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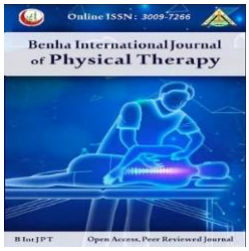

Original research

Self-reported and performance-based assessment of hand function in patients with post-mastectomy lymphedema

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Abstract

Background: Lymphedema is a prevalent adverse effect of breast cancer therapy, affecting around one-third of survivors. It can severely impact both the physical and psychological well-being of women, impairing functional mobility, kinesthetic awareness, and the ability to do daily tasks, particularly in the hands.**Purpose:** This research aimed to assess hand function comprehensively in patients with post-mastectomy lymphedema by self-reported and performance-based assessments. **Methods:** This cross-sectional study was conducted on 40 female patients (Group A), aged from 35 to 65 years old, with post-mastectomy lymphedema. They received the Disabilities of the Arm, Shoulder, and Hand (DASH) Questionnaire to fill it in and the Jebsen Taylor Hand Function Test (JTHFT) to perform. Forty healthy age-matched females (Group B) received the DASH questionnaire to fill it in and the JTHFT to perform to gather comparable normative data. **Results:** The Group A's DASH score was significantly greater than that of Group B (P= 0.001). There was a significant increase in time taken to complete each task of JTHFT (writing, card turning, picking up small common objects, simulated feeding, stacking checkers, picking up large light objects, picking up large heavy objects) and a total time of completing all tasks of JTHFT in Group A in comparison to that of Group B (P<0.05). **Conclusion:** Post-mastectomy lymphedema significantly affects hand function, as evidenced by both self-reported assessments and objective performance-based measures.

Keywords: Performance-Based Assessment,Post-mastectomy Lymphedema. Self-Reported Assessment.

Introduction

Post-mastectomy lymphedema is a worldwide medical concern that has significant impacts on the psychological and physical health of breast cancer patients. Pain, recurring cellulitis, and swelling of the affected upper extremity are the hallmarks of its clinical presentation. Atrophic skin abnormalities may also be observed[1]. The kinesthetic feeling of the hands, functional mobility, and routine daily abilities of women can all be adversely affected by post-mastectomy lymphedema. In 60–70% of cases of upper-limb lymphedema, hand edema also significantly impairs functional mobility and everyday

activities[2]. Hand dysfunction makes it difficult for people to take care of themselves and to engage in economic, leisurely, and physical activities[3] .

Although performance-based measures are objective and have accurate coding schemes, they only represent one assessment point and are not influenced by the individual's daily circumstances. Additionally, administering them can take a lot of time. On the other hand, self-reported questionnaires are inexpensive, simple to use, and can afford a summary of the reporter's experiences in a variety of real-life situations, but they are prone to reporter bias[4].

Assessing hand function accurately is crucial for developing plans to optimize functional potential as well as for tracking the effectiveness of treatment and disease progression. A functional hand evaluation establishes a patient's functional competence, or how they utilize their hand in spite of limitations and functional disabilities[5].

Up to the current study researchers' knowledge and search, the present study is the first to comprehensively assess hand function in patients with post-mastectomy lymphedema by both self-reported and performance-based assessments.

Methods

Study design and participants

This Cross-Sectional study was carried out on forty female patients (Group A), aged from 35 to 65 years old, with post-mastectomy lymphedema (3 to 6 months old mild to moderate lymphedema affecting the dominant hand), who underwent surgery and completed other cancer therapies for more than 6 months (patients were recruited from outpatient clinic of Faculty of Physical Therapy, Cairo University). Forty age-matched females (Group B) were selected to gain comparable normative data. Participants were excluded if they have difficulty in communication, cognitive, visual, or hearing impairment. They were also excluded if they were under psychiatric disorders medication or had a previous upper-limb surgery or fracture in the last three months, or had neuromuscular disorder affecting their upper limb functions. Patients with rheumatic, systemic, or deficient vitamin D disorders were excluded.

Ethical approval

Each participant completed an informed consent form after being fully informed of their rights prior to taking part in the study. The Institutional Review Board of Faculty of Physical Therapy, Cairo University granted ethical approval (P.T.REC/012/000000) before the study's conduction. Additionally, the study was registered under the number,PACTR202412794763155 at the Pan Africa Clinical Trial Registry (pactr.samrc.ac.za). Helsinki recommendations were considered.

Sample size calculation

Sample size was estimated utilizing the G*Power statistical software (version 3.1.9.2; Franz Faul, Universitat Kiel, Germany) depending on Jebsen-Taylor hand function test data derived from[6]; and revealed that the required sample size for this study was 39 subjects per group. Calculations were done utilizing α=0.05, power=80% and effect size = 0.65 and allocation ratio N2/N1 =1.

Allocation

One hundred and two participants were selected to participate in the study (Fifty-two post mastectomy patients and fifty age-matched healthy females). Twelve patients were excluded from the study (Six of them didn't fulfill the study's inclusion criteria and another more six rejected to take part in the study). Ten healthy participants weren't included in the study because they rejected to take part in the study. Forty patients with post-mastectomy lymphedema were allocated in Group A received (DASH) questionnaire to fill it in and (JTHFT) test to perform and forty age-matched healthy females were allocated in Group B received DASH Questionnaire to fill it in and JTHFT to perform. The study's patient flow is represented in Figure1 following CONSORT 2010 form .

Assessment tools and procedure

Disabilities of the arm, shoulder, and hand (DASH)

The Arabic version of the DASH Questionnaire Outcome Measure is a 30-item self-reported questionnaire employed to assess physical well-being and symptoms in individuals with upper limb musculoskeletal diseases[7] .

Jebsen Taylor Hand Function Test (JTHFT)

The JTHFT is a valid and reliable instrument[8],that measures hand function

objectively. Seven activities make up this task-specific tool for evaluating hand functions. Writing, card turning, picking up small common objects, simulated feeding, stacking checkers, picking up large light objects, picking up large heavy objects are the seven activities of JTHFT. The consumed time on each task is calculated[9].

All participants in both groups were asked to fill in The DASH which consists of 21 physical functional items, 6 symptom items, and 3 psychosocial ones. Then the answers were scored on a 5-point scale varying from ‘‘no difficulty' to ‘‘high impact.’’ The raw sum score is converted to end scores varying from 0 to 100 based on this formula: DASH score for disability/symptoms = ([sum of n responses]-1) / n) x (25) where n indicates the number of accomplished items. The lowest disability is represented by a score of 0, while the maximum disability is represented by a score of 10 10. The participants in both groups were also asked to perform JTHFT, as the test includes the seven tasks listed above to evaluate hand functions; time was calculated for every task [6].

Statistical analysis

The SPSS v26 was employed for statistical analysis (IBM Inc., Chicago, IL, USA). The mean and standard deviation (SD) of the quantitative variables were displayed, and the unpaired Student's t-test was applied to compare both groups. When applicable, the Chi-square or Fisher's exact test was applied to analyze the qualitative variables, which were displayed as frequency and percentage (%). Statistical significance was established at P value < 0.05.

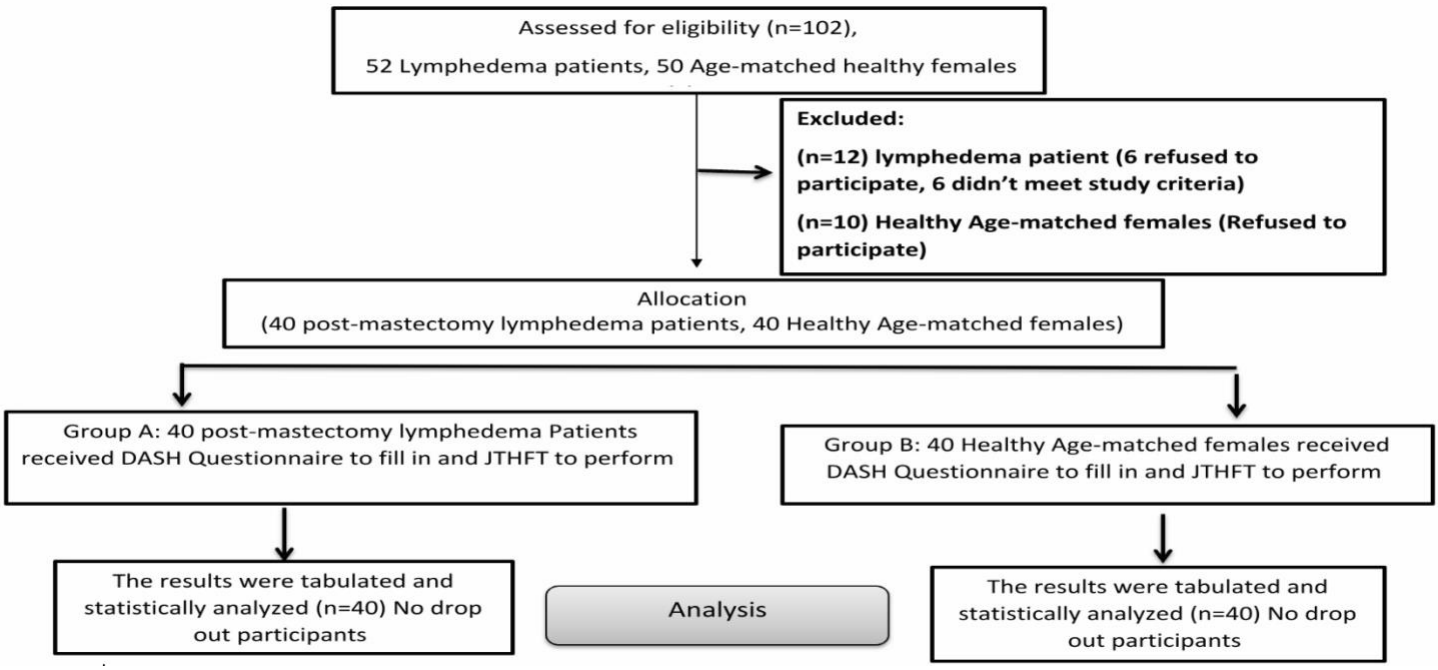

Figure 1: Participants flow in the study'

Results

No significant change across groups in age and dominant side distribution was detected (P value 0.35, 0.79, respectively) (Table 1).

Table 1: Comparison of age and dominant side distribution between group A and B

		Group A (n=40)	Group B (n=40)	Test of Significance	P
Age (years)		46.75 ± 8.88	44.98 ± 7.97	t= 0.94	0.35
Dominant side distribution	**Right side**	31 (77.5%)	32 (80%)	**χ^2=0.08**	0.79
	Left side	9 (22.5%)	8 (20%)		

Data are presented as mean±SD or frequency (%). t value: unpaired t value, χ2: Chi squared value.

The clinical characteristics of Group A patients, regarding type of surgery; severity of lymphedema; and duration of lymphedema, were summarized in Table 2.

Table 2. Clinical characteristics of patients

		Number of cases
Type of surgery	**Simple Mastectomy**	10
	Modified Mastectomy	15
	Radical Mastectomy	15
Severity of lymphedema	**Mild**	27
	Moderate	13
Duration of lymphedema	**3 Month**	4
	4 Month	11
	5 Month	13
	6 Month	12

The Group A's DASH score was significantly higher than that of Group B (p = 0.001) (Table 3).

Table 3: Comparison of DASH between group A and B

	DASH	Test of Significance	P
Group A	64.13 ± 9.37	16.64	**0.001***
Group B	27.03 ± 10.54		

Data are presented as mean ± SD, *: Significant p value <0.05, t value: unpaired t value, DASH: disabilities of the arm, shoulder, and hand.

Comparing both groups indicated significant increase in the amount of time needed for writing, card turning, picking up small common objects, simulating feeding, stacking checkers, picking up large light objects, picking up large heavy objects, and the total time of all tasks in Group A (P<0.05) (Table 4).

Table 4. Comparison of JTHFT between group A and B

	Group A (n=40)	Group B (n=40)	Test of Significance	P
Writing	32.95±11.79	14.87±9.68	t=7.49	**0.001***
Card turning	8.78±3.38	5.75±1.92	t=4.94	**0.001***
Picking up small common objects	8.12±2.45	5.87±1.78	t=4.68	**0.001***
Simulated feeding	11.90±2.79	8.15±2.45	t=6.38	**0.001***
Stacking checkers	5.65±1.88	4.80±1.48	t=2.25	**0.02***
Picking up large light objects	4.78±1.34	4.09±1.04	t=2.59	**0.01***
Picking up large heavy objects	4.98±0.95	4.45±0.97	t=2.45	**0.01***
Total time	77.16±11.69	47.97±15.15	t=9.64	**0.001***

Data are presented as mean ± SD, *: significant p value <0.05, t value: unpaired t value, JTHFT: Jebsen Taylor Hand Function Test.

Discussion

The majority of research has employed subjective evaluations to assess hand function in females with post-mastectomy lymphedema; however, only a small number of studies have employed objective assessments of hand functioning. Assessing hand function objectively is crucial for conducting a thorough and appropriate clinical evaluation and intervention to address any functional limits or impairments in patients with post-mastectomy lymphedema. Assessment of hand function in women with post-mastectomy lymphedema utilizing both self-reported and performance-based measures following surgery and chemotherapy was limited at previous literatures [6,11]. Hence, the need for the current study has been established.

In the present study, regarding self-reported assessment of hand function by DASH Questionnaire, group A reported significantly higher disability scores (mean DASH score: 64.13) compared to Group B (mean DASH score: 27.03). This indicates a substantial impact of lymphedema on daily activities and overall hand function. Regarding performance-based assessment of hand function by JTHFT, group A showed a significantly longer time to complete tasks across all seven subtests of the JTHFT compared to group B. The most notable differences were observed in tasks requiring fine motor skills and dexterity, such as writing and card turning (p value 0.001).

The results clearly demonstrate that post-mastectomy lymphedema significantly impairs hand function. The higher DASH scores in group A reflect greater perceived disability, which aligns with the objective performance deficits observed in the JTHFT.

In patients with post-mastectomy lymphedema, hand function affection may be explained by the buildup of protein-rich fluid, which can cause tissue thickening and fibrosis. Post-mastectomy lymphedema may further impair hand motion, strength, dexterity, and function by inhibiting the hand's intrinsic muscles[3].

The current study findings are consistent with the other studies evaluating hand functions subjectively or objectively in patients with post-mastectomy lymphedema[6,12].

Mistry et al. used hand dynamometer and JTHFT to assess handgrip strength and function respectively in a group of females with post-mastectomy. According to the findings, women with post-mastectomy lymphedema had significantly reduced handgrip strength and function in both their right and left hands in comparison to age-matched, healthy adult females ($p < 0.05$)[6].

Additionally, Wilczyński et al. evaluated the range of motion, strength, or graded extremity volume between the affected and the sound sides in sample of females with unilateral mastectomy within one year following. Results indicated that the majority of the participants had limited range of motion in two or more shoulder movements on the affected side and exhibited a trend towards a magnificent loss of muscle strength and hand function[12].

The loss of hand functioning had a cascading effect on how the patient was able to use or care for their affected limb. Patients always complained that their restrictive hand motion limited dressing, driving, and cooking, mediated their participation in essential sporting activities, and affected emotional and social roles[13,14]. This which makes it important to capture the full impact of lymphedema on patient life and how to manage it.

The present study may be limited by psychological and physical variations among the participants. In the current study, the relationship between post-mastectomy lymphedema and hand functions was discussed and more information has been added to the literature regarding hand functions in patients with lymphedema.

Conclusion

Post-mastectomy lymphedema significantly affects hand function, as evidenced by both self-reported assessments and objective performance-based measures. These findings underline the importance of targeted rehabilitation and interventions to address the functional impairments in patients with lymphedema, which could enhance their capability to do routine activities and improve their quality of life.

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Conflict of Interest: Nil

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