



RESEARCH ARTICLE

Does Hydrotherapy Improve Shoulder Abduction in Post-mastectomy Patients?

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Abstract

Background and purpose: Mastectomy is the surgical removal of one or both breasts, partially or completely. Cancer rehabilitation involves focusing on physical function while concurrently maximizing psychological function. Hydrotherapy is the use of water in treating diseases. The study aimed to clarify the effectiveness of hydrotherapy in improving shoulder abduction as well as shoulder pain and disability in post mastectomy female patients.

Subjects: Thirty patients with unilateral mastectomy shared in the current study. Their age ranged from 39 to 49 years old. They were assigned randomly into two equal groups. The first group was the control group treated by conventional physical therapy exercises (range of motion exercises) for 6 weeks three sessions weekly and the session lasts up to 20 minutes. While the second group (treatment group) was treated by underwater exercises three times weekly and up to 6 weeks, the session extends to 20 minutes.

Assessment was carried out by using student t-test before starting the treatment course and after 6 weeks of treatment.

Results: revealed that a significant difference between pre and post treatment measures; shoulder abduction range, Shoulder pain and disability index in both groups as ($p < 0.05$) for all measures, also there was significant difference in post treatment measures; shoulder abduction, Shoulder pain and disability index between both groups as ($p < 0.05$) for all measures.

Conclusion: underwater exercises have a great role in improving shoulder abduction as well as pain and disability in post mastectomy female patients.

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INTRODUCTION

Breast cancer is the 3rd leading cause of cancer in the world (after lung and gastric cancer) and the most common malignancy in women worldwide. In Egypt, breast cancer is the most common cancer among women, representing 18.9% of total cancer cases (Omar et al., 2003). Overall in the world, it is the 2nd leading cause of deaths after lung cancer in women (Silva and Zurrida, 2005).

Mastectomy is the medical term for the surgical removal of one or both breasts, partially or totally. Mastectomy is usually done to treat breast cancer; alternatively certain patients can have a wide local excision, also known as lumpectomy. Mastectomy and lumpectomy as referred to as "local therapies" for breast cancer, targeting the area of the tumor, as opposed to systemic therapies, such as chemotherapy or immunotherapy (Sainsbury, 2008).

A single motion only is often used as an indicator of the objective reduction in shoulder motion. In this situation the lateral elevation is frequently preferred as it is the motion most often compromised (Silva and Godoy, 2009). Objective reduction in shoulder movement was present in one third of patients. Patients with decreased range of motion also experienced more frequent and more severe pain in the operation area, treated neck, arm,

and shoulder. The majority of patients with decreased range of motion were post-mastectomy patients (**Tengrup et al., 2000**). Incidence or reduced of motion after mastectomy ranged from 13% to 77%. Comparing the results is difficult, as different surgical techniques and different radiation therapy regimens have been applied. Both axillary sampling and full axillary dissection of level I-III, and in some cases resection of the pectoral muscle has been performed in different studies (**Johansen et al., 2007**).

Exercise in women who have undergone breast cancer treatment should be initiated with caution and as much as adherence to the current level of research as possible. However many gaps exist in what experts know and how can safely recommended (**Shamley et al., 2005**).

Exercises can certainly help healing in women who have a history of breast cancer and may in fact assist in preventing cancer recurrence (**Dallal et al., 2007, Paskett et al., 2004, and Hayes et al., 2008**).

Regular post-operative physiotherapy exercises are essential to recover shoulder function in a consistent and timely pattern. Defects in upper limb function exist one month after mastectomy, but recovery of function occurs in most patients by three months with the majority of subjects achieving full recovery one year post surgery (**Springer et al., 2010, and Tran et al., 2003**).

Hydrotherapy is extremely beneficial in terms of water confidence, developing gross motor skills, sensory experience, and freedom of movement and self-help skills. All users must be aware that working in water is potentially hazardous for both patients and physiotherapists. These guidelines are to ensure that all appropriate precautions are put in place in order to minimize risks to both users and those assisting them (**Ahmed et al., 2006 and Hase et al., 2006**).

Hydrotherapy increases the muscular strength as the water provides a greater resistance to movement than air, allows the joint to move more freely. The submerged body parts encounter resistance in all directions of which requires greater energy expenditure. In the water movements are more consistent and more easily graded using principles of buoyancy without the pain of active movement (**Cole and Becker, 2004**).

Patients with shoulder problem can benefit from hydrotherapy exercises. Those who have sustained an acute injury can benefit from the upward force of buoyancy assisting the arm through its functional range of motion. The buoyancy of the water assists the function upward movement of the arm when the person is unable to do so independently on land (**Shew, 2010**).

Methods:

Subjects: This study was conducted on 30 patients with unilateral mastectomy. Their age was ranged from 39 to 49 years. The study was carried during the period of June 2013 to August 2014, at Benha teaching hospital. The approval for this study was obtained from the ethical committee of the University; Informed consent form had been signed from each patient before participating in the study.

Subjects were assigned into two equal groups. The first group treated by shoulder range of motion for abduction movement up to 6 weeks three times weekly, while the second group was treated by underwater shoulder abduction exercises up to 6 weeks, three times weekly.

Inclusion criteria:

- Patients with primary unilateral mastectomy.
- Their age ranged from 39-49 years old.
- Underwater exercises started after complete wound healing and removing the sutures.

Exclusion criteria:

- Wound complications
- Pre-operative shoulder disorders.
- Subjects who need re-operation during the rehabilitation due to any cause.

Assessment:

The shoulder range of motion was carried out by using the standard universal goniometer for all patients pre and after treatment. The shoulder pain and disability index (SPADI) was used to assess the pain and disability of the shoulder joint (**Roach et al., 1991**). The gained results were analyzed by the student t- test, the level of significance was $< (0.05)$.

Treatment:

The hydrotherapy pool was designed for permanent installations with direct connections to drain hot and cold water supply and overflow. All patients performed the same exercises. For the control group the conventional exercises were carried out in the form of active assisted, active free, and active resisted range of motion for shoulder

abduction. Each exercise was done 15 times for 3 sets, and the course of treatment extended up to 6 weeks by 3sessions weekly. While the treatment group performed the exercises but in the form of hydrotherapy exercises, considering the benefit of water assistance as well as water resistance to perform the exercises properly. Each exercise was done 15 times for 3 sets, and the course of treatment extended up to 6 weeks by 3sessions weekly

Results:

The statistical analysis of patient's demographic data revealed a non-significant difference between both groups, as explained in table (1).

Table (1): Patients demographic data between both groups.

	Control group		Treatment group		Comparison		Significance
	Mean	± SD	Mean	± SD	t-value	p-value	
Age (yrs)	44.73	2.81	43.66	3.19	0.96	0.34	NS
Weight (Kg)	75.46	8.05	76.6	5.62	0.44	0.65	NS
Height (cm)	160.6	3.33	161.26	4.41	0.46	0.64	NS

Shoulder abduction range

Comparison of pre and post treatment results of shoulder abduction range of motion for the control group as well as for the treatment; revealed a significant difference between pre and post treatment measures. As shown in table (2) and figure (1).

Table (2): Comparison between pre and post treatment shoulder abduction within each group.

	Control group		Treatment group	
	Pre	post	Pre	Post
Mean	93.66	106.33	94.66	122.0
SD	5.16	7.18	3.99	9.59
Mean difference	12.66		27.33	
(%) Improvement	13.51		28.87	
t-value	8.26		12.89	
p-value	0.001		0.0001	
Significance	Significant		Significant	

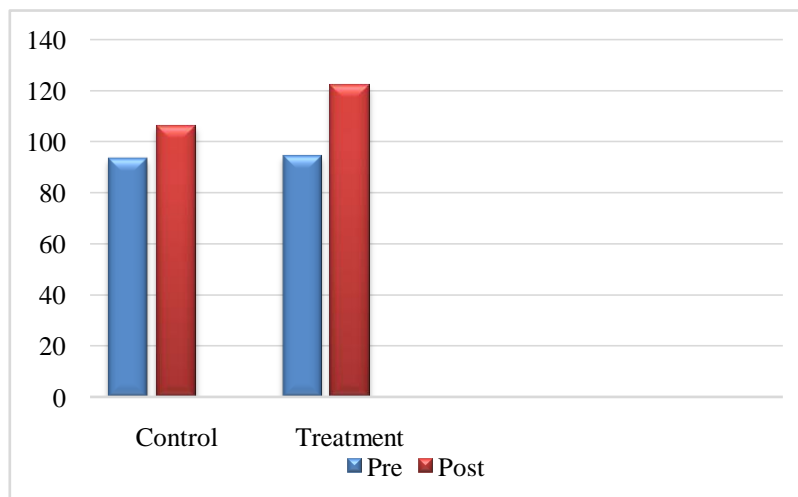


Figure (1): Mean values of pre and post treatment for shoulder abduction for each group.

By comparing the pre and post treatment results between both groups, there was no significant difference in pretreatment values between groups ($p > 0.05$). On the other hand there was a significant difference in the post treatment values between groups ($p < 0.05$). As shown in table (3) and figure 2.

Table (3): Comparison of Pre and post treatment mean values of shoulder abduction between two groups.

	Pre treatment		Post treatment	
	Control	Treatment	Control	Treatment
Mean	93.66	94.66	106.33	122.0
SD	5.16	3.99	7.18	9.59
Mean difference	1.0		15.66	
t-value	0.59		5.06	
p-value	0.55		0.001	
Significance	Non-significant		Significant	

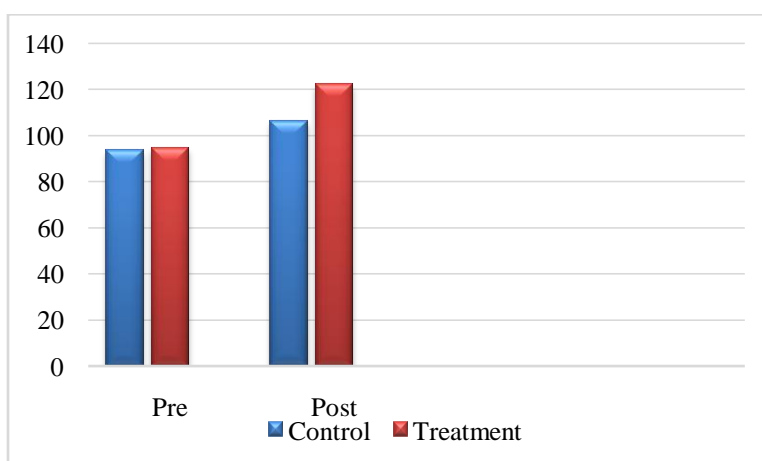


Figure (2): pre and post treatment mean values of shoulder abduction between groups.

Shoulder pain and disability index:

By comparing pre and post treatment results of the control group; there was a significant difference between pre and post treatment measures of the control group as well as for the treatment group ($p < 0.05$) as shown in table 4 and figure 3.

Table (4): Comparison between pre and post treatment shoulder pain and disability index within each group.

	Control group		Treatment group	
	Pre	post	Pre	Post
Mean	70.08	55.41	68.54	34.87
SD	5.42	9.19	4.78	6.06
Mean difference	14.66		33.67	
(%) Improvement	20.19		49.12	
t-value	6.57		23.13	
p-value	0.001		0.001	
Significance	Significant		Significant	

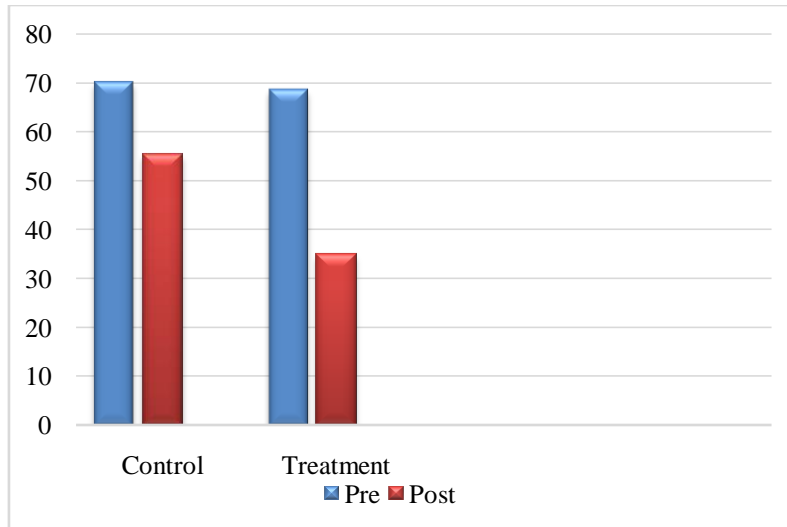


Figure (3): shoulder pain and disability index pre and post treatment for each group.

By comparing the pre and post treatment results between both groups, there was no significant difference between both groups pretreatment ($p > 0.05$). On the other hand there was a significant difference between both groups post treatment ($p < 0.025$) as shown in table 5 and figure 4.

Table (5): Comparison of pre and post treatment shoulder pain and disability index between two groups.

	Pre treatment		Post treatment	
	Control	treatment	Control	Treatment
Mean	70.08	68.54	55.41	34.87
SD	5.42	4.78	9.19	6.06
Mean difference	1.53		20.54	
t-value	0.82		7.22	
p-value	0.41		0.001	
Significance	Not significant		Significant	

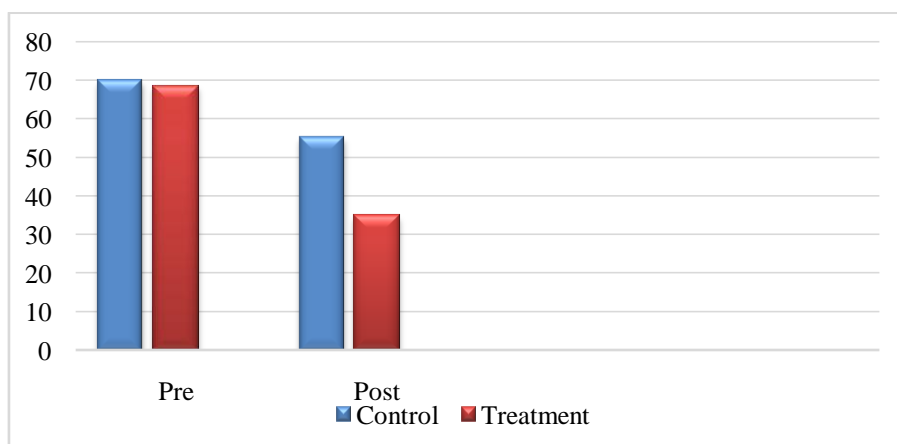


Figure (4): pre and post treatment results between both groups.

Discussion:

When a limb moves through water at a constant velocity, the resistance produced is mostly due to the shape of the model, the physical as well as hydrodynamic properties of water (**Matz et al, 2003**).

Despite the continued refinement of aquatic therapy technique, there has been little research that has critically evaluated its efficacy. Numerous of articles demonstrated different resistances placed upon the patient while using hydro fitness devices designed for strength conditioning (**Edlich, 1988, Goitz, 1988, Harrison, 1980 and Hillman et al, 1987**). However, there have been only a few studies that have attempted to demonstrate the value of these therapeutic interventions (**Green et al, 1993**) and (**Smit and Harrison 1991**).

One study investigated the effects of aquatic physical therapy on postsurgical patients comparing the effects of exercise in water and on land on patients rehabilitating from intra-articular anterior cruciate ligament reconstruction. The authors found that aquatic therapy may minimize the amount of joint effusion and lead to greater self-reports of functional improvement. Only one work was found discussing the clinical utility of aquatic physical therapy for the shoulder (**Speer, et al, 1993**).

The statistical analysis of the gained results of shoulder abduction revealed anon significant difference between both groups pretreatment. On the other hand the post treatment comparison between two groups revealed a significant improvement in shoulder abduction in treatment group.

Comparison of pretreatment results of shoulder pain and disability index between both groups revealed a non-significant difference pretreatment, but there was a significant difference in the post treatment values.as there was significant decrease in mean value shoulder pain and disability index in treatment group in comparison to control group.

The gained improvement in our study is on line with the work of **Karel, 2003**; who explained that the state of partial weightlessness and hydrostatic pressure seems to have unique effects on neuromuscular function during isometric and dynamic actions compared to dry land conditions. By considering the interrelationships between water, a moving object, and basic biomechanical principles, an aquatic environment seems to offer an effective medium for exercises for therapeutic or conditioning purposes.

Also our study results are consistent with work of **Speer, et al., 1993** who found and stated that; Aquatic physical therapy is a means toward early active motion of the postsurgical or injured shoulder. Aquatic therapy allows for early active range of motion of the shoulder and return of normal function and stability while minimizing potential postsurgical complications. Shoulder rehabilitation through water offers an avenue to begin active shoulder motion particularly for patients who cannot tolerate traditional land therapy. For very painful and guarded shoulders, exercise and active motion in water may be an effective method for introduction of shoulder rehabilitation. Patients are able to initiate normal active shoulder movement in the water within days of surgery. This compares to a lag of weeks for traditional active motion on land.

The results of this study showed an agreement with the study of **Ferris et al., 2001**, who measured the reproducibility of isometric force and EMG measurements both in water and on land. The EMG activity of the measured muscles and the EMG / force ratio underwater showed lower values than when measured on land, this mean that; active shoulder motion in water can be performed with decreased muscle activation , which confirming the neuromuscular basis for the positive clinical use of aquatic physical therapy for safe, early active motion of the shoulder.

The results of this study agreed with (**March and Stenmark., 2001**) and (**Brown, 2002**) as they suggested that reflex stabilization of posture underwater may depend mainly on the activation of the pressure receptors in comparison to the importance of the vestibulo-spinal and muscle proprioceptive reflex mechanisms on dry land, also The buoyancy effects of water create less load on the repaired tissues, so active motion can be done earlier and more safely compared with exercise on land.

Conclusion

It could be concluded that underwater exercises have a great role in improving shoulder abduction as well as pain and disability in post mastectomy female patients.

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