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Original Article

CYRIAX MANIPULATION VERSUS MULLIGAN's MOBILIZATION IN SUBACROMIAL PAIN SYNDROME

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ABSTRACT:

The study aimed to compare the effectiveness of chiropractic manipulation and Mulligan's mobilization in reducing pain, improving range of motion, and enhancing functional outcomes in individuals with subacromial pain syndrome. This was a randomized controlled trial (RCT) at DHQ Jhelum, CMH Jhelum, and Jhelum Sports Complex, Pakistan. A total of 62 participants with subacromial pain syndrome were randomly assigned to a chiropractic manipulation group (n = 31) or a Mulligan's mobilization with movement (MWM) group (n = 31). Both groups received their respective interventions over a set treatment period. Pain intensity (VAS), functional disability (SPADI), and shoulder range of motion (flexion, extension, abduction, internal and external rotation) were measured pre- and post-intervention. The mean age was 46.71 ± 8.30 years in the chiropractic group and 47.03 ± 7.74 years in the MWM group. Baseline VAS scores were 7.58 ± 1.12 and 7.32 ± 1.14, decreasing post-intervention to 2.45 ± 1.34 and 4.32 ± 1.33, respectively. SPADI scores improved from 63.93 ± 6.24 to 32.97 ± 6.67 in the chiropractic group and from 62.74 ± 5.62 to 42.58 ± 5.46 in the MWM group. Flexion, extension, abduction, internal rotation, and external rotation ROM all increased in both groups, with chiropractic improving from 117.42°, 38.70°, 94.21°, 37.65°, and 52.11° to 155.32°, 47.64°, 126.68°, 50.75°, and 69.13°, and MWM from 118.10°, 38.36°, 95.82°, 37.23°, and 52.74° to 145.56°, 44.91°, 118.34°, 46.12°, and 65.70°, respectively. Both chiropractic manipulation and Mulligan's mobilization with movement effectively reduced pain, improved range of motion, and enhanced function in individuals with subacromial pain syndrome. Chiropractic manipulation consistently produced superior outcomes across all parameters, likely due to combined biomechanical and neuro-physiological effects.

Keywords: Chiropractic manipulation, Manual therapy, Mulligan's mobilization with movement, Range of motion, SPADI, Subacromial pain syndrome, Shoulder pain, VAS.

INTRODUCTION

The subacromial pain syndrome (SAPS) is a common musculoskeletal condition, characterized by shoulder pain and functional limitations. It is basically brought on by irritation or mechanical compression of the biceps tendon, subacromial bursa, or rotator cuff ligaments inside the subacromial space (1). Individuals who perform monotonous overhead tasks, such as competitors and manual laborers, as well as those who have postural variations from the norm or age-related degenerative changes, are frequently influenced by this condition. The clinical presentation regularly incorporates localized pain within the anterolateral shoulder, exacerbated by arm elevation or abduction, together with a characteristic excruciating circular segment between 60 and 120 degrees (2). Night pain and weakness during functional movements are also common complaints, essentially affecting day by day activities and quality of life. Subacromial pain syndrome patients don't have a recognized diagnostic criteria or wording (SAPS)(3). The etiology of SAPS involves both intrinsic and extrinsic factors that contribute to the narrowing of the subacromial space and subsequent tissue irritation (4). Intrinsic factors include rotator cuff tendinopathy, degenerative changes in the tendon structure, and reduced vascular supply to the supraspinatus tendon, particularly in the critical zone of hypovascularity (5). Extrinsic factors encompass structural variations such as a hooked or curved acromion, osteophyte formation, and thickening of the coracoacromial ligament, all of which may mechanically impinge on the underlying soft tissues (6). Additionally, dynamic factors like scapular dyskinesis, characterized by altered scapulohumeral rhythm, and muscle imbalances around the shoulder girdle further exacerbate subacromial compression (7). Considering the global prevalence of SAPS, Adam Witten et al conducted a study in 2025 from Denmark and found that 29% had conflicting diagnoses, most often frozen shoulder, while 71% were diagnosed with SAPS. Among those with SAPS, 42% had at least one concomitant diagnosis and 13% had multiple, with acromioclavicular osteoarthritis and full-thickness rotator cuff tears being most common (8). Considering the

prevalence of shoulder pain among overhead-throwing athletes in Pakistan, Kabeer Afsar et al conducted a study in 2022 and found that 36.7% reported mild pain, 12% reported moderate pain, and 2% of participants reported severe pain (9). In differentiate, Mulligans MWM utilizes maintained adornment floats combined with dynamic active development to rectify positional deficiencies and reestablish pain-free function (10). Chiropractic manipulation for SAPS is grounded in the principle that spinal and extremity joint dysfunctions contribute to aberrant shoulder kinematics and increased subacromial loading. By applying focused HVLA thrusts to the cervicothoracic spine, ribs, or glenohumeral joint, clinicians look for to reestablish normal joint play and reduce mechanical strain on the rotator cuff ligaments (11). The immediate effects of manipulation are thought to stem from neurophysiological mechanisms, including the stimulation of joint mechanoreceptors, which modulate pain perception at the spinal cord level, and the reflexive inhibition of hypertonic muscles surrounding the shoulder (12). Moreover, manipulation may improve proprioceptive input, leading to enhanced motor control and scapular stability during arm movements (13). The previous depends on passive, clinician-delivered thrusts, whereas the last mentioned incorporates active patient movement, which may enhance engagement and motor learning. Both techniques, however, share the common objective of decreasing pain and improving function through biomechanical and neurophysiological mechanisms (14). Subacromial pain syndrome (SAPS) is a prevalent cause of shoulder pain and functional limitation, often managed with manual therapy. Chiropractic manipulation and Mulligan's mobilization are widely used techniques, but direct comparative evidence in SAPS is scarce. Evaluating their relative effectiveness can help determine the most efficient approach for pain reduction and mobility restoration. This study's findings can guide clinicians in making evidence-based choices to optimize outcomes in SAPS management. The objective of this study is to compare the effectiveness of chiropractic manipulation and Mulligan's mobilization in reducing pain, improving range of motion, and enhancing functional outcomes in individuals with subacromial pain syndrome.

METHODS

This randomized controlled trial was conducted in various hospitals, sports complexes and clinics in Jhelum, Pakistan, over a period of six weeks, beginning from the approval date of the research proposal. The study aimed to assess the effectiveness of the comparison between Cyriax manipulation with Mulligan's mobilization in patients with subacromial pain syndrome. The sample consisted of 62 participants, including both male and female patients aged between 35 to 65 years, all of whom were suffering from shoulder impingement syndrome. The sample was selected using non-probability convenience sampling from the sports complex and participating hospitals. The inclusion criteria required participants to have a confirmed history of subacromial pain syndrome, BMI of 18.5 to 24.9 kg/m², shoulder pain >3 months, a minimum of two of four positive tests (Painful arc, Hawkins impingement test, Neer's sign, Yocum test), and minimal to no limitation of passive shoulder range of motion. Glenohumeral instability, full rotator cuff tear, rheumatoid arthritis or osteoarthritis, bilateral shoulder pain, a history of shoulder surgery (i.e., rotator cuff repair, total shoulder replacement, and arthroscopy in the last 4 months), alcohol or substance abuse, subjects with a history of shoulder corticosteroid injections, and patients with systemic pathologies that might interfere with the application of interventions (e.g., heart problems that would prevent assuming a prone position required for Maitland mobilization) were excluded.

After taking consent, participants were selected based on the inclusion criteria. Participants were then randomly divided into two groups. Group A was given Cyriax manipulation with exercises and group B was given Mulligan's mobilization with same baseline exercise. Treatment was given for 6 weeks 2 sessions/ week. The study was single-blinded. The assessor was unaware of the treatment given to both groups. For routine physical therapy, application of cold packs for 10–15 minutes covering the shoulder area, along with soft tissue mobilization around the shoulder joint for 5–7 minutes, was performed. General stretches of biceps, triceps, rhomboids, and scapular muscles, held for 7–10 seconds with 5 repetitions, along with range of motion exercises (shoulder elevation and depression, scapular protraction and retraction, shoulder internal rotation and external rotation, shoulder abduction and adduction, shoulder flexion and extension), 8–10 repetitions were performed. After every exercise, there was a 10–20 seconds rest interval. A home plan of ROM and stretching exercises was advised for off-session days: 8–10 repetitions with 1 set, twice daily.

Strengthening exercises including wall push-ups, prone push-ups, punch exercises, and punch exercises with dumbbells in supine were also added to the above routine physical therapy exercises. Participants in Group A received Cyriax manipulation with the same baseline exercise program. Participants were advised to rest for a minimum of 10 minutes, after which routine physical therapy was performed. After routine physical therapy along

with strengthening exercises, Cyriax manipulation was given. For that, participants were allowed to sit on a chair with back supported, then participants were instructed to flex their elbow and bring their hand to the neck such that the web of the hand surrounds the neck posteriorly. High velocity, low intensity (HVLA) manipulation was given by the therapist; as a result, a popping sound was heard. Pain assessment through Shoulder Pain And Disability Index (SPADI) was measured. ROM of participants was also measured before starting the above plan. The second assessment was conducted at the end of the study.

Participants in Group B received Mulligan's posterolateral glide with the same baseline exercise program. Participants were advised to rest for a minimum of 10 minutes, after which routine physical therapy was performed. After routine physical therapy along with strengthening exercises, Mulligan's posterolateral glide was given. For posterolateral glide, participants were in sitting position with back straight and supported by a chair. The therapist stood on the contralateral side, stabilizing the scapula with one hand and translating the humeral head posteriorly and laterally from the other hand along the plane of the glenoid fossa. While the glide was sustained, participants actively elevated the arm through the plane of abduction. Three sets with 10 repetitions were performed. Pain assessment through SPADI was measured. ROM of participants was also measured before starting the above plan. The second assessment was conducted at the end of the study.

STATISTICAL ANALYSES

The data were entered and analyzed using SPSS Version 26. The numerical data were presented as mean ± SD. Categorical data were presented in the form of frequency (percentage) and tested for normality using the Shapiro–Wilk method. Since the data were non-normal, non-parametric tests, the Mann–Whitney U test and the Wilcoxon test, were used for between-group and within-group comparisons; a p-value < 0.05 was considered significant.

RESULTS

The mean age was 46.71 ± 8.30 years in the chiropractic group and 47.03 ± 7.74 years in the MWM group. Baseline VAS scores were 7.58 ± 1.12 and 7.32 ± 1.14, decreasing post-intervention to 2.45 ± 1.34 and 4.32 ± 1.33, respectively. SPADI scores improved from 63.93 ± 6.24 to 32.97 ± 6.67 in the chiropractic group and from 62.74 ± 5.62 to 42.58 ± 5.46 in the MWM group. Flexion, extension, abduction, internal rotation, and external rotation ROM all increased in both groups, with chiropractic improving from 117.42°, 38.70°, 94.21°, 37.65°, and 52.11° to 155.32°, 47.64°, 126.68°, 50.75°, and 69.13°, and MWM from 118.10°, 38.36°, 95.82°, 37.23°, and 52.74° to 145.56°, 44.91°, 118.34°, 46.12°, and 65.70°, respectively.

Table 1. Descriptive statistics of VAS score pre-treatment of subjects

VAS score pre treatment	
Group	**Mean ± SD**
Chiropractic group	7.58 ± 1.12
MWM group	7.32 ± 1.14

Table 2. Descriptive statistics of VAS score post-treatment of subjects

VAS score post treatment	
Group	**Mean ± SD**
Chiropractic group	2.45 ± 1.34
MWM group	4.32 ± 1.33

Table 3. Descriptive statistics of SPADI score pre-treatment of subjects

SPADI score pre treatment	
Group	**Mean ± SD**
Chiropractic group	63.93 ± 6.24
MWM group	62.74 ± 5.62

Table 4. Descriptive statistics of SPADI score post treatment of subjects

SPADI score post treatment	
Group	**Mean ± SD**
Chiropractic group	32.97 ± 6.67
MWM group	42.58 ± 5.46

Before treatment, VAS scores were similar between the chiropractic group (7.58 ± 1.12) and the MWM group (7.32 ± 1.14), indicating comparable baseline pain intensity in both groups (Table 1, Figure 1).

After treatment, VAS scores were lower in the chiropractic group (2.45 ± 1.34) compared to the MWM group (4.32 ± 1.33), indicating that chiropractic intervention led to a greater reduction in pain intensity (Table 2, Figure 2). Before treatment, SPADI scores were similar between the chiropractic group (63.93 ± 6.24) and the MWM group (62.74 ± 5.62), indicating no meaningful difference in baseline shoulder pain and disability between the two groups (Table 3, Figure 3).After treatment, the SPADI score was lower in the chiropractic group (32.97 ± 6.67) compared to the MWM group (42.58 ± 5.46), indicating that chiropractic intervention resulted in a greater reduction in shoulder pain and disability (Table 4, Figure 4).

Figure 1. Chart showing VAS pre-treatment score of subjects

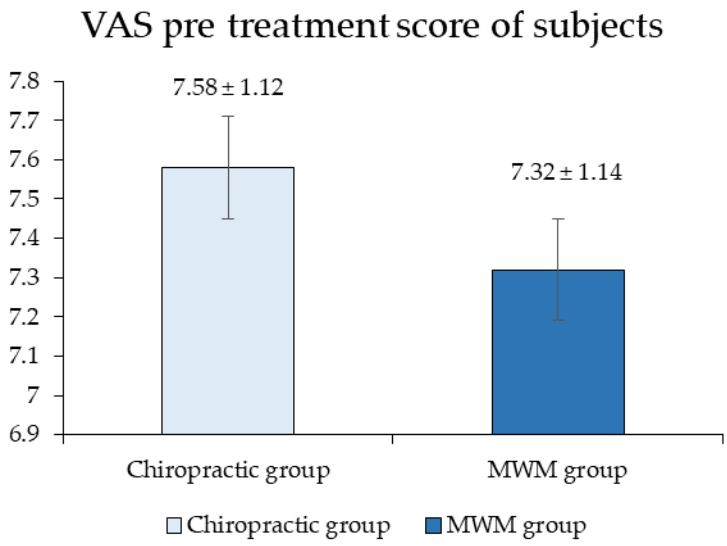


Figure.2 Chart showing VAS post-treatment score of subjects

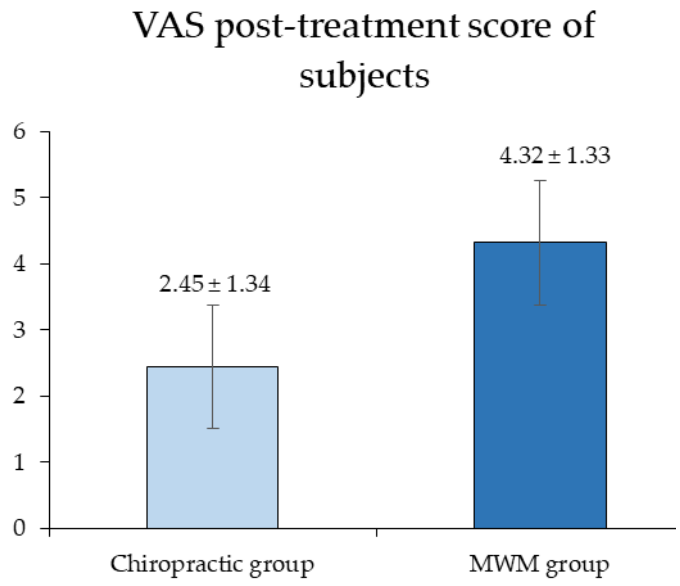


Figure 3. Chart showing SPADI pre-treatment score of subjects

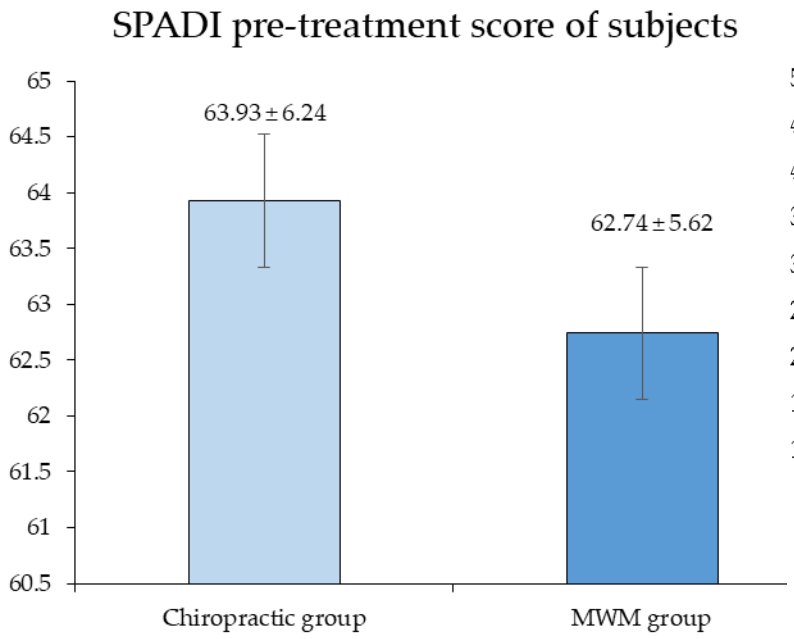
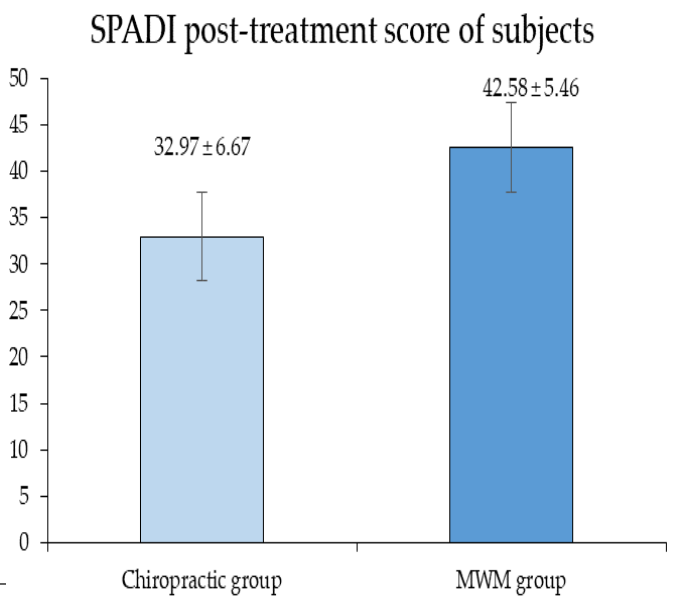


Figure 4. Chart showing SPADI post treatment of subjects



Based on the Shapiro-Wilk test, SPADI score, Abduction ROM, and External Rotation ROM showed normal distribution ($p > 0.05$), so parametric tests such as t-tests are appropriate. In contrast, VAS score, Flexion ROM, Extension ROM, and Internal Rotation ROM were not normally distributed ($p < 0.05$), hence non-parametric alternatives such as Mann–Whitney U test and Wilcoxon signed-rank test should be used for their analysis (Table 5).

At baseline, there was no significant difference in SPADI scores between the chiropractic and MWM groups ($p = 0.432$), indicating comparable levels of shoulder disability before treatment. After the intervention, however, a highly significant difference was found ($p < 0.01$), with the MWM group demonstrating a higher post-intervention mean score than the chiropractic group. This suggests that the MWM intervention was more effective in improving functional outcomes (SPADI scores) compared to chiropractic treatment (Table 6).

Table.5 Test for Normality

Tests of Normality		
	Group of subjects	Shapiro-Wilk
		Sig.
VAS score at baseline	MWM group	<0.001
SPADI score at baseline	MWM group	0.146
Flexion ROM at baseline	MWM group	0.050
Extension ROM at baseline	MWM group	0.026
Abduction ROM at baseline	MWM group	0.251
Internal Rotation ROM at baseline	MWM group	0.027
External rotation ROM at baseline	MWM group	0.068

*. This is a lower bound of the true significance.

a. Lilliefors Significance Correction

Table 6. Independent T-test of Pre- and Post-Intervention SPADI Scores Between Chiropractic and MWM Groups

Group Statistics					
	Group of subjects	**n**	**Mean**	**SD**	***P* value**
SPADI score at baseline	chiropractic group	31	63.9355	6.24465	0.432
	MWM group	31	62.7419	5.61526	
SPADI score after intervention	chiropractic group	31	32.9677	6.67075	<0.01
	MWM group	31	42.5806	5.45756	

Table 7. Wilcoxon test of Pre- and Post-Intervention VAS score Between Chiropractic and MWM Groups

Descriptive Statistics				
	VAS score at baseline	VAS score after intervention	Z	*P* value
Chiropractic group	7.58 ± 1.12	2.45 ± 1.34	-4.941	<0.01
MWM group	7.32 ± 1.14	4.32 ± 1.32		

The descriptive statistics reveal that the Chiropractic group showed a significant reduction in VAS scores, decreasing from 7.58 ± 1.12 at baseline to 2.45 ± 1.34 after the intervention, with a Z-value of -4.941 and a p-value less than 0.01, indicating a statistically significant decrease in pain. The MWM group also demonstrated a decrease in VAS scores from 7.32 ± 1.14 to 4.32 ± 1.32, but no statistical test results are provided here to confirm the significance of this change. Overall, the Chiropractic group experienced a more pronounced and statistically confirmed reduction in pain compared to the MWM group (Table 7).

Table.8 Paired *t*-test of Pre- and Post-Intervention SPADI score Between Chiropractic and MWM Groups

Paired Samples Statistics				
	Mean	n	Std. Deviation	*P* value
SPADI score at baseline	63.3387	62	5.92008	<0.01
SPADI score after intervention	37.7742	62	7.74685	

The paired samples statistics show a significant reduction in SPADI scores from baseline (Mean = 63.34) to after intervention (Mean = 37.77), with $p < 0.01$. This indicates that, overall, the intervention led to a statistically significant improvement in shoulder function and disability levels across the participants (Table 8).

DISCUSSION

The current study shows that both chiropractic manipulation and Mulligan's mobilization with movement (MWM) can reduce pain, increase shoulder range of motion (ROM), and improve functional outcomes in people with subacromial pain syndrome (SAPS). However, chiropractic manipulation presented greater improvements across all measures including pain intensity, functional disability, and active ROM. This study's findings corroborate literature demonstrating the clinical benefit of spinal manipulation for the treatment of SAPS and adds new evidence as it directly compared spinal manipulation and MWM. The better results in the chiropractic manipulation group are also comparable to previous reports that highlighted the positive outcomes of HVLA (high-velocity low-amplitude). Haider et al. (2018) and Bukhari et al. (2023) have reported that the addition of thoracic spinal manipulation added to exercise therapy resulted in greater pain and disability reductions and greater gains in ROM, especially abduction and internal rotation, than exercise therapy alone (15, 16). The trend of our study appeared consistent and the most significant difference in flexion, abduction, and rotational movements took place with chiropractic adjustment. These improvements can be explained by the mechanical restoration of optimal arthrokinematics, decreasing periarticular soft tissue tone/problematic tension, and better-than-usual neuromuscular activation patterns; all proposed physiological effects of HVLA manipulation. Our findings are also consistent with Dunning et al.'s (2020) study which found cervicothoracic thrust manipulations with electrical dry needling had statistically significantly greater improvements in pain, disability, and even medication reduction when compared to nonthrust mobilization and exercise (17). This reinforces the notion that HVLA techniques may possess a greater hypoalgesic effect, possibly via a neurophysiological mechanism including modulation of nociceptive input, decreased central sensitization, and recruitment of descending inhibition. These likely interact with the biomechanical correction to generate clinically meaningful effects. In a similar study, Grimes et al. (2019) found that Thoracic spine thrust manipulation (TSTM) had a successful effect on pain, function, scapular upward rotation, pectoralis minor length, scapulothoracic force, and thoracic spine range of motion (particularly flexion, extension, and bilateral rotation) (18). These results corroborate the findings of the present study, which concluded that chiropractic thrust mobilization substantially enhances pain reduction, decreases disability, and improves shoulder range of motion. The ROM improvements seen in our chiropractic group were more substantial and more widespread than those reported by Silva et al. (2019), who found only abduction exceeded the minimal detectable change after thoracic spinal manipulation (19). This discrepancy could be attributed to differences in treatment dosage, patient characteristics, or methods. Perhaps our process led to a repeated experience of HVLA manipulation and MWM that was combined with progressive mobilization to produce a greater carryover effect on shoulder kinematics and functional performance. Finally, the current results should be considered in the context of planning rehabilitation protocols for SAPS. While both chiropractic manipulation and MWM were found to be effective, given the larger effect of chiropractic manipulation the results may suggest more justification for use in

clinical practice, particularly in patients with significantly restricted ROM or presenting with higher levels of baseline pain. MWM is still a great option and is especially useful when manipulation is contraindicated, or when a patient prefers a more progressive lower-velocity mobilization. All in all, this study supports the clinical utility of chiropractic HVLA manipulation as a very effective intervention in patients with SAPS and adds comparative evidence that it may provide greater benefit than MWM for pain relief, functional improvement, and restoration of ROM. These findings support the vast body of literature on manipulation and reconcile differences in the literature by demonstrating that differences between types of manual therapy, such as HVLA manipulation and MWM, can be substantial if compared directly.

CONCLUSION

Both chiropractic manipulation and Mulligan's mobilization with movement effectively reduced pain, improved range of motion, and enhanced function in individuals with subacromial pain syndrome. Chiropractic manipulation consistently produced superior outcomes across all parameters, likely due to combined biomechanical and neurophysiological effects. Further studies are needed to confirm long-term benefits and optimize patient selection.

Conflict of Interest

Authors declare no conflict of interest.

Ethical consideration

The study was approved by local research ethics committee.

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