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Key Points

- Placing alloplastic materials to drain lymphatic fluid has not proved effective.
- The Kondoleon operation has been replaced by staged skin/subcutaneous excisional procedures.
- The Thompson operation does not offer advantages to staged skin/subcutaneous excisional procedures and is more complicated.
- The morbidity and efficacy of omental transposition are outweighed by current operations.
- Muscle flaps have not been popularized because the procedures are more complicated and have not shown superior efficacy compared to other procedures.

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Introduction

A standard operation for the treatment of lymphedema does not exist. Some surgeons prefer physiological procedures, which attempt to restore lymphatic flow, while others use excisional operations to remove diseased tissue. The most common physiological procedures currently performed include lymphatic–venous anastomosis and vascularized lymph node transfer. The most widely practiced excisional operations are liposuction and staged skin/subcutaneous excision. This chapter highlights other surgical treatments for lymphedema that are not commonly used (Table 21.1).

Physiologic Procedures Using Alloplastic Materials

In 1908, Handley attempted to drain a lymphedematous lower extremity by placing silk threads subcutaneously along the length of the limb [1]. He hypothesized that lymph might be transported proximally by capillary action, but found that his technique did not work [2]. Similar attempts using other substances to drain the limb also have failed (e.g., fascia, gelfoam, nylon, polythene, polyvinyl chloride) [2]. These techniques were not successful because of infection, extrusion, and movement of lymph against gravity with valveless materials.

Table 21.1 Operations for lymphedema that are no longer commonly performed

Alloplastic materials
Kondoleon
Thompson
Intraabdominal flaps
Muscle flaps

Kondoleon Procedure

In 1912, Kondoleon recognized that lymphedema only affects the tissues above the muscle fascia; the muscle compartment and deeper areas of the limb were not affected. He hypothesized that the muscle fascia was a barrier between the superficial and deep lymphatic systems. Consequently, he made long incisions along the extremity and removed strips of muscle fascia in an effort to allow superficial lymph drain into deeper lymphatics [3–5]. He removed subcutaneous tissue beneath the skin excision so that a path existed between skin and muscle.

Kondoleon’s procedure had minimal efficacy and no evidence of physiologic benefit. Reasons for the lack of improvement were hypothesized to be as follows: (1) the deep lymphatics are also abnormal and unable to drain superficial tissues, and/or (2) a neo-fascia reforms that again blocks superficial to deep drainage [2]. Although the Kondoleon procedure was abandoned, it served as the basis for the staged-skin/subcutaneous excisional procedures that are used today.

Thompson Procedure

In 1962 Thompson described an operation based on the work of Kondoleon (1912), Sistrunk (1918), and Homans (1936) [2]. Because Kinmonth showed that lymphedema also has abnormal deep lymphatics, it was hypothesized that the muscle compartment is not swollen because lymph is propelled by muscle contraction and pulsation of blood vessels [2, 6]. Sistrunk modified the physiologic Kondoleon operation by removing deeper fascia and adding the excision of skin and more subcutaneous fat [4–7]. Homans furthered Sistrunk’s excisional procedure to

include removal of all deep fascia and subcutaneous fat by raising thin vascularized skin flaps and applying them to the underlying muscle in staged procedures [8].

Thompson modified Homans’ procedure by de-epithelializing his thin skin flap, which he then buried into an intramuscular area along the entire extremity [2]. He hypothesized that by burying the flap into the muscle he would facilitate superficial drainage into the deep compartment as well as prevent fibrosis/neo-fascial formation that may re-separate the superficial and deep systems. In 1970, Thompson reviewed his experience using the procedure on 79 limbs (56 legs, 23 arms) [9]. He found that 61 % of his patients had “good” results and 33 % had “satisfactory” outcomes; all subjects had a reduced risk of infection [9]. Patients with secondary lymphedema of the lower extremity had a greater chance of having “good” results (83 %), compared to patients with primary disease (58 %) [9]. Thompson hypothesized that patients with primary lymphedema do not benefit as much from his technique because their deep lymphatics are more abnormal compared to patients with secondary disease [9].

Although there is evidence that Thompson’s procedure may improve lymphatic flow [10, 11], any physiologic benefit likely is based on the wide excisional component because skin/subcutaneous excisions (without a buried dermal flap) also have been shown to potentially improve lymphatic function [12–14]. Currently, the Thompson procedure does not appear to offer any additional benefit compared to staged skin/subcutaneous excision without burying a skin flap into muscle. In contrast to the Homans procedure, the Thompson operation is more complicated, and patients are at risk for epithelial sinuses and skin necrosis at the site where the de-epithelialized flap is sutured to the native skin (1/3 of patients in Thompson’s series) [9].

Intraabdominal Flaps

Pedicled transposition of omentum was first described by Goldsmith and De Los Santos as a treatment for lymphedema in 1966 [15]. They hypothesized that the lymphatics in the omentum

would be able to bridge the lymphedematous extremity and allow drainage of lymph from the limb. In 1974, Goldsmith published his long-term evaluation of the technique [16]. He performed the procedure in 22 patients (13 legs, 9 arms) [16]. Only ten patients (45 %) were thought to have benefit based on the following criteria: decreased size of the extremity, reduced infections, increased function, or reduction of tissue turgor [16]. One-third of the patients had major complications: hernia, infection, wound dehiscence, pulmonary embolus, gastric ulcer, adhesions causing bowel obstruction, and death from intestinal necrosis [16]. After Goldsmith reviewed his experience with omental transposition he questioned “whether the clinical results of omental transposition justify its continued performance.... I have been impressed with favorable reports of simpler operations such as the Thompson operation or the subcutaneous excision of lymphedematous tissue... if I were asked to recommend an operation... I would suggest that one of these two procedures be performed since neither operation violates the peritoneal cavity as does omental transposition” [16].

Hurst et al. described an enteromesenteric bridge procedure in eight patients [17]. A segment of ileum and its mesentery was transected and transferred to the inguinal area. After removing the mucosa, the bridge was sutured over the inguinal nodes that had been bisected or unroofed. The authors stated that six patients had improvement and two failed the procedure and required excisional operations [17]. Lymphoscintigraphy showed clearance of tracer in three out of four limbs. One patient had a bowel obstruction requiring lysis of adhesions [17].

Strong evidence that omental flap transposition or an enteromesenteric bridge improves lymphatic drainage or reduces the size of an extremity does not exist. The procedures require an intraabdominal operation that exposes the patient to significant risks, including the lifelong chance of adhesions and bowel obstructions. Currently performed physiologic (lymphatic–venous anastomosis, lymph vessel transplantation, lymph node transfer) and excisional (liposuction, staged skin/subcutaneous excision) have superior efficacy and are safer than intraabdominal flap transpositions.

Consequently, these flaps are rarely performed at this time and are not recommended by the International Society of Lymphology [18].

Muscle Flaps

Similar to the omental flap, extraabdominal flaps have been used as a physiological procedure to drain a lymphedematous extremity. Muscle flaps have not gained wide acceptance because of the morbidity of the procedure and equivocal benefit. Current excisional procedures offer better, more consistent results and have less morbidity.

Latissimus dorsi flap transposition has been reported as a treatment for upper extremity lymphedema in two patients who were felt to have improvement in their disease; although improved lymph drainage was not shown [19]. A case report of a free muscle flap for upper extremity lymphedema showed lymphatic drainage through the flap [20].

Lower extremity lymphedema has been managed with tensor fascia lata flaps in 13 patients who were reported to have some improvement [21]. However, follow-up was short and evidence of improved lymphatic drainage was not studied. More recently, a contralateral rectus abdominis musculocutaneous flap has been used to treat groin wounds in patients who also had lower extremity lymphedema; a cutaneous pedicle containing dermal lymphatics was maintained [22]. Improvement in limb volume and episodes of cellulitis were reported, although the effects of the flap in patients with lymphedema but without groin wounds are unknown. Also, sacrificing a rectus muscle in a patient with moderate/severe lower extremity lymphedema that may have difficulty ambulating could further inhibit the patient’s function.

Conclusions

Several types of operations may be used to treat lymphedema. A consensus about the best procedure for the disease does not exist. Physiologic procedures using alloplastic materials have been shown to be ineffective and are no longer used. The Kondoleon procedure was the foundation for

the current staged skin/subcutaneous excision operation. The Thompson procedure is more complicated and associated with greater morbidity than staged skin/subcutaneous excision and does not provide any added benefit. Although omentum and muscle flaps might have efficacy, the morbidity of these procedures do not favor their use compared to liposuction, staged skin/subcutaneous excision, lymphatic-venous anastomosis, and/or lymph node transfer.

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