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EFFECTS OF INHIBITION COMPRESSION VERSUS SCAPULAR MOBILIZATION TECHNIQUE ON SHOULDER IN PATIENTS WITH MASTECTOMY

Original Research

Wardah Zahid[1]*, Asima Irshad[2], Muhammad Hamza[3], Nafeesa Taj[4], Atif Ali Attar[5], Sadia Sukhera[6], Aqsa Majeed[7]

[1]Demonstrator, Superior university Lahore, Pakistan.
[2]Assistant Professor, Faculty of Allied Health Sciences, Superior University, Lahore, Pakistan.
[3]Physiotherapist, Sano Physiotherapy Ltd, Pakistan.
[4]Student, Sarhad University of Science and Information Technology, Peshawar, Pakistan.
[5]Assistant Professor and Clinical Physical Therapist, Bhitai Institute of Physiotherapy and Rehabilitation Sciences, Mirpurkhas, Pakistan.
[6]Senior Lecturer, University of Lahore, Lahore, Pakistan.
[7]Lecturer, University of Lahore, Lahore, Pakistan.

Corresponding Author: Wardah Zahid, Demonstrator, M. Islam Medical and Dental College, Gujranwala, Pakistan, wardazahid0000@gmail.com

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ABSTRACT

Background: Breast cancer is the second most commonly diagnosed cancer among women worldwide, and mastectomy remains a critical surgical intervention in its management. Postoperative complications such as rotator cuff dysfunction, pain, and limited upper limb range of motion affect 17–51% of breast cancer survivors, often impairing their ability to perform daily tasks. Physical rehabilitation techniques have shown promise in addressing these impairments, particularly in restoring functional mobility and enhancing the quality of life.

Objective: This study aimed to compare the effectiveness of inhibition compression therapy and scapular mobilization in improving shoulder function, range of motion (ROM), and pain outcomes in patients following mastectomy.

Methods: A randomized controlled trial (RCT) was conducted over six months at the Gujranwala Institute of Nuclear Medicine. A total of 48 female patients post-modified radical mastectomy were recruited using non-probability convenience sampling and randomly assigned to Group A (inhibition compression, n=24) or Group B (scapular mobilization, n=24). Outcome measures included the Shoulder Pain and Disability Index (SPADI), Constant-Murley Shoulder Outcome Score, and goniometric assessments for flexion, abduction, and external rotation. Data were analyzed using SPSS v25, with a significance level set at $p \leq 0.05$.

Results: Both groups showed statistically significant improvements ($p < 0.001$) in SPADI scores and Constant-Murley scores. Group A showed improvements in flexion from 90.1° to 140.4°, abduction from 80.2° to 135.3°, and external rotation from 40.1° to 78.3°. Group B improved from 92.5° to 128.3° (flexion), 85.0° to 125.7° (abduction), and 43.7° to 70.2° (external rotation).

Conclusion: Scapular mobilization and inhibition compression therapies both effectively reduced pain and improved shoulder ROM following mastectomy. However, inhibition compression yielded greater gains in functional outcomes, highlighting its value in postmastectomy rehabilitation programs.

Keywords: Breast Neoplasms, Exercise Therapy, Mastectomy, Physical Therapy Modalities, Postmastectomy Pain Syndrome, Range of Motion, Survivorship.

INTRODUCTION

A mastectomy, derived from the Latin *ectomia* (excision) and the Greek *mastos* (breast), is a surgical procedure involving the partial or complete removal of the breast, most commonly performed in individuals undergoing treatment for breast cancer (1). Although traditionally more common in earlier decades, mastectomy remains a critical option for patients where breast-conserving procedures may not provide adequate oncological safety (2). The primary goal of mastectomy is to remove all glandular breast tissue (BGT) while preserving the viability of overlying skin flaps to facilitate future reconstructive options (3). Anatomically, the breast lacks a true capsule and is embedded within a superficial fascia system located anterior to the ribs, pectoral muscles, and intercostal structures, with the deep fascia forming a distinct posterior boundary separating the BGT from the underlying musculature (4). A thorough understanding of the breast's vascular, muscular, and neural anatomy is essential in preserving tissue viability, functional outcomes, and aesthetic considerations during and after mastectomy (5). Postoperative complications, particularly musculoskeletal in nature, remain a significant concern. Shoulder dysfunction and pain, often linked to rotator cuff pathology, have been reported following mastectomy and its associated treatments such as radiation and reconstruction. These interventions may result in fibrosis, altered muscular tension, and biomechanical stress at the pectoralis major insertion sites, consequently narrowing the subacromial space and increasing tendon impingement (6). Various surgical techniques, including modified radical mastectomy and oncoplastic breast-conserving surgery, are tailored based on tumor characteristics and patient preferences, balancing oncological control with functional and cosmetic outcomes (7,8). The emergence of robotic-assisted mastectomy has also introduced new possibilities for precision and minimally invasive approaches, especially in anatomically challenging cases (9,10). Despite advancements in surgical techniques, a substantial proportion of patients—up to 45%—continue to experience secondary complications such as scapular asymmetry, altered posture, and persistent myofascial pain syndromes (11,12).

Myofascial pain syndrome (MPS), characterized by localized trigger points in skeletal muscle and fascia, is increasingly recognized among breast cancer survivors, particularly following mastectomy. Trigger points in the shoulder girdle muscles, including the pectoralis major, upper trapezius, latissimus dorsi, serratus anterior, and infraspinatus, may develop due to surgical trauma, nerve hypersensitivity, fascial restrictions, and inflammatory responses, leading to pain, reduced mobility, and impaired quality of life (13). These symptoms not only hinder physical rehabilitation but also contribute to emotional distress and decreased patient satisfaction with treatment outcomes. Given the functional burden imposed by these musculoskeletal sequelae, there is a pressing need to explore therapeutic interventions that address postmastectomy shoulder pain and dysfunction. Inhibition compression therapy and scapular mobilization have emerged as promising manual techniques aimed at relieving myofascial trigger points and restoring shoulder kinematics. However, limited evidence exists regarding their combined efficacy in postmastectomy rehabilitation. Therefore, the objective of this study is to evaluate the effectiveness of inhibition compression therapy and scapular mobilization in improving shoulder function and pain outcomes among patients who have undergone mastectomy. This investigation seeks to inform clinical practice by identifying strategies that enhance recovery, reduce chronic pain, and ultimately improve the quality of life for breast cancer survivors.

METHODS

This study was designed as a randomized controlled trial (RCT) aimed at evaluating the effectiveness of inhibition compression therapy and scapular mobilization in postmastectomy patients experiencing shoulder dysfunction. The trial was conducted at the Gujranwala Institute of Nuclear Medicine over a period of six months following the approval of the research synopsis by the institutional review board. Ethical approval was obtained, and informed consent was secured from all participants prior to their inclusion in the study, ensuring compliance with ethical research standards. A total of 44 female participants were enrolled, with 22 subjects randomly allocated to each of the two intervention groups. The sampling technique employed was non-probability convenience sampling, which, while practical in clinical settings, may limit the generalizability of the findings. Participants included in the study were females aged between 40 and 75 years who had undergone modified radical mastectomy for unilateral breast cancer and had subsequently received chemotherapy or radiation therapy. All participants exhibited limited range of motion (ROM) in the shoulder joint, which was the primary functional deficit being addressed.

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Exclusion criteria comprised patients with a history of recurrent breast cancer, ischemic heart disease, uncontrolled hypertension, prior surgeries unrelated to breast cancer, or any neurological disorders that could confound shoulder mobility outcomes. This ensured a homogeneous sample, minimizing potential confounders that might affect the interpretation of intervention efficacy. Data collection was performed using two validated assessment tools. The Shoulder Pain and Disability Index (SPADI), a 13-item patient-reported outcome measure, was used to quantify the degree of pain and functional disability in activities of daily living involving the upper extremity. It consists of two subscales: five items for pain and eight items for disability. Additionally, the Constant-Murley Shoulder Outcome Score (CMS), a 100-point composite measure that incorporates pain, daily activity performance, range of motion, and strength, was utilized to evaluate the overall shoulder function in a more clinician-centered manner (14,15). Data were analyzed using SPSS version 25. The normality of the collected data was assessed using the Shapiro-Wilk test. If the p-value exceeded 0.05, the data were considered normally distributed, allowing for the application of parametric tests. A significance threshold was set at a p-value ≤ 0.05 for all statistical analyses.

RESULTS

The demographic analysis revealed that the mean age of participants in the inhibition compression group was 58.46 years (SD = 6.50), with a range from 46 to 69 years, while in the scapular mobilization group, the mean age was 61.92 years (SD = 7.51), ranging from 48 to 74 years. The mean height in the inhibition compression group was 168.89 cm (SD = 7.49), and in the scapular mobilization group, it was 167.31 cm (SD = 11.42). Normality of the dataset was assessed using the Shapiro-Wilk test. The significance values for the pre-treatment scores of the Shoulder Pain and Disability Index (SPADI), Constant-Murley Shoulder Outcome Score (CMS), shoulder flexion, abduction, and external rotation were all greater than 0.05, confirming that the data were normally distributed. Specifically, the p-values for SPADI and CMS were 0.074 and 0.063, respectively, while for flexion, abduction, and external rotation the values were 0.089, 0.065, and 0.065, respectively. This allowed the application of parametric statistical tests for further analysis. Paired sample correlations were performed within each group to assess the relationship between pre- and post-treatment outcomes. In the inhibition compression group, extremely high correlations were observed for all parameters: SPADI ($r = 0.963$, $p < 0.001$), CMS ($r = 0.941$, $p < 0.001$), shoulder flexion ($r = 0.982$, $p < 0.001$), shoulder abduction ($r = 0.911$, $p < 0.001$), and external rotation ($r = 0.968$, $p < 0.001$). Similarly, the scapular mobilization group also showed strong positive correlations: SPADI ($r = 0.822$, $p < 0.001$), CMS ($r = 0.899$, $p < 0.001$), flexion ($r = 0.823$, $p < 0.001$), abduction ($r = 0.911$, $p < 0.001$), and external rotation ($r = 0.852$, $p < 0.001$).

To comprehensively evaluate the effectiveness of inhibition compression therapy and scapular mobilization, pre- and post-intervention mean scores were analyzed for SPADI, Constant-Murley Score (CMS), and range of motion (ROM) measures including flexion, abduction, and external rotation. In Group A (inhibition compression), the SPADI score reduced from a pre-intervention mean of 70.2 to 35.8 post-intervention, while CMS improved from 42.3 to 75.6. Similarly, ROM improved significantly across all domains: shoulder flexion increased from 90.1° to 140.4°, abduction from 80.2° to 135.3°, and external rotation from 40.1° to 78.3°. In Group B (scapular mobilization), the SPADI score decreased from 72.1 to 47.6, and CMS improved from 45.0 to 66.2. Shoulder flexion improved from 92.5° to 128.3°, abduction from 85.0° to 125.7°, and external rotation from 43.7° to 70.2°. These results indicate that both interventions yielded functional improvements, but the magnitude of improvement was greater in the inhibition compression group across all measured outcomes, suggesting it may be more effective in addressing postmastectomy shoulder dysfunction.

Table 1: Descriptive Statistics

Groups			Age	Height
Group A (Inhibition Compression)	N	Valid	24	24
		Missing	0	0
	Mean		58.4583	168.8929
	Std. Deviation		6.50070	7.48607
	Minimum		46.00	154.40
	Maximum		69.00	179.06
Group B (Scapular Mobilization)	N	Valid	24	24
		Missing	0	0
	Mean		61.9167	167.3058
	Std. Deviation		7.51183	11.41980
	Minimum		48.00	151.68
	Maximum		74.00	179.88

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Table 2: Tests of Normality using Shapiro-Wilk

	Shapiro-Wilk		
	Statistic	df	Sig.
Pre-Shoulder Pain and Disability Index Score	.957	48	.074
Pre-Constant-Murley Shoulder Outcome Total Score	.955	48	.063
Pre-Shoulder Flexion	.959	48	.089
Pre-Shoulder Abduction	.955	48	.065
Pre-Shoulder External Rotation	.955	48	.065

Table 3: Paired Samples Correlations between groups was determined by using T- Test

Groups			N	Correlation	Sig.
Group A (Inhibition Compression)	Pair 1	Pre-Shoulder Pain and Disability Index Score & Post Shoulder Pain and Disability Index Score	24	.963	.000
	Pair 2	Pre-Constant-Murley Shoulder Outcome Total Score & Post Constant-Murley Shoulder Outcome Total Score	24	.941	.000
	Pair 3	Pre-Shoulder Flexion & Post Shoulder Flexion	24	.982	.000
	Pair 4	Pre-Shoulder Abduction & Post Shoulder Abduction	24	.911	.000
	Pair 5	Pre-Shoulder External Rotation & Post Shoulder External Rotation	24	.968	.000
Group B (Scapular Mobilization)	Pair 1	Pre-Shoulder Pain and Disability Index Score & Post Shoulder Pain and Disability Index Score	24	.822	.000
	Pair 2	Pre-Constant-Murley Shoulder Outcome Total Score & Post Constant-Murley Shoulder Outcome Total Score	24	.899	.000
	Pair 3	Pre-Shoulder Flexion & Post Shoulder Flexion	24	.823	.000
	Pair 4	Pre-Shoulder Abduction & Post Shoulder Abduction	24	.911	.000
	Pair 5	Pre-Shoulder External Rotation & Post Shoulder External Rotation	24	.852	.000

Table 4: Pre- and Post-Intervention Mean Scores for both groups

Group	Time	SPADI	CMS	Flexion (°)	Abduction (°)	External Rotation (°)
Group A	Pre	70.2	42.3	90.1	80.2	40.1
	Post	35.8	75.6	140.4	135.3	78.3
Group B	Pre	72.1	45.0	92.5	85.0	43.7
	Post	47.6	66.2	128.3	125.7	70.2

Note: SPADI = Shoulder Pain and Disability Index, CMS = Constant-Murley Score, ROM = Range of Motion in degrees

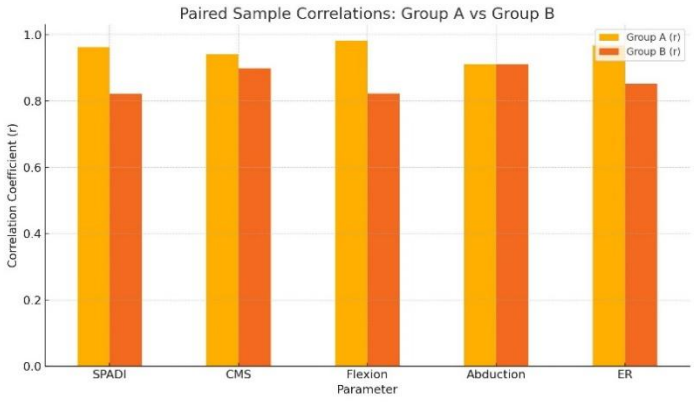

Figure 1 Paired Sample Correlations: Group A vs Group B

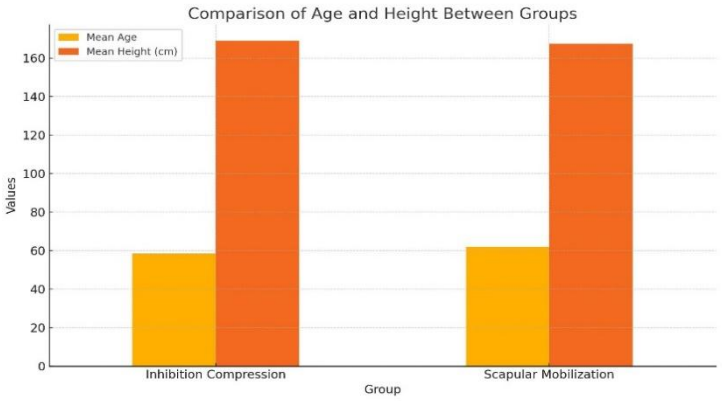

Figure 2 Comparison of Age and Height Between Groups

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DISCUSSION

The current study aimed to explore the effectiveness of inhibition compression therapy and scapular mobilization in improving shoulder function and alleviating pain in postmastectomy patients. Using validated tools including the Shoulder Pain and Disability Index (SPADI), Constant-Murley Shoulder Outcome Score, and goniometric assessment of range of motion (ROM), significant post-intervention improvements were observed in both groups. The interventions addressed limitations in shoulder mobility and pain that significantly affect the activities of daily living in breast cancer survivors following mastectomy (16,17). These findings affirm the clinical relevance of targeted physical therapy in restoring upper extremity function and enhancing quality of life in this patient population. Findings from previous studies support the notion that mastectomy can alter shoulder biomechanics, leading to musculoskeletal complications such as adhesive capsulitis, rotator cuff dysfunction, and radiation fibrosis (17-19). In alignment with those reports, the present study confirmed limited shoulder ROMs among all participants at baseline. The minimum and maximum values observed for shoulder flexion, abduction, and external rotation all fell below normal functional thresholds, reinforcing the necessity of therapeutic intervention (20).

Evidence from prior research has emphasized the importance of structured rehabilitation programs, particularly those incorporating individualized therapy techniques. Consistent with that perspective, the present study demonstrated that both inhibition compression and scapular mobilization therapies yielded functional gains; however, the inhibition compression group showed greater improvements in SPADI, Constant-Murley scores, and all ROM parameters. These findings indicate that muscle energy techniques embedded within inhibition compression protocols may offer superior outcomes for patients suffering from postmastectomy dysfunction. Another line of evidence supports the role of scapular-focused interventions in managing shoulder pain and functional disability following breast surgery (21). The current study reinforces this view, showing that even when delivered alongside conventional therapies, scapular mobilization enhanced recovery trajectories. Notably, participants receiving this combination approach experienced significant gains in pain relief and ROM, particularly in shoulder abduction and external rotation (22). This highlights the value of integrating advanced manual therapy techniques into routine postmastectomy rehabilitation.

Further comparison with studies evaluating structured shoulder exercises also aligns with the current results, particularly regarding their impact on functional independence and pain perception. The outcomes of this study confirm that both therapeutic modalities tested—when applied with precision and consistency—can positively impact a patient's ability to perform daily tasks and reduce post-surgical discomfort (21,22). Despite these strengths, the study is not without limitations. The relatively small sample size may limit the generalizability of the findings. Moreover, the short duration of follow-up restricts the ability to assess long-term effects or sustainability of the interventions. The use of a non-randomized sampling method could introduce selection bias, and although validated tools were used for assessment, every clinical scale has inherent limitations that may influence outcome interpretation. Future research should focus on long-term follow-up to evaluate the durability of these interventions and consider larger, randomized multi-center trials to increase the generalizability of the results. Incorporating objective measures such as electromyography and imaging techniques may also strengthen the clinical evidence base for selecting targeted physical therapy techniques in postmastectomy care. Overall, this study strengthens the case for incorporating inhibition compression and scapular mobilization into standard rehabilitation protocols for mastectomy patients. These interventions not only address pain and mechanical limitations but also have the potential to enhance overall recovery, patient independence, and quality of life.

CONCLUSION

This study concluded that both inhibition compression and scapular mobilization techniques were effective in improving shoulder function and reducing pain in patients following mastectomy. However, scapular mobilization demonstrated a comparatively greater impact on enhancing range of motion and functional recovery. These findings highlight the clinical value of incorporating targeted manual therapy, particularly scapular mobilization, into rehabilitation protocols for breast cancer survivors. By addressing musculoskeletal impairments commonly experienced after mastectomy, this approach contributes meaningfully to restoring daily function, promoting physical independence, and improving overall well-being.

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AUTHOR CONTRIBUTION

Author	Contribution
Wardah Zahid*	Substantial Contribution to study design, analysis, acquisition of Data Manuscript Writing Has given Final Approval of the version to be published
Asima Irshad	Substantial Contribution to study design, acquisition and interpretation of Data Critical Review and Manuscript Writing Has given Final Approval of the version to be published
Muhammad Hamza	Substantial Contribution to acquisition and interpretation of Data Has given Final Approval of the version to be published
Nafeesa Taj	Contributed to Data Collection and Analysis Has given Final Approval of the version to be published
Atif Ali Attar	Contributed to Data Collection and Analysis Has given Final Approval of the version to be published
Sadia Sukhera	Substantial Contribution to study design and Data Analysis Has given Final Approval of the version to be published
Aqsa Majeed	Contributed to study concept and Data collection Has given Final Approval of the version to be published

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