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Breast

Lymphedema Therapy Reduces the Volume of Edema and Pain in Patients with Breast Cancer

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Background: Despite recent advances in breast-conserving surgery, upper-extremity lymphedema remains a problem for patients after the treatment of breast cancer. This study examines the results of a protocol of therapy for lymphedema in breast cancer patients.

Methods: A total of 135 patients with lymphedema after breast cancer treatment were provided a protocol of complete decongestive therapy (CDT). This involved manual lymphatic drainage, compression garments, skin care, and range-of-motion exercises. Therapy was divided into an induction phase involving twice-weekly therapy for 8 weeks and maintenance therapy individualized to patient needs. Absolute volume and percentage of volume of lymphedema was compared before and after treatment. Also assessed was the degree of chronic pain and the need for pain medication.

Results: Mean initial lymphedema volume was 709 mL, and the percentage of lymphedema was 31%. The induction phase of CDT reduced this to 473 mL and 18%, respectively. Before therapy, 76 patients had chronic pain and 41 required oral pain medication. CDT reduced this to 20 and 11, respectively. The degree of pain was also assessed on a numerical scale from 0 to 10. Those patients with chronic pain initially rated their pain at an average of 6.9. After treatment, this was reduced to 1.1.

Conclusions: Lymphedema continues to be a problem for patients with breast cancer. A program of lymphedema therapy can reduce the volume of edema and reduce pain in this population.

Key Words: Word—Any order is fine.

Breast cancer continues to be the most common malignancy among women in the United States. Despite its high incidence, early detection and modern treatment have made long-term survival more common. One of the most important sequelae of the treatment of breast cancer is the development of lymphedema.[1] Historically, as many as 60% to 85% of women treated for breast cancer developed clinically important lymphedema.[2] However, with the advent of breast-conservation therapy and sentinel lymph node biopsy techniques, its incidence has been greatly reduced. Despite this reduction, as many as 4.5% to 30% of patients treated for breast cancer will develop lymphedema.[3,4] Several factors are thought to increase a patient's risk for the development of breast cancer–related lymphedema.

The degree of axillary dissection and the use of radiotherapy remain the two most important risk

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factors for the development of lymphedema.[3,5] The presence of lymphedema places these patients at risk for several morbidities. They are at risk for developing recurrent cellulitis along with other bacterial and mycotic infections.[6] These patients also experience decreased range of motion, pain, and psychological distress.[7] Because of the disrupted body image caused by the swollen arm, many of these patients will avoid any social engagement that requires the swollen arm to be exposed.[7]

Although breast cancer–related lymphedema cannot be cured, there are several available methods of treatment. These treatments range from simple exercises to medical treatment with benzopyrones[8–11] to a variety of microsurgical techniques.[12–14] The most promising form of treatment, however, is complete decongestive therapy (CDT). This type of therapy involves four aspects of treatment: manual lymphatic drainage (MLD), skin care, compression bandages, and exercise.[15] MLD was developed by Vodder in the 1930s. This technique is used to activate lymphatic vessels and move stagnant lymph from edematous to nonedematous areas.[16] MLD applies standard manual technique of light massage along superficial lymphatic pathways.[17,18] The massage is always in a proximal-to-distal direction to remove excess fluid from the affected limb.[16]

Skin care is also an important element of CDT. This helps prevent inflammatory conditions and infections that will increase capillary permeability and worsen edema in the affected extremity.[17] A third component of CDT is the application of compression bandages. Lymphedema decreases the skins elasticity causing decreased tissue pressure that results in the reaccumulation of edema.[16] Compression bandages help overcome this problem and prevent edema fluid from reaccumulating.[17] The final aspect of CDT is an exercise program. This aspect should be individualized for each patient and should focus on range of motion and endurance.[19] These repetitive exercises allow the extremities' muscle pump to work and help remove excess tissue fluid.[16]

In this study, we evaluated a program of CDT in a series of patients with breast cancer–related lymphedema. A standard treatment protocol was used, and success was based on the volume of the affected extremity before and after treatment. In addition to assessing lymphedema volume, patient motivation, patient compliance, and the need for pain medication were assessed.

PATIENTS AND METHODS

Medical records of all patients receiving lymphedema therapy at Methodist University Hospital and Health South Rehabilitation Hospital in Memphis, TN, were reviewed. Data were collected for all patients receiving CDT for lymphedema. However, for this data analysis, only patients with unilateral lymphedema of the upper extremity that resulted from the treatment of breast cancer were included.

Patients in this study underwent a standard protocol of CDT, including MLD, compression bandages, skin care, and exercise. The MLD was performed by a physical or occupational therapist trained in the Foldi method of lymphatic decongestion. The basic theory behind this method is that light skin massage stimulates the superficial lymphatics, resulting in dilation and increased transport of lymphatic fluid. Basic principles include a touch that is always light; stretching, not stroking, of the skin; and massage in a proximal-to-distal direction. The massage is repeated five to seven times in expanding circles and should not result in redness of the skin.

Patients were treated with MLD on a twice-weekly basis. In between therapy sessions, elastic compression bandages were worn and changed twice daily. Patients were also instructed on appropriate skin and nail care, and they were provided with an individualized exercise program to help facilitate lymphatic flow and improve range of motion.

Limb volumes were obtained by placing the arm in a column of water to a depth 2 inches above the elbow and measuring the volume of water displaced. The volume of edema was calculated as the difference between the affected and unaffected arms. The percentage of edema in the arm was then calculated with the following formula: $[(VI - N)/N] \times 100$, where VI is the volume of edema and N is the volume of the normal limb. The percentage of change in arm edema was calculated by the following formula: $[(VF - VI)/(VI - N)] \times 100$, where VF is the final volume of edema, VI is the initial volume of edema, and N is the volume of the normal limb.

In addition to measuring the changes in volume and changes in the percentage of edema with treatment, the effect of CDT on the level of chronic pain and the need for oral pain medication was assessed. Patients were asked to quantify their pain on a numerical scale from 0 to 10, with 0 being no pain at all and 10 being severe, constant pain.

TABLE 1. *Characteristics of patients treated with complete decongestive therapy*

Characteristic	Value
Patients (n)	173
History of breast cancer (n)	135
Right	69
Left	50
Bilateral	16
Age (y)	53.6
Average no. of treatments	14.3
Average weeks of treatment	7.5
Volume of edema at start of therapy (mL)	709
Edema at start (%)	31.9

Statistical analysis was performed by Sigma Plot statistics software. Changes in volume and percentage of edema were compared by a paired Student *t*-test, with *P* values of less than .05 considered significant.

RESULTS

Patients

One hundred seventy-three patients were treated at our institution with CDT. Patient characteristics are included in Table 1. One hundred thirty-five of these patients had lymphedema as a result of breast cancer treatment. Of these, 119 had a history of unilateral breast cancer, and it is this subset that is analyzed here. All of the breast cancer patients were female, with a mean age of 53.6 ± 12.9 years (range, 23–92 years). Sixty-nine of these patients had right-sided breast cancer and lymphedema, and 50 had lymphedema of the left upper extremity. On average, these patients underwent 7.5 ± 3.4 weeks of therapy, with 14.3 ± 6.8 total therapy sessions.

Effect of CDT on Lymphedema Volume

The volume of lymphedema in the affected limb was calculated as previously described. Patients then underwent a standard protocol of CDT. Figure 1 illustrates the volume of edema in the affected arm before and after treatment. Before CDT, patients had average volume of edema in the affected arm of 709 ± 76 mL. With therapy, this was reduced to an average volume of 473.2 ± 48.9 mL ($P = .004$). This is an average decrease in lymphedema volume of 236.7 mL.

Effect of CDT on Percentage of Lymphedema

The percentage of edema in the affected arm was measured as previously described. Before and after

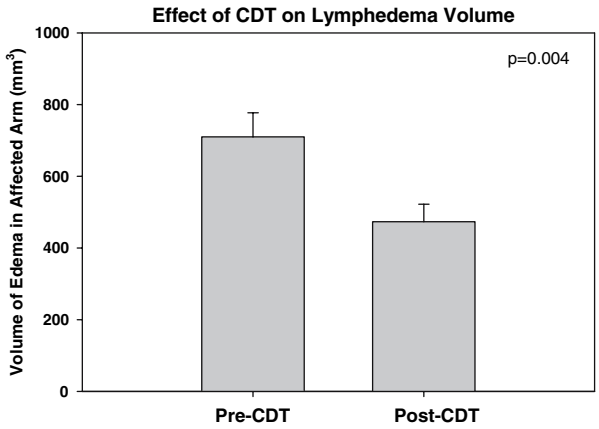

FIG. 1. Effect of complete decongestive therapy on lymphedema volume.

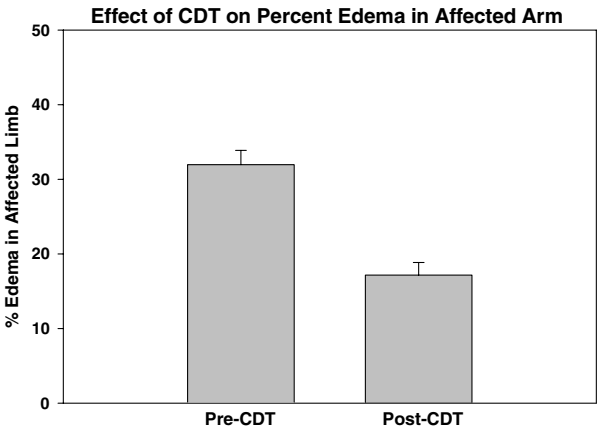

FIG. 2. Effect of complete decongestive therapy on percentage of edema in affected arm.

CDT, the percentage of lymphedema present was 31.9% ± 20.1% and 17.1% ± 12%, respectively ($P < .001$, Fig. 2). Thus, on average, there was a 41.7% decrease in the amount of lymphedema present with therapy.

Effect of Therapy on Need for Pain Medication

One of the primary complications of cancer–related lymphedema is chronic pain. In this study, 76 (51.9%) of 135 breast cancer patients had pain associated with their lymphedema. When asked to subjectively quantify their pain on a numeric scale from 0 to 10 (0 being free of pain and 10 being very severe, debilitating pain), the average score of these 76 patients was 6.9 ± 2.3 before CDT and 1.1 ± 2.3 after CDT ($P < .001$) (Fig. 3). In fact, of the 76 patients with pain before therapy, 56 (76%) were pain-free

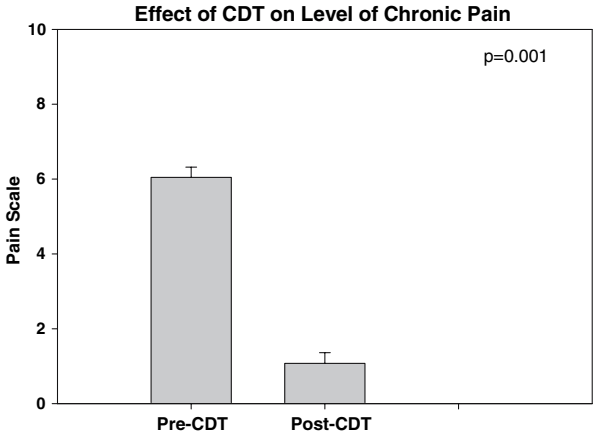

FIG. 3. Effect of complete decongestive therapy on level of chronic pain.

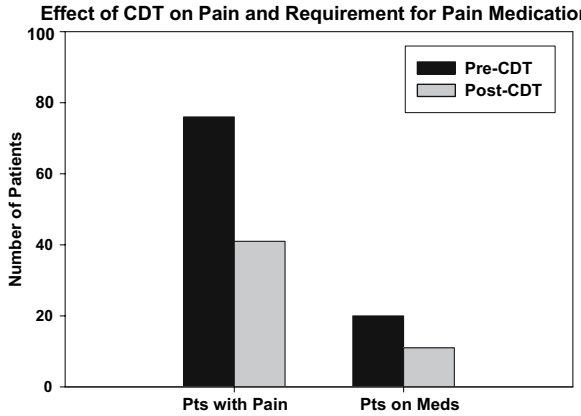

FIG. 4. Effect of complete decongestive therapy on pain and requirement for pain medication.

afterward. Of the patients with chronic pain before CDT, 41 (53.9%) required oral pain medications for comfort, whereas only 11 (14.5%) required these medications afterward (Fig. 4). Only one patient reported an increase in pain with treatment, and two patients without pain had measurable pain after treatment.

DISCUSSION

Lymphedema is an important sequelae of the treatment of breast cancer. Although the incidence has recently decreased with the advent of breast-conservation therapy, many patients still experience this condition.[1,2] Because there is no effective cure for cancer–related lymphedema, a variety of treatment techniques have been developed. These include compression bandages, a variety of physical and occupational therapy techniques, medical therapies, and microsurgical techniques.[5,8–13,15,18]

CDT, which involves MLD, compression bandages, exercise, and skin care, is a promising way to treat lymphedema. Although this method of therapy was initially developed several decades ago, relatively few studies exist evaluating it. This study, which shows that CDT can result in a marked decrease in the volume and percentage of lymphedema in the affected arm, is the largest study to date.

In 2000, Andersen et al.[20] published a prospective randomized study of 42 patients with breast cancer–related lymphedema. Their patients had an average volume of lymphedema of 346 mL. The authors showed that a regimen of CDT reduced edema volume by 60% compared with a reduction of 48% with standard techniques. Of note, patients with severe lymphedema (>30%) were excluded. In 2002, Williams et al.,[5] compared MLD to standard therapy in 31 patients. They showed that MLD was able to reduce lymphedema volume by an average of 71 mL compared with 30 mL with standard lymphatic drainage; however, MLD alone did not markedly reduce the edema when compared with pretreatment volumes. Mondry et al.[16] also showed that CDT can reduce lymphedema volume and limb girth. A fourth study by Hinrichs et al.[21] in 2004 showed that CDT could bring about a 60% reduction the degree of lymphedema of patients with melanoma who had lymphedema resulting from inguinal lymph node dissection.

The current study from our institution is by far the largest to date, with 135 patients. Although retrospective in nature, the results are in line with prior studies. Patients with severe edema (>30%) were not excluded, and in fact, the average patient had 31% edema in the affected arm. This protocol was able to achieve a 41.7% reduction in lymphedema, which also greatly reduced the amount of pain in these patients. It is difficult, however, to know how much pain reduction was to CDT itself or from a possible placebo effect of frequent physical therapy.

The results of this study also demonstrate the difficulty in treating cancer–related lymphedema. Although the volume of lymphedema was reduced by an average of 237 mL, an average volume of 473 mL remained. Although we did not look at timing of referral for CDT in this study, we believe that patients who are referred for CDT early, at the first evidence of lymphedema, will experience the greatest success. Further research will be needed to definitively answer this question. Because much evidence

exists that the best results of CDT occur early in the treatment process,[19] it is likely that these patients will continue to have intermittent problems with lymphedema in the long term.

In conclusion, CDT can greatly reduce the volume and percentage volume of breast cancer–related lymphedema, as well as reduce the amount of pain caused by this condition. However, a large amount of residual edema may remain after treatment. Further studies are needed to determine the exact role of this therapy in cancer patients with debilitating edema.

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