Medical Policy

Subject:	Microsurgical Procedures for the Treatment of Lymphedema		
Document#:	SURG.00154	**Publish Date:**	04/07/2021
Status:	Reviewed	**Last Review Date:**	02/11/2021

Description/Scope

This document addresses select surgical procedures for the treatment of lymphedema in the upper and lower extremities. Lymphedema is the abnormal accumulation of fluid in the body tissues that results from the disruption of lymphatic drainage. Lymphedema can result in pain, recurrent infections, and functional impairment. The surgical procedures in this document are proposed to treat lymphedema by increasing the function of the lymphatic system. This document does not address lipectomy or liposuction.

Note: Not Medically Necessary services (as opposed to Investigational and Not Medically Necessary) may be subject to the Women's Health and Cancer Rights Act of 1998 (WHCRA). Note also that some states have enacted legislation similar to WHCRA and some have expanded upon WHCRA.

Note: For more information on related topics, please see the following:

- ANC.00009 Cosmetic and Reconstructive Services of the Trunk and Groin
- MED.00105 Bioimpedance Spectroscopy Devices for the Detection and Management of Lymphedema
- SURG.00023 Breast Procedures; including Reconstructive Surgery, Implants and Other Breast Procedures

Position Statement

Investigational and Not Medically Necessary:

Microsurgery for the treatment of lymphedema (including lymphedema as a result of a mastectomy) is considered **investigational and not medically necessary**, including but not limited to the following:

1. Lymphaticolymphatic bypass;
2. Lymphovenous bypass;
3. Lymphaticovenular anastomosis;
4. Vascularized lymph node transfer;
5. Tissue/Flap transfer (for example, omental flap transfer).

Rationale

In determining the health outcomes of individuals treated with surgery for lymphedema, objective outcomes include limb volume/circumference reduction, reduction in rate of infection, and adverse events. Subjective outcomes include quality of life and symptom improvement. Several systematic reviews have compared multiple lymphedema surgical treatments.

In 2012, Cormier and colleagues published a systematic review to examine the surgical treatments for lymphedema. They identified 20 retrospective and prospective studies, which were categorized according to the type of surgery: excisional procedures (n=8), lymphatic reconstruction (n=8), and tissue transfers (n=4). Information was extracted from each study, including the number of subjects, surgical procedure, length of follow-up, criteria for defining lymphedema, measurement methods, volume or circumference reduction, and reported complications. The quality of the studies was assessed using the Quality Assessment of Diagnostic Accuracy Studies (QUADAS) scale. Due to the heterogeneity of the studies, the researchers were not able to perform a meta-analysis. However, they did pool summary statistics of volume/circumference reduction. They found that the overall incidence of postoperative volume ranged from a 118% reduction in volume to a 13% increase in volume. Excisional procedures had the largest volume reduction (91.1%), followed by lymphatic reconstructive procedures (54.9%), and tissue transfer (47.6%). Follow-up ranged from 6 months to 15 years, with 6 studies reporting follow-up past 24 months. Only 2 studies had comparison groups, and only 2 studies had more than 100 subjects. The researchers found considerable heterogeneity among studies for how lymphedema was measured and classified. The most consistent finding was a recommendation for ongoing postoperative compression bandaging, compression garments and physical therapy. Postoperative morbidity was only reported in 2 studies, and most studies were from a single institution. The researchers recommended prospective clinical studies that compare long-term outcomes of surgical procedures to conventional, nonsurgical treatment.

Granzow and colleagues (2014) conducted a retrospective chart review to assess the outcomes of individuals who underwent the following surgeries for lymphedema, lymphaticovenous anastomosis (LVA), vascularized lymph node transfer (VLNT), and suction-assisted protein lipectomy (SAPL). All cases were performed by the same surgeon and treated by a certified lymphedema therapist. The primary outcomes were the change in compression garment use/lymphedema therapy required for VLNT and LVA, the volume reduction achieved by SAPL at 4 and 12 months postoperation, and the change in the incidence of cellulitis in all cases. A total of 26 adult females were included in the study: LVA (n=8), VLNT (n=8), and SAPL (n=10). At an average of 32 months postoperation, the VLNT group had a significant decrease in the daily requirement for compression garments (p=0.009) and lymphedema therapy (p=0.009). One individual required bedside drainage of a seroma at the axillary recipient site, and 2 individuals had delayed healing of the irradiated mastectomy flaps after combined deep inferior epigastric perforator (DIEP) flap and VLNT. In an average of 27 months postoperation, the LVA group had a significant reduction in lymphedema therapy (p=0.008); however, the decrease in the daily requirement for compression garments was not significant (p=0.07). In this group, 1 individual had a small pulmonary embolus on the first postop day without consequence, and 1 individual had a self-resolving partial high sciatic neurapraxia distant from the surgical site that manifested as foot drop. For the SAPL group, there was a significant volume reduction at 4 months, and the values remained stable at 12 months. The average volume reduction was 87% in the legs and 111% in the arms when compared to the unaffected, opposite limb. At an average of 25 months postoperation, the overall incidence of cellulitis decreased from 58% to 15% ($p<0.0001$). The authors concluded that excellent outcomes were achieved, and the results are encouraging. They noted that no surgery offers a cure, and lymphedema precautions should be continued regardless of the results achieved with surgery. The study was limited by the retrospective design, single-institution/surgeon design, and small sample size of female-only subjects.

In a systematic review and meta-analysis, Basta and colleagues (2014) evaluated the efficacy and safety of microsurgical treatments for lymphedema. They included 27 microsurgery studies (lymphovenous shunt or LVA [n=22] and VLNT [n=5]) published between 1985 and 2013 (24 retrospective, 2 cohort, and 1 case-control). A total of 20 studies were included in the meta-analysis, including both upper and lower extremity populations. The

researchers collected information that included objective and subjective preoperative to postoperative change in lymphedema, average follow-up, incidence of complications, serial circumferential limb measurements and volumetric water displacement. The population (n=1619) had a female-to-male ratio of approximately 3:2 and an age range of 7 to 92 (majority between 45 and 60 years old). The majority of subjects had lymphedema secondary to surgery associated with oncologic conditions. The staging of lymphedema and subject selection was found to be inconsistent across studies. Overall, the researchers found that the excess circumference was reduced by 48.8 ± 6.0%, and absolute circumference was reduced by 3.31 ± 0.73 cm. Excess volume was reduced by 56.6 ± 9.1%, and absolute volume was reduced by 23.6 ± 2.1%. The incidence of no improvement in lymphedema postoperatively was 11.8%. A total of 91.2% of subjects reported improvement, and 64.8% of subjects discontinued compression garments at follow-up. Complications included operative-site infection (4.7%), lymphorrhea (7.7%), reexploration for flap congestion (2.7%), and the need for additional procedures including donor-site split-thickness skin grafting, liposuction, and excess skin excision (22.6%). The researchers found that VLNT subjects reported greater improvement and were more likely to discontinue compression garments. They recommended additional, well-designed studies to verify their findings. The study was limited by the heterogeneity of the subject population, assessment modalities, reporting of complications, and surgery techniques.

Carl and colleagues (2017) conducted a systematic review on the surgical treatment of extremity lymphedema. They categorized treatments into five groups: excision, liposuction, LVA, VLNT, and combined/multiple approaches. A total of 69 studies met inclusion criteria and were scored for methodological quality using the methodological index for nonrandomized studies (MINORS) scoring system. They found that in studies measuring excess volume reduction, the mean reduction was 96.6% (95% confidence interval [CI], 86.2 to 107%) for liposuction, 33.1% (95% CI, 14.4 to 51.9%) for LVA, and 26.4% (95% CI, –7.98 to 60.8%) for VLNT. The excision studies did not report volume reduction. They found that the overall quality of the studies was ‘fair’, and the MINORS criteria was effective for isolating the highest quality research. Due to the heterogeneity and lack of consistent reporting, they recommended head-to-head comparison studies and randomized controlled trials with homogenous populations.

A number of additional systematic reviews have been published evaluating quality of life improvements after interventional microsurgeries for lymphedema. These reviews did not include objective data, such as clinically significant measures, and many described limitations in merging data for analysis due to heterogeneous methods of evaluating self-reported outcomes (Coriddi, 2020; Fish, 2020; Forte, 2020; Grünherz, 2020). In addition to systematic reviews and meta-analyses that compare or combine available surgical treatments for lymphedema, researchers have published studies and reviews specific to a variety of microsurgical methods.

Lymphatic Bypass Procedures

Microvascular bypass surgery using varying techniques has been described to reduce lymphedema severity (Campisi, 2004; Chang, 2013; Koshima, 2000; Phillips, 2019; Yamamoto, 2003; Yamamoto, 2014). Poumellec and colleagues (2017) conducted a prospective cohort study that evaluated the efficacy of LVA for lymphedema of the upper extremity that resulted from axillary dissection surgery for the treatment of breast cancer. The researchers included 31 subjects and evaluated the percentage of volume reduction, functional improvements, and cosmetic improvements. Three-stepped anastomoses were constructed during each procedure at wrist level (2 cm upward from the wrist crease), on the forearm (at the medial third), and at the elbow crease opposite to a dense and macroscopically visible vein network. After a mean of 12.8 months post operation, the circumference reduction at

the wrist, forearm, and arm was 22.5, 21.32 and 30.2%, respectively. On the quality of life evaluation questionnaire, 55% of subjects reported significant functional improvement and 28% reported moderate improvement. A total of 6 subjects considered the results unsatisfactory. No reduction of lymphedema occurred in 2 subjects. Lymphedema recurrence was observed in 4 subjects (19.7%) between 7 and 22 months postop. No surgery-related complications were observed. The study was limited by a small sample and single-center design.

In a systematic review, Scaglioni and colleagues (2017) examined LVA for the treatment of lymphedema in the upper and lower extremities. A total of 18 studies (n=939) were included that were published up to September 2016. All included studies were observational (10 retrospective and 8 prospective) and described significant variations in surgical techniques, number of anastomoses, and supplementary interventions, such as compressive therapy or additional debulking surgery. The primary endpoint was postoperative volume, and the secondary endpoint was the assessment of subjective symptom improvement. The researchers found that all studies reported reductions in circumference measurements, and symptom relief was reported in 50-100% of subjects, depending on the study. There was also a reduction in cellulitis episodes. Due to the heterogeneity of the studies, a meta-analysis was not possible. Because concerns have been raised that LVA can fail after 2-3 years, they noted that intermediate and long-term studies are needed. They concluded the following:

> An attempt to compare the different studies more closely was an unrealistic goal of our work, as the studies show a tremendous variety in several factors associated with LVA surgery. The eligibility for LVA, the number and kinds of LVA anastomoses performed as well as the utilization of postoperative decompression therapy presented a large variety. In addition, time of follow-up in the vast majority of the included studies was too short to make a reliable statement about sustained benefits of LVA surgery. The deficiency of comparative designed studies and uniform outcome measurements continues to prevent us from drawing evidence based conclusions and limits us to the present available descriptive evidence. For this reason, we propose the development of standardized treatment guidelines for the treatment of extremity lymphedema and we call for studies with a longer follow-up time.

In 2018, Cornelissen and colleagues published a systematic review on the effect of LVA in breast cancer-related lymphedema in terms of volume and/or circumference reduction and quality of life. The researchers identified articles published between 1999 and July 1, 2017 and included 15 studies (11 prospective and 4 retrospective) in the review. The average follow-up was 20 months, and the total study population was 268 individuals. The intervention in the studies was LVA, but the technical procedure differed among studies. The overall level of evidence was considered low due to small sample sizes, lack of control groups, short follow-up durations, and lack of reporting about the selection process. A reduction in either circumference or volume was found in 13 out of 15 studies, but 2 studies reported an increase in upper limb volume. A total of 12 out of 15 studies reported symptom improvement, with the number of individuals who experienced improvement varying between 50 and 100%. The researchers concluded that the effects of LVA vary among studies, but the procedure may be effective in early stages of breast cancer-related lymphedema. They recommended randomized controlled studies to confirm the effectiveness of LVA and to determine the appropriate candidates for the procedure.

Vascularized Lymph Node Transfer

Several small studies and systematic reviews have been published that evaluate VLNT. Raju and colleagues (2015) performed a comprehensive literature review on VLNT that included 12 studies (7 human and 5 animal). They concluded:

> There are human and animal studies that individually report clear benefits. However, because of methodological shortcomings, comparative studies with uniform patient selection and outcomes measurement are lacking. Although the results with the use of VLNT for treatment of lymphedema have been largely positive, further exploration into standardized protocols for diagnosis, treatment optimization, and patient outcomes assessment is needed.

Dionyssiou and colleagues (2016) conducted a randomized controlled study to evaluate the effectiveness of free VLNT in stage II breast cancer-related lymphedema compared to non-surgical management. A total of 36 subjects either had VLNT followed by 6 months of physiotherapy and compression (n=18) or physiotherapy and compression alone for 6 months (n=18). After 6 months, all participants removed their elastic garments and were re-examined 1 year later. Outcome measurements included volumes of both the affected and the contralateral healthy limbs (estimated using the truncated cone formula based on 4-cm intervals serial perimeter measurements), episodes of infection, and subjective disturbances (pain, feeling of heaviness and function). There were no major complications, and postoperative lymphoscintigraphy of the VLNT group showed functional activity of the implanted lymph nodes in 13 out of 18 subjects (72 %). The volume of the affected limb was significantly decreased after treatment in both groups; however, mean volume reduction was significantly higher (p=0.000) in the VLNT group (57%) than the therapy-only group (18%). In addition, infection episodes in the VLNT group were significantly reduced compared to the therapy-only group (p=0.001). All subjects in the VLNT group reported significant improvement in subjective disturbances (p=0.000), but the therapy-only group had limited improvement that did not reach statistical significance. The authors noted that the study is limited by a small number of participants and short follow-up duration.

In a 2016 systematic review, Ozturk and colleagues evaluated the current evidence for outcomes of VLNT. They included 18 studies (n=305) that met inclusion criteria: free VLNT without adjunct modalities, treatment to upper or lower extremity lymphedema, and > 5 cases. They found that 165/182 (91%) of individuals who had limb circumference measurements showed postoperative improvement. There was a noted reduction of limb volume in 98/114 (86%) of individuals. A total of 55/92 (60%) of individuals who underwent lymphoscintigraphy showed moderate or significant improvement of flow. Of 198 individuals with reported donor site complications, the most common was delayed wound healing (n=8, 4.1%), followed by seroma/hematoma (n=6, 3.1%), infection (n=3, 1.6%), abdominal bulge (n=1, 0.5%), and swelling of the extremity (n=1, 0.5%). Recipient site complications included venous congestion of skin paddle (n=6, 3.1%), delayed wound healing (n=5, 2.5%), seroma (n=4, 2%) and cellulitis/infection (n=3, 1.5%). The researchers concluded that VLNT is still in an exploratory stage, and "more studies with improved methods of reporting outcomes and uniform patient selection are needed to evaluate this technique thoroughly."

In a prospective cohort study, Nguyen and colleagues (2017) examined the long-term outcomes of using an omental lymphatic flap for a VLNT procedure. The authors reviewed 42 consecutive subjects who underwent free vascularized omental lymphatic flap transfers (19 upper extremity and 24 lower extremity). Volumetric measurements were collected preoperatively and at 3, 6, and 12 months postoperatively. In addition, qualitative assessments and lymphoscintigraphy measurements were evaluated perioperatively. The mean follow-up was 14

months. Complications occurred in 7 subjects (16%), with all but 1 occurring in the lower extremity group. Donor site complications included 1 case of pancreatitis in a subject with a history of pancreatitis and 1 case requiring nasogastric tube replacement for an additional 48 hours after close pedicle dissection to the body of the stomach. Recipient site complications included two hematomas requiring operative evacuation and two seromas requiring percutaneous drain placement. Post-operative cellulitis occurred in 2 lower-extremity subjects with a history of cellulitis. One flap was lost due to venous hypertension. Subjective improvements (swelling, fatigue, heaviness, tightness, stiffness, sleep loss, aching, and skin quality) were reported in 83% (n=35) of subjects. Of the 7 that did not report improvement, 5 were in the lower extremity group. The mean volumetric improvement was 22% (74% improvement to 35% worsening), with 4 subjects having an increase in volume. Postoperative imaging showed viable lymphatic transfers with improved extremity drainage. Overall, the researchers concluded that the omental lymphatic flap is safe and provides a durable and versatile flap that is effective for lymphedema treatment.

In a prospective case series, Mardonado and colleagues (2017) studied the flap and donor site morbidity of the supraclavicular free flap with VLNT. They included 100 cases (upper and lower extremity) with a mean follow-up of 11 months. There were no flap losses; however, three flaps required exploration to be saved. Donor site infection developed in 2 subjects, 1 successfully treated with oral antibiotics and the other requiring an intraoperative wash and intravenous antibiotics. In 3 subjects, Chyle leak developed, but all resolved spontaneously. One subject had a lymphocele at 1 year postop that had to be surgically removed. No secondary donor site lymphedema was found. The researchers concluded that supraclavicular VLNT can be done safely with minimal morbidity.

Ciudad and colleagues (2017) retrospectively studied the long-term outcomes of VLNT at a single institution. The researchers included 83 subjects who had upper or lower extremity VLNT surgery between July 2010 and July 2016. Inclusion criteria included International Society of Lymphology (ISL) stage II and stage III and at least 2 years of continuous follow-up. The mean follow-up was 32.8 months. For the stage II subjects, the total mean circumference reduction was 29.1%, and for the stage III subjects, the total mean reduction was 17.9% ($p<0.05$). A total of 3 subjects with stage III lower limb lymphedema did not have a reduction in limb circumference. Of the 77 subjects who had recurrent infections prior to VLNT, 51 subjects (61.4%) did not have cellulitis during the follow-up period. Of the remaining 26 subjects, 23 had a significant decrease in the number of infectious episodes a year, and 3 subjects (stage III) did not have a significant improvement. Donor site complications included lymphatic leakage treated with conservative therapy (n=2) and active bleeding requiring return to the operating room (n=1). Recipient site complications included venous congestion salvaged with release of sutures (n=2), infectious complications (n=2), delayed wound healing (n=4), and partial loss of split thickness skin graft (n=2). After the follow-up period, 18 subjects (21.7%) underwent secondary excisional surgeries. The authors concluded that large, prospective, multicenter studies are needed to assess the long-term outcomes of VLNT.

In a prospective, single-institution study, Gratzon and colleagues (2017) examined the clinical, psychosocial and functional outcomes of VLNT to the axilla for the treatment of upper extremity lymphedema after breast cancer therapy. A total of 50 subjects (44 who had previous mastectomy and 6 who had previous lumpectomy) were evaluated preoperatively and at 1, 3, 6, 9, and 12 months postop by circumferential measurements, pain/heaviness scales, and the lymphedema quality of life (LYMQOL) questionnaire. After VLNT, pain and heaviness scores significantly decreased and LYMQOL scores improved from 5.72 preoperation to 7.79. Arm volumes decreased by 34.57 % at 1 month, 52.03 % at 3 months, 42.34 % at 6 months, 65.23 % at 9 months and 58.68 % at 12 months. However, when including subjects who reached 12-month follow-up and were not missing more than one data set (n=24), the median percent reduction rate was 20.42 % at 1 month, 37.68 % at 3 months, 50.16 % at 6 months, 48%

at 9 months, and 42.73 % at 12 months. Limb reduction data was near statistical significance (p=0.052). There was a significant decrease in the number of infections and a decreased need for physiotherapy. Complications (mostly minor wound complications) occurred in 17 subjects. The authors noted that although preliminary results are promising, longer follow-up and a larger sample size is needed to further evaluate the safety and efficacy of VLNT.

Scaglioni and colleagues (2018) performed a literature review focusing on the clinical applications, outcomes, and complications of VLNT. The authors included 24 studies that included 271 VLNTs (1 to 35 flaps per study). A total of 260 cases were free VLNT procedures, while 11 cases were pedicle lymph node flaps. The researchers found that follow-up time ranged from 1 to 96 months. In addition, the measurements reported were heterogeneous and the number and degree of improvement following VNLT was not thoroughly or consistently documented in most studies. The inguinal nodes were the most commonly used donor site, followed by the lateral thoracic lymph nodes. The lateral thoracic lymph nodes had the highest complication rate (27.5%) compared to inguinal (10.3%) and supraclavicular (5.6%). Upper extremity lymphedema responded better than lower extremity (74.2% versus 53.2%). There was no difference in placing the lymph nodes more proximally versus distally on the extremity (proximal 76.9% versus distal 80.4%). For the recipient site, complications included total flap loss (n=1), partial flap loss (n=1), venous congestion (n=1), wound infection (n=2), delayed wound closure (n=5), partial loss of split-thickness skin graft (n=1), and prolonged flap edema (n=1). For the donor site, complications were broken down by site. For the inguinal flaps (n=195), the total complication rate was 10.3% (n=20), including 15 cases of lymphocele or seroma, 3 cases of iatrogenic lymphedema, 3 cases of donor site pain, 1 case of testicular hydrocele, and 1 case of delayed wound healing. For the lateral thoracic flap (n=40), there was a total complication rate of 27.5% (n=11), including 5 cases of iatrogenic lymphedema, 1 case of lymphocele, and 1 case of long-term pain in the donor site. For the supraclavicular flap (n=18), there was 1 case of lymphorrhea. No complications were reported for the submental or omental flaps. The researchers concluded that VLNT shows promise in early and advanced stage lymphedema, but long-term, prospective studies are needed.

Koide and colleagues (2019a) retrospectively investigated the long-term outcome and venous complications of vascularized submental lymph node (VSLN) transfer for unilateral lower extremity lymphedema. A total of 70 subjects (7 males and 63 females) who underwent 75 VSLN flaps were enrolled in the study. The mean symptom duration was 92.9 (± 88.3 months; range, 2-480 months). Of the 75 flaps, 13 (17.3%) were performed on individuals with primary lymphedema and 62 flaps (82.7%) on individuals with secondary lymphedema. All 75 flaps transferred survived (100% success rate), although 5 (6.7%) developed partial flap loss. A total of 6 flaps (8%) had venous complications and 69 flaps (92%) did not. There were no statistical differences in types, numbers, and techniques of anastomoses between the group with venous complications and the group without (p=0.65, p=1.0, and p=0.56, respectively). At a mean follow-up of 32.0 months (± 23.0 months), the mean circumferential improvement and episodes of cellulitis between the two groups did not statistically differ significantly (p=0.31 and 0.09, respectively). Authors concluded that VSLN is an effective treatment for primary and secondary lymphedema. The small sample size and retrospective design are limitations of the trial design.

A number of additional small, retrospective studies have investigated differing approaches to VLNT, such as delayed primary retention suture for inset of vascularized flaps, harvesting nodes from alternative sites such as the jejunal mesenteric lymph or greater curvature of the stomach nodes, combined VLNT in combination with scar release with fat grafting and the impact of microsurgery on total-knee prosthesis failure (Koide, 2019b; Kraft, 2019; Marucci, 2019 Mousavi, 2019; Voravitvet, 2019).

Conclusion

Overall, the responses from the surgical procedures to treat lymphedema have been variable and there is not enough evidence to determine the long-term outcomes. There has been an inconsistency among studies for subject selection, subject classification, staging classification, volume measurement techniques, physical therapy/compression therapy utilization, and subjective questionnaires. Most studies have been from single institutions, and the results may not be generalizable to the general population. Furthermore, studies have not compared the surgical procedures to conservative therapy. Well-designed, randomized studies with appropriate controls and large sample sizes reporting long-term outcomes are needed to demonstrate the safety and efficacy of lymphedema surgical procedures.

Other Considerations for Lymphedema

In a Physician Data Query (PDQ®) on lymphedema (2019), the National Cancer Institute (NCI) stated the following:

> Surgery is rarely performed on patients who have cancer-related lymphedema. The primary surgical method for treating lymphedema consists of removing the subcutaneous fat and fibrous tissue with or without creation of a dermal flap within the muscle to encourage superficial-to-deep lymphatic anastomoses. These methods have not been evaluated in prospective trials, with adequate results for only 30% of patients in one retrospective review. In addition, many patients face complications such as skin necrosis, infection, and sensory abnormalities. The oncology patient is usually not a candidate for these procedures. Other surgical options include the following: microsurgical lymphaticovenous anastomoses, in which the lymph is drained into the venous circulation or the lymphatic collectors above the area of lymphatic obstruction, liposuction, superficial lymphangiectomy, and fasciotomy.

In 2019, a Cochrane review was published evaluating the evidence for surgical interventions for the prevention and treatment of lymphedema after breast cancer therapy (Markkula, 2019). Only two randomized controlled trials (RCTs) were identified that met study criteria. The review concluded:

> There is low-certainty evidence that lymphaticovenular anastomosis is effective in preventing the development of lymphoedema after breast cancer treatment based on the findings from two studies. One study providing very low-certainty evidence found that vascularised lymph node transfer is an efficacious option in the treatment of established stage 2 lymphoedema related to breast cancer. Important secondary outcomes in this review were rarely reported in the included studies. More high-quality RCTs are required to further elucidate the effectiveness of surgical interventions in the prevention and treatment of lymphoedema after breast cancer treatment.

There is currently a multicenter, randomized controlled trial underway enrolling 120 adult women with breast cancer-related lymphedema of the arm and investigating if LVA is more effective than standard conservative treatment. The estimated primary completion date is August 2022 (NCT02790021).

Background/Overview

Lymphedema occurs when lymphatic vessels cannot adequately drain, resulting in the accumulation of protein-rich lymphatic fluid in the interstitial compartment. The accumulated fluid may lead to chronic inflammation and the scarring or hardening of body tissues. While lymphedema can affect any part of the body, it is most common in the upper or lower extremities. Symptoms include swelling, pain, a heavy feeling in the affected area, skin tightening, difficulty moving, skin thickening, itching, and a burning sensation. Lymphedema can become chronic, leading to decreased ambulation, difficulty performing activities of daily living, and emotional and psychological distress. In addition, lymphedema increases the risk of infection, such as cellulitis. In advanced cases, the accumulated fluid can lead to the deposition of fat and fibrotic solids (fibrofatty tissue). The most severe cases can be classified as elephantiasis, the extreme enlargement and hardening of a part of the body. In rare cases, long-standing lymphedema can lead to Stewart-Treves syndrome, a cancerous condition that can be fatal.

Lymphedema can be classified as primary or secondary. Primary lymphedema is caused by the abnormal fetal development of the lymphatic system. Secondary lymphedema is caused by damage to the lymphatic system from infection, injury, obesity, cancer, cancer treatment, inflammatory conditions, or surgery. In the United States, most cases of lymphedema occur secondary to cancer and cancer treatments. Severity of lymphedema is commonly determined using a staging system, such as the International Society of Lymphology (ISL) scale or the Campisi scale. The degree of lymphedema is assessed using several different measurement techniques, including comparing the circumference of the affected extremity to the unaffected side, volumetric measurement using water displacement, and infrared perometry.

Because damage to the lymphatic system cannot be repaired, there is no cure for lymphedema. The goal of treatment is volume reduction to control swelling, thereby minimizing symptoms. Drug therapy has not been found to be beneficial for lymphedema, other than the use of antibiotics when infection is present. Research is underway to determine if anti-inflammatory drugs may be beneficial. The current gold-standard treatment is a conservative physical therapy program known as complete decongestive therapy (CDT), which includes exercise, compression garments, bandaging, manual lymph drainage, skin breakdown prevention, and lifestyle changes. To retain the benefits of CDT, maintenance therapy must remain ongoing. Several surgical procedures have been proposed to treat lymphedema when conservative treatment has failed. These include physiologic procedures, which are used to decrease fluid volume by increasing the function of the lymphatic system.

Lymphedema may be misdiagnosed as, or develop comorbidly with, lipedema, a painful, chronic, incurable disease that almost exclusively affects women after puberty and is characterized by abnormal bilateral enlargement of subcutaneous adipose tissue of the legs or arms but with normal hands and feet. The cause of lipedema is unknown, but evidence suggests it may be genetically inherited and triggered by hormonal changes, such as puberty, pregnancy, or menopause. The lymphatic system is not typically affected by lipedema; however, in severe cases, the lymphatic system can become overloaded whereby secondary lymphedema (referred to as lipolymphedema or lympho-lipedema) can develop. Primary symptoms are painful sensation in the involved limbs, impaired mobility and disfigurement with lipoma-like lumps under the skin. There is no cure for lipedema, ongoing conservative and sometimes operative treatment is necessary to manage the condition.

Physiologic procedures

- *Lymphaticolymphatic bypass (also called lymphatic-lymphatic bypass):* Lymphaticolymphatic bypass is the direct connection of lymphatic vessels in a lymphedematous limb to lymphatic vessels in a healthy donor area of the body using a microsurgical anastomosis technique.

- *Lymphovenous bypass:* Lymphovenous bypass is the connection, using a microsurgical anastomosis technique, of a vein graft between distal lymphatic vessels and proximal vessels that are past an area of obstruction.

- *Lymphaticovenular anastomosis (LVA):* LVA is the connecting of lymphatic vessels in a lymphedematous limb to nearby veins using a microsurgical anastomosis technique. Lymphatic fluid is cleared by the one-way movement of excess lymph into the venous system.

- *Vascularized lymph node transfer (VLNT):* VLNT is the transplantation of lymph nodes (including the surrounding tissue, fat, and blood supply) from a donor site to the lymphedematous limb using a microsurgical anastomosis technique between the blood vessels of the lymph node flap and the recipient site. It is unclear how VLNT improves lymphedema, although it is thought it may work by releasing scar tissue that is blocking lymphatic fluid, by bridging lymphatic pathways through lymphangiogenesis or by acting as a lymphatic pump. A potential complication of VLNT is the development of lymphedema at the donor site. To reduce this risk, researchers are investigating the use of the omentum, a fatty curtain of tissue that is thought to act as a giant lymph node, as a donor site.

Definitions

Anastomosis: The surgical connection between two structures.

Campisi Staging System for Lymphedema:

- Stage 1A: “Latent” lymphedema, without clinical evidence of edema, but with impaired lymph transport capacity (provable by lymphoscintigraphy) and with initial immuno-histochemical alterations of lymph nodes, lymph vessels and extracellular matrix.
- Stage 1B: “Initial” lymphedema, totally or partially decreasing by rest and draining position, with worsening impairment of lymph transport capacity and of immuno-histochemical alterations of lymph collectors, nodes and extracellular matrix.
- Stage IIA: “Increasing” lymphedema, with vanishing lymph transport capacity, relapsing lymphangitic attacks, fibroindurative skin changes, and developing disability.
- Stage IIB: “Column shaped” limb fibrolymphedema, with lymphostatic skin changes, suppressed lymph transport capacity and worsening disability.
- Stage IIIA: Properly called "elephantiasis", with scleroindurative pachydermitis, papillomatous lymphostatic verrucosis, no lymph transport capacity and life-threatening disability.
- Stage IIIB: “Extreme elephantiasis” with total disability (Campisi, 2010b).

Cellulitis: An infection that spreads to deep tissues of the skin and muscle, which may cause warmth, tenderness, fever, chills, swollen lymph nodes, and blisters.

Chyle leak: The leaking of Chyle, a milky fluid made in the small intestine during fat digestion, which results from damage to the lymphatic system.

Elephantiasis: The extreme enlargement and hardening of parts of the body due to the obstruction of lymphatic vessels.

International Society of Lymphology Staging System:

- Stage 0 - refers to a latent or subclinical condition where swelling is not yet evident despite impaired lymph transport, subtle alterations in tissue fluid/composition, and changes in subjective symptoms. It may exist months or years before overt edema occurs (Stages I-III).
- Stage I - represents an early accumulation of fluid relatively high in protein content (e.g., in comparison with "venous" edema) which subsides with limb elevation. Pitting may occur. An increase in various types of proliferating cells may also be seen.
- Stage II - signifies that limb elevation alone rarely reduces the tissue swelling and pitting is manifest. Later in Stage II, the limb may not pit as excess subcutaneous fat and fibrosis develop.
- Stage III - encompasses lymphostatic elephantiasis where pitting can be absent and trophic skin changes such as acanthosis, alterations in skin character and thickness, further deposition of fat and fibrosis, and warty overgrowths have developed (ISL, 2016).

Interstitial compartment (also called tissue space): The space surrounding tissue cells.

Lipedema: A chronic disease affecting almost exclusively women after puberty, characterized by painful abnormal enlargement of subcutaneous adipose tissue of the arms and legs.

Lymphatic fluid: A clear fluid that contains white blood cells (lymphocytes) and plasma.

Lymph nodes: Small, bean-shaped structures, found in the axilla, pelvis, neck, abdomen, and groin, that filter lymphatic fluid and store white blood cells.

Lymphatic system: A network of lymph vessels, tissues, and organs that carry lymphatic fluid throughout the body and return it to the bloodstream.

Microsurgery: Surgery performed with miniaturized instruments under magnification.

Omentum: A curtain of fatty tissue that connects the stomach to other abdominal organs and plays a role in immunity.

Stewart-Treves syndrome: A rare angiosarcoma that develops as a result of chronic lymphedema.

Coding

The following codes for treatments and procedures applicable to this document are included below for informational purposes. Inclusion or exclusion of a procedure, diagnosis or device code(s) does not constitute or imply member coverage or provider reimbursement policy. Please refer to the member's contract benefits in effect at the time of service to determine coverage or non-coverage of these services as it applies to an individual member.

When services are Investigational and Not Medically Necessary:
For the following procedure and diagnosis codes; or when the code describes a procedure indicated in the Position Statement section as investigational and not medically necessary.

CPT	
38999	Unlisted procedure, hemic or lymphatic system [when specified as lymphaticolymphatic bypass, lymphovenous bypass, lymphaticovenular anastomosis, vascularized lymph node transfer]
ICD-10 Diagnosis	
I89.0	Lymphedema, not elsewhere classified
I97.2	Postmastectomy lymphedema syndrome [see Note regarding WHCRA]
I97.89	Other postprocedural complications and disorders of the circulatory system, not elsewhere classified [identified as post-surgical lymphedema]
Q82.0	Hereditary lymphedema

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Index

The use of specific product names is illustrative only. It is not intended to be a recommendation of one product over another, and is not intended to represent a complete listing of all products available.

Document History

Status	Date	Action
Reviewed	02/11/2021	Medical Policy & Technology Assessment Committee (MPTAC) review. Updated Rationale and Reference sections.
	10/15/2020	Revised the Note pertaining to the Women's Health and Cancer Rights Act of 1998 (WHCRA) in the Description/Scope.
New	02/20/2020	MPTAC review. Initial document development.