrawn from the study because of medication changes or the initiation of oral analgesics.

After ethical approval and IRCT registration, the researcher identified eligible patients at the designated clinics. The 62 participants were randomly assigned to Group A and Group B (n=31 each). Patients were placed in the prone position, and the researcher identified and marked trigger points. After sterile disinfection, mesotherapy was administered at each marked point with a sterile, disposable 27-gauge needle.

Group A (G a): In addition to routine standard care, patients received subcutaneous injections of 20 mg piroxicam (in 1 mL) combined with 1 mL of 2% lidocaine, administered over 4 sessions (twice weekly, 4 days apart, for 2 weeks). Each trigger point received 0.25 mL of piroxicam and 0.25 mL of 2% lidocaine.

Group B (G b): In addition to routine standard care, patients received subcutaneous injections of 1 mL of 2% lidocaine over 4 sessions (twice weekly, 4 days apart, for 2 weeks). Each trigger point received 0.25 mL of 2% lidocaine.

All patients were instructed to adopt healthy lifestyle modifications and to perform upper trapezius stretching exercises (3-5 repetitions per session, 3 times daily, holding each stretch for 20–30 seconds). Standard routine care consisted of shoulder elevation and retraction, each held for 20–30 seconds, performed 3-5 times per session, 3 times daily.

Participants followed the standard treatment protocol for one month and completed a daily checklist to record exercise adherence.

Clinical assessment occurred at four time points: baseline, immediately post-treatment, one-month post-treatment, and three months' post-treatment. Data were collected using a checklist covering demographic information (age, sex, BMI) and standardized clinical scales, specifically the Shoulder Pain and Disability Index (SPDI) and McGill Pain Questionnaire (SF-MPQ).

The Shoulder Pain and Disability Index (SPDI) assessed shoulder pain and functional impairment. This two-dimensional questionnaire consists of a pain subscale with five questions assessing pain intensity and a functional subscale with eight questions evaluating upper-body movement during daily tasks. Responses were rated on a 10-point scale, yielding a total score range of 0–130, where higher scores indicate greater pain and disability.

A form of the SF-MPQ has been developed. The main component of the SF-MPQ consists of 15 descriptors (11 sensory; 4 affective) which are rated on an intensity scale as 0 = none, 1 = mild, 2 = moderate, or 3 = severe. Three pain scores are derived by summing the intensity rank values of the words chosen for sensory, affective, and total descriptors. The SF-MPQ also includes the standard MPQ's Present Pain Intensity (PPI) index and a visual analog scale (VAS).

The SF-MPQ is a 15-item checklist assessing the sensory and affective dimensions of the pain experience. The 15 items are rated on a four-point pain intensity scale: 0 = none, 1 = mild, 2 = moderate, and 3 = severe.

Sum the intensity values for the corresponding descriptors to obtain the sensory (11 items), affective (4 items), and total (15 items) pain score. All 15 descriptors make a total score, ranging from 0–45, which is defined as the pain rating index (PRI). A higher SF-MPQ score indicates worse pain.

Patients rated their pain level on the PPI index: 1 = no pain, 2 = mild, 3 = discomfort, 4 = distressing, 5 = horrible, and 6 = excruciating. Patients also described whether their pain was brief, intermittent, or continuous. The SF-MPQ includes a numerical rating scale (NRS) from 0–10.

Quantitative variables were summarized for statistical analysis as mean ± standard deviation (SD), while categorical variables were analyzed using frequency distributions and percentages. Statistical computations were performed using SPSS (version 16), and a P-value < 0.05 was considered statistically significant. We used the chi-square test, t-test, and Bonferroni correction for data analysis.

This study was approved by the Ethics Committee of Isfahan University of Medical Sciences under the ethics code IR.MUI.MED.REC.1403.428 and was registered in the Iranian Registry of Clinical Trials (IRCT) under registration number IRCT20221108056446N13.

Results

A total of 62 patients of both genders were included in the study, with 31 participants assigned to each group. The demographic characteristics of the two groups are presented in Table 1. There were no significant differences in age, gender, BMI, Duration of pain, and smoking status ($P>0.05$). The patients were generally overweight.

Table 2 presents the SPDI scores across the follow-up stages. The results indicate that the mean SPDI scores in both Group A and Group B decreased significantly at each follow-up interval compared with the previous assessment ($p < 0.05$), reflecting clinical improvement in both cohorts. In addition, although no significant differences in mean SPDI scores were observed between Group A and Group B at baseline, one month, or three months' post-treatment ($p > 0.05$), the mean SPDI score in Group A was significantly lower than that in Group B immediately post-treatment ($p < 0.05$), indicating better functional outcomes in the piroxicam-lidocaine group.

Table 3 presents the SF-MPQ scores across the follow-up stages. In both groups, mean SF-MPQ scores decreased significantly over time. Pairwise comparisons with Bonferroni adjustment showed significant reductions in SF-MPQ scores at each follow-up assessment compared with the preceding assessment ($p < 0.05$). Although no significant between-group differences were observed at baseline, one month, or three months' post-treatment ($p > 0.05$), the mean SF-MPQ score was significantly lower in Group A than in Group B immediately post-treatment ($p < 0.05$), indicating greater pain reduction in the piroxicam–lidocaine group.

Table 4 presents the odds ratios (ORs) derived from the univariate and multivariate regression analyses. To maintain conciseness, only variables with a significance level of ($p < 0.05$) in the univariate analysis were included in the multivariate model. The results showed that piroxicam and lidocaine reduced pain frequency (OR 1.43), whereas lidocaine monotherapy yielded an OR of 1.0. Additionally, the combination therapy reduced pain persistence, with an OR of 2.13, compared with an OR of 1.1 for lidocaine alone. Age >47 years and female gender were also identified as predictors of pain reduction. In the piroxicam-lidocaine group.

Table 1. Demographic Characteristics of the two Groups

Variable	G a (n=31)	G b (n=31)	P value
Age, year, (mean±SD)	47.67±12.56	48.08±11.23	0.456
Sex, M/ F, (n (%))	12 (38.7)/ 19 (61.3)	14 (45.1)/ 17 (54.9)	0.687
BMI, kg/m2 , (mean±SD)	28.93±6.32	30.27±5.97	0.984
Smocking, yes, (n (%))	17 (45.1)	11 (35.48)	0.567
Duration of Pain (month), (mean±SD)	8.34±4.67	9.07±5.28	0.968
SD: Standard Deviation, n: Number, F: Female, M: Male, BMI: Body Mass Index, kg/m2: Kilogram Per Square Meter			

Table 2. SPDI of the Two Groups

Variable, (mean±SD)	G a				G b			
	Baseline	IAT	One-m	Three-m	Baseline	IAT	One-m	Three-m
	n=31	n=31	n=30	n=27	n=31	n=31	n=29	n=28
SPDI, Pain	32.70±8.32	30.11±6.45	27.17±6.72	25.29±7.91	32.21±9.43	30.21±3.13	26.79±6.32	25.13±6.91
SPDI, Disability	45.11±10.10	42.45±5.43	41.18±5.21	40.32±6	46.65±6.92	44.51±4.76	43.85±6.16	40.03±5.87
Total SPDI	77.72±6.21	72.16±5.32	68.45±5.34	65.15±6.71	78.06±5.98	74.43±4.87	69.54±6.31	65.32±5.54
P value	-	0.032	0.001	0.001	-	0.0001	0.001	0.001
P value (a,b,c)	**a : 0.001, b : 0.087, c : 0.645**							
n: number, SPDI: Shoulder Pain and Disability Index, SD: Standard Deviation, IAT: Immediately After Treatment, One-m: One Month Later Post-Treatment, Three-m: Three Months Later Post-Treatment, P value (a,b,c): a: P value between G a and G b (Immediately After Treatment), b: P value between G a and G b (One Month Later Post-Treatment), c: P value between G a and G b (Three Months Later Post-Treatment).								

Table 3. SF-MPQ of the Two Groups

Variable	G a				G b			
	Baseline	IAT	One-m	Three-m	Baseline	IAT	One-m	Three-m
	n=31	n=31	n=30	n=27	n=31	n=31	n=29	n=28
SF-MPQ								
PRI-T, IQR	7 (2,15)	5 (2,11)	4 (3,11)	4 (3,9)	7 (2,15)	5 (3,15)	5 (4,11)	4 (3,10)
NRS, IQR	7 (6,9)	6 (5,7)	4 (3,6)	3 (1,5)	7 (6,9)	6 (5,8)	4 (2,5)	3 (1,5)
Pain Quality, (mean±SD)								
PRI-S	36.21±7.32	31.54±4.21	30.92±5.61	28.25±4.72	35.78±8.92	33.72±3.88	31.63±5.57	29.09±4.31
PRI-A	12.32±2.34	10.48±3.56	9.32±1.76	7.31±1.43	13.05±3.42	10.63±3.93	8.98±3.42	7±0.82
PRI-E	3.21±1.63	2.76±0.99	2.44±0.43	2.12±0.57	3.45±1.56	3.11±1.06	2.71±0.21	2.18±0.32
PRI-M	11.32±3.76	10.27±2.22	8.92±1.54	8.31±0.48	10.43±2.77	10±1.98	9.16±1.90	8.76±1.67
PRI-T	15.76±4.76	13.77±3.82	12.38±2.33	11.25±2.21	15.5±3.88	14.41±2.76	13.21±3.71	11.78±2.91
P value	-	0.001	0.0001	0.001	-	0.001	0.001	0.001
P value (a,b,c)	a : 0.0.65, b : 0.345, c : 0.267							
Pain Description, n (%)								
Brief	3	16	13	15	3	14	11	11
Intermittent	17	8	9	6	13	8	7	7
Continuous	11	7	8	6	15	9	11	10
n: number, SF-MPQ: McGill Pain Questionnaire, IAT: Immediately After Treatment, One-m: One Month Later Post-Treatment, Three-m: Three Months Later Post-Treatment, PRI-T: Pain Rating Index-Total, NRS: Numerical rating scale, IQR: medians and interquartile range (25th and 75th percentile), PRI-S: pain rating index-sensory, PRI-A: pain rating index-affective, PRI-E: pain rating index-evaluative, PRI-M: pain rating index-miscellaneous, P value (a,b,c): a: P value between G a and G b (Immediately After Treatment), b: P value between G a and G b (One Month Later Post-Treatment), c: P value between G a and G b (Three Months Later Post-Treatment).								

Table 4. Regression multivariate

Variable	OR (95%CI)
Piroxicam+ Lidocaine	
Intermittent	1.43 (1.32-5.98)
Continuous	2.13 (1.09-3.31)
Age>47	1.89 (1.65-2.56)
Sex, Female	1.12 (1.06-2.31)
Lidocaine	
Intermittent	1.35 (1.11-2.32)
Continuous	1.10 (1.02-3.21)
Age>47	1.31 (1.06-2.13)
Sex, Female	1.15 (1.05-3.01)

Discussion

This study aimed to compare 2 mesotherapy protocols, lidocaine alone versus lidocaine combined with piroxicam, for improving clinical symptoms in patients with upper trapezius trigger points. The results indicate that immediately after a 2-week course of mesotherapy combined with routine care, the piroxicam-lidocaine combination significantly improved pain reduction and functional outcomes. However, no significant differences in outcomes were observed between the 2 groups at the 3-month follow-up. Moreover, the piroxicam-lidocaine combination showed a higher odds ratio for reducing persistent pain than lidocaine alone.

Mesotherapy is an established modality for local pain control, particularly in musculoskeletal disorders. It involves intradermal microinjections that facilitate the slow release of therapeutic agents [14]. Several studies have reported a 50% reduction in pain compared with baseline following mesotherapy for various conditions, including neck pain, low back pain, and tendonitis, often accompanied by rapid functional improvement [6,2,15]. Preclinical studies suggest that intradermal administration of anti-inflammatory agents, anesthetics, and antibiotics allows lower dosing and longer retention than intramuscular administration [16,17]. Furthermore, the mechanisms of mesotherapy may involve immune, endorphin, glial, and keratinocyte pathways, as well as mechanical stimulation from the needle, suggesting that site selection, especially when targeting trigger points, significantly affects clinical outcomes [1].

The literature on this specific topic is limited. Topal [18] (2024) studied 96 patients with post-COVID-19 musculoskeletal pain syndrome in Turkey and found that mesotherapy (lidocaine and cyanocobalamin) was more effective and better tolerated than oral therapy (diclofenac potassium, thiocolchicoside, and cyanocobalamin), which is consistent with the results of the present study.

In another Turkish study, Tseveendorj [6] (2023) followed 43 patients with knee osteoarthritis for 16 weeks and reported that mesotherapy (lidocaine, pentoxifylline, cyanocobalamin, and meloxicam) resulted in greater pain reduction than subcutaneous saline injections. Although the injected substances differed between the two studies, the results on mesotherapy's ability to reduce pain were consistent in both. Also, no complications were observed in the patients.

Furthermore, a systematic review by Paolucci [19] (2019) concluded that mesotherapy is an effective and well-tolerated treatment for both acute and chronic musculoskeletal pain, with one to five sessions.

In this study, no complications such as hematoma, ecchymosis, pain, burning, and itching were observed at the injection site.

According to studies, mesotherapy techniques can have different results depending on the number, location, and type of injected drug, but more clinical studies and trials are needed in this field [20].

Limitations of this study include the small sample size, and the study period and patient follow-up could be extended. In addition, it is suggested that different protocols be investigated.

Another important limitation is the open-label design. Blinding of patients and outcome assessors was not feasible because of the nature of the intervention, which may have introduced performance and detection bias. This limitation is particularly relevant for pain and functional outcomes, which are inherently subjective and may be influenced by participants' expectations or assessors' perceptions. Although standardized and validated assessment instruments were used, the potential influence of the lack of blinding on the observed treatment effects cannot be completely excluded.

Conclusion

This study investigated the effects of fatigue on The efficacy of mesotherapy depends on the frequency, site, and composition of the injected agents, highlighting the need for further large-scale clinical trials. Our findings suggest that routine care provides a foundational effect in treating upper trapezius pain and functional impairment, whereas adjuvant mesotherapy significantly accelerates recovery. Specifically, the combination of lidocaine and piroxicam provides superior short-term pain relief and functional improvement immediately post-treatment.

Conflict of Interest Disclosures

The authors declare no conflict of interest.

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None.

Authors' Contributions

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

Ethical Statement

The current study was approved by the Isfahan University of Medical Sciences Ethics Committee with the code of IR.MUI.MED.REC.1403.428.

Declaration of Generative AI and AI-assisted technologies

During the preparation of this work, the authors did not use Chatgpt to write the manuscript.

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