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# Comparison of Spinal Manipulation and Sustained Natural Apophyseal Glide in Patients with Mechanical Thoracic Back Pain

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## ABSTRACT

***Objective***: To compare the outcome and comparative efficacy of spinal manipulation and Mulligan sustained natural apophyseal glides in patients with mechanical upper back pain.
***Study Design*:** Quasi-experimental study.
***Place and Duration of Study*:** Riphah International University, Lahore Pakistan, from June to Dec 2020.
***Methodology*:** A sample of 26 patients with upper back pain was included. Subjects were distributed in two Groups: Group-A got spinal manipulation along with central sustained natural apophyseal glides treatment, and Group-B was treated with Mulligan-based central sustained natural apophyseal glides treatment. Faces pain scale, MODI questionnaire, and goniometer were used as data collecting tools. Pre-treatment and post-treatment values after 12 treatment sessions measured.
***Results*:** Pain decreased to a greater extent in the treatment of the Spinal Manipulation-Group with a mean value 1.85±1.28 as compared to 5.08±1.04 to Group-B (The *p*-value was <0.001). Oswestry disability index score decreased to a greater extent in post-treatment of Spinal Manipulation Group with a mean value of 16.85±3.16 as compared to Group-B, with a mean difference of 39.62±8.63 (The *p*-value was <0.001).
***Conclusion***: The study results were statistically significant. Both spinal manipulation and central Mulligan central sustained natural apophyseal glides are well-accepted methods of treatment for subjects with upper back pain.

**Keywords**: Mechanical pain, Manipulation, Range of motion, Thoracic.

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## INTRODUCTION

In contrast to the cervical and lumber spine, the thoracic spine needs to gain more surveillance. However, the pain perceived in the thoracic spine can be evenly disabling and striking the same load on a person's community and employment.[1] Pain is located in the upper back area across the posterior aspect of the chest.[2]

Recent studies indicated a narrow population of extremely susceptible workers, with a 7% to 38% rate. It has been estimated that the incidence of TSP is likely low in adolescents and middle-aged men and rising with age.[3] Studies have highlighted how much TSP influences the fitness reputation and bodily capacities of an enormous segment of our populace. TSP in men was related to age, recurrent bending, absence of recovery period, and driving automobiles.[4] Another commonly going furnish of UBP is myofascial discomfort syndrome; the most affected muscular tissues are the trapezius, supraspinatus, and rhomboid. Spinal deformities (scoliosis, kyphosis), thoracic spondylosis, stenosis, disc herniation. Osteoporosis is the only reason that can cause mechanical UBP.[5] Clinically, movement dysfunction in one location may also underlie a primary criticism of symptoms in another, such as shoulder pain secondary to a mechanical restriction in the thoracic spine where thoracic extension is required for full shoulder elevation.[6]

Diverse interventions were used, including mobility exercises, muscle energy techniques of the erector spine, stretching of paravertebral muscles, and thoracic and ribs mobilization and manipulation. Para scapular muscle strengthening includes thoracic extension, wall angle, side bending, rotation mid-trap exercises, scapula squeezes, etc. Active Trigger point release may have been favorable in decreasing pain and improving ADLS.[7,8]

Because of the demonstrated influence of each Spinal Manipulation and Mulligan mobilization in musculoskeletal system dysfunction, limited data indicates the application of spinal manipulation on the thoracic spine as opposed to Placebo or no therapy in

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alleviating mechanical upper back pain. TSP and the comparative effectiveness of spinal manipulation and mulligan-based Central SNAG are still unclear, and more research is needed to shed light on various issues. This research showed how spinal manipulation (SM) and Mulligan-mobilization-based central SNAG affected MUBP.

## METHODOLOGY

The quasi-experimental study was conducted at the Riphah International University, Lahore Pakistan, from June 2020 to December 2020, after approval from the Institutional Review Board and the Ethics Committee (IDRECLRCRS/20/1060). Sample size was calculated using WHO calculator.[9]

**Inclusion Criteria**: Patients aged 20 to 50 years, of either gender, with complaints of non-traumatic posterior thoracic pain of an insidious onset in the region of the fourth to seventh thoracic vertebral levels, pain aggravated with active thoracic movements were included.

**Exclusion Criteria**: Patients with symptoms originating from the cervical spine, patients with a history of systemic or autoimmune disease affecting the musculoskeletal system, positive radicular signs, myelopathy, or previous surgery to the thoracic spine and contraindicated to manipulation were excluded.

Patients were divided into two Groups (Group-A: spinal manipulation and Group-B: Central SNAG) (Figure). The researchers completed the thorough case history, full physical examination, and thoracic regional assessment. The physical therapist completed the assessment after obtaining consent from the patient. Outcome measures were a face pain scale (FPS) to measure pain intensity, a goniometer to range of motion for mobility, and a back pain, and disability index (MODI) for functional status.

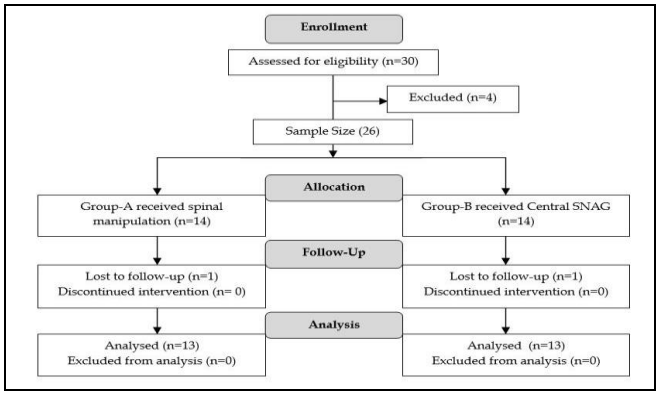


**Figure: Patient Flow Diagram (n=26)**

In Group A, patients received thoracic manipulative therapy, which included one non-thrust mobilization and two different thrust manipulation techniques directed at the thoracic spine level between T4 to T7 and along with central SNAG applied between T4 to T7 at the suspected spinous process.[10] In Group-B, Central SNAG was applied in the cephalad direction to the suspected spinous process between the level of T4 to T7 with an ulnar border of the physiotherapist's hand assisting the movement combined with the restricted and/or painful physiological active patient's movement (rotation, flexion, extension, side bending) in a pain-free manner and the glide sustained in corrected position for several second. Then, it released the patient, who reported no pain during the procedure. This procedure was repeated three times.[11,12] Each patient's first assessment was done before the first treatment session and terminal assessment after the 12-treatment session. Patients were treated for 4 weeks with three sessions per week. Patients were followed for another week for any change in signs and symptoms.

Statistical Package for Social Sciences (SPSS) version 25.0 was used for the data analysis. Quantitative variables with normal distribution were expressed as Mean±SD and qualitative variables were expressed as frequency and percentages. Independent sample t-test was applied to explore the inferential statistics. The *p*-value lower than or up to 0.05 was considered as significant.

## RESULTS

Out of 30 subjects who met the inclusion criteria, 28 were selected. Twenty-eight subjects were distributed into two treatment Groups (Group-A: spinal manipulation; Group-B Central SNAG). One patient from each Group dropped out due to a loss of follow-up. Participants in spinal manipulation were presented with a mean age of 36.38±8.4 years and in the Central SNAG Group with 37.46±9.79 years. Participants in the spinal manipulation Group were presented with a mean BMI of 26.35± 3.9 kg/m2, and in the Central SNAG Group with 25.8±4.57 kg/m2. After the analysis, it was observed that there was a significant reduction of pain and disability in comparison between Groups A and B, as shown in Table-I. Pre-treatment mean of Group-A was 7.38±1.26, 56.85±9.27 and in Group-B was 7.54±1.45, 53.54±8.14 which were reduced to 1.85±1.28, 16.85±3.15 and 5.08±1.04 in post-treatment values of FES and MODI respectively. The *p*-value was <0.001. Significant

improvements in thoracic ranges of motion are described in Table-II. In contrast to central SNAG, IT found that with spinal manipulation and central SNAG, the range of motion increased and improved over time.

**Table-I: Comparison of Faces Pain Scale (FPS) and Modified Oswestry Disability Index (n=26)**

| | | Treatment Groups | | *p*-value |
|---|---|---|---|---|
| | | Group-A (n=13) | Group-B (n=13) | |
| Faces Pain Scale | Pre-treatment (Means) | 7.38±1.26 | 7.54±1.45 | 0.78 |
| Faces Pain Scale | Post-treatment (Means) | 1.85±1.28 | 5.08±1.04 | <0.001 |
| Modified Disability Index | Pre-treatment (Means) | 56.85±9.27 | 53.54±8.14 | 0.34 |
| Modified Disability Index | Post-treatment (Means) | 16.85±3.16 | 39.62±8.63 | <0.001 |

*MODI=Modified oswestry disability index) Fps (faces pain scale) SNAG=sustained natural apophyseal glides*

therapy seems to be a productive way to treat patients with thoracic spine pain.[13] Randol *et al*. results regarding the pain concern were the same.[14] Considerable reduction in mean (SM 16.85±3.16 and CSNAG 39.62±8.63) and the *p*-value <0.005 of MODI score in spinal manipulation unfold that Current biomechanical and neurophysiological models predominantly explained SMT clinical effects by the stimulation of spinal reflexes resulting among others, in a hypoalgesia's effect an increased in spinal mobility and an increase in maximal voluntary Contraction and proprioception. Pagé *et al*. found no significant between-Group differences in disability across the four sessions (F3, 71 =0.43, *p*=0.73). However, it did confirm that the control Group had higher pain intensity at baseline than the spinal manipulation Group (F3, 71 =3.61, *p*=0.02, =0.13). There were significant variations in pain intensity and impairment between sessions: F3, 213 = 18.92, *p*< 0.001, =0.21 and F3, 71 = 0.43, *p*= 0.73, respectively statistics reported the existence of a gradual improvement across sessions.[15]

**Table-II: Comparison of Thoracic Ranges of Motion (n=26)**

| | | Treatment Groups | | *p*-value |
|---|---|---|---|---|
| | | Group A (n=13) | Group B (n=13) | |
| Thoracic Flexion | Pre-treatment (Means) | 21.38±5.96 | 21.08±5.09 | 0.88 |
| | Post-treatment (Means) | 31.38±3.73 | 25.92±3.48 | <0.001 |
| Thoracic Extension | Pre-treatment (Means) | 11.38±3.28 | 11.15±3.36 | 0.861 |
| | Post-treatment (Means) | 21.85±3.26 | 16.54±3.95 | <0.001 |
| Thoracic Right Rotation | Pre-treatment (Means) | 17.38±5.38 | 16.77±4.73 | 0.76 |
| | Post-treatment (Means) | 32.62±2.73 | 23.5±3.8 | <0.001 |
| Thoracic Left Rotation | Pre-treatment (Means) | 18.46±4.74 | 16.92±4.8 | 0.42 |
| | Post-treatment (Means) | 32.69±2.59 | 24.62±3.20 | <0.001 |
| Thoracic Right Lateral Flexion | Pre-treatment (Means) | 4.85±0.9 | 4.85±1.1 | 1.00 |
| | Post-treatment (Means) | 10.54±1.33 | 7.62±1.4 | <0.001 |
| Thoracic Left Lateral Flexion | Pre-treatment (Means) | 4.92±0.9 | 4.85±1.1 | 0.84 |
| | Post-treatment (Means) | 10.54±1.33 | 7.46±1.4 | <0.001 |

## DISCUSSION

In the current study, there was a statistically significant difference in the results of FPS between-Group analyses. Pain decreased significantly in the spinal manipulation Group post-treatment compared to the central SNAG Group. According to Lehtola *et al*. the measurement was taken one week after the previous treatment; the VAS-information form averages Manipulation 2.0(1.0–3.1), acupuncture 2.5(1.0–3.1). For the control, the scores were 1.4–3.4 and 2.9(2.1–3.7). Regarding comparison, The *p*-value for the manipulations against the control was 0.01. This number was statistically significant, and the results were in. According to that assessment, manipulative

In 2017, Roenz *et al*. did a systematic review and meta-analysis. That review showed that mobilization, when done in the same way as in real-life clinical practice, could be just as effective as manipulation. Many studies included in the review explained TSM as part of a neck and back pain treatment regimen. These studies showed consequential short-term recovery in pain and disability.[16] It is considered that TSM is the efficacious treatment regime in regions of the body adjacent to the thoracic spine, such as the neck and shoulder, due to a concept known as regional interdependence. The anatomy and biomechanics of the lumbar and cervical spines are very similar to that of the thoracic spine in that, amongst different things, the thoracic vertebrae are highly fine with the

beneficial aid of way of the ability of ribs. However, our effects suggest that these anatomical versions have not now made any significant distinction to clinical results after manual therapy is applied. Flexion Angle increased to a greater extent in post-treatment of spinal manipulation Group 31.38±3.73, 25.92±3.48 compared to 25.92±3.48 Central SNAG Group. Fiaad *et al*. supported these findings *at al*. A significant increase was in lumbar flexion ROM in favor of spinal manipulations 44.47±4.05 (41.94%)in contrast to 40.27±3.24 (25.06%).[17] Our study showed the efficacy of thoracic spinal manipulation and central SNAG against central SNAG, which improved the thoracic range of motion. Furthermore, in the end, the patient efficiently performed all the activities. Thoracic lateral flexion Angle increased considerably in the treatment spinal manipulation Group compared to the Central SNAG Group, which concluded that there was dissimilarity between the two Groups. These objective measurements were supported by one RCT conducted in 2004 about thoracic mechanical pain, which showed impressive upgradation in the spinal manipulation Group with more clinical benefits than Placebo. There was no significant difference at the one-month follow-up appointment ($p$=0.025) between the two Groups.[18] Minimal data is available, which proves that TSM is effective in the areas of the thoracic spine and treats upper back pain. However, the current study showed statistically as well as clinically significant results in terms of FPS and MODI score and thoracic range of motion in all directions. Both spinal manipulation and Mulligan-based central SNAG mobilization are skillfully acquired and recognized methods of treatment of subjects with mechanical thoracic back pain. The present study indicated that a combination of spinal manipulation and mulligan-based central SNAG mobilization was helpful in pain relief, upgrading the extent of motion, strength, and functional status in subjects with thoracic mechanical pain.

## CONCLUSION

The results of this study concluded that thoracic Spinal manipulation is a more effective technique to improve pain, ROM, and function in thoracic mechanical back pain. The central SNAG technique is also effective, but results showed significant effects of spinal manipulation.

**Conflict of Interest:** None.

**Authors' Contribution**

Following authors have made substantial contributions to the manuscript as under:

NUA & NA: Data acquisition, data analysis, data, critical review, approval of the final version to be published.

ST & HS: Study design, data interpretation, drafting the manuscript, critical review, approval of the final version to be published.

TA & SS: Conception, data acquisition, drafting the manuscript, approval of the final version to be published.

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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