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Active exercises utilizing a facilitating device in the treatment of lymphedema.

Maria de Fátima Guerreiro Godoy OT, PhD [1], Antonio Helio Oliani MD, PhD

Adress: [1]Rua Floriano Peixoto, 2950- São Jose do Rio Preto-SP- Zipe code:15020-010

E-mail: * Maria de Fátima Guerreio Godoy godoyjmp@riopreto.com.br *author corresponding

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Abstract

The aim of this study was to evaluate the reduction in volume of arm lymphedema secondary to breast cancer therapy utilizing an exercise facilitating device. Twenty-four women with arm lymphedema resulting from the surgical and radiotherapeutic treatment of breast cancer were randomly selected. Evaluation was made by water-displacement volumetry before and after each session. The patients were submitted to a series of active exercises using a facilitating device for four 12-minute sessions with intervals of 3 minutes between sessions in the sitting position with alignment of the spinal column. The lymphedematous arm was maintained under compression using a cotton-polyester sleeve. The active exercising device used was a mobile rotating circular device fixed table. The paired t-test was utilized for statistical analysis with an alpha error of 5% (p-value ≤ 0.05) being considered significant. The initial mean volume of the arms was 2089.9 and the final volume was 2023.0 mL with a mean loss of 66.9 mL (p-value < 0.001). In conclusion, active exercises utilizing facilitating devices can contribute to a reduction in size of lymphedematous limbs.

Key words: lymphedema, active exercises, devices.

Introduction

Lymphedema is one complication of breast cancer treatment. A 10-year follow up study reported an incidence of lymphedema of 38.7% [(1)] and identified the degree of axillary dissection and radiotherapy as important risk factors. [(2)] The hypothesis of the authors is that these procedures damage the lymphatic system and make drainage of proteins and macromolecules from the cell interstice difficult. [(3)]

The treatment recommended for lymphedema is a combination of therapies including: lymph drainage, [4,5] exercising, [6-8] hygienic care [9], psychological support [10] and more recently the association of occupational activities [10] with compression mechanisms and cervical stimuli [11].

The exercises used to treat lymphedema should be programmed controlled muscle activities to improve the physical condition but without competitive objectives. [7,10] Even so, it is very important to consider the principles of biomechanics, velocity, duration and positioning with this approach to therapy.

However, one of the difficulties related to exercising is controlling how they are carried out, where the development of facilitating devices may assist in this aspect and establish a specific plan of exercises for the patient. The objective of the present study was to evaluate the reduction in volume of arm lymphedema resulting from cancer treatment utilizing a specific exercise facilitating device.

Method

A total of 24 women were randomly selected from a rehabilitation group of arm lymphedema related to the surgical and radiotherapeutic treatment of breast cancer. Evaluation of the edema was achieved by water displacement volumetry immediately before and after each experiment. The patients were submitted to a one-hour session of active exercising, divided in 12-minute stints with intervals of 3 minutes, utilizing a facilitating device. The patients remained sitting with alignment of

the vertebral column and used a cotton-polyester compression sleeve on the lymphedematous limb 2 An active exercising device, denominated mobile rotating circular device fixed table with distance of 10 cm from the body of the patient in vertical position. The objective this position permitting bending of the elbow with the greatest reduction of the negative effects of gravitational pressure, figure 1.

The paired Student t-test was utilized for statistical analysis with an alpha error of 5% (p-value ≤ 0.05) being considered acceptable. The study was approved by the Research Ethics Committee of the institution and all patients signed informed consent forms.

Figure 1. Exercises using the rotating circular device

Results

The initial and final mean volumes were 2098.9 mL and 2062.6 mL, respectively with a mean loss of 36.33 mL (p-value < 0.0007), table 1. Table 2 illustrates the volume loss before and after the activities and the variations for each patient.

Table 1. Initial and final mean volumes before and after the activities

	Before	After	Difference	p<0.0007
N	24	24		
Mean	2098.9	2062.6	36.333	
Std deviation	452.22	441.73	45.724	
Std error	92.310	90.168	9.333	
Median	1998.0	1985.0	46.500	

Table 2: Volume before and after the activities of each patient

N° of Patient	Initial vol. (mL)	Vol. After 60 minutes (mL)	Difference
1	1926	1863	-63
2	1742	1748	6
3	2643	2612	-31
4	2032	2015	-17
5	1377	1317	-60
6	1799	1745	-54
7	2031	1987	-44
8	1534	1572	38
9	2852	2784	-48
10	2017	2106	89
11	1943	1923	-20
12	1978	1942	-36
13	2189	2125	-24
14	1568	1572	4
15	2034	1993	-41
16	1656	1580	-76
17	1979	1975	-4
18	2387	2310	-77
19	1976	1917	-59
20	3326	3243	-83
21	2677	2656	-21
22	1976	1983	6
23	2587	2538	-49
24	2145	2096	-45

Vol. = volume

Discussion

The current study adopted a pedal arrangement with the objective of facilitating, programming and controlling exercises of patients with arm lymphedema and showed that these exercises are efficacious in reducing the volume of edema. There are no publications analyzing the use of devices with these characteristics in lymphedema treatment. The device was developed after a pilot study of lymphedematous upper limbs which evaluated the working pressures of the main muscle groups which are involved in flexion and stretching movements and cause the greatest working pressure variations.

The main difficulty in respect to myolymphokinetic exercises is the control of how they are carried out. Exercises utilize muscle contractions

and these cause external compression on the blood vessels; this compression on veins and lymphatic vessels favors drainage. However, exercising demands a higher blood flow to the region and consequently increases in the capillary filtration and in lympho-venous drainage. Thus, exercising may lead to an increase in the volume of the limbs or a reduction depending on the filtration demand versus drainage. In the treatment of lymphedema, the main objective is the reduction in edema , hence exercises should be performed so that there is a resulting reduction.

Myolymphokinetic exercises and activities can all, in truth, stimulate lymphovenous drainage. The authors suggest the term myolymphokinetic therapy for exercises and activities that lead to greater drainage than filtration and thus a reduction in the size of the limb.

Passive exercises are preferable to active exercises as they demand less energy 12. However, active exercises are important to assist in maintaining the muscle trophism and maintain the efficacy of contractions.

The development of active exercises that can be controlled will constitute an advance in the treatment of lymphedema in respect to exercising. It will be possible to establish, for each patient, an individually adapted device that leads to a reduction in the lymphedema. This is a new research line that will help to better understand exercising, a low cost therapy which is easy to perform. Another advantage is that exercises can be performed in any place giving greater independence to these patients. Exercising will not constitute the only therapy for lymphedema, but is part of the combination of therapies .

Conclusion

The development of myolymphokinetic devises may facilitate the indication of more specific and efficacious exercises in the treatment of lymphedema of the upper limbs.

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