RESEARCH PAPER

Efficacy of Exercise Program on Upper Cross Syndrome post Unilateral Mastectomy

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ABSTRACT

Introduction: Breast cancer is the most common disease in females and the major cause of mortality and morbidity, breast cancer survivors live after surgical treatment with adverse effects on the upper limb like pain and joint dysfunction, The aim of this study was to determine the efficacy of exercise program on upper cross syndrome post unilateral mastectomy. **Methods:** Sixty female patients post unilateral mastectomy participated in this study. Their ages were between 45-65 years old, their height ranged from 1.52 to 1.79 m and their weight ranged from 59 to 81 kg with body mass index were ranged from 25 to 30 kg/m^2. The patients were selected randomly and placed into two equal groups: Group A (Study group): composed of thirty female patients post unilateral mastectomy, received exercise program (stretching, strengthening and active ROM exercise) Patients received 3 sessions per week for 12 weeks, time of session was 45 minutes and routine medical treatment for same time and Group B (Control group): composed of thirty female patients post unilateral mastectomy, received routine medical treatment only for 12 weeks. **Results:** there was a statistical significant difference (increase) in Craniovertebral Angle, Functional Shoulder Score and FACT-B post treatment between both groups A and B in favor of Group A (Study group) and there was statistical significant difference (decrease) in Cobb Angle and ECOG-PSR post treatment between both groups A and B in favor of Group A. **Conclusion:** Specific Exercise Program (Stretching, Strengthening and active ROM) can be a very important part of unilateral mastectomy rehabilitation program which can correct postural deformities resulting after surgery, range of shoulder motion, psychological support and improving their quality of life.

Keywords: Unilateral mastectomy, Breast cancer, Exercise program, CVA, FSS

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INTRODUCTION

A Modified radical mastectomy (MRM) being one of the most commonly performed procedures. The advantages of MRM surgery are mainly to remove breast tissue and axillary lymph nodes while retaining the pectoralis major and secondary muscles. The advantages of MRM surgery are mainly to remove breast tissue and axillary lymph nodes while retaining the pectoralis major and secondary muscles ([1]).

Enhanced recovery after surgery (ERAS) is an evidence-based pathway used with fast-track surgery that standardizes care to minimize postoperative stress and pain, reduce complications, and improve clinical outcomes. The concept of accelerated rehabilitation has been widely used in breast cancer surgery. Despite this, there is still no nursing pathway related to scientific and systematic perioperative accelerated rehabilitation for patients undergoing radical mastectomy for breast cancer ([2]).

In post-mastectomy patients, connective tissue fibrosis of the shoulder joint is normal. As a result, the majority of patients who have had a mastectomy report discomfort and shoulder impairment. Shoulder discomfort and adhesive capsulitis are linked to incredible human suffering and financial costs in post-mastectomy patients. In post-mastectomy patients, shoulder pain, disability, and impaired movements are common complications. Disability and Shoulder pain in mastectomy patients can be decreased or even eliminated in the majority of cases, but due to a lack of knowledge, most cases go unreported, putting the patient's psychosocial life in danger. Knowledge of the prevention, early diagnosis, and timely treatment of shoulder problems in post-mastectomy patients is crucial to reducing human and financial distress ([3]).

Rehabilitation after mastectomy should be a continuous process that begins at an early stage, allowing for the planning of a structured and individualized rehabilitation program, valuing health education in the preoperative, postoperative and post discharge periods, and enabling women to provide self-care and respond to future challenges. Rehabilitation plans for women with breast cancer should be appropriate to the stage of treatment in which they are in. Studies focusing on the evaluation of rehabilitation programs for women who undergo a mastectomy have revealed gains in terms of the functional capacity of the limb on the mastectomy side, with increased range of motion of the shoulder joint, increased muscle strength, and decreased adhesions, seromas and lymphedema ([4]).

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MATERIALS AND METHODS:

Study design:

A randomly assigned, blind and controlled trial was performed from July 2025 to November 2025 (Recruitment, Measurements, treatment and statistical analysis) at the Outpatient Clinics of General Organization of Teaching Hospitals and Institutes mainly (National Institute of Neuromotor System) in Cairo. This study was complied with the Helsinki Declaration, obtained approval from the ethical committee of the College of Physical Therapy, Cairo University which had (approval No.P.T.REC/012/004071). Following the ethical approval, participants provided informed consent before enrolment.

Participants:

Sixty female patients suffering from complications of unilateral radical mastectomy. Their age between 45-65 years old. Were diagnosed, recruited and referred from outpatient clinics of General Organization of Teaching Hospitals and Institutes mainly (National Institute of Neuromotor System). The subjects were selected at random from the hospitals affiliated split evenly into two groups.

-After clinical assessment they randomly allocated into two equal groups in number (30 patients for each group).

- Study Group(A): They had upper crossed syndrome post unilateral modified radical mastectomy and who received exercise program (stretching, strengthening and active ROM exercise) and routine medical treatment. Patients received 3 sessions per week for 12 weeks, time of session was 45 minutes..

- Control Group(B): They had upper crossed syndrome post unilateral modified radical mastectomy and who received routine medical treatment only for 12 weeks.

Ethical considerations:

-Faculty of physical therapy Ethical Committee Approval.

-Confidentiality was assured.

All patients signed a consent form before starting of the study and knew about the study (aim – procedures).

Sample Size Calculation:

Sample size calculation was performed according to **Naghmeh, et al., 2018** ([5]) using the comparison of Craniovertebral Angle, Cobb Angle, Functional Shoulder Score, FACT-B and ECOG-PSR between female patients with unilateral radical mastectomy treated by specific exercise program. F-test MANOVA within and between interaction effects is selected. The sample size is calculated using the G*Power software (version 3.0.10). Considering a power of 0.90, an α level of 0.05 (2 tailed) and effect size of 0.556; two groups and number of measurements four, a generated sample size of at least 56 subjects, adding 4 (10% as drop out), so total sample size is 60. 30 participants per group are required.

Randomization:

Each participant was provided with information regarding the characteristics, objectives, and benefits of the research, as well as their right to withdraw or decline participation at any point. After signing the consent forms, demographic data were obtained. An independent researcher then assigned the 60 **participants** (**blinded**) randomly and equally to either Group A or B using computer-generated random cards, enclosed in sealed and opaque envelopes. The envelopes were sealed and sequentially numbered to ensure the concealed allocation and participants were unaware of their group allocation.

Limitations:

This study was limited by:

1. The patient's economic status.
2. Treatment efficacy varies from patient to patient.
3. Possibility of human mistake.
4. The long period of application.

Application of Exercise Program:

1-Prone scapular stabilization:

Dosage: Perform 1-3 sets, holding for 15–30 seconds or doing 8-15 repetitions, focusing on control.

Motion: Focus on the shoulder blades moving down and back (depression and retraction) rather than just lifting the arms.

2-Deep neck flexor (chin tucks):

Procedure: Place the tip of your tongue on the roof of your mouth to help stabilize the temporomandibular joint (TMJ) and increase DNF activation.

Progression: Start with shorter holds (3–4 seconds) and gradually increase to 10–12 seconds as strength improves.

3-Shoulders shrug McKenzie exercise for neck:

Steps of exercise:

-Sit or stand in an upright, neutral posture.

-Perform a chin tuck (pulling your chin straight back to create a "double chin").

-While holding the chin tuck, shrug or lift your shoulders upward.

-Hold this position for a few seconds, then return to the starting position.

4-Repeated Shoulder horizontal adduction:

These exercises often involve bringing the arm across the body to improve range of motion, often performed for 10-15 repetitions. The patient was instructed to perform passive shoulder horizontal adduction at 90°of shoulder flexion. The patient has to hold this position for about 15 to 30 seconds and this exercise to be repeated 2 to 4 times a day.

5-Repeated shoulder flexion:

-It became determined to discover repeated flexion first, as this became maximum confined and painful movement. Performing this passively with help from a doorway became demonstrated.

-The patient has to hold this position for about 15 to 30 seconds and this exercise to be repeated 2 to 4 times a day.

6-Repeated shoulder extension:

-The patient was instructed on how to perform passive shoulder extension with overpressure. This movement produced no appreciable change in his symptomatic or mechanical baselines.

-Hold this position for 15 to 30 seconds and repeat 2 to 4 times a day.

7-Neck flexion McKenzie exercises:

-Drop your head towards your chest.

-Raise your hands and interlock your finger behind your head in any such manner that elbows points downwards.

-The weight of the hands placed stress on the head and assist you experience the stretch behind your neck.
-The assistant push your head closer to the chin, the extra stretch may be felt. This must be repeated for 10 times three times a day.

Outcome measures:

Primary outcomes:

1-Craniovertebral angle (CVA):

The Craniovertebral angle (CVA) is measured by creating an angle between a horizontal line passing through the seventh cervical (C7) vertebra and a line connecting C7 to the tragus of the ear. It is commonly used to assess forward head posture, with smaller angles indicating more severe forward head posture.
-Measured for all patients in both groups two times, the first before beginning the program and the other after finishing the program.
-Patients selected with CVA ranged between 30-50 degrees.

2-Cobb angle:

To measure the Cobb angle, identify the most tilted vertebrae at the top and bottom of a scoliosis curve on an X-ray, draw lines along their upper/lower endplates, and measure the intersection angle of perpendicular lines drawn from them. A curve of more than or equal 10 degrees is defined as scoliosis.
-Measured for all patients in both groups two times, the first before beginning the program and the other after finishing the program**.**

3-The Functional Shoulder Score (FSS):

The structure of the FSS was produced using an informal composite qualitative method combining patient opinion, experienced clinician opinion and observation of other validated shoulder scoring systems in use.
Was calculated for all subjects in both groups two times, the first before beginning of trial and the other after finishing the trial.

Secondary outcome:

1-Functional Assessment of Cancer Therapy-Breast Quality-of- Life Instrument (FACT-B):

It was calculated for all subjects in both groups two times, the first before beginning of trial and the other after finishing the trial.

2-Eastern Cooperative Oncology Group (ECOG) performance status rating: (ECOG-PSR):

It was calculated for all subjects in both groups two times, the first before beginning of trial and the other after finishing the trial.

Data analysis and statistical design:

Data were expressed as mean± SD. Unpaired t-test was used to compare between subjects Characteristics of the two groups and chi square for comparison of sex distribution between both groups. Shapiro-Wilk test was used for testing normality of data distribution. MANOVA was performed to compare within and between groups' effects for all measured variables. Statistical package for the social sciences computer program (version 20 for Windows; SPSS Inc., Chicago, Illinois, USA) was used for data analysis. *P* less than or equal to 0.05 was considered significant.

Normality test:

Data were screened for normality assumption, homogeneity of variance, and presence of extreme scores. Shapiro-Wilk test for normality showed that all measured the variables (CVA, Cobb angle, FSS, FACT-B and ECOG-PSR) were normally distributed (p>0.05).

RESULTS:

There was a statistically significant increase in **Craniovertebral angle** post-treatment than pre-treatment by 9.9% ($P < 0.001$) in both groups and in favor of Study group (A) (figure 1).

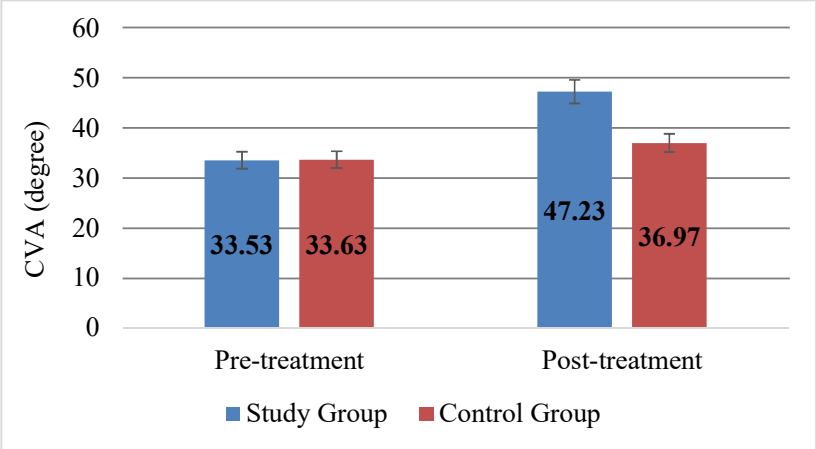

Figure (1): Mean values of CVA (degree) pre- and post-treatment between groups.

-There was statistically significant difference in **Cobb angle** post-treatment between both groups A and B ($P< 0.001$*) in favor of group A. (figure 2).

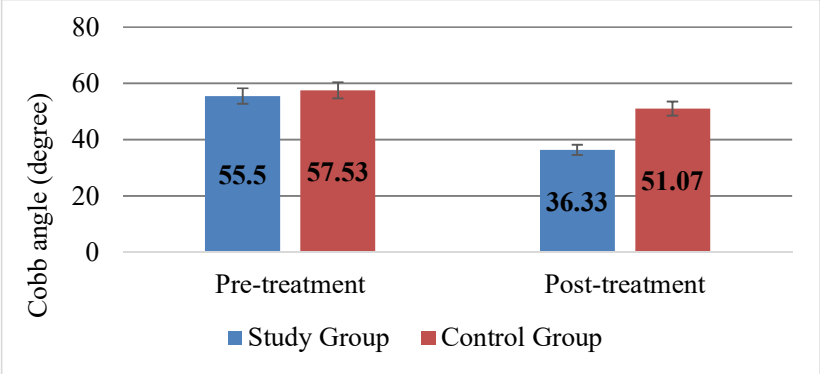

Figure (2): Mean values of Cobb angle (degree) pre- and post-treatment between groups.

-There was a statistically significant increase in **Functional Shoulder Score (FSS)** between pre- and post-treatment, it was increased by 114.4% in favor of Study group (A) ($P < 0.001$*) (figure 3).

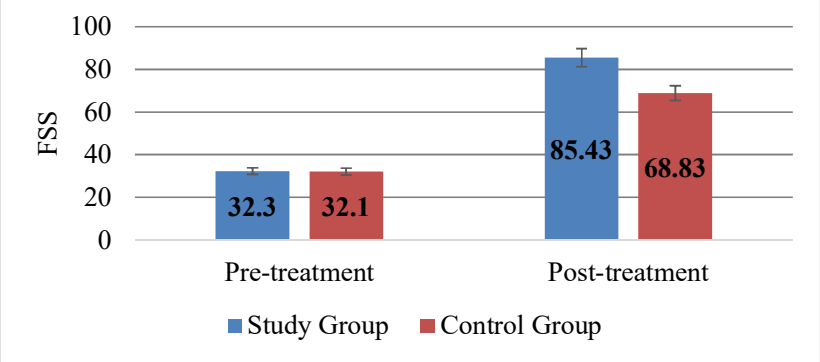

Figure (3): Mean values of FSS pre- and post-treatment between groups.

DISCUSSION:

The current study was established to find out effect of exercise rehabilitation program on upper limb range and forward head posture post unilateral radical mastectomy.

- Study Group (A): They received exercise program (stretching, strengthening and active ROM exercise) and routine medical treatment. Patients received 3 sessions per week for 12 weeks.

- Control Group (B): They received routine medical treatment only for 12 weeks.

There was a statistical significant difference (**increase**) in **Craniovertebral Angle, Functional Shoulder Score and FACT-B** post treatment between both groups A and B in favor of **Group A (Study group)** and there was statistical significant difference (**decrease**) in **Cobb Angle and ECOG-PSR** post treatment between both groups A and B in favor of **Group A (Study group).**

So, specific exercise program (stretching, strengthening and active ROM exercise) can be an effective part of rehabilitation of forward head and rounded shoulder post unilateral mastectomy.

The results of this study are in accordance with **{Amit and Song, 2025, Makki, et al., 2024, Pirincci, et al., 2023}.**

Amit and Song, 2025 agreed with results of this study through this review about neck and upper back pain and bad posture are prevalent among office workers and are commonly linked to prolonged sitting, poor workstation design, and sustained postural strain. Twelve eligible trials were identified: three provided quantitative data and nine were narratively synthesized. Combined ergonomic and postural or exercise-based approaches generally demonstrated greater short-term improvements, particularly among participants with pre-existing symptoms. Current evidence therefore supports short-term benefits of ergonomic and combined interventions for symptom reduction in office workers, while highlighting the need for well-powered trials with standardized outcomes and extended follow-up to establish sustained effectiveness. ([6])

Makki, et al., 2024 also agreed with results of this study through study aimed to investigate the effect of corrective exercise intervention (corrective exercise reminding and training software) on musculoskeletal disorders (rounded shoulders), fatigue, posture and working memory among office workers. A total of 66 office workers participated in the present study. There was a significant difference between the two groups in terms of the severity of musculoskeletal discomfort after the intervention. There was also a significant difference in physical and mental fatigue scores before and after the intervention. There was a significant difference in the accuracy score of office workers after the intervention compared to before the

intervention. Overall, the results confirm the effectiveness of this low-cost, simple and easy-to-use ergonomic intervention. ([7])

Pirincci, et al., 2023 also stated results of this study through study aimed to investigate the effects of scapulothoracic stabilization exercises (SSE) on scapular function, posture, and balance in women with lymphedema after mastectomy. The patients were randomly divided into two groups as complex decongestive physiotherapy (CDP) (n: 12; age: 55.25 ± 8.17 years) and CDP+SSE (n: 13; age: 54.38 ± 9.08 years). While only CDP was applied in the CDP group, CDP and SSE were applied in the CDP+SSE group. Improvements in the lower trapezius muscle strength were found in both groups after the TP ($p < .05$). In addition, the middle trapezius muscle strength and general posture improved more in the CDP+SSE group than in the CDP group after the TP ($p < .05$). In the MP, scapulothoracic muscle strength, scapular endurance, and general posture improved more in CDP+SSE group compared to the CDP group ($p < .05$). In upper extremity lymphedema patients, incorporating additional SSE in CDP may contribute to the improvement of posture and scapular functions. ([8])

On the other hand, the results of this study contradict with {**Liu, et al., 2024**}.

Liu, et al., 2024 not on the same direction with results of this study through study about unilateral mastectomy induce postural alterations, yet the temporal development pattern of these changes remains elusive. This study aimed to explore the impact of unilateral mastectomy on body posture. Methods: A prospective, longitudinal, observational study with a one-group repeated-measures design was conducted. The final analysis included 159 patients. Postural abnormalities increased gradually in the first 3 months, notably between the 3rd and 6th months, and slowed between the 6th and 12th months. On the mastectomy side, coronal plane abnormalities significantly increased within 12 months. Conclusions: Postural changes are common post-unilateral mastectomy, with prevalence and deviation increasing gradually, particularly between 3 and 6 months post-mastectomy. Early rehabilitation initiation is recommended to mitigate postural changes while it was **not efficient** after 3 months of procedure. ([9])

Study Limitations:

This study is limited by its relatively small sample size and the lack of long-term follow-up. Additionally, the trial was single-blinded, and future multi-center studies including functional capacity tests, are recommended to further validate these findings.

Conclusions: Specific Exercise Program (Stretching, Strengthening and active ROM) can be a very important part of unilateral mastectomy rehabilitation program which can correct postural deformities resulting after surgery, range of shoulder motion, psychological support and improving their quality of life.

Recommendations:

1-A similar study should be undertaken to large number of patients providing better statistical analysis of data.

2-Further researches using different treatment durations, techniques of application and number of weekly sessions of specific exercise program are needed to detect their effect.

3-Another research is recommended to investigate the effect of exercise program on patients from different body positions.

4-Another research is recommended to investigate the effect of other different techniques of this program associated with breathing exercises on females with unilateral mastectomy.

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Conflicts of interest: The authors declare no conflict of interest.

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