Journal of Neonatal Surgery
ISSN(Online): 2226-0439
Vol. 14, Issue 4s (2025)
https://www.jneonatalsurg.com

OPEN ACCESS

Effect of Core strengthening along with Conventional Physiotherapy on Spinal Dysfunction in post operative modified Radical Mastectomy patients

Rutuja Rajendra Gat[1], Dr. Suraj Bhimarao Kanase[*2]

[1,*2]Department of Neuro Physiotherapy, Krishna College of Physiotherapy, Krishna Vishwa Vidyapeeth Deemed to be university, Karad

***Corresponding Author:**

Email ID: drsurajkanse7@gmail.com

.Cite this paper as: Rutuja Rajendra Gat, Dr Suraj Bhimarao Kanase, (2025) Effect of Core strengthening along with Conventional Physiotherapy on Spinal Dysfunction in post operative modified Radical Mastectomy patients. *Journal of Neonatal Surgery*, 14 (4s), 1035-1044.

ABSTRACT

Background: Modified Radical Mastectomy is a prevalent surgical intervention for breast cancer, involving the removal of breast tissue and lymph nodes while preserving chest muscles. Subjects often experience post-operative complications, including spinal dysfunction, chronic pain, and reduced mobility. These complications can lead to significant functional restrictions and postural alterations. Exercises are key component of treatment, can mitigate these adverse effects by enhancing spinal stability, alleviating chronic pain, and improving functional capacity. There role in enhancing movement and minimising disability needs to be evaluated

Method: A total of 100 participants were enrolled in this study and randomly assigned to one of two groups: Group A (experimental group) and Group B (control group). Participants in Group A received a comprehensive exercise program consisting of core strengthening exercises in addition to conventional exercises, while those in Group B received conventional exercises only. A range of outcome measures were assessed at pre-test and post-test, including: Numerical Pain Rating Scale ,Spinal Range of Motion, Spinal Manual Muscle Testing ,Functional Rating Index, Spinal Static and Dynamic Stability Test , Postural Assessment.

Result: The results of this study demonstrated significant improvements. Specifically, Group A exhibited: Reduced pain intensity (2.87 ± 0.65 vs 3.10 ± 0.82), Improved Manual Muscle Testing scores (4.56 ± 1.05 vs 4.14 ± 1.03), Enhanced Functional Rating Index scores (38.6 ± 4.2 vs 51.4 ± 14.1), Significant improvements in spinal mobility and postural alignment were observed in Group A compared to Group B.Enhanced spinal static (35.6 ± 4.2 vs 26.3 ± 4.9) and dynamic (60.1 ± 7.2 vs 42.6 ± 7.5) stability test.

Conclusion: The integration of core strengthening exercises into conventional therapy yields significant improvements in spinal function and quality of life following modified radical mastectomy.

Keywords: *Core strengthening, Conventional Physiotherapy, Spinal Dysfunction, Modified Radical Mastectomy.*

1. INTRODUCTION

Breast cancer is a pervasive global health issue, with Modified Radical Mastectomy (MRM) being a commonly performed surgical procedure for its treatment [1]. Cancer refers to a condition characterized by unregulated cell growth, where aberrant cells proliferate uncontrollably and invade adjacent tissues [2]. Among various types of cancer, breast cancer has an exceptionally high surgical survival rate, primarily owing to the availability of advanced screening techniques that facilitate timely detection and intervention[3].Globally, breast cancer is the leading cause of mortality among women aged 45 and above, accounting for a significant proportion of deaths within this demographic[4]. Mastectomy refers to a surgical procedure that involves the removal of part or all of the breast tissue, along with adjacent tissues and nearby lymph nodes[5].The management of breast cancer typically involves a multidisciplinary approach, incorporating various treatment modalities such as surgery, systemic therapies (including hormone therapy and chemotherapy), and radiation therapy[6].Lymph node dissection in the axillary region during breast cancer surgery is associated with an increased risk of postoperative pain[7].Effective postoperative pain management remains a significant clinical challenge for patients undergoing surgical intervention for breast cancer[8]. The pathophysiology of pain associated with breast cancer is multifactorial, encompassing musculoskeletal factors such as muscle hypertonicity and imbalance, neuropathic pain secondary to axillary lymph node dissection, and biomechanical alterations resulting in restricted range of motion [9].Beyond upper limb dysfunction, post-mastectomy women often experience debilitating trunk impairments, particularly thoracic kyphosis, which can precipitate a cascade of functional disorders affecting the thoracolumbar spine[10].Surgical interventions and adjuvant treatments for breast cancer can directly impact the thoracic region, including the pectoralis major and minor muscles. The spine, as an integral component of the musculoskeletal system, functions as a kinematic chain, wherein alterations in one segment can precipitate a cascade of functional and structural changes throughout the spine and entire motor system, ultimately leading to the development of compensatory deformities and movement pattern dysfunctions [11].The pectoralis major, pectoralis minor, and latissimus dorsi muscles share a proximal relationship due to their anatomical attachments. Notably, the pectoralis minor muscle has a fascial connection with the external oblique abdominal muscle, which spans from the fifth rib to the pelvic bone, and also interfaces with the latissimus dorsi muscle along the anterior median line. Bilateral contraction of these muscle groups induces thoracic flexion and depression, whereas prolonged activation can lead to attenuation of postural stabilizing muscles, ultimately compromising muscular endurance and contributing to postural deformities[12].The spine is a complex, multifunctional structure that plays a crucial role in facilitating mobility and stability of the trunk and extremities, while also providing essential protection to the spinal cord. From a functional perspective, the spine is vital for maintaining postural stability, encompassing both dynamic and static stability, and ensuring optimal spinal alignment is critical for preserving overall bodily posture. Conversely, spinal dysfunction can precipitate a cascade of postural disturbances, affecting the trunk and extremities, and ultimately compromising overall musculoskeletal function[13].Restrictive motion patterns, musculoskeletal pain, tissue tightness, and muscle imbalance affecting the trunk, including the skin, muscles, and tendons, can culminate in significant functional impairments, ultimately compromising an individual's ability to perform activities of daily living and negatively impacting overall quality of life[14].The spine exhibits dynamic compensatory mechanisms, wherein disturbances in one vertebral segment prompt adaptive changes in adjacent segments. Following modified radical mastectomy, alterations in spinal kinematics, including muscle tightness, pain, and reduced range of motion, can disrupt spinal alignment, leading to secondary changes in spinal structures and scapulothoracic motion patterns, which can perpetuate a cascade of musculoskeletal dysfunctions[15].Mastectomy-induced soft tissue asymmetry and alterations in chest wall mass distribution can disrupt the body's centre of gravity, leading to compensatory changes in upper limb kinematics, including scapular elevation and spinal inclination, which can ultimately impact functional movement patterns and overall musculoskeletal function[16].Targeted exercise interventions focusing on strengthening weakened spinal stabilizers, including abdominal and extensor muscles, and stretching tight musculature, can be effectively implemented post-operatively. Physiotherapy plays a pivotal role in optimizing spinal function, correcting postural deviations, enhancing mobility, strength, and endurance, mitigating pain, and preventing secondary complications, thereby facilitating comprehensive rehabilitation and functional recovery[17].Core strengthening exercises are designed to restore optimal deep trunk muscle function, facilitating coordinated activation of deep and superficial trunk musculature during various tasks. This multifaceted program targets the activation of deep abdominal muscles, integrating this activation into functional movements, and encompasses a comprehensive range of components, including strength, endurance, balance, posture, and neuromuscular control of the core and lower extremity, ultimately aiming to mitigate injury risk and promote overallmusculoskeletal resilience[18]. The core musculature, comprising the transverse abdominis, rectus abdominis, internal and external obliques, and paraspinal muscles, plays a critical role in maintaining lumbopelvic and spinal stability. Targeted strengthening of these muscles can enhance spinal control, promote optimal pelvic and lumbar alignment, and ultimately contribute to improved overall musculoskeletal function and reduced injury risk[19]. Physiotherapy is a crucial component of post-operative rehabilitation following modified radical mastectomy, facilitating the restoration of functional activity and overall quality of life. Conventional physiotherapy interventions focus on optimizing shoulder mobility, alleviating post-surgical pain, and enhancing thoracic expansion, thereby addressing the multifaceted physical impairments associated with this surgical procedure[20].Assessing the impact of core strengthening exercises on spinal stability and alignment is crucial in preventing spinal dysfunction, a potential sequela of mastectomy. Therefore, in conjunction with conventional physiotherapy interventions, individuals undergoing modified radical mastectomy should receive comprehensive spinal function assessments from therapists and physicians. This proactive approach enables the implementation of prophylactic treatments aimed at mitigating spinal dysfunction and promoting optimal spinal health[21].This investigation aimed to examine the efficacy of a core strengthening exercise protocol in alleviating pain, spinal dysfunction, and functional disability following modified radical mastectomy. The exercise program, emphasizing core strengthening, was hypothesized to mitigate post-surgical weakness and muscle imbalance, enhance spinal range of motion, and ultimately reduce dysfunction and disability, while also improving strength and functional capacity in breast cancer survivors undergoing modified radical mastectomy.

2. MATERIALS AND METHOD

Following institutional review board and ethics committee approval, a comparative study was undertaken at Krishna Vishwavidyapeeth to investigate the therapeutic benefits of integrating core strengthening exercises with conventional physiotherapy in breast cancer survivors who had undergone modified radical mastectomy. The primary aim of this research was to evaluate the efficacy of this combined intervention in mitigating spinal dysfunction in post-operative patients, thereby informing evidence-based practice in oncological rehabilitation.

Participants

A total of 100 breast cancer survivors who had undergone modified radical mastectomy were recruited for this study. Participants were selected based on stringent inclusion criteria, including: (1) a confirmed unilateral breast cancer diagnosis, (2) completion of adjuvant chemotherapy and radiotherapy, (3) modified radical mastectomy surgery, and (4) presence of spinal dysfunction. Conversely, individuals with recurrent breast cancer, pre-existing spinal pathologies, neurological impairments, or uncontrolled medical comorbidities were excluded from participation to minimize confounding variables and ensure a homogeneous sample population.

The recruited participants were randomly allocated into two groups of 50 subjects each: Group A (Experimental) and Group B (Control). The experimental intervention consisted of a structured exercise program, comprising three sessions per week for a duration of six weeks, with each session lasting approximately 45-50 minutes, totalling 18 sessions per participant.

Procedure

All patients provided informed verbal consent after receiving a comprehensive explanation of the study protocol. Baseline assessments were conducted utilizing a multifaceted outcome measurement battery, encompassing pain intensity, spinal mobility, functional capacity, muscle strength, postural evaluation, and spinal stability tests. Participants were randomly allocated to either the experimental group (Group A), receiving core strengthening exercises in conjunction with conventional exercises, or the control group (Group B), receiving conventional exercises alone. Both groups underwent supervised exercise sessions, consisting of three 45-50 minute sessions per week for six weeks. Post-intervention assessments were conducted using the same outcome measures as the baseline evaluation. Statistical analysis, performed using Instat software, compared pre- and post-intervention values between the two groups to evaluate the efficacy of the core strengthening exercise program.

Outcome Measures

Numerical Pain Rating Scale (NPRS) -

The Numerical Pain Rating Scale is a widely utilized, patient-reported outcome measure that quantitatively assesses pain intensity. This self-administered scale requires participants to rate their pain severity on a continuous scale ranging from 0 (indicating no pain) to 10 (representing the worst possible pain), thereby providing a standardized and reproducible measure of pain intensity.

Range of motion (ROM)

Spinal Range of Motionwas objectively assessed using a standardized goniometer, which quantitatively measured flexion, extension, rotation, and lateral flexion movements. Participants were instructed to perform maximum active movements through their full range of spinal motion, with the goniometer calibrated to zero prior to each measurement. The resulting data provided a reliable and quantitative evaluation of spinal mobility, with increased values indicating enhanced range of motion and improved spinal flexibility.

Manual Muscle Testing (MMT)

The Trunk Manual Muscle Testis a standardized, clinically validated assessment tool utilized to evaluate the strength and integrity of the trunk musculature, encompassing both abdominal and paraspinal muscles. This evaluation involves isometric contractions of trunk flexion and extension with arms positioned at the sides. Muscle strength was graded using the Medical Research Councilscale, ranging from 0 (no movement) to 5 (normal strength), enabling the identification of muscle imbalances or weaknesses that may contribute to spinal pain or dysfunction, and informing the development of targeted therapeutic interventions to address these deficits.

Functional Rating Index (FRI) Questionnaire

The Functional Rating IndexQuestionnaire is a standardized, assessment tool utilized to evaluate functional capacity and disability in individuals experiencing spinal pain. This validated, patient-reported outcome measureprovides a comprehensive examination of the impact of spinal pain on daily functioning, encompassing various domains, including sleep quality, lifting ability, and flexibility during bending movements, thereby offering valuable insights into the effects of spinal pain on everyday activities and overall quality of life.

Postural Assessment

A comprehensive postural assessment was conducted to evaluate the participant's overall posture, examining the spatial alignment of key anatomical landmarks, including thescapulae, vertebral column, pelvis, and lower extremities, in both standing and sitting positions. This evaluation aimed to identify any postural deviations or malalignments that may be contributing to spinal pain, functional impairments, or movement dysfunctions, thereby informing targeted interventions to optimize postural alignment and promote overall musculoskeletal health.

Spinal Static and Dynamic Stability Test

The Spinal Static and Dynamic Stability Test is a multifaceted assessment tool designed to evaluate an individual's ability to maintain optimal spinal stability during various movements and postures. This comprehensive test provides a nuanced examination of core muscle strength, flexibility, and neuromuscular coordination, which are critical determinants of spinal function and stability, thereby offering valuable insights into the complex interplay between spinal stability, movement patterns, and overall musculoskeletal health.

The experimental group (Group A) received a comprehensive exercise program that combined core strengthening exercises with conventional exercises. The core strengthening exercises consisted of three primary components: (1) diaphragmatic breathing exercises to enhance respiratory function and promote relaxation, (2) range of motion exercises to maintain or improve spinal mobility, and (3) core activation exercises to strengthen the stabilizing muscles of the trunk.

The core activation exercises included several key movements. Firstly, participants performed the supine bridge exercise, which involved lying in a supine position, flexing the knees, and lifting the pelvis while contracting the gluteal muscles. This exercise effectively activated the gluteus medius, gluteus maximus, hamstrings, and multifidus muscles.

To engage the trunk rotators, including the rectus abdominis, internal and external obliques, and transverse abdominis muscles, participants performed a seated rotational exercise. This involved sitting on the floor with knees bent and feet flat, leaning the upper body back at a 45-degree angle, and rotating the arms to one side and then the other. Progression of this exercise involved lifting the feet off the ground while maintaining control.

Finally, to target the lower abdominal muscles, specifically the transverse abdominis and lower rectus abdominis, participants performed straight leg raises. This exercise effectively activated the desired muscle groups while minimizing strain on the lower back.

To enhance spinal stability, participants performed alternate arm and leg raises in a quadruped position. This exercise effectively strengthened the stabilizing muscles of the spine, including the subscapularis, infraspinatus, supraspinatus, teres minor, deltoid, latissimus dorsi, and erector spinae muscles.

To promote spinal mobility, participants performed cat-camel exercises, a series of movements designed to facilitate flexion and extension of the spine. Initially, participants assumed the cat pose by exhaling, rounding the spine towards the ceiling, tucking the chin towards the chest, and engaging the abdominal muscles by drawing the belly towards the spine. Subsequently, participants transitioned into the camel pose by inhaling, arching the back, and lowering the belly towards the floor, thereby experiencing a gentle stretch in the abdominal region. This exercise sequence helped to improve spinal flexibility and range of motion.

The control group (Group B) received conventional physiotherapy treatment, which consisted of a standardized exercise program and manual therapy techniques. The exercise program included breathing exercises, pendulum exercises to promote shoulder mobility (flexion, extension, abduction, adduction, and circumduction) for 2-3 minutes in each direction, and progressive resistance exercises using TheraBand and weights to strengthen the shoulder muscles (flexion, extension, abduction, and adduction).

Additionally, manual therapy techniques were applied, including soft tissue mobilization using myofascial release for 7-8 minutes. Scapular stabilization exercises were also performed, consisting of wall slides, scapular protraction, and retraction (10 repetitions each), to enhance scapular stability and promote optimal shoulder function.

3. RESULT

The patients who finished a complete session for them analysis was made and on whom complete pre and post assessments were performed. Group A and Group B both consisted of 50 subjects each.

Pain:

The Pain intensity significantly decreased in group A post-treatment.The mean decrease in pain scores was significantly higher in group A than in group B (2.87 ± 0.652vs3.1 ± 0.82).

Pain (NPRS)	Pre	Post
Group A	8.45 ± 0.92	2.87 ± 0.652
Group B	8.4 ± 1.05	3.1 ± 0.82
P – value	0.9	<0.0001
Inference	Not significant	Extremely significant

Manual Muscle Testing:

The experimental group (Group A) demonstrated a more significant increase in mean scores compared to the control group (Group B), with scores of (4.56 ± 1.045 vs 4.14 ± 1.03).

MMT	Pre	Post
Group A	3.48 ± 1.06	4.56 ± 1.045
Group B	3.07 ± 1.04	4.14 ± 1.03
P – value	0.1	<0.001
Inference	Not significant	Extremely significant

Functional Rating Index:

The experimental group (Group A) exhibited a more significant enhancement in FRI scores, recording (38.6 ± 4.2 vs 51.4 ± 1.4) in the control group (Group B).

FRI	Pre	Post
Group A	55.7 ± 11.4	38.6 ± 4.2
Group B	56.8 ± 10.6	51.4 ± 1.4
P – value	0.68	<0.0001
Inference	Not significant	Extremely significant

Range of Motion :

Cervical	**Flexion**		**Extension**		**Side flexion (right)**		**Side flexion (left)**	
	Pre	**Post**	**Pre**	**Post**	**Pre**	**Post**	**Pre**	**Post**
Group A	40.2 ± 8.5	55.2 ± 6.2	30.5 ± 7.2	40.8 ± 5.9	30.8 ± 7.5	40.2 ± 6.1	31.2 ± 7.8	41.1 ± 6.3
Group B	39.5 ± 9.2	43.2 ± 8.3	29.2 ± 7.9	32.1 ± 7.2	29.5 ± 8.2	32.2 ± 7.5	30.2 ± 8.5	33.1 ± 7.8
P – value	0.6936	<0.001	0.39	<0.001	0.41	<0.001	0.54	<0.001
Inference	NS	ES	NS	ES	NS	ES	NS	ES
Thoracic	**Flexion**		**Extension**		**Side flexion (right)**		**Side flexion (left)**	
	Pre	**Post**	**Pre**	**Post**	**Pre**	**Post**	**Pre**	**Post**
Group A	15.2 ± 5.5	24.5 ± 6.8	8.5 ± 3.2	14.2 ± 4.5	12.1 ± 4.2	18.3 ± 5.2	11.9 ± 4.1	18.1 ± 5.1
Group B	14.5 ± 5.2	17.2 ± 5.8	8.2 ± 3.1	10.5 ± 3.8	11.5 ± 4.0	14.2 ± 4.8	11.3 ± 3.9	13.9 ± 4.6
P – value	0.51	<0.001	0.63	<0.0001	0.46	<0.001	0.45	<0.001
Inference	NS	ES	NS	ES	NS	ES	NS	ES
Lumbar	**Flexion**		**Extension**		**Side flexion (right)**		**Side flexion (left)**	
	Pre	**Post**	**Pre**	**Post**	**Pre**	**Post**	**Pre**	**Post**
Group A	30.1 ± 8.1	50.5 ±	15.2 ± 5.5	25.9 ± 8.5	25.8 ± 8.1	32.2 ± 8.0	20.2 ± 6.1	29.8 ± 8.0

		12.2						
Group B	29.5 ± 7.9	35.2 ± 9.5	14.5 ± 5.2	18.2 ± 6.3	23.5 ± 5.8	27.6 ± 6.9	18.9 ± 5.7	22.5 ± 6.7
P – value	0.70	0.0001	0.51	<0.0001	0.1	<0.005	0.27	<0.001
Inference	NS	ES	NS	ES	NS	ES	NS	ES

(where, NS indicates not significant and ES indicates extremely significant)

The experimental group (Group A) demonstrated a more substantial improvement in cervical flexion, extension, side flexion (Right and Left) range of motion (ROM),with scores of (55.2 ± 6.2 vs 43.2 ± 8.3),(40.8 ± 5.9 vs 32.1 ± 7.2),(40.2 ± 6.1 vs 32.2 ± 7.5) and(41.1 ± 6.3 vs 33.1 ± 7.8) in the control group (Group B).

The experimental group (Group A) demonstrated a substantial improvement in thoracic flexion, extension, side flexion (Right and Left) range of motion (ROM),with scores of (24.5 ± 6.8 vs 17.2 ± 5.8), (14.2 ± 4.5 vs10.5 ± 3.8),(18.3 ± 5.2 vs 14.2 ± 4.8) and(18.1 ± 5.1 vs 13.9 ± 4.6) than control group (Group B).

The experimental group (Group A) demonstrated a substantial improvement in lumbar flexion, extension, side flexion (Right and Left) range of motion (ROM),with scores (50.5 ± 12.2 vs 35.2 ± 9.5),(25.9 ± 8.5 vs 18.2 ± 6.3),(32.2 ± 8.0 vs 27.6 ± 6.9) and(29.8 ± 8.0 vs 22.5 ± 6.7) than control group (Group B).

Postural assessment and Spinal Stability test:

Postural assessment	**Forward head**		**Kyphosis**		**Lordosis**	
	Pre	**Post**	**Pre**	**Post**	**Pre**	**Post**
Group A	43.2 ± 10.5	24.5 ± 6.8	45.1 ± 12.1	30.8 ± 8.5	32.5 ± 9.5	25.9 ± 7.2
Group B	42.5 ± 10.2	38.2 ± 9.5	44.2 ± 11.5	41.1 ± 10.8	31.2 ± 9.0	28.5 ± 4.2
P – value	0.753	<0.001	0.712	<0.001	0.48	<0.029
Inference	Not Significant	Extremely Significant	Not Significant	Extremely Significant	Not Significant	Extremely Significant

Spinal Stability test	**Spinal static stability test**		**Spinal dynamic stability test**	
	Pre	**Post**	**Pre**	**Post**
Group A	23.4 ± 5.1	35.6 ± 4.2	40.2 ± 8.5	60.1 ± 7.2
Group B	22.9 ± 5.3	26.3 ± 4.9	39.5 ± 8.2	42.6 ± 7.5
P – value	0.63	<0.0001	0.67	<0.001
Inference	Not Significant	Extremely Significant	Not Significant	Extremely Significant

The experimental group exhibited a more significant reduction in forward head posture,kyphosis and lordosis with scores of (24.5 ± 6.8 vs 38.2 ± 9.5), (30.8 ± 8.5 vs 41.1 ± 10.8)and (25.9 ± 7.2 vs 28.5 ± 4.2) in the control group B.This suggests that the intervention was effective. Overall, the results indicate that the experimental group achieved substantial improvements.

The experimental group exhibited a more substantial improvement in spinal static and dynamic stability, with scores of (35.6 ± 4.2 vs 26.3 ± 4.9) and (60.1 ± 7.2 vs 42.6 ± 7.5) in the control group B. This suggests that the intervention was effective. Overall, the results indicate that the experimental group achieved significant enhancements in spinal stability.

4. DISCUSSION

This study, titled "Effect of Core Strengthening along with Conventional Physiotherapy on Spinal Dysfunction in Post-Operative Modified Radical Mastectomy Patients," aimed to investigate the efficacy of a core strengthening exercise program in alleviating spinal dysfunction following modified radical mastectomy.

Previous research done by Babasaheb SS et al. has indicated that females who undergo modified radical mastectomy surgeries exhibit a higher incidence of spinal dysfunction, characterized by pain, functional disability, and reduced range of motion. A notable study, "Analysis of Spinal Dysfunction in Breast Cancer Survivors with Lymphedema," conducted a comprehensive assessment of spinal dysfunction in breast cancer survivors with lymphedema. The researchers employed a range of outcome measures, including goniometric assessment of range of motion, lymphedema measurement using an inch tape, spinal stability testing, and the Functional Rating Index. The findings of this study revealed significant correlations between spinal dysfunction and lymphedema in breast cancer survivors.Building upon this existing body of research, the present study sought to explore the therapeutic benefits of core strengthening exercises in conjunction with conventional physiotherapy for mitigating spinal dysfunction in post-operative modified radical mastectomy patients[22].

The most common alterations observed in this population were shoulder elevation, neck lateralization, and muscle imbalance, which collectively compromise the biomechanical integrity of the spine. These postural deviations and muscular imbalances can lead to altered spinal kinematics, potentially exacerbating spinal dysfunction and contributing to the development of chronic pain and disability[23].

Extensive research has documented postural abnormalities in both the sagittal and frontal planes following modified radical mastectomy. Specifically, thoracic hyperkyphosis, shoulder elevation, scapular asymmetry, rib cage alterations, and scoliosis have been observed. These postural deviations exacerbate symptoms such as postoperative pain, muscle weakness, and involuntary shoulder protraction on the operated side, often as a compensatory mechanism to conceal aesthetic defects.

Notably, patients with more pronounced functional deficits tend to experience greater difficulties. The associated psychological tension is transmitted to the spine via muscular pathways, resulting in increased loading on the vertebrae and intervertebral discs. This overload contributes to the development of degenerative diseases and chronic back pain, ultimately perpetuating a vicious cycle of postural defects and musculoskeletal dysfunction. [24].

Post-mastectomy women often experience debilitating trunk disorders, characterized by thoracic kyphosis, neck lateralization, and shoulder asymmetry. These postural deviations can precipitate functional impairments in the thoracic spine, ultimately compromising overall spinal function.

The deepening of thoracic kyphosis leads to shortened pectoralis major and minor muscles, as well as abdominal and hip extensor muscles. This pathological alteration reduces muscular flexibility and endurance, impairing the muscles' ability to generate tone and increasing the risk of functional impairment and pain.

From a biomechanical perspective, spinal curvature in the sagittal plane plays a crucial role in maintaining optimal spinal function. Alterations in curve angles can significantly impact body posture, compromising the spine's ability to transfer loads and perform its normal functions. These changes can initiate a cascade of musculoskeletal adaptations, ultimately contributing to the development of chronic pain and disability[25].

Following unilateral mastectomy, the removal of tissue disrupts the body's weight distribution, leading to a compensatory lateral bending of the trunk towards the operated side. To counteract this deviation, the erector spinae muscle on the non-operative side must increase its static activity to pull the trunk back towards the upright midline. This compensatory mechanism can result in muscular overload, potentially leading to fatigue, strain, and pain in the affected muscle group. This altered biomechanical environment may also contribute to the development of postural asymmetries and movement dysfunctions [26].

A randomized controlled trial, research done byMalicka et al.“Body posture of women after breast cancer treatment” revealed a significantly higher prevalence of faulty body postures among post-mastectomy women (82.3%) compared to healthy controls (35.1%). Furthermore, the study found a tendency towards increased thoracic kyphosis in the post-mastectomy population, indicating a potential alteration in the anteroposterior curvature of the spine. This finding suggests that mastectomy may contribute to changes in spinal alignment, potentially leading to long-term musculoskeletal consequences[27].

Research by Crosbie et al. “Effects of mastectomy on shoulder and spinal kinematics during bilateral upper-limb movement” highlights the significant impact of surgical-induced shoulder asymmetry on spinal kinematics. Specifically, their findings suggest that the altered shoulder position resulting from mastectomy disrupts the normal movement patterns of the spine, leading to disturbed kinematics and potential long-term consequences for spinal function and overall musculoskeletal health [28].

Recent studiesconducted byShamley Det al. “Shoulder morbidity after treatment for breast cancer is bilateral and greater after mastectomy” have highlighted the profound impact of breast cancer treatment on shoulder morbidity, revealing that mastectomy is associated with greater bilateral shoulder dysfunction compared to other treatments. Furthermore, research has demonstrated that even unilateral mastectomy or minor breast surgery can have far-reaching consequences for posture and musculoskeletal function. Specifically, these procedures have been linked to decreased shoulder joint angles on the operated side, increased thoracic kyphosis, upper limb dysfunctions, and alterations in spine alignment. The study concluded that there is a significant need for targeted rehabilitation interventions to mitigate these adverse effects and optimize postoperative recovery and long-term musculoskeletal health in breast cancer survivors [29].

A comprehensive review conducted by Rangel et al. "Effect of Breast Cancer Treatment on Posture: A Current Review" underscored the efficacy of physical therapy in addressing the musculoskeletal sequelae of breast cancer treatment. Specifically, the authors highlighted the therapeutic benefits of physical therapy in mitigating pain, promoting postural realignment, and restoring functional autonomy. The primary objective of this review was to systematically characterize the primary postural dysfunctions that occur following breast cancer treatment, providing a foundation for the development of targeted rehabilitation strategies [30].

Enhancing the stability of the trunk can be achieved by facilitating the simultaneous co-contraction of the lumbar vertebrae surrounding muscles, including the abdominal muscles (rectus abdominis, external and internal obliques), transverse abdominis, multifidus, and erector spinae muscles. This coordinated muscular activation is essential for optimizing trunk stability, as it generates a stabilizing force that enhances the structural integrity of the lumbar spine [31,32]

A study conducted by Abdullah and Beltagi “Effect of core stability exercises on trunk muscle balance in healthy adult individuals” investigated the impact of core stability training on the maximal torque production of trunk flexors and extensors. Their findings revealed a significant increase in maximal torque output of both flexors and extensors in the experimental group, whereas no changes were observed in the control group. Notably, the activation of core musculature during movements that integrate extremity patterns, such as those commonly performed in basketball, has been shown to enhance postural control. This phenomenon may have contributed to the improvements observed in the group that completed core stability exercises, suggesting a positive carryover effect of core training on functional movements [33,34]. Scapular strengthening along with traditional exercises has shown to be effective in reducing pain and improving functional disability [35].

The findings suggest that incorporating core strengthening exercises into conventional rehabilitation programs can effectively reduce pain, enhance spinal alignment and range of motion, and improve spinal stability. This is attributed to the efficient recruitment and activation of key muscles, including the latissimusdorsi, rectus abdominis, obliques, transverse abdominis, erector spinae, serratus anterior, and scapular stabilizers. By maximizing the activity of these muscles, core strengthening exercises can help restore spinal biomechanics and alleviate dysfunction.

This study demonstrates the significant efficacy of core strengthening exercises in alleviating pain, enhancing spinal stability, improving spinal range of motion, and strengthening muscles, while also addressing muscle imbalance in patients following modified radical mastectomy.

In conclusion, the findings of this study suggest that the integration of core strengthening exercises into conventional treatment protocols yields superior outcomes compared to conventional treatment alone in addressing spinal dysfunction in post-operative modified radical mastectomy patients. These results underscore the importance of incorporating targeted core strengthening exercises into rehabilitation programs to optimize functional recovery and reduce morbidity in this patient population.

5. CONCLUSION

These findings suggest that targeted core strengthening exercises can be a valuable adjunct to traditional rehabilitation approaches, enhancing functional recovery and reducing morbidity in this patient population. The results of this study demonstrate that the addition of core strengthening exercises to conventional physiotherapy can effectively address spinal dysfunction, a common complication following MRM. By improving spinal mobility, reducing pain intensity, and enhancing functional capacity, core strengthening exercises can play a critical role in promoting optimal functional recovery.

Funding source

The study was funded by Krishna Institute Of Medical Sciences Deemed To Be University, Krishna Vishwa Vidyapeeth, Karad.

Ethical Clearance

This study was approved by Institutional Ethical Committee of Krishna institute of medical sciences deemed to be university, Karad (Protocol number 281/2024-25)

Statement of Conflict Of Interest

We claim that there is no conflict of interest in the content of this study.

REFERENCES

[1] Mangone M, Bernetti A, Agostini F, Paoloni M, De Cicco FA, Capobianco SV, Bai AV, Bonifacino A, Santilli V, Paolucci T. Changes in spine alignment and postural balance after breast cancer surgery: a rehabilitative point of view. BioResearch open access. 2019 Jul 1;8(1):121-8.

[2] Sariego J. Breast cancer in the young patient. The American surgeon. 2010 Dec;76(12):1397-400.

[3] Hoe AL, Iven D, Royle GT, Taylor I. Incidence of arm swelling following axillary clearance for breast cancer. British journal of surgery. 1992 Mar;79(3):261-2.

[4] Pisani P, Parkin DM, Bray F, Ferlay J. Estimates of the worldwide mortality from 25 cancers in 1990. International journal of cancer. 1999 Sep 24;83(1):18-29.

[5] Schwartz SI, Brunicardi FC, editors. Schwartz's principles of surgery. McGraw Hill Professional; 2010.

[6] Del Bianco P, Zavagno G, Burelli P, Scalco G, Barutta L, Carraro P, Pietrarota P, Meneghini G, Morbin T, Tacchetti G, Pecoraro P. Morbidity comparison of sentinel lymph node biopsy versus conventional axillary lymph node dissection for breast cancer patients: results of the sentinella–GIVOM Italian randomised clinical trial. European Journal of Surgical Oncology (EJSO). 2008 May 1;34(5):508-13.

[7] Cherny NI, Truong PT. Chapter 79: Brachial plexopathy in patients with breast cancer. Harris JR, Lippman ME, Morrow M, Osborne CK. Diseases of the Breast, 5th edition. Lippincott Williams and Wilkins. 2014.

[8] Apfelbaum JL, Chen C, Mehta SS, Gan TJ. Postoperative pain experience: results from a national survey suggest postoperative pain continues to be undermanaged. Anesthesia & Analgesia. 2003 Aug 1;97(2):534-40.

[9] Stubblefield MD, Custodio CM. Upper-extremity pain disorders in breast cancer. Archives of physical medicine and rehabilitation. 2006 Mar 1;87(3):96-9

[10] Lopera-Muñeton C, Valencia-Legarda F, Bedoya-Bedoya OM, Correa-Castaño D, Páramo-Velásquez CA. Body posture and biomechanics in women after mastectomy. InJournal of Physics: Conference Series 2019 Dec 1 (Vol. 1418, No. 1, p. 012009). IOP Publishing.

[11] Ryan SD, Fried LP. The impact of kyphosis on daily functioning. Journal of the American Geriatrics Society. 1997 Dec;45(12):1479-86.

[12] Malicka I, Hanuszkiewicz J, Stefańska M, Barczyk K, Woźniewski M. Relation between trunk muscle activity and posture type in women following treatment for breast cancer. Journal of Back and Musculoskeletal Rehabilitation. 2010 Jan 1;23(1):11-9.

[13] George BA, Shinde SB. Effect of activity specific spinal stabilization exercises on pain and spinal mobility in lumbar spondylosis. Int J Health Sci Res. 2019;9:174-82.

[14] Comerford MJ, Mottram SL. Movement and stability dysfunction–contemporary developments. Manual therapy. 2001 Feb 1;6(1):15-26.

[15] Serel S, Tuzlalı ZY, Akkaya Z, Uzun Ç, Kaya B, Bayar S. Physical effects of unilateral mastectomy on spine deformity. Clinical breast cancer. 2017 Feb 1;17(1):29-33.

[16] Rostkowska E, Bak M, Samborski W. Body posture in women after mastectomy and its changes as a result of rehabilitation. Adv Med Sci. 2006 Jan 1;51(2):287-97.

[17] Kim MS, Cha YJ, Choi JD. Correlation between forward head posture, respiratory functions, and respiratory accessory muscles in young adults. Journal of back and musculoskeletal rehabilitation. 2017 Jan 1;30(4):711-5.

[18] Akuthota V, Nadler SF. Core strengthening. Archives of physical medicine and rehabilitation. 2004 Mar 1;85:86-92.

[19] Smrcina Z, Woelfel S, Burcal C. A systematic review of the effectiveness of core stability exercises in patients with non-specific low back pain. International journal of sports physical therapy. 2022;17(5):766.

[20] Mehta JN, Vaghela NP, Patel H. The effect of physiotherapy in patients with modified radical mastectomy. National Journal of Physiology, Pharmacy and Pharmacology. 2018;8(2):163-6.

[21] Angin S, Karadibak D, Yavuzşen T, Demirbüken İ. Unilateral upper extremity lymphedema deteriorates the postural stability in breast cancer survivors. Contemporary Oncology/Współczesna Onkologia. 2014 Jul 22;18(4):279-84.

[22] Babasaheb SS, Rajesh KK, Yeshwant KS, Patil S. Analysis of spinal dysfunction in breast cancer survivors with lymphedema. Asian Pacific Journal of Cancer Prevention: APJCP. 2021 Jun;22(6):1869.

[23] Shamley D, Lascurain-Aguirrebeña I, Oskrochi R, Srinaganathan R. Shoulder morbidity after treatment for breast cancer is bilateral and greater after mastectomy. Acta Oncologica. 2012 Nov 1;51(8):1045-53.

[24] Hojan K, Manikowska F, Chen BP, Lin CC. The influence of an external breast prosthesis on the posture of women after mastectomy. Journal of Back and Musculoskeletal Rehabilitation. 2016 Jan 1;29(2):337-42.

[25] Malicka I, Hanuszkiewicz J, Stefańska M, Barczyk K, Woźniewski M 2011 Relation between trunk muscle activity and posture type in women following treatment for breast cancer Journal of Back and Musculoskeletal Rehabilitation 23(1) 11

[26] Malicka I, Barczyk K, Hanuszkiewicz J, Skolimowska B, Woźniewski M. Body posture of women after breast cancer treatment. Ortopedia Traumatologia Rehabilitacja. 2010 Aug 31;12(4):353-61.

[27] Malicka I, Barczyk K, Hanuszkiewicz J, Skolimowska B, Wozniewski M, et al. (2010) Body posture of women after breast cancer treatment. Ortop Traumatol Rehabil 12:353-361.

[28] Crosbie J, Kilbreath SL, Dylke E, Refshauge KM, Nicholson LL, Beith JM, Spillane AJ, White K. Effects of mastectomy on shoulder and spinal kinematics during bilateral upper-limb movement. Physical therapy. 2010 May 1;90(5):679-92.

[29] Shamley D, Lascurain-Aguirrebeña I, Oskrochi R, Srinaganathan R. Shoulder morbidity after treatment for breast cancer is bilateral and greater after mastectomy. Acta Oncologica. 2012 Nov 1;51(8):1045-53.

[30] Rangel J, Perez C, Oliveira R, Guirro E. Effects of breast cancer treatment on posture: a current review. Int. J. Phys. Ther. Rehabil. 2019 Jun;5:152.

[31] Brumitt J, Heiderscheit BC, Manske RC, Niemuth P, Mattocks A, Rauh MJ. The lower-extremity functional test and lower-quadrant injury in NCAA division III athletes: a descriptive and epidemiologic report. Journal of sport rehabilitation. 2016 Aug 1;25(3):219-26.

[32] Mohammad Ali Nasab Firouzjah E, Daneshmandi H, Norasteh AA. Effect of Core Stability Training on the Endurance and Strength of Core in Basketball Players with Trunk Dysfunction. Journal of Rehabilitation Sciences & Research. 2020 Jun 1;7(2):80-6.

[33] Abdallah AA, Beltagi AA. Effect of core stability exercises on trunk muscle balance in healthy adult individuals. International Conference on Human Biomechanics. 2014;8(5):243-9.

[34] Kahle NL, Gribble PA. Core stability training in dynamic balance testing among young, healthy adults. Athletic Training & Sports Health Care. 2009 Mar 1;1(2):65-73.

[35] Mohite PP, Kanase SB. Effectiveness of scapular strengthening exercises on shoulder dysfunction for pain and functional disability after modified radical mastectomy: A controlled clinical trial. Asian Pacific Journal of Cancer Prevention: APJCP. 2023;24(6):2099.