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Expert Opinion Article

Effectiveness Of Manual Therapy And Respiratory Muscle Training To Improve Pain, Posture, And Pulmonary Function In Post Mastectomy Patients

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Abstract

Background: Breast cancer is the most common cancer among women, by means of mastectomy being one of the major treatments and According to the Global Cancer Observatory, it accounts for nearly a quarter of all female cancer cases and over 15% of cancer deaths. Surgical management chiefly mastectomy, is frequently performed to control the disease, yet this procedure can result in significant postoperative complications, with shoulder pain, restricted mobility, poor posture, and respiratory dysfunction. Post-mastectomy respiratory dysfunction is a common notable concern, decreased thoracic mobility and increased kyphosis have been associated with reduced pulmonary restrictions such as forced vital capacity (FVC),forced expiratory volume in one second (FEV_1). The weakness of respiratory muscles may contribute to fatigue through the metabo-reflex mechanism, where metabolic by-products in fatigued respiratory muscles activate neural pathways that limit blood flow to limb muscles, thereby decreasing exercise tolerance and functional capacity. These impairments can be further compounded by anxiety, fatigue, and reduced quality of life. Given the increasing incidence of breast cancer, especially among younger women, effective rehabilitation strategies are needed to address both musculoskeletal and respiratory complications simultaneously.Current physiotherapy approaches frequently address musculoskeletal and respiratory issues separately, potentially limiting recovery outcomes wheres, Manual therapy techniqueslike Spencer's Technique, have demonstrated benefits in enhancing glenohumeral joint mobility, reducing adhesions, and facilitating lymphatic drainage. Correspondingly respiratory muscle training (RMT) has shown potential in improving inspiratory and expiratory muscle potency reducing fatigue, and enhancing lung function in cancer survivors. However, research evaluating the combined application of manual therapy and RMT in post-mastectomy rehabilitation is lacking.An integrated approach targeting equally musculoskeletal and respiratory components may offer aadditional comprehensive solution, potentially reducing pain, improving posture &enhancing pulmonary function. This study aims to explore the effectiveness of combining manual therapy with respiratory muscle training for post-mastectomy women, thereby addressing a critical gap in current rehabilitation strategies.

Objective: This study aimed to evaluate the effectiveness of a combined rehabilitation intervention involving manual therapy (Spencer's Technique) and respiratory muscle training (RMT) in improving pain, postural alignment, and pulmonary function in post-mastectomy patients.

Methods: A randomized controlled experimental study was conducted with 60 female participants who underwent mastectomy within the past 12 weeks. Participants were randomly assigned to two groups: Group A (experimental) received combined treatment – (Respiratory muscle training + Spencer's Technique + TENS), while Group B (control) received only conventional physiotherapy interventions which includes TENS – For pain management, Postural correction exercise (Chin tuck, Scaption exercise, Codman's exercise),Passive stretching of pectoralis major & breathing exercise (Pursed lip breathing , Diaphragmatic breathing & Buteyko Breathing).The intervention lasted for 12 weeks. Pulmonary function was assessed by Maximum Inspiratory Pressure (MIP) and Maximum Expiratory Pressure (MEP) and peak flow meter score. Kyphosis was measured using occiput to wall distance (OWD) test and pain was quantified using the Numeric Pain Rating Scale (NPRS). The primary outcomes were improvements in respiratory muscle strength, shoulder mobility, pain reduction, and postural correction.
Results: It was found that the combined intervention of Respiratory muscle training and manual therapy yield significant improvements in pulmonary function, decreased kyphosis, and pain reduction compared to conventional physiotherapy with enhanced shoulder range of motion, reduced pain, better respiratory muscle strength, improved thoracic expansion and reduced kyphosis resulting in overall improved functional capacity and quality of life. **Conclusion:** The study presents a novel approach to post-mastectomy rehabilitation by integrating manual therapy with respiratory muscle training. This comprehensive approach may provide better rehabilitation outcomes for breast cancer survivors, addressing both musculoskeletal and pulmonary issues. The results could have significant implications for enhancing rehabilitation protocols and improving the long-term recovery and quality of life for post-mastectomy patients.

KEYWORDS : Respiratory muscle training (RMT), Pain management, Shoulder mobility, Range of motion, Maximum Inspiratory Pressure (MIP), Maximum Expiratory Pressure (MEP), Numeric Pain Rating Scale (NPRS), OWD (occiput to wall distance)

INTRODUCTION

Cancer is the third foremost cause of death globally, Among these, breast cancer (mammary carcinoma) remains one of the most common form, particularly affecting women. Breast cancer is the most common cancer in women, accounting for 23.8% of all cancer cases and 15.4% of all cancer deaths in women globally, according to the Global Cancer Observatory. Mastectomy, the surgical removal of breast tissue, is frequently performed in response to functional and anatomical changes caused by the disease. The physical and emotional consequences of this procedure can significantly affect a patient's posture as well as breathing pattern. As breast cancer incidence continue to rise, especially among younger women, there is a growing need for effective postoperative rehabilitation strategies.[1,2] Respiratory muscle dysfunction is an important issue with high morbidity and mortality and associated costs in post mastectomy patients that leads to poor posture and pulmonary status.[3] Previous studies claimed that the increase in thoracic kyphosis and the decrease in the mobility of the thoracic spine are associated with the decrease in respiratory functions such as Forced Expiratory Volume in 1 Second (FEV1) and Forced Vital Capacity (FVC).Mastectomy is one of the commonly spread surgeries to remove breast cancer, however, this type of intervention disturbs the ventilatory function as well as increase pain sensitivity of the patient after surgery.It is estimated that 30–80% of cancer patients have several age-related persistent diseases, such as metabolic, cardiovascular, and pulmonary disorders. Accordingly the oxygen cycle and ventilation are negatively affected. Women with breast cancer besides these adverse effects of aging have reduced respiratory strength, which is caused by unfavorable changes in systolic and diastolic function, lung elastic recoil, ventilation, vascular conductance, and oxidative capacity. Chest wall muscle was affected during mastectomy, which led to postoperative complications such as reduced shoulder mobility, pain, The resulting restrictions in the glenohumeral joint can significantly affect a patient's ability to perform daily activities. It may also affects decreased thoracic expansion, respiratory muscle weakness, and altered respiratory mechanics. furthermore, patients who have had breast cancer surgery have decreased respiratory muscle strength. [4,5] The role of physical therapy is crucial in such cases as to improve the function of the respiratory system, improving pain and reducing capsular adhesions of glenohumeral join and provide better health after mastectomy. [4]

FHP is suggested to cause impaired respiratory functions due to biomechanical effects on accessory inspiratory muscles such as the scalene muscles, and the sternocleidomastoid muscles. Previous researchers showed that FVC, FEV1, and accessory inspiratory muscle strength were lower in the individuals with FHP, in comparison with the non-FHP individuals.[6] Reduction or inappropriate respiratory muscle strength leads to respiratory muscle fatigue during activity performance, this can be explained by metaboreflex. Respiratory muscle fatigue resulting from accumulation of lactic acid metabolites in respiratory muscles activates group III and group IV nerve afferents of respiratory muscles, which increases sympathetic flow to exercising limb muscles from brain and reduces muscle function by limiting blood flow to the active muscles. Which is known as metaboreflex. Respiratory muscle fatigue increases the severity of exercise induced locomotor muscle fatigue causing reduced motor output to the working limb muscles and reduction in functional outcome. So as with Metaboreflex there is early termination of activity due to respiratory muscle fatigue. [7] Studies in patients with lung, breast and other cancers reported a significantly poorer survival rate in those who present respiratory muscle dysfunction compared to those who did not . In addition to a high mortality risk, the stressful burden of dyspnea is frequently compounded by fatigue, anxiety and depression, resulting in functional limitations in activity of daily living, anticipation of physical activity and poor quality of life.[8] Although supervised exercise therapy/pulmonary rehabilitation has been shown to be effective in reducing respiratory muscle dysfunction in patients with lung cancer. A mastectomy is a surgical procedure including the removal of all or a part of the breast. The existence of lesions or the removal of serratus, pectoralis major, and pectoralis minor muscles, the presence of a surgical drain, superficial breathing, fear of experiencing pain, and/or use of analgesics may diminish thoracic expansion altering respiratory mechanics. While preliminary findings of respiratory muscle training (RMT) are encouraging with potential benefits in alleviating respiratory status among cancer survivors. Herein, the current review paper aimed to explore the potential therapeutic role of RMT and manual therapy to improve pain, posture, and pulmonary function in post mastectomy patients management in cancer survivors. The article outlines the evidence on the effectiveness of RMT on respiratory muscle function as potential mechanism to reduce respiratory muscle dysfunction.[9] Post-mastectomy patients frequently experience shoulder pain, stiffness, and limited range of motion (ROM) due to surgical trauma, scar tissue formation, and lymph node dissection. Early and appropriate physiotherapy interventions are critical to prevent chronic dysfunction. One proven manual therapy method is Spencer's Technique, a structured sequence of joint mobilizations targeting the glenohumeral joint. This technique, commonly used in osteopathic manual therapy, is highly effective in improving ROM, reducing adhesions, and promoting lymphatic drainage-all vital for a holistic recovery.[10,11,12] Therefore, integrating respiratory muscle training (RMT) with manual therapy techniques such as Spencer's Technique presents a comprehensive approach to rehabilitation. This combined strategy not only addresses the physical limitations posed by post-mastectomy complications but also enhances respiratory efficiency, alleviates pain, and improves overall quality of life.To the best of our knowledge, this is the first article that highlights the potential application of Spencer's Technique in post-mastectomy patients, thereby addressing an important gap in current rehabilitation literature. Current physiotherapy approaches frequently address musculoskeletal and respiratory issues separately, potentially limiting recovery outcomes wheres, Manual therapy techniques like Spencer's Technique, have demonstrated benefits in enhancing glenohumeral joint mobility, reducing adhesions, and facilitating lymphatic drainage. correspondingly respiratory muscle training (RMT) has shown potential in improving inspiratory and expiratory muscle potency reducing fatigue, and enhancing lung function in cancer survivors. However, research evaluating the combined application of manual therapy and RMT in post-mastectomy rehabilitation is lacking.An integrated approach targeting equally musculoskeletal and respiratory components may offer a additional comprehensive solution, potentially reducing pain, improving posture & enhancing pulmonary function. This study aims to explore the effectiveness of combining manual therapy with respiratory muscle training for post-mastectomy women, thereby addressing a critical gap in current rehabilitation strategies.

OBJECTIVE OF THE STUDY

To evaluate the effectiveness of a combined intervention involving manual therapy and respiratory muscle training (RMT) in reducing pain, reducing hyperkyphosis, and enhancing pulmonary function in post mastectomy females.

HYPOTHESIS

Null Hypothesis (H_0): Manual therapy and respiratory muscle training have no significant effect on pain, posture, and pulmonary function in post-mastectomy patients.

Alternative Hypothesis (H_1): Manual therapy and respiratory muscle training have a significant effect on pain, posture, and pulmonary function in post-mastectomy patients.

NEED OF THE STUDY

1. Post-mastectomy patients often experience shoulder pain, poor posture, and reduced pulmonary function due to surgical trauma and respiratory muscle weakness.Current rehabilitation strategies often treat musculoskeletal and respiratory complications separately, limiting holistic recovery.

2. Spencer's Technique is known to improve shoulder mobility and reduce adhesions but has not yet been studied specifically in post-mastectomy patients.
3. Respiratory Muscle Training (RMT) has shown benefits in improving lung function and reducing fatigue in cancer survivors, but its use in post-mastectomy rehabilitation remains limited.
4. No existing research has evaluated the combined effectiveness of manual therapy and RMT in improving pain, posture, and pulmonary function in this population.
5. Therefore, this study aims to fill a significant gap by investigating an integrated approach that may enhance recovery and quality of life in post-mastectomy patients.

MATERIALS &METHODS:

1. Respiratory Muscle Trainer with electronic manometer- with mouth piece, nose

2. Peak flow meter

2. Couch
3. Pillow

STUDY DESIGN: Experimental

SAMPLE DESIGN: Simple random sampling

SAMPLE SIZE:30 in each group (experimental & Control)

STUDY CENTRE: JRNRVU, Dept. of Physiotherapy (Dabok)Udaipur, Rajasthan

SOURCE OF COLLECTION OF DATA : Data was be collected from clinical settings of OPD of JRNRV (deemed to be university) Udaipur , Rajasthan, Department of Physiotherapy

OUTCOME MEASURE

1. **For evaluation of Pulmonary Functions**
   i. Maximum inspiratory pressure – measured with respiratory muscle trainer
   ii. Maximum Expiratory Pressure- measured with respiratory muscle trainer
   iii. Peak flow measurement – with peak flow meter
   iv. Peak flow measurement is a quick test to measure air flow out of the lungs. The measurement is called peak expiratory flow rate. Peak flow measurement can be started after full lung inhalation. During the test patient blow out forcefully into the mouthpiece of device.

Peak flow zones : peak flow zones are the areas of measurement on a peak flow meter .

1) Green zone: Green zone is 80 to 100% of highest peak flow reading. This zone means air is moving well through large airways in your lungs.
2) Yellow zone : yellow means 50 to 80% of one's personal best . measurement in this zone is a sign that airways are started to narrow.
3) Red : means less than 50% of your personal best.

Peak flow measurement follows this process:

1. Before each use, make sure the sliding pointer on the peak flow meter is reset to the 0 mark.
2. Hold the PFM by the handle.
3. Stand up straight.
4. Remove chewing gum, candy, or food from mouth.
5. Take a deep breath and put the mouthpiece in your mouth. Patient will be asked to Seal lips and teeth tightly around the mouthpiece.
6. Then he/she will be instructed to Blow out as hard and as fast as he can.
7. Note the number where the sliding pointer has stopped on the scale.
8. Reset the pointer to 0.
9. Repeat this 3 times. The 3 readings should be close together. If not, adjust your method.
10. Record only the highest of the 3 readings. Do not average the numbers together. The highest number is called your peak flow or personal best.

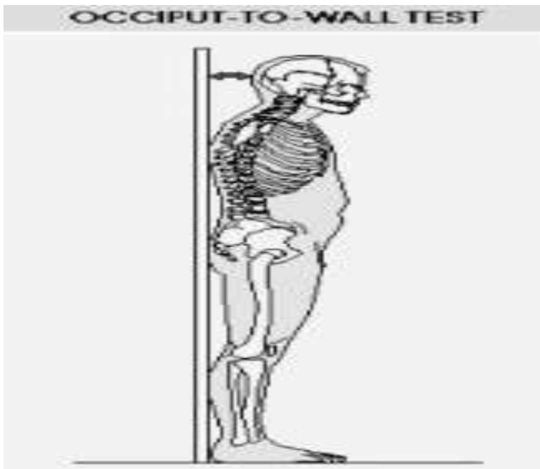
2. **For Evaluation of posture-** OWD (Occiput to wall distance) Test

It is also known as **Flesche test.**[13] The Occiput to Wall Distance (OWD) is easy clinical test used to evaluate thoracic kyphosis, curvature of the upper back. In A normal OWD the back of the head can touch the wall that is normally considered to be zero wheres , OWD greater than 2 cm is generally considered abnormal and may indicate thoracic hyperkyphosis. The OWD test involves a patient to stand with their back against a wall, ensuring their heels, calves, buttocks, shoulders are touching the wall and then the patient attempts to touch the back of their head (occiput) to the wall while keeping their head level and facing forward. OWD had good concurrent validity with the Cobb angles (r = 0.683, $P < 0.001$) and excellent rater reliability when assessed by well-trained health professionals (ICCs > 0.9, $P < 0.001$).[14,15]

Interpreting the Results:

Normal: The occiput touches the wall, and the OWD is 0 cm.

Abnormal: If the occiput cannot touch the wall then distance between occiput and the wall is measured, OWD greater than 2 cm considered as abnormal.



3. **For Evaluation of pain -** NPRS .

CRITERIA OF SELECTION: The following inclusion/exclusion criteria will be applied:

INCLUSION CRITERIA

(1) women over 40-60 years of age[16,17]
(2) Baseline pain of ≥3 on NPRS[16]
(3) Post mastectomy 1 to 2 months
(4) Limited active or passive shoulder ROM
(5) Patients with occiput to wall wall distance more than 2 cm

EXCLUSION CRITERIA

The exclusion criteria were:
(1) Distal metastasis or secondary malignancies
(2) Altered mental state,
(3) Unable to provide informed consent,
(4) Presenting with signs and symptoms of mastectomy scar infection or inflammation,
(5) Unhealed mastectomy wounds,
(6) lymphedema or other post surgical complications,
(7) Unstable medical or cardiovascular conditions,
(8) Pregnancy
(9) Undergoing radiotherapy during the study

INTERVENTION:

1. **Group A (Respiratory muscle training [18] + Manual Therapy + TENS):**
2. **Group B (conventional physiotherapy): (TENS + Postural correction exercise + breathing exercise + Passive stretching).**

PROCEDURE

GROUP A

1. Respiratory muscle training : It includes Maximum inspiratory and expiratory pressure measurement. The MIP and MEP was measured with respiratory muscle trainer. Demonstration of test was given prior to the commencement of session. Maximum inspiratory pressure was measured near to the residual volume for which participants were asked to exhale maximally and then inhalation for 3-4 seconds with maximum effort.The maximum expiratory pressure was measured at near to total lung capacity for which participant was asked to inhale maximally and then exhale for 3-4 seconds with maximum expiratory effort. Minimum 5-6 trials were given to get final recording.45 seconds to 1 minute rest was allotted in between trials. Maximum value of three readings was considered as a final reading. FITT Protocol for concurrent respiratory muscle strength training:

FREQUENCY: RMST was done for 5 days a week total 2 sessions per day consisted of 5 set of 6 inspiratory and 6 expiratory effort in a same breathing cycle without any break in between inspiratory and expiratory effort were performed in one set. After completion of one set, around 45 seconds to 1 minute of restwas given in between 5 sets. The rest time duration of 10 minutes was given in between the sessions resulting in 2 sessions of 30 inhalation and 30 exhalation on same breathing cycle per day at a same time.

First session(~6 minutes) 10 minutes (Rest) second session(~6 minutes)

First and second session

1st set = 6 (Inhalation + Exhalation) (8 -10 sec)	45 seconds – 1 minute rest
2nd set = 6 (Inhalation + Exhalation) (8 -10 sec)	45 seconds – 1 minute rest
3rd set = 6 (Inhalation + Exhalation) (8 -10 sec)	45 seconds – 1 minute rest
4th set = 6 (Inhalation + Exhalation) (8 -10 sec)	45 seconds – 1 minute rest
5th set = 6 (Inhalation + Exhalation) (8 -10 sec)	45 seconds – 1 minute rest

INTENSITY :For the first week training intensity was kept at 50% of MIP and MEP value and from the second week till 5th week training intensity was increased by 10 cm H_2O with increase in resistance level by one unit each week.

Example: MIP on baseline data = 60cm H_2O, training intensity starts at 30cm H_2O.

1st week training intensity = 30cm H2O
2nd week training intensity = 40cm H2O
3rd week training intensity = 50cm H2O
4thweek training intensity = 60cm H2O
5th week training intensity = 70cm H2O

TIME :RMST took around 30-40 minutes of time per day including 10 minutes of rest in between the two sessions for total 5 weeks of training duration.

TYPE: Resisted respiratory muscle strength training.

2. **Manual Therapy (~10- 12 min.):** It includes spencer technique which has 7 stages [19]

[Stage 1]Extension: Patient in side lying position with affected shoulder at upper side. Therapist's one hand stabilizes acromioclavicular joint and other hand extend the patient's shoulder with elbow in flexed position until a barrier is felt.

[stage 2]Shoulder flexion with elbow extension: Patient with flexed elbows were extended andmoved anteriorly into flexion until a restricted barrier is felt.

[stage 3] Circumduction with compression: With elbow in 90* flexion while the therapist grasp the patient's elbow and shoulder and move the elbow in small clockwise and anti clockwise direction with compressive forces.

[stage4] Circumduction with traction and elbow extension: The therapist maintained the traction shoulder joint at 90* abduction and holding their elbow or wrist and start rotating in clockwise and anti clockwise direction.

[stage5] Shoulder abduction and internal rotation with elbow flexion: The patient was asked to place his hand on therapist forearm , then the therapist carried out the abduction and internal rotation movement of patient's arm.

[stage6]Internal rotation with arm abducted ,hand behind back: Therapist places his hands on patients shoulder and scapula and move the patient's hand to lumbosacral area then pull the elbow anteriorly to internally rotate the shoulder into a limiting barrier.

[stage7] Distraction, stretching tissue and enhancing fluid drianage with arm extended: The therapist clamp his fingertips over the deltoids muscle, the patients hand is placed over therapist's shoulder and therapist then slowly shifts his arm away from shoulder and releases , repeating it 5-10 times if necessary.[20]

3. **TENS :**Pulsed mode for ~ 8 minutes[21,22]

GROUP B (Conventional Physiotherapy)

This includes:

1. TENS – For pain management (8min)
2. Postural correction exercise : (10 minutes)

(i) Chin tuck [23]

(ii) Scaption exercise [24]

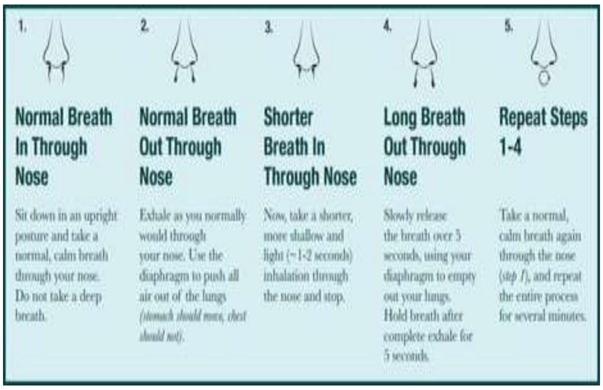
(iii) Codman's exercise for shoulder mobility [25]

3. Breathing exercise (20 min.)

(i) Pursed lip breathing [26,27]

(ii) Diaphragmatic breathing [28,29]

(iii) Buteyko Breathing



The Buteyko Breathing Technique teaches how to breathe properly through the nose (not the mouth) and with the diaphragm to improve nitric oxide and carbon dioxide levels in the body. When done properly, Buteyko breathing encourages the activation of the parasympathetic nervous system, resulting in a reduction of blood pressure, a reduction of stress and the strengthening of the immune system. [30,31]

4. Passive Stretching (pectoralis major) (~8-10 min)

RESULTS:

TABLE 1: Pre- and Post-MIP (Maximum Inspiratory Pressure) Comparison

GROUP	PRE MIP (cmH2O)		POST MIP (cm H2O)		Paired t value	p value
	MEAN	SD	MEAN	SD		
CONTROL (n=30)	55.27	19.26	66.57	15.44	**-5.671**	**<0.001***
EXPERIMENTAL (n=30)	59.73	19.26	88.47	21.31	**-8.259**	**<0.001***
Unpaired t value	-0.897		**-4.558**			
p value	0.374		**<0.001***			

The control group demonstrated a mean increase in inspiratory pressure from 55.27 ± 19.26 cm H_2O before intervention to 66.57 ± 15.44 cmH2O after intervention, which was statistically significant (p < 0.001). Similarly, the experimental group improved from 59.73 ± 19.26 cmH2O pre-treatment to 88.47 ± 21.31 cmH2O post-treatment, also showing high significance (p < 0.001). When comparing between groups, baseline values

TABLE 2: Pre- and Post-MEP (Maximum Expiratory Pressure) Comparison

GROUP	PRE MEP		POST MEP		Paired t value	p value
	MEAN	SD	MEAN	SD		
CONTROL (n=30)	67.33	16.02	79.33	15.63	**-5.053**	**<0.001***
EXPERIMENTAL (n=30)	64.17	16.82	98.53	18.43	**-10.512**	**<0.001***
Unpaired t value	0.745		**-4.352**			
p value	0.459		**<0.001***			

In the control group, maximum expiratory pressure raised from 67.33 ± 16.02 to 79.33 ± 15.63, with the change being statistically significant (p < 0.001). The experimental group exhibited a greater improvement, increasing from 64.17 ± 16.82 to 98.53 ± 18.43 (p < 0.001). Intergroup comparison showed no significant baseline variation (p= 0.459). However, post-intervention analysis revealed a significant difference (p < 0.001), suggesting that the experimental intervention produced a superior effect on expiratory muscle strength compared to standard management.

TABLE 3: Pre- and Post-NPRS (Numerical Pain Rating Scale) Comparison

GROUP	PRE NPRS		POST NPRS		Paired t value	p value
	MEAN	SD	MEAN	SD		
CONTROL(n=30)	7.63	0.89	4.20	1.24	**13.862**	**<0.001***
EXPERIMENTAL (n=30)	7.50	1.04	2.07	0.94	**31.82**	**<0.001***
Unpaired t value	0.520		**7.498**			
p value	0.605		**<0.001***			

Pain intensity, measured using NPRS, reduced significantly in both groups. The control group reported a decline from 7.63 ± 0.89 to 4.20 ± 1.24 (p < 0.001), while the experimental group showed a sharper reduction from 7.50 ± 1.04 to 2.07 ± 0.94 (p < 0.001). Between-group comparison indicated no baseline difference (p = 0.605). However, after intervention, the difference was highly significant (p< 0.001), confirming that the experimental strategy was more effective in alleviating pain.

TABLE 4: Pre- and Post-Peak Flow Comparison

GROUP	PRE PEAK FLOW		POST PEAK FLOW		Paired t value	p value
	MEAN	SD	MEAN	SD		
CONTROL (n=30)	285.47	59.64	326.13	65.98	**-25.161**	**<0.001***
EXPERIMENTAL (n=30)	278.97	70.08	381.50	97.51	**-17.147**	**<0.001***
Unpaired t value	0.387		**2.576**			
p value	0.700		**0.013***			

The peak expiratory flow rate improved significantly in both groups. The control group increased from 285.47 ± 59.64 to 326.13 ± 65.98 ($p< 0.001$), while the experimental group improved from 278.97 ± 70.08 to 381.50 ± 97.51 ($p < 0.001$). Baseline values were comparable ($p= 0.700$), but post-intervention differences were statistically significant ($p = 0.013$). These findings suggest that the experimental intervention facilitated greater enhancement of pulmonary function compared to control measures.

TABLE 5: Improvement in Peak Flow Percentage

GROUP	IMPROVEMENT IN PEAK FLOW (%)		Unpaired t value	p value
	MEAN	SD		
CONTROL (n=30)	14.39	2.51	**-14.884**	**<0.001***
EXPERIMENTAL (n=30)	36.89	7.89		

When expressed as percentage improvement, the control group showed a mean increase of 14.39 ± 2.51%, whereas the experimental group achieved a significantly higher gain of 36.89 ± 7.89%. The difference between the two groups was highly significant ($p < 0.001$), reinforcing the superior effectiveness of the experimental protocol in augmenting respiratory function.

PRE AND POST ANALYSIS OF POSTURE:

There was a greater improvement in occiput to wall distance in 25 subjects out of 30 in experimental group. Wheres in control group only 17 subjects shows improvement in occiput to wall distance.

DISCUSSION

The present study aimed to evaluate the effectiveness of a combined rehabilitation approach integrating manual therapy (Spencer's Technique) and respiratory muscle training (RMT) in improving pain, posture, and pulmonary function in post-mastectomy patients. The findings of the study demonstrate a statistically significant improvement in maximum inspiratory pressure (MIP) and maximum expiratory pressure (MEP) in the experimental group receiving combined therapy, while the control group showed no significant change. These results highlight the clinical relevance and potential benefits of a comprehensive rehabilitation strategy post-mastectomy. Postoperative pain in breast cancer survivors is a major contributor to functional limitations and reduced quality of life. In the current study, the use of Spencer's Technique contributed to a significant reduction in shoulder pain, likely through improved joint mobility, myofascial release, and lymphatic drainage. These results are in agreement with prior studies by Basilio et al. (2014), who reported significant reduction in post-mastectomy pain through manual therapy interventions. The inclusion of TENS further complemented pain relief by modulating pain perception at the neural level. Post-mastectomy women often exhibit forward head posture (FHP) and thoracic kyphosis due to pain avoidance, or surgical changes. In this study, the experimental group exhibited notable improvement in reducing kyphosis , reflecting better postural alignment. This improvement can be credited to the combined effect of shoulder mobility exercises(via Spencer's Technique) and postural correction strategies integrated into the rehabilitation protocol. Our findings support the earlier conclusions drawn by Lorbergs et al. (2017), who linked kyphotic posture to impaired lung function, emphasizing the importance of early postural intervention. A significant highlight of this study is the demonstrated efficacy of RMT in enhancing respiratory muscle strength. Participants in the experimental group exhibited statistically significant increases in MIP, MEP scores and PEFR values, indicating improved strength of both inspiratory and expiratory muscles. These findings align with previous literature (e.g., Al-Najar et al., 2022; Ibrahim et al., 2024), suggesting that RMT is effective in reversing respiratory muscle weakness, improving ventilation, and ultimately enhancing oxygen delivery in cancer survivors. The training likely mitigated metaboreflex effects and reduced early onset of respiratory fatigue, thereby enhancing overall endurance and function.

The results of this study emphasize the benefit of a multimodal physiotherapy approach that combines both musculoskeletal and cardiorespiratory strategies. Traditionally, rehabilitation post-mastectomy tends to address pain and mobility in isolation. However, our results suggest that addressing both respiratory and musculoskeletal impairments concurrently yields superior outcomes in terms of pain relief, posture correction, and pulmonary function enhancement.

This study introduces Spencer's Technique as a novel intervention in the post-mastectomy population and provides realistic evidence supporting its use. Combined with RMT, this approach can be integrated into clinical practice to address multi-dimensional deficits in breast cancer survivors. Furthermore, the intervention is non-invasive, cost-effective, and easily deliverable in outpatient physiotherapy settings.

LIMITATIONS

1. The sample size was relatively small, which may limit the generalizability of the findings.
2. The duration of follow-up was limited and long-term benefits of the intervention remain to be studied.
3. Furthermore, psychosocial variables such as anxiety, depression, and quality of life, which could influence rehabilitation outcomes, were not assessed.

CONCLUSION:

The study demonstrates that a combined intervention involving manual therapy (Spencer's Technique) and respiratory muscle training significantly improves pain, posture, and pulmonary function in post-mastectomy patients.

These findings support the integration of such multimodal approaches into standard post-operative rehabilitation to promote faster recovery and better quality of life.

Further Scope of Study:

1. **Long-Term Follow-Up:** Evaluating the long-term impact of the combined intervention on pulmonary function, pain management, and postural alignment at 6 months or 1 year post-intervention could provide vision into how lasting these benefits are.

2. **Broader Patient Population:** Future studies could expand the sample to include patients at different stages of recovery or with varying cancer treatments (e.g., chemotherapy, radiation). This would help determine if the combined intervention is effective across diverse patient profiles. Including participants from different age groups (older women or even younger survivors) might yield insights into how age impacts the effectiveness of rehabilitation.

3. **Impact on Mental Health:** Post-mastectomy patients often experience psychological distress such as anxiety, depression, and body image issues. Future research could incorporate mental health assessments (e.g., the Hospital Anxiety and Depression Scale, or HADS) to evaluate the psychosocial benefits of this combined rehabilitation program. Exploring the impact of improved physical function on emotional well-being and body image may further emphasize the holistic benefits of this rehabilitation approach.

4. **Pilot Studies in Diverse Settings:** Conducting pilot studies in different geographical locations or in rural and underserved areas could explore the feasibility and accessibility of this combined intervention outside of controlled experimental settings. It may also identify potential barriers to implementation in clinical practice or home-based settings.

5. **Technology Integration:** The integration of technology, such as wearable devices to monitor posture and breathing, could enhance the rehabilitation process. Future studies could explore whether real-time feedback provided by wearable devices or mobile apps improves patient adherence and outcome measurement.

RESULT:

For RMST group : There was statistically highly significant difference in maximum inspiratory pressure and maximum expiratory pressure post study.

For control group : There was no statistically significant difference in maximum inspiratory pressure and maximum expiratory pressure.

There was a statistically significant difference present with increment in MIP and MEP in RMST group but control group didn't show any significant changes in MIP and MEP after the study. The current study reveals that RMST assisted in improving respiratory muscle pressure. respiratory muscle pressure.

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