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RESEARCH ARTICLE

Effectiveness of Ultrasound Therapy Versus Exercise Therapy in Shoulder Impingement Syndrome

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Abstract: ***Background***: Shoulder impingement syndrome is a common musculoskeletal disorder causing pain and functional limitation of the shoulder joint. Conservative physiotherapy modalities such as ultrasound therapy and exercise therapy are commonly used for its management. This study aimed to compare the effectiveness of ultrasound therapy and exercise therapy in patients with shoulder impingement syndrome. ***Methods:*** This comparative interventional study was conducted at the Department of Physical Medicine and Rehabilitation, Bangabandhu Sheikh Mujib Medical University from January 2017 to December 2017. A total of 40 clinically diagnosed patients with shoulder impingement syndrome were selected purposively and divided equally into two groups. Group A received ultrasound therapy, while Group B underwent exercise therapy. Pain intensity was assessed using the Visual Analog Scale (VAS) and shoulder functional status was evaluated before and after treatment. Data were analyzed using SPSS version 22. ***Results:*** The majority of patients belonged to the 31–40 years age group (42.5%) and males constituted 57.5% of the study population. Baseline VAS scores were similar between the ultrasound and exercise groups (7.4 ± 1.1 vs 7.2 ± 1.0; p=0.561). After treatment, the exercise therapy group demonstrated significantly greater pain reduction (3.7 ± 1.0 vs 2.6 ± 0.9; p=0.001) and better functional improvement (26.6 ± 5.1 vs 17.6 ± 4.5; p<0.001) compared to the ultrasound group. ***Conclusion:*** Both ultrasound and exercise therapy improved pain and shoulder function; however, exercise therapy was significantly more effective than ultrasound therapy in managing shoulder impingement syndrome.

Keywords: Shoulder impingement syndrome, ultrasound therapy, exercise therapy, pain, shoulder function, physiotherapy.

INTRODUCTION

Shoulder impingement syndrome is one of the most common causes of shoulder pain and functional limitation, particularly among adults engaged in repetitive overhead activities, manual labor and sedentary occupations [1]. It is characterized by pain arising from compression and irritation of the rotator cuff tendons and subacromial bursa during shoulder elevation [2]. The condition significantly affects daily activities such as lifting, dressing, combing hair and overhead reaching, thereby reducing quality of life and work productivity [3].

In clinical practice, conservative management remains the first line of treatment for shoulder impingement syndrome [4]. Among the commonly used physiotherapeutic interventions, ultrasound therapy and exercise therapy are widely practiced modalities [5]. Therapeutic ultrasound is believed to promote tissue healing by increasing local blood flow, reducing inflammation and enhancing soft tissue extensibility. It is often used for its analgesic and anti-inflammatory effects, especially in the early symptomatic phase. However, its clinical effectiveness as a standalone treatment has been debated in several studies [6,7].

On the other hand, exercise therapy, particularly structured physiotherapy programs focusing on rotator cuff strengthening, scapular stabilization and range of motion exercises, has been increasingly recognized as a cornerstone of rehabilitation [8]. Exercise therapy addresses underlying biomechanical dysfunction, improves shoulder kinematics and enhances functional recovery [9]. Evidence suggests that targeted exercise programs may provide sustained long-term benefits compared to passive treatment modalities.

In the context of clinical settings, shoulder impingement syndrome is frequently encountered among patients presenting with shoulder pain, where both ultrasound therapy and exercise therapy are routinely prescribed either alone or in combination [10]. However, there is ongoing discussion regarding which modality provides superior outcomes in terms of pain relief, functional improvement and overall patient satisfaction [11].

Therefore, it is important to evaluate and compare the

effectiveness of these two commonly used treatment approaches. Such comparison helps to guide evidence-based physiotherapy practice and optimize treatment protocols for better patient outcomes. This study aimed to assess and contrast the therapeutic outcomes of ultrasound therapy and exercise therapy in patients with shoulder impingement syndrome, focusing on pain reduction and functional improvement.

Methodology & Materials

This comparative interventional study was conducted at the Department of Physical Medicine and Rehabilitation in Bangabandhu Sheikh Mujib Medical University from January 2017 to December 2017 to evaluate the effectiveness of ultrasound therapy versus exercise therapy in patients with shoulder impingement syndrome. A total of 40 patients diagnosed clinically with shoulder impingement syndrome were selected purposively and divided equally into two groups: Group A received ultrasound therapy and Group B received exercise therapy. Adult patients aged between 20 and 60 years presenting with shoulder pain, restricted shoulder movement, positive impingement signs and symptoms lasting more than four weeks were included in the study. Patients with previous shoulder surgery, fracture or dislocation around the shoulder joint, cervical radiculopathy, rheumatoid arthritis, neurological disorders, rotator cuff tear, malignancy, or severe systemic illness were excluded from the study. Baseline demographic and clinical data were recorded using a structured questionnaire. Pain intensity was assessed by Visual Analogue Scale (VAS) and shoulder functional status was evaluated using a standard functional assessment score before and after completion of treatment. Both groups underwent treatment for a specified duration under supervised conditions. All collected data were checked, verified and analyzed using Statistical Package for Social Sciences (SPSS) version 22. Quantitative variables were expressed as mean ± standard deviation, while qualitative variables were expressed as frequency and percentage. Statistical significance was determined by paired and unpaired Student's t-test and Chi-square test where applicable, with p value <0.05 considered statistically significant.

RESULTS

Table I: Age Distribution of the Study Patients (n=40)

Age Group (Years)	Ultrasound Therapy n (%)	Exercise Therapy n (%)	Total n (%)
20–30	6 (30.0)	5 (25.0)	11 (27.5)
31–40	8 (40.0)	9 (45.0)	17 (42.5)
41–50	4 (20.0)	5 (25.0)	9 (22.5)
>50	2 (10.0)	1 (5.0)	3 (7.5)
Total	20 (100.0)	20 (100.0)	40 (100.0)

Table I presents the age distribution of the 40 study patients, divided equally between the ultrasound therapy and exercise therapy groups (n=20 each). The largest proportion of patients were in the 31–40 years age group, comprising 17 patients (42.5% of the total), followed by the 20–30 years group with 11 patients (27.5%). Within the ultrasound group, the highest percentage was also in the 31–40 years range (8 patients, 40.0%), while the exercise therapy group had 9 patients (45.0%) in the same age bracket. Only 3 patients (7.5%) were over 50 years old, with the smallest representation in both groups.

Table II: Sex Distribution of the Study Patients (n=40)

Sex	Ultrasound Therapy n (%)	Exercise Therapy n (%)	Total n (%)
Male	12 (60.0)	11 (55.0)	23 (57.5)
Female	8 (40.0)	9 (45.0)	17 (42.5)
Total	20 (100.0)	20 (100.0)	40 (100.0)

Table II shows the sex distribution of the 40 study participants, with 23 males (57.5%) and 17 females (42.5%). In the ultrasound therapy group, males accounted for 12 patients (60.0%) compared to 8 females (40.0%), while the exercise therapy group had 11 males (55.0%) and 9 females (45.0%).

Table III: Comparison of Pain Score (VAS) Before and After Treatment

Pain Score (VAS)	Ultrasound Therapy (Mean ± SD)	Exercise Therapy (Mean ± SD)	p value
Before treatment	7.4 ± 1.1	7.2 ± 1.0	0.561
After treatment	4.8 ± 1.2	3.5 ± 1.1	0.002
Mean reduction	2.6 ± 0.9	3.7 ± 1.0	0.001

Table III compares the Visual Analog Scale (VAS) pain scores before and after treatment between the two groups. At baseline, both groups had similar mean pain scores (ultrasound: 7.4 ± 1.1; exercise: 7.2 ± 1.0), with no statistically significant difference (p = 0.561). After treatment, the exercise therapy group showed a markedly lower mean pain score of 3.5 ± 1.1 compared to 4.8 ± 1.2 in the ultrasound group, a difference that was highly significant (p = 0.002). The mean pain reduction was also significantly greater with exercise therapy (3.7 ± 1.0) than with ultrasound (2.6 ± 0.9), yielding a p value of 0.001.

Table IV: Comparison of Shoulder Functional Outcome After Treatment

Functional Outcome	Ultrasound Therapy (Mean ± SD)	Exercise Therapy (Mean ± SD)	p value
Baseline Shoulder Function Score	48.6 ± 6.3	47.9 ± 5.8	0.712
Post-treatment Score	66.2 ± 7.1	74.5 ± 6.8	0.001
Mean Improvement	17.6 ± 4.5	26.6 ± 5.1	<0.001

Table IV presents the comparison of shoulder functional outcomes between the two treatment groups. Baseline shoulder function scores were similar between the ultrasound group (48.6 ± 6.3) and the exercise group (47.9 ± 5.8), with no significant difference (p = 0.712). Following treatment, the exercise therapy group achieved a significantly higher post-treatment score of 74.5 ± 6.8 compared to 66.2 ± 7.1 in the ultrasound group (p = 0.001). Furthermore, the mean improvement in shoulder function was substantially greater with exercise therapy (26.6 ± 5.1) than with ultrasound (17.6 ± 4.5) and this difference was highly significant (p < 0.001).

DISCUSSION

Shoulder impingement syndrome is a common musculoskeletal disorder that significantly affects pain, mobility and functional capacity of the shoulder joint. Conservative physiotherapy modalities, particularly ultrasound therapy and exercise therapy, are widely used in management. The present study compared the effectiveness of ultrasound therapy and exercise therapy among 40 patients with shoulder impingement syndrome and demonstrated superior outcomes with exercise therapy regarding pain reduction and functional improvement.

In this study, the majority of patients belonged to the 31–40 years age group (42.5%), followed by the 20–30 years group (27.5%). Male patients constituted 57.5% of the total study population. These findings are consistent with the observations of Amin et al., who reported a higher prevalence of musculoskeletal disorders among middle-aged adults and males attending physiotherapy centers [12]. Similarly, Siddiq et al., found that shoulder pain and related rheumatological conditions were more common among active working-age populations, reflecting the occupational and functional demands associated with shoulder pathology [13].

The baseline pain scores were comparable between the two groups, with mean VAS scores of 7.4 ± 1.1 in the ultrasound therapy group and 7.2 ± 1.0 in the exercise therapy group. After treatment, both groups showed improvement; however, exercise therapy produced significantly greater pain reduction (mean reduction 3.7 ± 1.0) compared to ultrasound therapy (2.6 ± 0.9), with a statistically significant difference (p=0.001). These findings are supported by Celik et al., who demonstrated that exercise-based rehabilitation significantly reduced pain in patients with subacromial impingement syndrome [14]. Moezy et al. also reported notable pain reduction and improved shoulder mobility following scapular stabilization exercise programs [15].

The present findings are further corroborated by Kromer et al., who concluded that individualized physiotherapy and exercise programs were more effective in improving pain and shoulder function than standard conservative approaches [16]. Braun et al., similarly emphasized the beneficial role of exercise and manual therapy in restoring shoulder biomechanics and reducing symptoms in impingement syndrome [17].

Functional outcome assessment in the current study revealed substantial improvement in both treatment groups, although exercise therapy yielded superior results. The post-treatment functional score was significantly higher in the exercise group (74.5 ± 6.8) than in the ultrasound group (66.2 ± 7.1), with mean improvement values of 26.6 ± 5.1 and 17.6 ± 4.5 respectively (p<0.001). These findings align with Analan et al., who observed significant improvement in shoulder function and rotator cuff strength following therapeutic exercise combined with physiotherapy modalities [18]. Marzetti et al. also reported enhanced functional recovery and pain control with therapeutic exercise interventions in patients with shoulder impingement syndrome [19].

Although ultrasound therapy showed beneficial effects in reducing pain and improving function, its outcomes were comparatively less pronounced than exercise therapy. Similar observations were noted by Alexander et al., whose systematic review suggested that low-intensity ultrasound alone may not provide substantial clinical benefit in soft tissue shoulder disorders [20]. Yu et al. also concluded that passive physical modalities demonstrate limited long-term effectiveness when compared with active rehabilitation approaches [21].

Several studies nevertheless support the adjunctive value of ultrasound therapy. Haque et al. and Barua et al. demonstrated positive effects of ultrasound and phonophoresis in adhesive capsulitis and other painful shoulder conditions [22,23]. Rahman and Shakoor also reported improvement in post-stroke shoulder pain with therapeutic ultrasound [24]. These studies indicate that ultrasound may be beneficial as part of a combined rehabilitation strategy, particularly for short-term pain relief.

Limitations of the study

This study was conducted on a relatively small sample size, which may limit the generalizability of the findings to the wider population. The study duration and follow-up period were also limited, making it difficult to assess the long-term effectiveness of the treatment modalities. In addition, patients were selected from a single tertiary care center, which may not fully represent all socioeconomic and occupational groups.

Conclusion

The present study demonstrated that both ultrasound therapy and exercise therapy were effective in reducing pain and improving shoulder function in patients with shoulder impingement syndrome. However, exercise therapy showed significantly greater improvement in pain relief and functional outcome compared to ultrasound therapy. Therefore, structured exercise therapy may be considered a more effective conservative treatment option for the management of shoulder impingement syndrome.

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Conflicts of interest

There are no conflicts of interest.

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