

Original Article: Advanced pneumatic compression for treatment of breast cancer-related lymphedema of the thorax

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Persistent truncal swelling as a result of breast cancer-related lymphedema (BCRL) may cause significant disfigurement and disability. This can include pain and motion-limiting fibrosis, axilla (armpit) swelling and cording, and persistent/progressive enlargement of the breast. Often the thorax is overlooked by physicians and other clinicians because treatment focus is on arm swelling, or patients may feel uncomfortable discussing their breasts.

We present three lumpectomy patients who experienced severe thoracic radiation damage with significant persistent symptoms and describe the therapy programs with positive outcomes of reduced swelling and pain and increased range of motion following clinic treatment and self-administered therapy at home.

The three breast cancer-related lymphedema patients in this case series continued to display significant thoracic pain, swelling, and fibrosis, even after 28 days of complete decongestive therapy (CDT) and conservative home treatment.

Lympha Press® therapy, utilizing a trunk and directed axilla compression garment, was applied at home over a subsequent 3-4 week period. This therapy resulted in decreased arm and thoracic swelling, decreased pain, and increased functional range of motion of the arm, along with significant relief of pain, hardness, and tightness in the breast.

Treatment

Treatment of each of the three patients began with in-clinic therapy ranging from 8 to 12 weeks. During these sessions, all patients received standard complete decongestive therapy (CDT) as well as antifibrotic treatment consisting of manual therapy, positive and negative pressure, low level laser, silicone scar gel, and specialized quilted compression garments¹. All patients followed a daily conservative treatment home program beginning the day of assessment consisting of elevation, shoulder active range of motion (AROM) exercise, diaphragmatic breathing, and use of either a 20-30 mmHg or 30-40 mmHg circular knit elastic arm compression sleeve. Additionally, all patients were taught self-manual lymph drainage (MLD).

The patients were reevaluated at 28 days to measure carryover of the decongestive effects of the home program, including circumferential measurements (taken at four segments on the affected arm, and at the axilla and thorax over the nipple line), shoulder AROM measurements, and pain assessment using the visual analog scale (VAS). All measurements were taken at the start of a clinic appointment, prior to beginning any clinical treatment.

The three patients described here were found to have continued significant persistent upper quadrant (thoracic and arm) swelling after 28 days of conservative treatment, and therefore it was reasonable for each to have a trial of additional therapy with intermittent pneumatic compression (IPC) using a "half jacket" garment that treats the arm, axilla, thorax, and breast (Lympha Press®, *Lympha Press, Glen Mills, PA*). During the pneumatic compression trial, treatment pressure was titrated to patient comfort and ranged from 40-55 mmHg. Additional measurements taken following the IPC trial showed significant measurable decrease in circumferences of the arms ranging between 0.7 cm and 4.4 cm, and at the thorax ranging between 3.6 and 5.5 cm. Following these findings of patient comfort, suitability, and reduction effects, a Lympha Press® system was prescribed and authorized by the patients' health insurer for use at home.

Case 1:

Significant breast pain, breast/axilla swelling, cording, and limited shoulder range of motion

SD is a 48-year-old woman who initially presented to lymphedema therapy 27 months following a left breast lumpectomy and 23 months following completion of radiation therapy. She had prior lymphedema treatment at a different clinic 11 months before referral and sought further treatment because she was having continued significant left breast pain and swelling as well as cording and fibrosis throughout her left upper quadrant that limited her left shoulder movement. At the time of her initial assessment, she was following a home program established at prior therapy which included conservative treatment of elevation, exercise, and use of a 30–40 mmHg elastic arm compression sleeve, as well as self-MLD. She had another manufacturer's IPC device, which she was no longer using because it was too cumbersome to put on and she didn't feel it applied enough pressure to affect her pain and swelling.

At her initial assessment she complained of pain of her left lateral breast, left axilla, and thorax that she rated five out of ten on the Visual Analog Scale (VAS), and displayed moderately severe swelling of her left breast and axilla, left lateral and posterior thorax, and left arm with circumferential differences ranging from 1.6 to 4.2 cm greater than her dominant right arm. She also presented with cording between her left axilla and mid-upper arm which restricted her range of motion. Following the initial 28-day period of CDT concurrent with her established home program, she reported pain decreased to four out of ten and demonstrated some reduction of her left arm and breast following MLD, but she was unable to maintain decongestive gains for more than a day after MLD treatments. She brought her current pump into the clinic to see if it could be used in a modified fashion, but even with adjustments to make the appliance fit more snugly, she still didn't feel she was getting significant relief from her pain and swelling to warrant use.

After a trial with Lympha Press®, she reported decreased pain and more freedom in her shoulder movement. Based on this as well as her measurable left arm and thoracic reduction, she chose to pursue the Lympha Press® for home use and received her home unit at ninth week of clinic treatment. She found the half jacket appliance very easy to don and doff, and was particularly happy with the axilla chamber because of the focused treatment to her axillary cording. She benefited from the Wave (peristaltic) treatment mode, which allowed greater tolerance for increased overall pressure to treat the swelling and fibrosis at her axilla and torso. With the combination of anti-fibrotic clinic treatment and daily home pneumatic treatment, she stopped feeling tightness and pulling at her left axilla, experienced increased left shoulder range of motion, and her left upper quadrant pain was decreased to zero out of ten. Moreover, with this more aggressive home treatment, she was able to maintain a substantial edema reduction of left arm and breast as measured circumferentially at discharge after 12 total weeks of treatment and three weeks of home Lympha Press® pneumatic compression use. Because her insurance had changed since receiving her initial pneumatic compression equipment, she qualified for Lympha Press® pneumatic compression, which provided a greater therapeutic outcome than her previous system.

Case 1: Swelling	Baseline	28 Days Pre-IPC Trial	%	Total Change at 12 Weeks	%
Left Arm at Axilla	27.3 cm	26.1 cm ↓ -1.2 cm	4.4	24.2 cm ↓ -3.1 cm	11.4
Left Elbow	24.1 cm	23.2 cm ↓ -0.9 cm	3.7	22.2 cm ↓ -1.9 cm	7.9
Left Forearm	22.2 cm	21.6 cm ↓ -0.6 cm	2.7	20.7 cm ↓ -1.5 cm	6.8
Left Wrist	16.7 cm	15.8 cm ↓ -0.3 cm	1.9	15.4 cm ↓ -0.7 cm	4.3
Thorax: Axilla	37.7 cm	36.2 cm ↓ -1.5 cm	4.0	35.0 cm ↓ -2.7 cm	7.2
Thorax: Nipple Line	42.8 cm	41.1 cm ↓ -1.7 cm	4.0	38.7 cm ↓ -4.1 cm	9.6

Case 1: *Continued*

Case 1: AROM	Baseline	28 Days Pre-IPC Trial	%	Total Change at 12 Weeks	%
Left Shoulder Flexion	147°	156° ↑ +11°	6.1	175° ↑ +28°	19.0
Left Shoulder Abduction	143°	148° ↑ +5°	3.5	172° ↑ +29°	20.3

Case 1: Pain Level	Baseline	28 Days Pre-IPC Trial	%	Total Change at 12 Weeks	%
Left Shoulder Abduction	5/10	4/10	20	0/10	100

Case 2:

Breast pain, surgical/radiation fibrosis, arm and thoracic swelling

SN is a 44-year-old woman who initially presented to lymphedema treatment 20-and-a-half months post left breast lumpectomy and 17 months post-radiation therapy with complaints of intense left breast pain of seven out of ten as rated by VAS. She also complained of severe hardness and swelling of her left breast. On examination she presented with left arm and thoracic swelling as well as significant surgical and radiation fibrosis of her left breast that created deformation and poor tissue extensibility. In addition to the initial conservative home program, she wore an anti-fibrotic quilted cherry pit pad during the day in a post-mastectomy bra along with a silicone prosthesis, and the pit pad in a sports bra with a softer prosthetic at night. She used a vibrator for five minutes per day on her left medial breast. In addition to daytime use of an elastic 30-40 mmHg arm sleeve, she wore a quilted arm compression sleeve nocturnally.

After 28 days of CDT and home treatment she demonstrated only a modest reduction in left arm. Breast swelling and left breast induration remained with pain decreased to five out of ten. Due to her persistent breast and arm swelling, a trial of IPC (Lympha Press®) in clinic was performed, and a home care Lympha Press® system was pursued through patient's insurer.

Seven weeks after her initial evaluation, she began daily home treatment with Lympha Press® pneumatic compression concurrent with use of the quilted cherry pit breast compression pad over her left medial breast and the quilted arm sleeve. Her device was programmed with the Wave (peristaltic) treatment mode, which provided a wave-like compression on her hand and arm, allowing the ability for increased overall pressure to treat the swelling and fibrosis at her axilla and breast. Four weeks after beginning home pneumatic compression treatment, she demonstrated a marked reduction in left arm and thorax circumferences, her left breast was palpably softer, and she rated her left breast pain between one and two out of ten.

Case 2: Swelling	Baseline	28 Days Pre-IPC Trial	%	Total Change at 12 Weeks	%
Left Arm at Axilla	41.9 cm	41.1 cm ↓ -1.8 cm	1.9	37.5 cm ↓ -4.4 cm	10.5
Left Elbow	34.1 cm	33.2 cm ↓ -0.9 cm	2.6	30.6 cm ↓ -3.5 cm	10.3
Left Forearm	31.2 cm	30.6 cm ↓ -0.6 cm	2.7	29.7 cm ↓ -1.5 cm	4.8
Left Wrist	22.8 cm	22.2 cm ↓ -0.6 cm	1.9	20.1 cm ↓ -1.7 cm	11.8
Thorax: Axilla	44.7 cm	42.2 cm ↓ -2.5 cm	5.6	39.5 cm ↓ -5.2 cm	11.6
Thorax: Nipple Line	49.8 cm	47.5 cm ↓ -2.3 cm	4.6	44.3 cm ↓ -5.5 cm	11.0

Case 2: *Continued*

Case 2: Pain Level	Baseline	28 Days Pre-IPC Trial	%	Total Change at 12 Weeks	%
Left Shoulder Abduction	7/10	5/10	28.6	1-2/10 (Averaged 1.5/10)	78.6

Case 3:

Significant breast enlargement/swelling, breast pain, rigid surgical incision/radiation damage

JM is a 59-year-old woman who initially presented to lymphedema treatment two-and-a-half years post right breast lumpectomy and radiation therapy with no prior lymphedema treatment other than wearing a 20-30 mmHg arm sleeve. She had initial complaints of right breast pain rated six out of ten on the VAS, a rigid right breast surgical incision compounded by radiation fibrosis, and marked swelling of her right breast, which was significantly larger than her left unaffected breast. She had very mild right arm swelling that did not significantly improve with conservative treatment. In addition to CDT and home conservative treatment, she wore a quilted compression pad in a camisole day and night. After 28 days, measurements showed mild reduction in right arm swelling and her right breast surgical incision demonstrated a mild change in mobility. She reported right breast pain had decreased to four out of ten. Due to her persistent breast pain and upper quadrant swelling, a trial of IPC (Lympha Press®) in clinic was performed, and a home care Lympha Press® system was pursued through patient's insurer. She began using Lympha Press® pneumatic compression seven weeks after starting clinic treatment. The amount of pressure was titrated in the clinic to achieve the maximum comfortable level, and using the Wave (peristaltic) treatment mode, increased her tolerance for a therapeutic amount of pressure to treat the swelling and fibrosis at her axilla and torso.

She initially used her pneumatic compression device daily, and after two weeks of home use was able to decrease use to three times a week. After 3 weeks of pneumatic compression use, her right dominant arm reduced to within 2 cm of her left arm, she was able to maintain the right arm reduction for several days after pneumatic compression, and she found she no longer needed to wear her 30-40 mmHg arm compression sleeve every day. Her complaints of right breast pain decreased to between zero and one out of ten. Her right breast became smaller than her unaffected left breast, and she began to wear a balancing prosthesis.

Case 3: Swelling	Baseline	28 Days Pre-IPC Trial	%	Total Change at 12 Weeks	%
Left Arm at Axilla	30.3 cm	29.9 cm ↓ -0.4 cm	3.6	24.2 cm ↓ -3.1 cm	11.4
Left Elbow	28.1 cm	27.5 cm ↓ -0.6 cm	3.7	22.2 cm ↓ -1.9 cm	7.9
Left Forearm	24.2 cm	23.6 cm ↓ -0.6 cm	2.7	20.7 cm ↓ -1.5 cm	6.8
Left Wrist	18.1 cm	17.8 cm ↓ -0.3 cm	1.9	15.4 cm ↓ -0.7 cm	4.3
Thorax: Axilla	42.3 cm	41.2 cm ↓ -1.1 cm	4.0	35.0 cm ↓ -2.7 cm	7.2
Thorax: Nipple Line	47.5 cm	46.1 cm ↓ -1.4 cm	4.0	38.7 cm ↓ -4.1 cm	9.6

Case 3: Pain Level	Baseline	28 Days Pre-IPC Trial	%	Total Change at 12 Weeks	%
Right Breast Pain	6/10	4/10	33.3	0-1/10 (Average 0.5/10)	91.7

Discussion

Breast-conserving cancer treatments are increasingly favored over mastectomy, and as a result, it is not uncommon for lymphedema therapists to encounter cases of lymphedema of the breast and thorax². A recent study³ showed that the ipsilateral axillary region is the most common pathway for lymphatic drainage in BCRL patients, indicating that therapeutic decongestion of the axilla may be important for successful therapeutic results.

Each of the three patients in this case series displayed significant thoracic pain, swelling, and fibrosis, which was helped somewhat initially by CDT, anti-fibrotic treatment, self-MLD, and a conservative home program. However, each continued to display significant symptoms of pain, swelling, and fibrosis after 28 days of CDT and conservative home treatment.

Advanced pneumatic compression using Lympha Press[®] has been shown to stimulate lymphatic uptake and transport in lymphedema patients⁴, reduce tissue stiffness⁵, and reduce swelling⁶. It has also been shown to reduce pain⁷ and, when used together with techniques of CDT, to decrease pain and increase shoulder range of motion⁸.

For these three patients, IPC therapy at home over a subsequent 3-4 week period with an appliance (Lympha Press[®] half jacket) that treated the thorax with direct compression via a dedicated axillary chamber produced a significant decrease in arm and thoracic swelling, with final measurements showing carryover of decongestion for up to three days following Lympha Press[®] treatment. Pain symptoms decreased to 0/10 in one of the three patients, decreased to 1-2/10 residual pain in the second patient, and 0-1/10 residual pain in the third patient. Most importantly, these three patients reported that their affected breasts no longer felt hard or tight, with one patient able to use a breast prosthesis after her edematous breast reduced.

The ultimate goal of treating breast cancer-related lymphedema is not only to facilitate reduction of swelling, but also to empower the patient to be able to self-manage lymphedema symptoms effectively at home. Recommending appropriate self-treatment tools and techniques can increase the effectiveness of home treatment⁹. These three cases demonstrated that the addition of Lympha Press[®] pneumatic compression treatment following conservative care augmented treatment outcomes.

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