Surgical Treatment of Lymphedema: A Review of the Literature and a Discussion of the Risks and Benefits of Surgical Treatment

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Introduction

The surgical treatment of lymphedema has recently received significant attention in the press as an effective treatment of lymphedema for select groups of patients. Despite advances in a number of different surgical techniques, it is still not clear which lymphedema patients would benefit the most from surgical treatment and which surgical techniques are the most effective.\textsuperscript{1} Some investigators have suggested that surgery for lymphedema should be considered when there is substantial functional impairment, frequent lymphedema-associated infections, therapy-resistant pain, or considerable cosmetic deformity. Complete decongestive therapy (CDT) is still considered the gold standard lymphedema treatment, and with an aggressive approach and adherent patient, CDT should be able to manage limb swelling in the majority of patients. The approach in the United States is currently to evaluate referral patients for surgical treatment options when nonsurgical treatments have failed. The potential benefits of surgery are to reduce the weight of the lymphedematous region, minimize the frequency of inflammatory episodes, and improve cosmesis and function.

Surgical treatment of lymphedema can be categorized as follows: excisional operations (e.g., debulking, amputation, and liposuction), lymphatic reconstruction, and tissue-transfer procedures (e.g., lymph node transplantation and tissue transfers). Recently, we conducted a systematic review of peer-reviewed literature to try to identify which lymphedema patients benefit the most from surgical treatment and which surgical techniques are the most effective in treating lymphedema.

Methods

A systematic review of the literature was performed in two phases. First, a reference research librarian searched 11 major medical indices (PubMed-MEDLINE, CINAHL, Cochrane Library databases [Systematic Reviews and Controlled Trials Register], PapersFirst, ProceedingsFirst, Worldcat, PEDro, National Guidelines Clearing House, ACP Journal Club, and Dare) for articles published between 2004 and 2010 using terms to capture all literature related to lymphedema. In the second phase, abstracts were reviewed by experts in the field for confirmation of defined inclusion (lymphedema-related, \(>8\) patients) and exclusion criteria (non-refereed articles). Abstracts were sorted by topic experts. Full original research articles for each of the studies and English translations were requested as needed. In addition, published articles from the archives of the authors were also examined as well as reference lists from related articles. A total of 20 studies met the inclusion criteria. The studies were categorized according to the type of surgical procedure performed: (1) excisional procedures

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\textsuperscript{1}Excisional/debulking volume reduction was only reported in one study.
blood clots, scarring or poor appearance, chronic wounds or delayed healing, death of the grafted skin (necrosis), infection, and soft tissue in the lymphedematous area. Excisional procedures involve the radical removal (resection) of skin and soft tissue in the lymphedematous area. The area is then covered by a skin graft for healing. Complications associated with this procedure include bleeding (hematoma), death of the grafted skin (necrosis), infection, chronic wounds or delayed healing, blood clots, scarring or poor appearance, destruction of remaining lymphatic vessels, and recurrence of lymphedema. The overall volume reduction reported for the excisional procedures ranged from 18% to 118%, with a weighted average reduction (based on the number of patients in the study) of 91.1%. Mehrara et al found that excisional procedures for lymphedema are typically reserved for patients with lymphostatic elephantiasis, whereas liposuction is used in patients for whom conventional treatments have failed.

**Liposuction**

We reviewed four published studies that included 105 patients who underwent excisional procedures (debulking) on either the extremities (upper or lower) or the genital region (penile/scrotal). Excisional procedures involve the radical removal (resection) of skin and soft tissue in the lymphedematous area. The area is then covered by a skin graft for healing. Complications associated with this procedure include bleeding (hematoma), death of the grafted skin (necrosis), infection, chronic wounds or delayed healing, blood clots, scarring or poor appearance, destruction of remaining lymphatic vessels, and recurrence of lymphedema. The overall volume reduction reported for the excisional procedures ranged from 18% to 118%, with a weighted average reduction (based on the number of patients in the study) of 91.1%. Mehrara et al found that excisional procedures for lymphedema are typically reserved for patients with lymphostatic elephantiasis, whereas liposuction is used in patients for whom conventional treatments have failed.

**Lymphatic Reconstructive Procedures**

We also reviewed eight studies that reported on the use of microvascular lymphovenous anastomoses procedures to treat lymphedema in a total of 2,058 patients. These procedures create microscopically connections between lymphatic channels and adjacent veins to allow for a type of “bypass” of lymphatic obstruction. An advantage of microvascular lymphovenous anastomoses procedures is the minimal tissue dissection and destruction; however, these procedures are only performed by highly skilled plastic surgeons who have received extensive training in microvascular surgery, which is performed using a microscope. In addition, a high number of early-failure rates (e.g., narrowing and scarring of the connections) has been reported. The overall weighted volume reduction reported for lymphatic reconstructive procedures was 54.9%.

**Tissue Transfer Procedures**

We reviewed four studies on tissue transfer procedures (upper and lower extremity) in which included 61 LE patients. These procedures included lymph node transplantation and/or transfer and tissue transfer and involved transplanting distant lymph nodes or lymphatic tissue into the area of obstructed lymphatics. Complications that were associated with tissue transfer procedures include skin-flap failure and lymph node or tissue donor-site complications. Particularly in lymph node transfer procedures, the remaining lymph nodes at the donor site may be damaged, resulting in lymphedema at the site of lymph node or tissue collection. The overall weighted average for studies that reported a volume reduction was 47.6%.

**Discussion**

Findings from our systematic review of the published literature on the surgical treatment of lymphedema indicate that, overall, excisional procedures are associated with the greatest volume reduction, followed by lymphatic reconstruction procedures and then tissue transfer. However, it was not possible to identify one surgical technique as more effective than another because the patient characteristics and selection criteria varied substantially among the studies. For example, it is likely that the most dramatic volume reductions were related to excisional procedures performed on limbs with massive lymphedema. Patients with elephantiasis and fibrosis would not likely be candidates for lymphatic reconstruction procedures. In addition, the studies presented in this review were all observational studies, largely without comparison groups, and were not randomized controlled trials. A randomized clinical trial offers the opportunity to evaluate new procedures against the current standard of care. The process of randomization within a clinical trial is designed to create groups with similar characteristics. The primary advantage of randomized controlled clinical trials is to eliminate patient selection bias, which ensures that the findings and outcomes of the study can be attributed to the procedure or treatment itself rather than to the more favorable characteristics in a particular group of patients.

An important component of determining whether surgical treatment is indicated is to examine the risk-benefit ratio. The risk-benefit ratio considers the surgical risks or morbidity associated with an individual procedure in terms of the likelihood or frequency of a complication (such as postoperative infection) versus a rarely occurring complication that may be life threatening (such as a stroke). The individual goals of the patient, the extent of the surgical procedure, and the level of expertise and experience required to perform the surgery should also be carefully considered. As discussed above, significant complications have been reported with each of the surgical procedures, and in almost all of the studies, patients were required to wear postoperative compression garments.

The reported success of many of these procedures was likely strongly influenced by the selection of patients. The majority of the studies were performed overseas, and performed by clinicians with significant experience with these procedures. Patients were often selected patients who had recent-onset secondary lymphedema with no previous history of cellulitis or venous hypertension, and these patients were more likely to have good outcomes. Given the lack of randomized clinical trials and the overall quality of the studies reported to date, insurance companies in the United States consider these surgical procedures for the treatment of lymphedema “investigational,” resulting in a lack of insurance coverage for the majority of procedures. Medicare, which is the US government’s insurance for people over the age of 65, does not
Currently cover lymphatic venous bypass or transplantation. Many private insurance companies use Medicare as a guide for their own reimbursement policies. In a few reported cases, individual insurance companies have approved reimbursements after an extensive petition process. Without insurance coverage, surgical procedures for the treatment of lymphedema are often limited to wealthy individuals who can afford to pay the costs out of pocket, which range from $20,000 to $40,000 for the procedure itself and this does not include the costs of post-operative hospitalization and rehabilitation if needed.

Despite the promising results from surgical treatment of lymphedema, complete decongestive therapy and compression garments should continue to be considered the primary treatment for lymphedema. Potential risks are associated with all surgical procedures, including general risks and stressors related to anesthesia. No prospective randomized controlled clinical trials have been conducted to date to compare the nonsurgical and surgical treatments of lymphedema. Additional studies are required to select appropriate lymphedema patient populations who would derive the greatest benefit from surgery. Only when these results are available will it be possible to advocate for wider insurance coverage.

References


