ASSESSMENT OF POSTURAL DEVIATIONS POST MASTECTOMY USING SMART PHONE MOBILE APPLICATION

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Abstract:

Background: The most commonly diagnosed type of cancer is breast cancer., The aim of this study is to evaluate posture deviations in women after mastectomy based on the surgically treated side. **Methods:** This study was conducted between November 2022 to May 2023. Forty-two female participants aging from 40-60 years were suffering from Breast cancer and had gone on Mastectomy surgery. All patients were assessed before and after surgery. The first evaluation was done before mastectomy and the second assessment was done 3 months after mastectomy. **Results:** Showed that in lateral translation variables, there was significant increase in Head and Shoulders variables after mastectomy and no significant increase in Hip/Pelvis variable after mastectomy. While in anterior translation variables, there was significant increase in Head, Shoulders, and Hip/Pelvic variables after intervention). **Conclusion:** according to the results of the study, it can be concluded that Posture Screen Mobile® could measure postural deviations post mastectomy.

Keywords: Smart phone application; Postural deviations; Mastectomy.

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1. INTRODUCTION:

Outside of skin cancer that isn't melanoma, Breast cancer is among the most frequently diagnosed cancer in females worldwide **(1)**

After having mastectomy, women's posture and biomechanics changed in a number of ways. Examples include altered scapular rotation patterns across all movement planes in comparison to controls. In particular, scapular outing occurred because the scapula on the mastectomy side became vertical to a greater degree compared to that on the non-mastectomy side. The altered kinematics of the spine are caused by the surgery-induced asymmetry in shoulder position. The human motor system's various components are intimately interconnected. **(2)**

Shoulder mobility impairment is common among women who experienced a mastectomy for breast cancer, and when left untreated can have serious consequences for the women's daily lives and overall quality of life. Some symptoms, like arm swelling from lymphedema, are easy to explain. However, other symptoms, like chronic pain in the shoulder as well as upper trunk that women report months to years following surgery, are ignored. The loss of a breast causes an asymmetry in the distribution of mass and soft tissue motility across the chest wall. This imbalance may have an impact on the use of your upper extremities and could lead to problems with trunk or arms. Surgery for breast cancer has been linked to altered muscle size and activity in the upper trunk, and protective posture and movement may cause soft tissue contracture. **(3)**

Patients with breast cancer often suffer from physical symptoms and psychological distress after having a mastectomy, reducing their QOL. The emotional distress caused by negative body image and decreased quality of life can be alleviated through the provision of a suitable breast prosthesis **(4).**

The study of the biomechanics related to mastectomy and the postural alterations caused by it are the subjects of current research. After surgery, female patients had less physical and functional activity. As a result, the motor system may experience negative modifications including altered shoulder symmetry and decreased range of motion in the shoulder joint (also brought on by localized radiation exposure. **(2)**

The human body's posture changes throughout the course of development due to internal as well as external factors (such as trauma and illness) **(5)**

It's obvious that breast cancer's side effects may interfere with an individual's posture. Injury to the long thoracic nerve as well as the thoracodorsal nerve

during surgery can cause paralysis of the muscles that control movement of the shoulder joint. Functional impairments and atrophy of muscle may also result from the use of adjuvant therapies like radiation and chemotherapy. Pathological alterations cause postural deficits, which can present in any plane of the body but most commonly as abnormalities of the spine and its associated structures (**6).**

2. MATERIAL AND METHODS:

2.1. Patients:

Forty-two patients (females) who underwent modified radical/radical mastectomy operation participated in this study. The patients were selected randomly from The National cancer institute. The study was conducted between November 2022 to May 2023. All patients gave permission to take part in the study after being informed of the measurement tools and signing an informed consent form. The Ethical Committee of the Faculty of Physical Therapy at Cairo University in Giza, Egypt has approved the proposed study (P.T.REC /012 /004102).

A- Inclusion Criteria:

The patient's selection was according to the following criteria: Age ranged between 40 and 60 years. Patients underwent modified radical/radical mastectomy operation. All enrolled patients signed the informed consent. Body mass index ranged from (25 – 35 kg/m2)

B- Exclusion Criteria:

The patients were excluded if they fulfill one of the following criteria: Patients with complications (musculoskeletal, neurological, etc.). Patients with body mass index above 35. Consent withdrawal at any time for any reason

2.3. Measurement tool:

Posture Screen Mobile: Application used to measure angles and linear distances of postures displacement by using mobile camera iPhone 13pro max. it is a valid and reliable method

Both height and weight were measured using an anthropometer accurate to within 5 mm and an electronic scale accurate to within 0.5 kg, respectively. Measurements were taken, and a BMI was determined as a result.

Body posture was assessed using Posture Screen Mobile. **(7)**

2.4. STATISTICAL PROCEDURES

Descriptive Statistics: the mean as well as the standard deviation were determined for all of the subjects in the two groups to establish whether or not the groups were homogeneous. Analytical statistics: The student's t-test was used to evaluate the differences between the two sets of data collected pre and post mastectomy. SPSS 20 (IBM, USA) was used to conduct paired t-test comparisons between pre- and post-surgery.

3. RESULTS

3.1. PATIENTS' CHARACTERISTICS:

Age: Data in table (1) showed their mean age was 46.6±3.9 years, and mean Body Mass Index (BMI) was 28.1±1.9.

Table 1. Descriptive statistics of Age & Body Mass Index (BMI) of subjects.

	Mean	Std. Deviation
Age (years)	46.5952	3.88907
BMI	28.0952	1.92303

DESCRIPTIVE STATISTICS:

1.Lateral Translation

1. Data in **Table 2** showed the Mean of head lateral translation before intervention (8.07±0.75) Centimeters anteriorly, and after intervention (12.18±2.38) Centimeters anteriorly.
2. The Mean of Shoulder lateral translation before intervention (1.76±0.17) Centimeters anteriorly and after intervention (3.49±0.55) Centimeters anteriorly.
3. The Mean of Hip/Pelvis lateral translation before intervention (0.2±0.13) Centimeters posteriorly and after intervention (0.24±0.06) Centimeters posteriorly.

Table 2. Descriptive statistics of Lateral translation of Head, Shoulders, and Hip/Pelvis before and after intervention.

		Mean (cm)	Std. Deviation
Head	**Before**	8.07	0.75
	After	12.18	2.38
Shoulder	**Before**	1.76	0.17
	After	3.49	0.55
Hip/ Pelvis	**Before**	0.20	0.13
	After	0.24	0.06

2.Anterior Translation

1. Data in **Table 3** showed the Mean of head anterior translation before intervention (2.00±0.36) Centimeters Left/Right, and after intervention (2.2±0.43) Centimeters Left/Right.
2. The Mean of Shoulder anterior translation before intervention (1.07±0.23) Centimeters Left/Right and after intervention (1.76±0.34) Centimeters Left/Right.
3. The Mean of Hip/Pelvis anterior translation before intervention (1.52±0.38) Centimeters Left/Right and after intervention (2.61±0.53) Centimeters Left/Right.

Table 3. Descriptive statistics of Anterior translation of Head, Shoulders, and Hip/Pelvis before and after intervention.

		Mean (cm)	Std. Deviation
Head	**Before**	2.00	0.36
	After	2.20	0.43
Shoulder	**Before**	1.07	0.23
	After	1.76	0.34
Hip/ Pelvis	**Before**	1.52	0.38
	After	2.61	0.53

Data in table 4 showed the P value of Posture Screen mobile Lateral Translation variables before intervention and after intervention. P value of head variable was (Significant difference 0.00), shoulder variable was (Significant difference 0.00) and Hip/pelvis variable (Significant difference 0.08).

Table 4. the P value of Posture Screen mobile Lateral Translation variables before intervention and after intervention.

		T	Degree of freedom (Df)	Sig. (2-tailed)	Significance
Pair 1	**Head**	-10.65	41.00	0.00	Significant
Pair 2	**Shoulder**	-20.27	41.00	0.00	Significant
Pair 3	**Pelvis**	-1.83	41.00	0.08	Not Significant

Data in table 5 showed the P value of Posture Screen mobile Anterior Translation variables before intervention and after intervention. P value of head variable was (Significant difference 0.00), shoulder variable was (Significant difference 0.00) and Hip/pelvis variable (Significant difference 0.00).

Table 5. the P value of Posture Screen mobile Lateral Translation variables before intervention and after intervention.

		T	Df	Sig. (2-tailed)	Significance
Pair 1	**Head**	-5.12	41.00	0.00	Significant
Pair 2	**Shoulder**	-14.54	41.00	0.00	Significant
Pair 3	**Pelvis**	-15.14	41.00	0.00	Significant

5. DISCUSSION:

Based on the findings of this study, the results showed that in lateral translation variables, there was significant increase in Head and Shoulders variables after intervention and no significant increase in Hip/Pelvis variable after intervention.

While in anterior translation variables, there was significant increase in Head, Shoulders, and Hip/Pelvic variables after intervention.

This indicates that there was a significant deviation in most of the variables. The non-significant change in Hip/Pelvic values in lateral translation might be due to the short time between assessments and that there might be a significant difference after more than 3 months.

Using a mobile application to analyze posture provides the door for an easy-to-use, affordable, and a diagnostic method based on evidence. Utilizing such a technology enables medical providers to create customized intervention procedures. (**8)**

Additional study carried-out a photogrammetric assessment of the patient's body posture for one year and also six months in patients who experienced unilateral mastectomy and another group of healthy women. When comparing mastectomy patients to healthy women, the study found that those with mastectomy exhibited more trunk as well as shoulder

girdle asymmetry, more anterior trunk deviation, and more scapula position imbalance **(9)**

In mastectomies, body position will be impacted, particularly assuming the patient has huge and weighty breasts. Emotional stress causes muscle contraction in the cervical and scapular regions, which is linked to muscle masses, postoperative scars, or fibrosis from radiation therapy. **(10)**

Investigations have been done on how a unilateral mastectomy affects a patient's posture over time. In a study of patients' chest radiographs taken before and after one-sided mastectomy, Serel et al. found that spinal arrangement exhibited alterations in the course against the mastectomy side and may result in ongoing spinal deformity. **(11)**

One previous study about the impact of mastectomy on chest tightness as well as upper extremity impairment reported that soon after surgery, breast cancer survivors had an increase in chest tightness as well as upper extremity impairment. Following mastectomy, the range of motion (ROM) of the shoulder is reduced, more so in mastectomy patients. A cautious observation is needed for prevention since post-operative chest discomfort is linked to upper limb dysfunction after surgery. **(12)**

Some strengths are demonstrated in this study. Firstly, it has an affordable cost to examine postural deviations following mastectomy. secondly, It's an easy tool to measure postural deviations after mastectomy.

The current research needs Further studies with more sample size and with more time of observation to clarify the long-term effects of mastectomy on postural deviations.

5- CONCLUSION

Depending on the study, it is concluded that Posture Screen Mobile® could measure postural deviations post mastectomy.

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CONFLICT OF INTEREST STATEMENT

The authors declare that there are no conflicts of interest regarding the publication of this paper.

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