

USING EXERCISE CLASSES TO REDUCE ARM LYMPHOEDEMA

Jillian Bracha, Tamar Jacob

Abstract

Background: Arm lymphoedema is a chronic condition affecting multiple aspects of patients' daily lives but quality of life can be improved with excess volume reduction. Treatment consists of infection prevention, lymphatic massage, compression therapy and special exercises. However, there is little evidence regarding the effect of exercise in a group framework.

Aims: Using a series of case reports, this article explores changes in arm volume and patients' perceptions of quality of life after participation in a lymphoedema-specific group exercise class (as described in the Casley-Smith Method of Lymphoedema Treatment [Casley-Smith and Casley-Smith, 1997]). **Methods:** Data from eight women with post-breast cancer lymphoedema who partook in a weekly exercise class for a period of eight weeks was documented. The outcome measures used were arm volume and perception of quality of life evaluated by the Upper Limb Lymphoedema-27 questionnaire (ULL-27) (Launois et al, 2002). Participants' comments are also reported. **Results:** Limb volumes reduced after each class and over the entire eight-week period. Quality of life scores improved for most participants in some of the dimensions. **Conclusions:** In this series of case reports, an eight-week exercise class was found to be beneficial for women with post-breast cancer lymphoedema. **Declaration of interest:** None.

Key words

Quality of life
Group exercise classes
Arm volume
Compression

Breast cancer-related lymphoedema (BCRL) of the arm is a common sequel to breast cancer treatment (Williams, 2005). The diagnosis of lymphoedema can be devastating to patients as it has far-reaching consequences and is a constant reminder of their breast cancer (Weiss and Spray, 2002; Radina and Armer, 2004; Fu et al, 2009).

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Patients with BCRL often experience physical symptoms including numbness, tenderness, aching, increased limb weight, restricted motion and altered limb sensation (Williams et al, 2004; Armer, and Fu 2005; Armer and Heckathorn, 2005; McWayne and Heiney, 2005; Preira de Godoy and da Silva, 2007). These factors can interfere with a patient's daily activities including their home life, work and recreation, especially when the dominant hand is involved. Some patients also suffer fatigue from the burden of having to undergo regular physical therapy treatments (McWayne and Heiney, 2005; Ridner, 2005; Preira de Godoy and da Silva, 2007).

Difficulty in putting on compression garments also causes dependence on other family members and poorly fitting garments can compromise treatment results. Many patients also suffer from upper body discomfort as a result of the surgery, breast reconstruction and radiation.

Lymphoedema has psychological and social aspects. Reported psychological sequelae of BCRL include depression,

anxiety, poor self-image, reduced self-esteem and distress (Armer and Fu, 2005; Armer and Heckathorn, 2005; Pyszel et al, 2006; Preira de Godoy and da Silva, 2007).

The main social problems faced by women with BCRL are due to a lack of family support and difficulty in performing daily activities (Radina and Armer, 2004; Armer and Fu, 2005). Patients may experience reduced employability and earning capacity and the visible compression garment and swollen arm may cause embarrassment (McWayne and Heiney, 2005). Clothing options may also be limited (Weiss and Spray, 2002). Relationships may be adversely affected by the demands of lymphoedema control as some patients feel less sexually attractive and the break-up of partnerships has been reported (Pyszel et al, 2006; Radina et al, 2008). This further complicates the body image problems experienced by some patients following breast cancer treatment. Consequently, lymphoedema has a major impact on patients' quality of life.

Lymphoedema treatment usually involves a multifaceted programme

including skin care to ensure infection prevention, lymphatic massage (also known as manual lymph drainage [MLD]), compression bandaging and garments, exercises to improve lymphatic and venous return, and psychosocial support (Morgan et al, 1992; Moffatt, 2006; Fu et al, 2009).

The treatment programme is delivered in two phases:

- ▶ A: the intensive phase, lasting 2–4 weeks on average and usually involving daily treatment. The lymphoedema is maximally reduced and the limb size becomes more normal. However, the sensation of having a 'lymphoedematous arm' may remain
- ▶ B: the maintenance phase (lifelong) involves compression, infection avoidance measures and self-treatment, including massage and exercises, all of which need to be part of the patient's daily routine.

Arm lymphoedema reduction of 63% has been reported after intensive treatment and this can be maintained or even improved with good adherence to a maintenance programme (Boris et al, 1997). However, any lymphoedema reduction can be reversed in non-adherent patients (Foldi et al, 1989). Boris et al (1997) also state that outcomes depend on the patient's adherence with all the components of the treatment. Thus, maintenance of lymphoedema reduction is regarded as the patient's responsibility. Unfortunately, many patients are only partially compliant and a return of their swelling may occur.

Exercise

Regular exercise is an important element of treatment and there is evidence that it improves lymphatic return (Leduc et al, 1993) and helps to reduce lymphoedema (Casley-Smith and Casley-Smith, 1997; Havas et al, 1997; Foldi et al, 2003). A recent study has shown that gentle arm and deep breathing exercises reduce lymphoedema swelling and improve sensations of heaviness and tightness (Moseley et al, 2005). In keeping with the above, exercise instructions should be included with any individual treatment programme — unfortunately, patients

do not always follow these consistently (Boris et al, 1997).

Group exercise has been shown to improve patients' motivation to perform self-care in chronic low back pain as well as improving symptoms (Nykanen and Koivisto, 2004). In one study, group physical therapy provided a new learning process that helped to rebuild self-esteem (Mannerkorpi and Gard, 2003). In addition, interaction between participants in group exercise may serve as a support mechanism and promote new patterns of thinking, for example observing other people's coping mechanisms can help an individual acquire similar strengths (Mannerkorpi and Gard, 2003; Nykanen and Koivisto, 2004).

In the author's private lymphoedema clinic, regular follow-up interviews revealed that patients were not regularly performing the daily arm lymphoedema exercises during the intensive phase of their treatment. These exercises included low repetition arm exercise, beginning with the proximal muscle groups then gradually moving to the distal arm muscles.

Based on the fact that group treatment has been helpful in other chronic conditions, the authors decided to investigate whether the maintenance stage of treatment for BCRL could be strengthened by group exercise classes. The following series of case reports describe the results in a group of eight women, all of whom have BCRL. They took part in a weekly exercise class over a period of eight weeks in addition to their routine self-care.

Method

The patients featured in these case reports were referred by an oncologist or surgeon for physical therapy to treat lymphoedema. All of them were in the maintenance phase of their treatment and had a good understanding of Hebrew.

The average time since breast cancer surgery was eight years (the range was eight months to 25 years). All had undergone axillary lymph node dissection and adjuvant therapies included radiotherapy (five patients),

chemotherapy (five patients) and hormonal therapy (four patients).

The post-intensive stage of their lymphoedema treatment had on average lasted for 27.5 months (range one month to seven years). Patients' ages ranged from 39–67 years and four were working, while the other four were pensioners. In two patients the dominant arm was lymphoedematous (*Table 1*). Four patients had mild lymphoedema, three were moderate and one severe (*Table 2*).

All of the patients had received individual exercise instruction during the intensive phase of the treatment, however all eight reported that they were no longer performing these exercises, mainly through a lack of motivation to exercise routinely.

The patients all signed consent forms and the study was approved by the ethics committee for human research at Ariel University Center of Samaria.

On the basis of positive feedback received from patients who had been individually instructed in Casley-Smith arm exercises during the intensive treatment phase, the authors decided to implement this as a group exercise programme for patients in the maintenance phase.

The exercises are designed to improve lymphatic and venous return from the affected arm and re-route the lymphatic flow to areas of intact lymph drainage (Casley-Smith and Casley-Smith, 1997). The programme utilises gentle movement, beginning with deep breathing progressing to slow rhythmic exercise of the proximal and distal arm muscles. Interspersed between these exercises are self-massage techniques aimed at improving lymphatic return. The same exercise sequence is performed at each class with the goal of creating a routine that can be reinforced through repetition.

The classes lasted for an hour and included the following exercise and self-massage regimen:

- ▶ Supine lying:
 - Relaxation for one minute
 - Bend knee on lymphoedematous side to chest and hold shin with

Table 1

Characteristics of the participants

Case number	Age	Marital status	Surgery	Radiotherapy	Chemotherapy	Hormone therapy	Hand dominance	Time post surgery	Time post-intensive stage of lymphoedema treatment	Occupation
1	48	Married Two children	Left mastectomy + ALND* + silicone implant	No	Yes	No	Right	Two and a half years	16 months	Dental hygienist
2	49	Married Two children	Left mastectomy + ALND	No	Yes	Yes	Left	Five years	One year	Secretary
3	67	Married Three children	Left lumpectomy + ALND	Yes	No	Yes	Left	Eight months	Three months	Pensioner
4	39	Married Two children	Left mastectomy + ALND	Yes	Yes	Yes	Right	One year	One month	Nurse
5	66	Divorced Three children	Right Mastectomy + ALND	Yes	Yes	No	Left	Two years	Five months	Pensioner
6	68	Married Two children	Left mastectomy + ALND	No	No	No	Right	18 years	Two years seven months	Pensioner
7	60	Married Three children	Left lumpectomy + ALND	Yes	Yes	Yes	Right	Eight years	Seven years	Bookkeeper
8	71	Married	Left mastectomy + ALND	Yes	No	No	Right	25 years	Five years, eight months	Pensioner

* Axillary lymph node dissection

both hands. Bounce the knee against the body. Repeat with the other leg. Repeat 16 times

- Massage the supraclavicular nodes on both sides with fingertips using circular movements. Repeat five times
- Curl-ups — slide the hands down the thighs towards the bent knees while exhaling. Repeat three times

▶ Sitting with the back well supported:

- Slow neck rotations, centre, right, centre, left. Repeat five times
- Side flex neck to right, bring chin to chest, side flex neck to left and

back to centre. Repeat five times

- Elevate shoulders, return to normal position, depress shoulders, return to normal position. Repeat five times
- Shoulder elevations, protraction, depression, retraction, elevation, relax. Repeat in the opposite direction. Repeat five times
- Massage axillary nodes on both sides five times
- Shoulder protraction. Repeat five times
- Bend forward slightly, sway lymphoedematous arm in a

circular, pendular movement. Change direction. Repeat five times in each direction

- Hold the lymphoedematous arm adducted to the trunk, elbow flexed to 90°, retract the shoulder and scapular, while maintaining relaxation in the opposite shoulder. Repeat five times

▶ Standing:

- Breathing exercises. Exhale while flexing the thoracic trunk. Straighten up while inhaling. Repeat five times
- Press hands together with the

Table 2

Measurement of arm volume and swelling before and after eight-weekly exercise classes

Case number	Severity of oedema	Good arm volume: (ml) N	Baseline affected arm volume (ml) I	Volume of oedema (ml) I-N	Follow-up arm volume (ml) F	Change in arm volume (ml) F-I	Baseline swelling in relation to good arm (%) $100 * (I-N)/N$	Follow-up swelling in relation to good arm (%) $100 * (F-N)/N$	Change in swelling (%) $100 * (F-I)/(I-N)$
1	A*	1702	1717	-15	1684	33			
2	A	1762	1962	200	1890	72	11%	7%	36%
3	A	2344	2692	348	2539	153	15%	8%	44%
4	A	2395	2792	397	2679	113	17%	12%	29%
5	B	2106	2589	483	2575	14	23%	22%	3%
6	B	2274	2902	628	2902	0	28%	28%	0%
7	B	1841	2385	544	2272	113	30%	23%	21%
8	C	2540	4002	1462	3763	239	58%	48%	16%

* A = mild lymphedema <20% excess limb volume

B = moderate lymphedema 20–40% excess limb volume

C = severe lymphedema > 40% excess limb volume (Moffatt, 2006)

shoulders abducted to 90° while inhaling. Relax the pressure on the hands while exhaling. Repeat five times

- Perform lymphatic massage to the unaffected axilla five times. Perform lymphatic massage strokes across the front of the chest towards the 'normal' side
 - Perform lymphatic massage to the inguinal lymph nodes on the lymphatic side five times. Perform lymphatic massage strokes over the chest downwards towards the inguinal lymph nodes
 - Hold the ends of a rod (about 70cm long) across the chest with palms facing the chest. Lift the rod above the head and behind the shoulders. Repeat five times
- ▶ Sitting:
- Ensure the lymphoedematous arm is supported and abducted at shoulder height. Flex the elbow to touch the shoulder. Repeat five times

- In the same position, clench the hand to make a fist. Repeat five times
 - In the same position with the palm facing downwards, make a fist, supinate the forearm, externally rotate the shoulder and retract the scapula. Hold the position and release the arm to the starting position. Repeat five times
- ▶▶ Standing:
- Interlock the fingers behind the head; adduct the shoulders to meet the elbows in front of the face. Abduct the shoulders to the sides, and stretch them back as far as possible. Repeat five times
 - Perform lymphatic massage to the unaffected axilla five times. Perform lymphatic massage strokes across the front of the chest towards the normal side
 - Perform lymphatic massage on the inguinal lymph nodes on the lymphatic side five times. Perform

lymphatic massage strokes over the chest downwards towards the inguinal lymph nodes

- Stand with arms extended upwards, palms resting on the wall. Push against the wall with the hands. Repeat five times
 - Stand with arms extended upwards, fingers resting on the wall as if playing the piano from small finger to thumb. Repeat 10 times
- ▶▶ Supine lying:
- Curl-ups, slide the hands down the thighs towards the knees while exhaling. Repeat three times
 - Relax for a few minutes. Elevate the lymphoedematous arm on a pillow.

A list of the exercises was handed out to encourage the patients to perform them at home. The authors also attempted to foster an atmosphere of camaraderie by encouraging socialising and providing refreshments before and

after each class. The classes were held in a lymphoedema clinic during the spring, with outdoor temperatures ranging from 16–24°C — this was comfortable for exercise at room temperature (even while wearing a compression garment).

During the eight-week exercise period, all of the patients were instructed to continue their routine self-maintenance programme, including infection prevention measures (preventing skin puncture), compression (garments and bandaging) and home-based individual exercise. Patients who did not bring their compression sleeves were not prevented from partaking in the class.

During the eight-week exercise period none of the patients were seeing a physical therapist for lymphoedema massage. Patients were not prevented from partaking in other exercise provided that it was part of their previous regular routine.

Outcome measures

Two main outcome measures were included, arm volume (lymphoedema measurement) and quality of life.

The arm volume was calculated by using the formula for a truncated cone then summing the cones:

$$V = h(C1^2 + C1 \times C2 + C2^2) / 12\pi$$

(V=volume of the segment, C1 and C2 are the circumferences at each end of the cone; h is the distance between them).

To ensure reliability, all circumference measurements were performed by the same physical therapist who is trained in lymphoedema treatment and has 10 years of experience. Measurements were taken in a quiet, well-lit room. Each patient was placed in the same position for all measurements — seated alongside a high-low plinth with the arm fully supported at shoulder height, flexed forward, with the elbow extended and forearm pronated. The same spring-loaded retractable tape measure was used for all measurements. Arm circumferences were measured before and after each class and were taken at six points (at the thenar space of the hand,

the wrist, and at 10cm intervals up to the axilla). Each time the arm circumferences were taken a new measurement sheet was used so the therapist was blinded to previous measurements.

The volumes were used to show:

- ▶▶ The difference in volume between lymphoedematous and normal arms
- ▶▶ The difference in lymphoedematous arm volume before and after each exercise class
- ▶▶ The lymphoedematous arm volume over the eight-week period.

Lymphoedema severity was graded according to the volume of the arm — mild lymphoedema is seen as <20% excess limb volume; moderate lymphoedema as 20–40% excess limb volume; and severe lymphoedema as >40% excess limb volume (Moffatt, 2006).

Quality of life was evaluated by the Upper Limb Lymphoedema-27 questionnaire (ULL-27) (Launois et al, 2002), which comprises 27 questions covering physical functioning and psychological and social dimensions. Each item scores between 1–5 points, whereby 1 indicates 'no difficulty' and 5 indicates 'maximum difficulty'. Fifteen of these questions relate to physical function (score range 15–75):

- ▶▶ During the past four weeks, have you experienced any of the following difficulties because of your arm:
 - Falling asleep, i.e. difficulty in positioning the affected arm?
 - Bathing, brushing your hair or putting on make-up?
 - Grasping objects, e.g. opening a door or turning a tap off?
 - Frequent awakening at night due to pain?
 - Walking (the arm is heavy, bothersome, swollen)?
 - Grasping high objects?
 - Using public transport?
 - Dressing and undressing?
 - Maintaining a static position?
 - Grasping certain objects, such as cutlery or crockery?
 - Carrying out your work?

Seven of the questions relate to psychological function (score range 7–35):

- ▶▶ During the past four weeks, have you felt any of the following because of your arm:
 - Anger?
 - Sadness?
 - Lack of self-confidence?
 - Helplessness, depression?
 - Lack of confidence in the future?
 - Lack of self-esteem?
 - Discouraged?

Five of the questions relate to social function (score range 5–25):

- ▶▶ During the past four weeks, has your arm caused you difficulties with:
 - Getting out socially?
 - Taking advantage of good weather to spend time outside?
 - Your emotional life with your spouse/partner?
 - Having the confidence to look in the mirror?

To the best of the authors' knowledge, the minimal detectable change (MDC) has not been evaluated on this questionnaire.

The questionnaire has been translated into Hebrew (Tidhar, 2007), and has been used in a previous study (Tidhar and Katz-Leurer, 2010).

The level of self-care performed by each patient was provided by self-report. The authors were interested to know if the level of self-care would be improved as a result of partaking in an exercise class, possibly due to increased motivation gained from the experience.

The participants were asked to complete another questionnaire one month after completing the exercise classes. This provided information about the compression they used (e.g. bandaging, sleeve and glove, or both), and how often (e.g. during the day, during the night, both or other). They also reported subjective perceptions of benefit from the exercise class.

Results

The ULL-27 questionnaire was completed before and after completion of the exercise classes. The results were analysed by using descriptive statistics. As the goal of maintenance

treatment is to prevent the recurrence of lymphoedema, the authors felt that the maintenance of stable limb volumes allied to improvements in quality of life was a satisfactory outcome.

The average attendance was 6.9 out of eight classes (86%). The average limb volume reduction after each class was 26mls (range 12–44mls).

After the eighth class, five of the patients (cases 2, 3, 4, 7 and 8) experienced a lymphoedema reduction of more than 15% (range 16–88%) (Figure 1 illustrates cases 2, 3, 4 and 7). The remaining three patients (cases 1, 5 and 6) maintained their original volume (Table 2). Cases 1, 2, 3, 4, 7 and 8 experienced reductions in their arm volume greater than 33mls (range 33–239). The volume of patient 1's affected arm was less than the uninvolved arm, probably due to good lymphoedema reduction and some muscle wasting (Table 2).

The change in lymphoedema did not match its severity. For example,

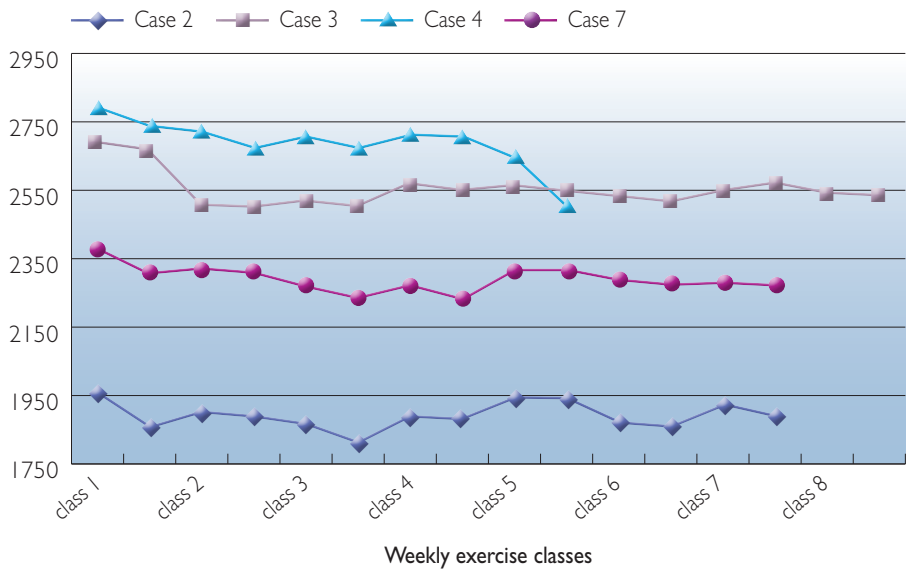


Figure 1: Individual volume weekly improvement (cases 2, 3, 4, 7)

cases 3 and 4 had mild lymphoedema but experienced more than 100ml reductions, while cases 5 and 6, who had moderate lymphoedema, experienced minimal and zero swelling change (Table 2). The average overall volume change after completing the exercise classes was 92mls.

Over the eight-week period the body weight of all patients remained stable.

Quality of life

The physical scores (ULL-27) of cases 2, 3, 4 and 8, the psychological scores of cases 1, 2, 3, 5 and 8, and the social scores of cases 2, 5 and 8 reflected an

Table 3

Measures of quality of life* (physical, psychological and social scores) before and after eight weeks of exercise classes using the Upper Limb Lymphoedema-27 (ULL-27) questionnaire

Case no	Grade of oedema***	Physical score (range 15-75)			Psychological score (range 7-35)			Social score (range 5-25)		
		Before a	After b	Difference** (a-b)/60*100	Before a	After b	Difference** (a-b)/28*100	Before a	After b	Difference** (a-b)/20*100
1	A	28	27	1 (1.7%)	13	7	6 (21.4%)	5	6	-1 (5%)
2	A	28	16	12 (20%)	13	8	5 (17.8%)	7	5	2 (10%)
3	A	56	45	11 (18.3%)	18	12	6 (21.4%)	13	14	-1 (5%)
4	A	63	47	16 (27.7%)	18	19	1 (3.6%)	14	16	-2 (10%)
5	B	22	18	4 (6.7%)	12	7	5 (17.8%)	6	5	1 (5%)
6	B	15	30	-15 (25%)	12	16	-4 (14.3%)	6	7	-2 (10%)
7	B	30	25	5 (8.3%)	14	12	2 (7.1%)	5	5	0 (0%)
8	C	65	38	27 (45%)	27	20	7 (25%)	22	20	2 (10%)

* Ref: R Launois et al (2002) A specific quality of life scale in upper limb lymphedema: the ULL 27 questionnaire. *Lymphology* 35(suppl): 1–760: 181–187

** Score reduction indicates improvement; a minus sign preceding indicates worsening

*** A – mild lymphoedema, <20% excess limb volume; B – moderate lymphoedema, 20–40% excess limb volume; C – severe lymphoedema, >40% excess limb volume

Table 4

Comments made by some of the patients after completing the exercise classes

Case 1	'I took part in the exercise class with a group of women who also have lymphoedema. I enjoyed this group very much. I saw women much older than me with lymphoedema making a great effort to help improve this difficult condition. This gave me strength to deal with my illness and feel much better.'
Case 5	'The exercises were useful to me after the class. The group arrived on time and contributed to an easygoing and cheerful atmosphere. For me the group provides mental support and an exchange of information. A worthwhile experience which gave me the feeling of being able to help myself.'
Case 6	'The exercise class benefited me and helped me feel better. At home I sometimes do the exercises I learned and they help me feel better and more confident.'

improvement greater than 15%, 17% and 5–10% respectively. The last is a borderline improvement (Table 3).

Most of the patients expressed enjoyment, encouragement, a feeling of strength, and improved confidence.

Patients' comments about partaking in an exercise class for BCRL were positive (Table 4).

Discussion

In this series of case reports the outcomes of participation in an eight-week period of group exercise were recorded for eight patients who were in the maintenance stage of their lymphoedema treatment. All of the patients maintained their lymphoedema reductions or experienced additional overall volume reduction. The participants exhibited small volume reductions immediately after most of the classes, however in the week-long interval between the classes, the volumes improved or regressed slightly.

In addition, most of the patients said that their quality of life had improved after participating in the exercise class. The overall results are encouraging as the aim of the maintenance stage is to avoid swelling recurrence (Casley-Smith and Casley-Smith, 1997; Zuther, 2005; Johansson et al, 2005).

Arm volume

The method used to measure the patients' arm circumference was chosen because it correlated strongly with

the water displacement method of arm volume measurement, which is considered the gold standard for limb volume measurement (Karges et al, 2003). However, the water displacement method is rarely used in a clinical setting as it is cumbersome, time-consuming and poses a risk of infection.

Limb volume calculation using circumference measurement is considered a valid and reliable method to calculate arm volume (Casley-Smith and Casley-Smith, 1997; Ramos, 2002). In addition, the arm circumference measurement is easy to perform, hygienic, requires no costly equipment and can be readily performed in the clinical setting. The measurement reliability was based on the therapist's expertise as well as the attention paid to performing the circumference measurements accurately, with regards to technique, consistency and appropriate environment, i.e. lack of distraction.

A previous study reported that there was no systematic bias when arm circumference measurements were performed by a blinded physiotherapist or by an unblinded treating physiotherapist (Box et al, 2002).

The average group volume change after the exercise classes was 92ml. Standard errors using similar measurement techniques have been recorded as 65.4mls (Taylor et al, 2006) and 116mls (Sander et al, 2002), therefore it cannot be ruled

out that the overall volume change recorded in the study may be a result of measurement error and not of real change. Nevertheless, the authors were encouraged by the findings as the goal in lymphoedema services is to maintain the results of intensive treatment and none of the patients demonstrated an increased arm volume.

The small volume changes measured after the classes can be attributed to exercise, whereas the volume changes between the classes can be attributed to the participants' adherence to compression and self-treatment activities (massage and exercise).

The body weight of all the patients remained stable over the eight-week period and therefore cannot be held responsible for any changes in arm volume.

Comments by the patients about the classes illustrate that partaking in group exercise influenced their motivation and strengthened their resolve to perform self-treatment on a regular basis.

Similar arm volume improvements due to adherence to an exercise programme have been described previously. Casley-Smith and Casley-Smith (1997) described the improvement in lymphoedema volume achieved by individuals who exercised while waiting for treatment.

Moseley et al (2005) reported a median arm volume reduction of

52mls with physical and breathing exercises performed over 10 minutes by 38 patients. It was not clear if this exercise was taken individually or as part of a group. The volume returned to baseline after 60 minutes, but reductions recorded at 24 hours and one week later were thought to be related to self-exercise at home.

In another study (Tidhar, 2007), lymphoedema reduction was reported after each class in a group of 15 patients in the maintenance phase who took part in 12 weekly aqua-exercise classes based on the Casley-Smith arm exercise routine. However, the arm volume reductions in this study were not maintained, possibly due to poor adherence to compression therapy.

Some patients did experience increases in arm volume following their participation in the current study. This is not surprising as exercise is a double-edged sword for lymphoedema patients, improving lymphatic and venous return, while simultaneously increasing vasodilation, perfusion and tissue fluid volume. Johansson et al (2005) also reported an increase of arm lymphoedema in patients who performed low intensity resistance exercise. This dissipated after 24 hours with the participants' arms showing a tendency towards reduced lymphoedema volume.

Had the authors of the current study measured the patients' arms 24 hours after the exercise classes, it is possible that the volume increases that were noted may have reduced.

A worthwhile addition would be the development of an arm circumference measurement technique that could be performed by patients themselves and which would monitor any changes. Similarly, instructing patients to perform lymphatic massage after exercise would help to dissipate any increased swelling. Developments such as these might improve adherence rates by providing an enhanced sense of control in patients who may fear that some forms of exercise could worsen their lymphoedema.

It was interesting to note that the volume reduction (239mls) in the patient (case 8) who had severe lymphoedema (1,498mls volume) was only a 16% swelling reduction, while the patients with smaller volumes (200mls [case 2]; 348mls [case 3]; 129mls [case 4]) demonstrated a greater percentage reduction in lymphoedema (36%, 44%, and 29% respectively) (Table 2).

A similar result was reported by Ramos (1999), who found that more patients with a small lymphoedema volume (less than 250mls) achieved a greater than 50% reduction compared to those with a larger volume (greater than 500mls). Although case reports can only provide observations, the findings in the current study do provide additional support to Ramos' (1999) conclusion that patients with the lowest swelling volumes have the greatest chance of a successful outcome.

Ramos (1999) also encourages aggressive treatment in the early stages of lymphoedema in order to achieve the best results. Based on the fact that lymphoedema tends to recur in the maintenance phase, especially when there is a lack of adherence to self-treatment, ongoing interventions are justified to ensure that the lymphoedema volume is kept as low as possible. Lymphoedema exercise classes may provide an effective and economical means of achieving this.

Compression

Adherence to compression was partial in all but one of the patients who wore her sleeve during the day and a bandage at night. Cases 1, 5, 6 and 7, who stated that they wore their sleeves regularly but interspersed with periods of non-use, and did not change their compression routine during the eight-week period, improved or maintained a constant arm volume. It is likely that the sleeve was responsible for the maintenance of volume in these cases. This is supported by Vignes et al (2007) who stated that consistent use of compression is the main factor in long-term lymphoedema reduction.

However, in the current study,

patients who did not use compression at all (cases 2, 3 and 4) also demonstrated impressive volume reductions. It is possible that these volume reductions were in response to the exercise classes and that the patients were also performing exercises at home.

Further explanation is offered by Moseley et al (2005) and Johansson (2005, 2007) who provide evidence that arm lymphoedema volume can be reduced by exercise, that exercising without compression may be preferable and that any reduction can be maintained by regular exercise.

Questions arising from these observations include:

- ▶▶ Can lymphoedema reduction be maintained by regular exercise in the absence of the use of compression?
- ▶▶ Could improved venous and lymphatic return created by the muscle pump effect be sufficient to prevent fluid and protein stagnation in the tissues?
- ▶▶ If this is so, which exercise is the most efficient and at what intensity should it be performed?
- ▶▶ Do lymphoedemas of different severities respond differently to exercise?

However, more research is needed to fully answer these questions.

One patient (case 8) reported that she changed her use of compression from 12 to 24 hours a day during the eight weeks and achieved a lymphoedema volume reduction of 16%. She did not exercise at home and it would seem that she became more adherent to compression and self-treatment between the classes. As she was an older married woman with no other family, the group experience may have provided her with the necessary support to cope with stressors, thus enabling her to devote more time and energy to self-treatment (Radina and Armer, 2004).

Quality of life

Some of the patients surveyed demonstrated an improvement in aspects of quality of life — four of the

patients (cases 2, 3, 4, 8) improved their physical scores on the ULL-27 questionnaire by more than 10%. Many patients with or at risk of arm lymphoedema are fearful of exercising the affected limb, believing that they may worsen the condition (Sagen et al, 2009). This means they avoid or limit their activity, resulting in weakness and a feeling of disablement. This can become a vicious circle, causing further loss of function, which may also be associated with the sensations of heaviness, pain and discomfort often reported by patients following breast cancer treatment (Armer and Fu, 2005; McWayne and Heiney, 2005).

Moseley et al (2005) reported that lymphoedema patients who performed mild exercise enjoyed less heaviness and tightness in their arms, as well as improved perception of limb size. The researchers state that exercise helps to promote a return to more normal arm sensation and function.

An exception in the current study group was one patient (case 6) whose physical score dropped by 25% after the exercise programme. This contradicted her statement one month later, where she commented that she 'benefitted a lot' from the exercise class. It is possible that a family crisis, which was resolved one month later, contributed to the way she answered the questionnaire.

In the current study, previous to the exercise class, only two of the participants reported partaking regular exercise. After the eight-week period of exercise classes, an additional four patients took up regular exercise. According to the patients' comments after the exercise classes, this can be attributed to the benefits of the group experience.

The psychological score improved for five patients (cases 1, 2, 3, 5, 8) in areas such as self-confidence, self-esteem and optimism for the future. In addition, these patients reported that the exercise class contributed to a sense of wellbeing, personal strength and enjoyment. This is consistent with the psychological benefits of exercise

reported elsewhere (Hassmen et al, 2000; Salmon, 2001; Hwang et al, 2008). Previous studies have demonstrated that group exercise improves psychological functioning in breast cancer patients (Mutrie et al, 2007; Hwang et al, 2008).

Social benefits, including enjoyment of the outdoors and social activities (e.g. restaurants, going to the cinema, parties and shopping) were also recorded in cases 2, 5, 8, but to a lesser degree than the physical and psychological benefits.

The social challenges of dealing with lymphoedema include embarrassment at other people's reaction to arm compression garments, not being able to wear clothing of one's choice, confidence in participating in group activities, and feeling uncomfortable in intimate situations. These were not addressed by the group exercise programme and more work needs to be done in these areas.

Limitations

A cause-effect relationship cannot be described by a case report series. In addition, as the minimal detectable change in quality of life dimensions has not been established, it is difficult to demonstrate significant changes in these items.

The ULL-27 questionnaire has only been validated in French (Launois et al, 2002) and Dutch (Viehoff et al, 2008), and its responsiveness has not been determined.

Circumference measurements, which were performed by the same therapist who ran the exercise class, were another limitation. Although the therapist had long-term experience in measurement-taking, abided by uniformity of measurement (therapist and patient position, physical surroundings, absence of distractions) and was also blinded to the previous measurements, having two separate people performing these tasks would have avoided a possible bias. However, this is not always possible in a clinical setting.

The reliability would also have been improved had standard error

of measurement or coefficient of variance calculations been done in advance of the study. Without this, the authors assume that the measurement error would fall in the range of those reported in other studies (Taylor, et al 2006; Sander et al, 2002).

Conclusion

There is consensus in the literature that the long-term control of lymphoedema through swelling limitation depends on self-management by patients and their carers (Moffatt, 2006). This consensus is based mainly on evidence from individual rather than group therapy. However, the psychological, social and family aspects of lymphoedema care (McWayne and Heiney, 2005; Ridner, 2005; Weiss and Spray, 2005; Pyszel, 2006), and the psychological and social strengths of group therapy (Mannekorpi and Gard, 2003; Nykanen and Koivisto, 2004), motivated the authors to attempt group therapy for the maintenance treatment of patients with BCRL. This method also offers patients and healthcare providers a cheaper option compared to individual treatment.

The exercise classes featured in this study benefited the group of eight patients. At least half showed arm volume reductions and improved scores for quality of life in the physical and psychological domains. Adherence to self-treatment was strengthened in some participants and this may be attributed to the group experience.

It would seem that participation in a class consisting of specially designed exercises may be beneficial for maintaining and improving lymphoedema as well as some aspects of quality of life, however, this would need to be further tested in a randomised controlled trial (RCT). JL

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Key points

- » Participation in group exercise was beneficial in maintaining limb volume reduction in a small group of patients with BCRL.
- » Some participants became more adherent to their self-treatment programme.
- » Some participants experienced improvement in physical and psychological aspects of quality of life.

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