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Exercises using leisure resources to reduce arm lymphedema

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Abstract

The aim of this study was to evaluate a form of programmed exercises in the recumbent position using leisure resources.

Ten female patients aged between 42 and 72 years old (mean age of 66 years) referred for an evaluation of lymphedema were enrolled in this study. Inclusion criteria were a history of treatment for cancer leading to arm edema evidenced as a difference in volume greater than 200 mL compared to the contralateral limb. Women with active infections, skin lesions or active disease were excluded from the study. Four types of exercises were selected including using a ball, a bat for arm lifting movements, flexion and extension movements of the arm and flexion and extension movements with the arm supported on a foam wedge. These exercises were performed as four 15-minute stints over one hour. All participants were supervised during activities and warned to perform few movements (maximum 10 per minute) in the supine position and to use a compression arm sleeve. Changes in volume were calculated using plethysmography before the start and after completing the exercises. The paired t-test was used for statistical analysis with an alpha error of 5% being considered acceptable (p-value < 0.05).

For the group as a whole, the change in volume of the lymphedematous arms was insignificant; for seven patients the volume increased and for three it diminished.

The types of exercises used in this study did not reduce the volume of lymphedematous arms.

Keywords: Myolymphokinetic exercises, lymphedema, upper limb, treatmen

Introduction

Lymphedema is characterized by a type of edema caused by the abnormal accumulation of fluid and other substances in tissues resulting from a failure of the lymphatic drainage system, together with insufficient extralymphatic proteolysis of the cell interstitium [(1)] and mobilization of macromolecules [(2)].

Lymphedema can cause a high degree of dysfunction including decreased joint mobility with a reduced range of movements due, in part, to the weight of the limb and pain causing difficulty or even inability to perform daily tasks. Additionally, the psychological condition of the patient is impaired from the moment of breaking the news about the disease, throughout treatment and after due to the sequelae that follow treatment. Mastectomized patients require multidisciplinary care in both the prevention and treatment of sequelae.

There is a consensus that there is no single method of treating lymphedema instead a combination of therapies is recommended [(3,4)]. Treatment should include some or all of the following: lymphatic drainage [(5-7)], myolymphokinetic exercises [(8-10)], use of compression

garments or bandages [11-14], day-to-day hygienic care [15,16], nutritional guidance [17], psychological support (18) and lymphokinetic drugs [19].

An analysis of the different forms of lymphedema treatment shows that myolymphokinetic exercises, lymphatic drainage and compression mechanisms constitute the most effective combined therapy. Muscle activities should be programmed and structured to improve fitness and health, but without competitive purposes [20]. Myolymphokinetic exercises are activities in which the movement of muscles favors the venous-lymphatic circulation [8,21]. However care in respect to the biomechanical principles, intensity and duration of activities should be taken [22].

The aim of this study was to evaluate a form of programmed exercises in the recumbent position using recreational resources.

Methods

Ten female patients referred to the Godoy Clinic for an evaluation of breast cancer-related lymphedema due to surgery, radiotherapy and chemotherapy were enrolled in this study. The ages of the participants ranged between 42 and 72 years old with a mean age of 66 years. Inclusion criteria were a history of treatment for cancer associated with arm edema as evidenced by a difference in volume of more than 200 mL between the arms. Women with active infections, skin lesions or active disease were excluded from the study. Women who met the inclusion criteria were informed about the study objectives and on acceptance were required to sign informed consent forms. Four types of exercises were selected including using a ball, a bat for lifting movements, flexion and extension movements of the arm and flexion and extension movements with the arm supported on a foam wedge. These exercises were performed as four 15-minute stints over one hour. All participants were supervised during activities and warned to perform few movements (maximum 10 per minute) in the supine position and to use a compression arm sleeve. Changes in volume were calculated using water displacement plethysmography before the start and after completing the exercises. The displaced water was measured using calibrated digital weighing scales where 1 mL of water corresponds to 1 g. The paired t-test was used for statistical analysis with an alpha error of 5% being considered acceptable (p-value < 0.05).

Results

For the group as a whole, the change in volume of the lymphedematous arms was insignificant (p-value < 0.934 - Table 1); for seven patients the volume increased and for three it diminished (Table 2).

Table 1: Results of water displacement plethysmography before the start and after completing one hour of exercises

	Initial volume (mL)	After 1 hour (mL)	Difference (mL)
Mean	1973.4	1976.7	-3.30
n	10	10	10
Standard deviation	437.97	466.13	123.42
Standard error	138.50	147.40	39.03
Median	1971.5	2074.5	-52.50

p-value < 0.934

Table 2: Lymphedematous arm volume before and after 60 minutes of exercises in the supine position with compression sleeve

Patient #	Initial volume (mL)	Final volume (mL)	Difference (mL)
1	1926	2043	117
2	1806	1848	42
3	2543	2301	-242
4	2052	2115	63
5	1377	1217	-160
6	1799	1909	110
7	2119	2152	33
8	1360	1272	-88
9	2735	2804	69
10	2017	2106	89

Discussion

The current study shows that compression using a sleeve made of a cotton-polyester textile associated to this type of exercise program did not significantly reduce the volume of lymphedematous arms. There are very few publications that establish criteria for exercising in the treatment of lymphedema, particularly of the lower limbs even though exercises are considered one of the standard treatments of lymphedema. This study evaluated a series of four established modes of movement using leisure activities together with compression. Simple and low cost equipment was used as when this population has easy access to materials individuals can be trained to perform the exercises independently at home. It is essential to remember that exercising can increase or decrease the volume of the limb and so perhaps this study is very important to illustrate that exercising can be an instrument of treatment or can aggravate lymphedema.

The key issue is to establish the best type of activity or exercise that each patient can tolerate. For this study, patients remained in the recumbent position as elevation of limbs favors drainage due to a reduction in the effect of gravity. However, lifting the limb requires muscle activity and a higher blood flow. So, for most patients in this study, the increase in blood flow was greater than that of lymph drainage. This highlights the fact that the use of exercising in the treatment of lymphedema needs to be controlled by a professional with experience. It is suggested that each patient is evaluated individually to determine the best type of exercise or myolymphokinetic activity; passive activities are recommended for these patients, however, active activities can be beneficial as long as they are carefully controlled. The use of compression is of fundamental importance during exercising with low-elastic or inelastic mechanisms being recommended. Patients often do not tolerate elastic compression mechanisms, especially with passive exercising and elevation of the limb. The main complaints during exercise were fatigue and the start of pain. These are symptoms that suggest that the duration or type of activity are not correct for that specific patient. On the other hand three patients tolerated the activities and the volume of the lymphedematous arm diminished. The monitoring of patients during activities and guidance related to fatigue or discomfort are essential. Another study involving same patients assessed the reduction of the volume of lymphedematous arms using exercising in the seated position with devices that facilitate flexion, extension and rotation movements. Under these conditions a statistically significant reduction in volume was observed. This finding might suggest that exercising in the supine position with the aim of reducing the effect of gravity to improve lymphovenous drainage was worse than the seated position for this group of patients perhaps due to the higher demand in energy required because of the position of the shoulder. Other studies should be performed on women with different clinical stages of lymphedema and using different positions in order to identify exercises that improve lymphovenous drainage.

Moreover, when exercise is indicated the individual as a whole, including other possible diseases, psychological aspects, the patients' relatives, nutritional support and socioeconomic situation, must be considered. The results are normally better with this therapeutic approach mainly due to the patient's compliance to treatment.

Hence, exercising, associated with compression, is an important method to treat lymphedema, but should be customized for the individual, supervised and frequently evaluated.

Conclusion

Exercises must be evaluated individually for each patient establishing the individual's response otherwise the outcome may not be favorable as in this study.

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