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LYMPHEDEMA MICROSURGERY

Comparisons of Variable Treatments for Extremity Lymphedema

		Compression Garments	Liposuction	Side-to-End Lymphovenous Anastomosis	Vascularized Lymph Nodes Transfer
Indications	Cheng's Lymphedema Grading System with Lymphoscintigraphy	• Grade 1- 4	• Grade 1- 4 • Without pitting edema	• Grade 1- 2 • Patent lymphatic vessels on indocyanine green lymphography	• Grade 2- 4 • Partial obstruction with no patent lymphatic vessels or total obstruction on Lymphoscintigraphy
	Indocyanine Green Lymphography (ICG)	• Not required	• Not required	• Linear pattern, patent lymphatic vessels on indocyanine green lymphography	• Dermal backflow patterns
Time	Garments Wearing	• 24/7	• 24/7	• None	• None
	Procedures / Postoperative Care	• Complex decongestive therapy (CDT) typically lasts 2 to 12 weeks • One hour per section, 2 to 3 sessions per week • Continue to wear compression garments during the day • Self-manual lymphatic drainage about 20 minutes per day	• Continue to wear bandage and compression garments for 4 weeks • Self-manual lymphatic drainage • 2- 4 hours each time • May need blood transfusion for larger amount liposuction • Ecchymosis of the limb for 1- 2 weeks	• 2- 4 hours for surgery • 7 post-operation recovery days to return to regular activity	• 4- 6 hours for vascularized submental lymph node transfer • Hospitalization for 7 days for upper limb and 14 days for lower limb • 7 recovery days after hospitalization to resume regular activity

		Compression Garments	Liposuction	Side-to-End Lymphovenous Anastomosis	Vascularized Lymph Nodes Transfer
Outcomes	Clinical and Objective Results	At a 26-month follow-up • The circumference increased by 2%.1 • Episodes of cellulitis increased from 2.1/year to 2.9/year1 At an 8.5-months follow up • The circumferential reduction rate reached 10%.2 • Episodes of cellulitis decreased from 2.3/year to 1.2/year2	• Up to 100% reduction rate in non-pitting edema cases	At a 10-month follow-up • The circumferential reduction rate reached 17.3%2 • Episodes of cellulitis decreased from 4.4/year to 1.4/year2	At a 58-month follow-up • The circumferential reduction rate reached 34%2 • Episodes of cellulitis decreased from 7.4/year to 2.6/year2
	Quality of Life (Lymphedema Quality of Life (LYMQoL) or Lymphedema Quality of Life Inventory (LyQLI)	• Higher quality of life (QOL) for the patients treated with complete decongestive therapy (CDT) than the ones without CDT[4]	• Significant higher QOL in physical, psychosocial, and practical domains[5]	After a 8.5-month follow-up • Significant improvements in function, appearance, symptom, mood, and overall quality of life domains[6]	After a 12-month follow-up • Significant improvements in function, appearance, symptom, mood, and overall quality of life domains[3]
	Cost Estimate (USD)	• Daytime Garments $1,200/year • Nighttime Garments $2,000/year • Wrapping supplies $375/year • Massage cost $105/hour • Ready-made garments are less expensive, easier to replace and quicker to obtain than ready-made garments • Last about 6 months	• $4,000 to $6,000 per treatment region, not including anesthesia and other fees. • Requires 2 - 3 sections post-operation	• $20,000 at CGMH (including supermicrosurgery, general anesthesia, and hospitalization for 3 days)	• $20,000 at CGMH for breast cancer-related lymphedema (including surgery and hospitalization for 7 days) • $25,000 at CGMH for lower limb lymphedema (including surgery and hospitalization for 10-14 days)

	Compression Garments	Liposuction	Side-to-End Lymphovenous Anastomosis	Vascularized Lymph Nodes Transfer
Pros	• Non-surgical • Less costly (first year)	• Less costly (first year) • Immediate volume decreases	• No more compression garments - lifelong • Lighter and softer extremity • Decreased episodes of cellulitis • Moderate decreases in circumference and volume of lesion limb	• No more compression garments – lifelong • Lighter and softer extremity • Decreased episodes of cellulitis • Significant decreases in circumference and volume of lesion limb
Cons	• Life-long cost • Side effect of contact dermatitis • Higher risk of cellulitis • Limited physical activities • Cosmesis and physical discomfort	• Life-long cost • Side effect of contact dermatitis • Higher risk of cellulitis • Limited physical activities • Cosmesis and physical discomfort	• Limited application • LVA is only indicated in the lesioned limb with linear patent lymphatic vessels on indocyanine lymphography	• Temporary unsighted scar on the distal recipient sites (wrist or ankle) • One or a few follow-up revision surgeries (1 hour) for cosmetic improvement

1.Cheng MH, et. al., Validity in the Application of the Novel Lymphoscintigraphy Staging for Unilateral Extremity Lymphedema. Annals of Surgery. 2018;268: 513.
2.Engel H, Cheng MH, et al., Outcome of Lymphedema Microsurgery for Breast Cancer Related Lymphedema with or without Microvascular Breast Reconstruction. Annals of Surgery. 2018; 268:1076.
3.Patel KM, Cheng MH, et al., A Prospective Evaluation of Lymphedema-Specific Quality-of-Life Outcomes Following Vascularized Lymph Node Transfer. Ann Surg Oncol. 2015, 22: 2424.
4.Luchi T, et al., Associations between the treatments and outcomes of patients with upper and lower lymphedema in Japan: a cross-sectional observational study. Int J Nurs Stud. 2015; 52: 913.
5.Klernäs P, et al., Test of Responsiveness and Sensitivity of the Questionnaire "Lymphedema Quality of LifeInventory". Lymphat Res Biol. 2018, 16:300.
6.Marzia Salgarello, et al., A Prospective Evaluation of Health-Related Quality of Life following Lymphaticovenular Anastomosis for Upper and Lower Extremities Lymphedema. J Reconstr Microsurg. 2018; 34:701.

Side-to-end fashion is the preferred technique by Dr. Cheng for lymphovenous anastomosis for Cheng's Lymphedema Grade 1- early Grade 2 patients. Other end-to-end anastomosis technique is not compared in this table.