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RESEARCH ARTICLE

Evaluation of Scapular Taping in Enhancing Shoulder Function in Shoulder Injury

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ABSTRACT

Background and Objective: Subacromial Impingement Syndrome (SIS) is a common cause of shoulder pain and is often linked to scapular dysfunction. This study aimed to compare the efficacy of conventional shoulder exercises with laser therapy, scapular taping with laser therapy, and scapular stabilization exercises with laser therapy in treating SIS. **Methods:** A randomized controlled trial was conducted in outpatient clinics in Bangalore over six months. Forty-five subjects (aged 25-40 years) with Stage II SIS were randomly assigned to three groups: Group A (conventional exercises + laser therapy), Group B (scapular taping + laser therapy), and Group C (scapular stabilization exercises + laser therapy). Outcome measures included the Shoulder Pain and Disability Index (SPADI) and McGill Pain Questionnaire. Pre and post-intervention assessments were performed using the appropriate statistical tests. **Findings:** All groups showed significant improvements in the SPADI scores and pain levels ($p < 0.001$). Group C, who received scapular stabilization exercises, demonstrated the greatest reduction in pain and disability, with a post-test SPADI score of 23.00 ± 4.99 ($p < 0.001$). Group B (scapular taping) and Group A (conventional exercises) also showed significant improvements, but to a lesser degree. **Novelty:** This study compared scapular taping and stabilization exercises combined with laser therapy for SIS, offering valuable insights into their relative efficacy. **Conclusion:** Scapular stabilization exercises with laser therapy were more effective than scapular taping and conventional exercises in reducing pain and improving shoulder function in SIS patients. Individualized treatment approaches are recommended for optimal outcomes.

Keywords: Subacromial Impingement Syndrome; Scapular Taping; Scapular Stabilization; Laser Therapy

1 INTRODUCTION

Subacromial Impingement Syndrome (SIS) is a prevalent condition characterized by painful compression of the soft tissues in the shoulder joint, often leading to significant discomfort and functional limitations. Studies show that SIS accounts for 45-65% of shoulder pain syndromes in clinical settings.[1] In a study of the North Indian population, the most common acromion shape was found to be curved (53.34%), which is associated with a higher risk of SIS.[2] Another study on the Eastern Indian population reported significant variations in scapular morphology, which can influence the likelihood of developing SIS.[3] The management of SIS can be approached using various methods, including conservative treatments, surgical interventions, and alternative therapies. SAIS results from the narrowing of the subacromial space, which can be due to: Extrinsic factors like anatomical variations of the acromion.[1] Intrinsic factors such as muscle imbalances, including tightness in the pectoralis muscles and weakness in scapular stabilizers.[1] Clinical tests, such as the Neer, Hawkins, and Yocum tests, are commonly used to diagnose SIS. A study found that the Neer test had a significant correlation with ultrasonographic findings, indicating its reliability in diagnosis.[4] Conservative treatment includes physiotherapy, manual therapy, and acupuncture, which have shown effective outcomes in pain reduction and functional improvement.[5,6] Arthroscopic subacromial decompression is an option, but studies indicate that conservative methods may yield similar results with less recovery time.[5] Dynamic and rigid taping can enhance muscle function and reduce pain, although they are not recommended as standalone treatments.[7] Conservative treatments are often effective, and some patients may require surgical intervention for severe cases of SIS, highlighting the need for individualized treatment plans based on the severity and specific characteristics of the syndrome. This study

aimed to compare the effectiveness of scapular taping and scapular stabilization exercises in subjects with SIS while also incorporating laser therapy as a common adjunct treatment.

2 METHODS

The study was conducted in the outpatient department (OPD) of Krupanidhi College and the Recoup Group of Clinics in Bangalore over 6 months. A total of 45 subjects participated in the study and were selected based on the inclusion and exclusion criteria. The subjects included in the study were diagnosed with Stage II subacromial impingement syndrome, aged between 25 and 40 years, and of both genders. They presented with pain of variable duration localized in the proximal anterolateral region of the shoulder. The diagnosis of impingement was confirmed through physical examination, including at least two positive tests: Neer's test, Hawkins-Kennedy test, and the empty can test. In addition, a positive scapular repositioning test and scapular retraction test were required. Subjects also had difficulty performing activities of daily living (ADLs) that involved shoulder function, such as overhead activities, and could have either the left or right shoulder affected. The exclusion criteria for the study included a history or diagnosis of fibromyalgia, rotator cuff tears, thoracic outlet syndrome, traumatic shoulder pain, ligamentous laxity (as indicated by sulcus and apprehension tests), numbness or tingling in the upper extremity, previous shoulder or cervical spine surgery, corticosteroid injection within the past year, cervical spondylitis, subluxating shoulder, acromioclavicular joint disorders, adhesive capsulitis, glenohumeral arthritis, trapezius paralysis, subacromial bursitis, arthropathy, or glenohumeral instability. A total of 45 subjects were randomly divided into three groups: Group A (n=15) received conventional shoulder exercises and laser therapy, Group B (n=15) was treated with scapular taping and laser therapy, and Group C (n=15) underwent scapular stabilization exercises along with laser therapy.

Outcome measures included the Shoulder Pain and Disability Index (SPADI) to assess shoulder disability, and the McGill Pain Questionnaire to measure pain intensity. Both variables were used as dependent variables in this study. The independent variables were interventions, which consisted of scapular taping, scapular stabilization exercises, and conventional shoulder exercises. The tools used in the study included the McGill Pain Questionnaire, SPADI, hand-held dynamometer, kinesio tape, TheraBand (gray colour), towel, physio ball, and laser for treatment application. The data collected from the pre, and post-test assessments were analyzed to evaluate the effectiveness of the interventions in reducing pain and improving shoulder function.

3 RESULTS

The distribution of subjects with subacromial impingement syndrome according to gender, along with the range and mean $\pm$ SD of age, is presented in Table 1. Regarding gender distribution, the majority of subjects in each group were male, with 12 males (80%) in both Groups A and C, and 11 males (73.3%) in Group B. Female participants accounted for 20% in Groups A and C (3 females each) and 26.7% in Group B (4 females). The Chi-Square test yielded a value of 0.257, with 2 degrees of freedom and a p-value of 0.082, indicating no significant gender difference between the groups. The age range for all the groups was 25–40 years. The mean age for Group A was 34.33 $\pm$ 4.73 years, while for Group B it was 34.00 $\pm$ 4.69 years, and for Group C, it was 34.53 $\pm$ 4.59 years. The ANOVA test resulted in an F value of 0.268, with a p-value greater than 0.05, suggesting no significant differences in the age distribution across the groups (Table 1).

Table 1: Distribution of subjects with subacromial impingement syndrome according to gender, age range, mean, and standard deviation across Groups A, B, and C

Variables	Group A	Group B	Group C
Male	12 (80.0%)	11 (73.3%)	12 (80.0%)
Female	3 (20.0%)	4 (26.7%)	3 (20.0%)
Chi-Square value = 0.257, df = 2, p = 0.082			
Range (Years)	25-40	25-40	25-40
Mean $\pm$ SD	34.33 $\pm$ 4.73	34.00 $\pm$ 4.69	34.53 $\pm$ 4.59
ANOVA	F = 0.268, p > 0.05		

The range, mean, and standard deviation (SD) of the outcome measures for subjects in Groups A, B, and C, specifically focusing on the Shoulder Pain and Disability Index (SPADI) and pain levels as assessed by the McGill Pain Questionnaire, both before and after the interventions, are presented in Table 2. For Group A, the SPADI score ranged from 32 to 57 at the pre-test, with a mean of 48.87 $\pm$ 6.53, and decreased to a range of 27–48 at the post-test, with a mean of 35.27 $\pm$ 6.67. A significant improvement in SPADI scores was observed, with a Wilcoxon test result of Z = 3.408 and p-value < 0.001. In Group B, the SPADI score ranged from 28 to 62 at the pre-test (mean = 46.77 $\pm$ 9.10) and improved to a range of 17 to 41 at the post-test (mean = 32.93 $\pm$ 6.65). The improvement was statistically significant, with Z = 3.533 and a p-value < 0.001. For Group C, the pre-test SPADI scores ranged from 31 to 60 (mean = 45.93 $\pm$ 9.23), which improved significantly to a range of 15 to 30 (mean = 23.00, SD = 4.99) at the post-test, with Z = 4.567 and a p-value < 0.001. Similarly, for pain, the McGill Pain Questionnaire scores ranged from 48 to 70 at pre-test (mean = 60.00 $\pm$ 5.64) and decreased to a range of 30 to 58 at post-test (mean = 44.57 $\pm$ 8.57), with a significant reduction indicated by Z = 3.409 and a p-value < 0.001.

Table 2: Distribution of subjects with subacromial impingement syndrome according to range, mean, and standard deviation of outcome measures in Groups A, B, and C (Pre-test and Post-test Results)

Groups	Outcome measures	Pre-test		Post-test		Wilcoxon test	p-value
		Range	Mean ± SD	Range	Mean ± SD		
Group A	SPADI	32-57	48.87 ± 6.53	27-48	35.27 ± 6.67	Z=3.408*	P<0.001
	Pain (McGill pain questionnaire)	48-70	60.00 ± 5.64	30-58	44.57 ± 8.57	Z=3.409*	P<0.001
Group B	SPADI	28-62	46.77 ± 9.10	17-41	32.93 ± 6.65	Z=3.533*	P<0.001
	Pain (McGill pain questionnaire)	46-70	5.600 ± 6.58	27-52	40.33 ± 6.79	Z=3.469*	P<0.001
Group C	SPADI	31-60	45.93 ± 9.23	15-30	23.00 ± 4.99	Z=4.567*	P<0.001
	Pain (McGill pain questionnaire)	44-65	55.80 ± 6.95	14-34	23.67 ± 5.84	Z=4.980*	P<0.001

*Significant

The pain scores in Group B, as measured by the McGill Pain Questionnaire, ranged from 46 to 70 at pre-test (mean = 56.00 ± 6.58) and decreased to 27–52 at post-test (mean = 40.33 ± 6.79), showing a significant reduction with Z = 3.469 and a p-value < 0.001. Pain scores in Group C, as assessed by the McGill Pain Questionnaire, ranged from 44 to 65 at the pre-test (mean = 55.80 ± 6.95) and decreased significantly to a range of 14 to 34 (mean = 23.67 ± 5.84) at the post-test, with Z = 4.980 and a p-value < 0.001. All groups showed significant improvements in both SPADI scores and pain levels, with p-values well below the 0.05 threshold, indicating that the interventions were effective in reducing pain and improving shoulder function in subjects with subacromial impingement syndrome ($).

The two outcome measures assessed were the Shoulder Pain and Disability Index (SPADI) and pain levels, as measured by the McGill Pain Questionnaire, with data provided for both pre-test and post-test results. For the SPADI scores, Group A had a pre-test mean of 48.87 ± 6.53, which decreased to 35.27 ± 6.67) after the intervention. Group B started with a pre-test mean of 46.77 ± 9.10, which improved to 32.93 ± 6.65 at the post-test. Group C showed the most significant improvement, with a pre-test mean of 45.93 ± 9.23 reducing to 23.00 ± 4.99 post-test. The Kruskal-Walli's test, which compared differences between the groups, revealed a Chi-square value of 0.886 (p > 0.05) for the pre-test SPADI scores, indicating no significant differences between the groups at baseline. However, for post-test SPADI scores, the test showed a significant difference, with a chi-square value of 21.174 (p < 0.001), suggesting that the interventions led to differing levels of improvement between the groups.

For pain, as assessed by the McGill Pain Questionnaire, Group A had a pre-test mean of 60.0 ± 5.64 and a post-test mean of 44.57 ± 8.57. Group B had a pre-test mean of 56.60 ± 6.58, which decreased to 40.33 (SD = 6.79) after the intervention. Group C had a pre-test mean of 55.80 ± 6.95 and a post-test mean of 23.67 (SD = 5.84). The Kruskal-Wallis test for the pre-test pain scores showed no significant differences between the groups, with a chi-square value of 2.432 (p > 0.05). However, the post-test pain scores revealed a significant difference, with a chi-squared value of 26.926 (p < 0.001), indicating that the interventions resulted in varying levels of pain reduction between the groups. These results suggest that while there were no significant differences between the groups at baseline, significant improvements were observed after the interventions, with Group C showing the greatest reduction in both SPADI scores and pain levels (Table 3).

Table 3: Range, mean, and Standard Deviation of outcome measures of subjects with subacromial impingement syndrome in between the groups

Outcome Measures	Pre-test (Mean ± SD)	Post-test (Mean ± SD)
SPADI		
Group A	48.87±6.53	35.27±6.67
Group B	46.77±9.10	32.93±6.65
Group C	45.93±9.23	23.0±4.99
Krushkal (Non-parametric ANOVA for between more than 2 groups)	Chi-square value = 0.886, p>0.05	Chi-square value = 21.174, p<0.001*
Pain (McGill pain questionnaire)		
Group A	60.0±5.64	44.57±8.57
Group B	56.60±6.58	40.33±6.79
Group C	55.80±6.95	23.67±5.84
Krushkal (Non-parametric ANOVA for between more than 2 groups)	Chi-square value = 2.432, p>0.05	Chi-square value = 26.926, p<0.001*

*Significant

4 DISCUSSION

The effectiveness of scapular taping versus scapular stabilization exercises in treating subacromial impingement syndrome (SIS) has been a subject of recent research. Scapular taping is suggested to improve scapular positioning and muscle activation, potentially leading to reduced pain and improved function in SIS patients.[8] Evidence indicates that taping may provide immediate benefits in pain relief and functional performance, although long-term effects are less clear.[9] Scapular stabilization exercises have shown significant effectiveness in reducing pain and disability among SIS patients.[10] A systematic review highlighted that these exercises enhance neuromuscular control of the scapulothoracic muscles, which is crucial for shoulder function.[11] However, some studies indicate that adding scapular stabilization to existing strengthening protocols may not yield additional benefits.[12]

The present study results indicate no significant gender or age differences among the groups, with a predominance of male participants and a mean age of approximately 34 years. This demographic consistency allows for a focused comparison of the treatment efficacy. The study reported 80% male participants in both Groups A and C and 73.3% in Group B, with no significant gender differences (p=0.082). The age distribution was also consistent, with no significant differences across groups (p>0.05) which is similar to the study by Patel et al. (Patel et al., 2013) Recent literature supports the superiority of scapular stabilization exercises over taping. Patel et al. found significant improvements in the Shoulder Pain and Disability Index (SPADI) for stabilization exercises compared to taping.[13] Janet and Ramalingam's study corroborated these findings, showing greater pain relief and improved range of motion with stabilization exercises.[14]

The results of the current study indicated significant improvements in both the SPADI and pain levels across all intervention groups, demonstrating the efficacy of these treatments. Some studies suggest that scapular stabilization exercises may yield superior long-term outcomes, particularly in terms of functional improvements and pain reduction.[13,15] The baseline scores were similar across groups, and the post-intervention scores showed marked differences, particularly in Group C, which demonstrated the greatest reduction in both SPADI and pain levels. This aligns with recent literature that emphasizes the role of scapular stabilization in managing shoulder pain. Scapular stabilization exercises have been shown to improve shoulder pain and disability significantly, as evidenced by a study where muscle strength of the serratus anterior and trapezius was associated with better outcomes.[16] A case report highlighted the positive effects of scapular stabilization on pain and quality of life, reinforcing its efficacy in similar conditions.[17] Exercise therapy, including scapular stabilization, has been effective in reducing pain and improving function in patients with rotator cuff injuries, demonstrating the broader applicability of these interventions.[18] The rehabilitation of rotator cuff injuries often incorporates similar principles, focusing on pain management and muscle strengthening, which supports the findings of the current study.[19] The scapular stabilization exercises demonstrate greater effectiveness in managing SIS, some studies suggest that taping can provide temporary relief and may be beneficial in specific contexts, such as acute pain management.[20] Further research is needed to explore the long-term outcomes and potential for combined approaches.

5 CONCLUSION

This study demonstrated that both scapular with laser therapy are significantly better than scapular taping with laser therapy and conventional shoulder exercise with laser therapy in reducing pain and improving shoulder function in patients with Subacromial Impingement Syndrome. The results indicate that, while both interventions lead to positive outcomes, scapular stabilization exercises with laser therapy provide greater long-term benefits. These findings align with the current literature and highlight the importance of individualized treatment approaches for managing SIS.

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