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AUTOTRANSPLANTATION OF THE GREATER OMENTUM IN THE TREATMENT OF CHRONIC LYMPHEDEMA

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ABSTRACT

We evaluated the use of transplantation of the greater omentum in the management of chronic lymphedema in 21 patients. The omentum provides a large surface with fluid absorbing capability and potentially therefore is useful in management of patients with primary or hypoplastic peripheral lymphatics. Based on the angio- and lymphangio-architecture of the gastroepiploic architecture, we used large segments of greater omentum as a free autotransplant with microrevasculari-zation to the femoral or axillary artery and vein thereby avoiding technical drawbacks of a pedicle graft with the feeding vessels traversing the abdomen. Elongation of the omentum must be done properly because omental lymphatic arcades do not consistently follow the blood vascular arcades in its more distal part. Accordingly, if not properly mobilized the blood supply may be retained whereas the lymph circulation is interrupted. We combined omental implantation with lymph nodal-venous anastomoses using an omental vein with a nearby systemic venous tributary. In 19 of the 21 patients followed from 3 months to 2 years after operation, remission of lymphedema was good (reduction in swelling more than 50%) in 14 patients and satisfactory in 5 (~25-50% reduction in swelling) with improvement gradually increasing with the passage of time.

A number of operations have been advocated for management of lymphedema including lymph nodal-venous and lymphatic-venous shunts, transplantation of lymphatic collectors, myocutaneous flaps, and one stage transplantation of the greater omentum (1-6). Except for use of the omentum, however, none is suitable for treatment of primary (hypoplastic) lymphedema or where extensive destruction of lymphatic collectors has occurred as in longstanding secondary (obstructive) lymphedema. To provide better lymph drainage and resistance to peripheral infection, we examined the value of a micro-revascularized free autograft of the greater omentum in patients with primary and secondary lymphedema. The technical details were previously worked out in experimental studies (see *Lymphology* previous article).

MATERIALS AND METHODS

Patients

Twenty-one patients (age 4-37 years) with chronic lymphedema were treated between March 1987 and March 1992. Nineteen patients had primary lymphedema and two had secondary lymphedema. Eighteen patients had lymphatic dysplasia (hypo- or aplasia) of lymphatic collectors in the legs and one had lymphatic aplasia of the arm. In one

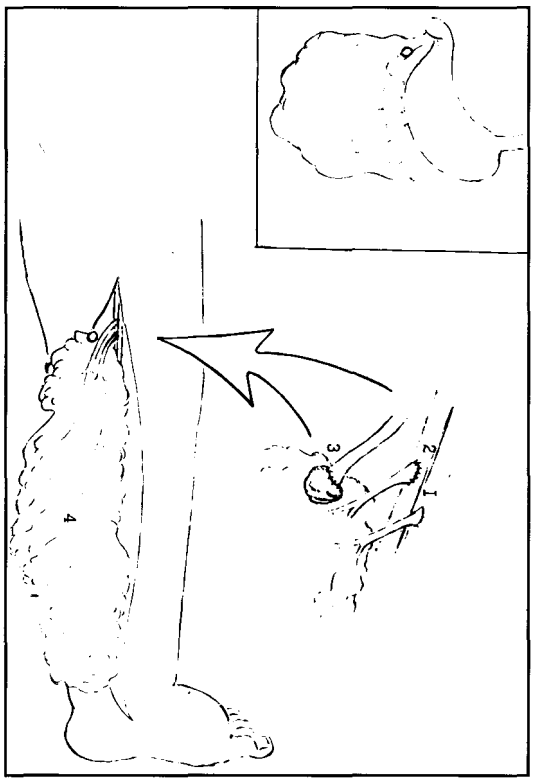

Fig. 1. Schematic representation of autotransplantation of the greater omentum into the left leg. 1—end-to-side anastomosis between the right gastroepiploic and femoral artery; 2—end-to-side anastomosis between the right gastroepiploic and femoral vein; 3—lymph nodal-venous anastomosis between a lymph node of the greater omentum and a tributary of the greater saphenous vein. Inset: Preferred technique for the detachment of the greater omentum from the stomach and the transverse colon.

Fig. 2. The left leg of a patient with longstanding lymphedema during the operation. Note the prominent amount of thickened, edematous and blubbery subcutaneous tissue.

patient, lymphedema appeared after excision of a groin lymphangioma. Seven patients had been treated by operation in the past. Five had had a lymphatic-venous anastomosis, one had a Thompson operation, and one had undergone a Charles operation. Seven patients had had a history of recurrent erysipelas. Each patient had been treated before with pneumatic compression, elastic stockinette, "bandaging", and medication without success. The previous operations in the seven patients mentioned were also unsuccessful.

Operative Technique

Operation consisted of 5 basic steps *(Figs. 1-3)*:

1. Development of a recipient bed in the groin or axilla for the detached piece of greater omentum with dissection of the femoral or axillary and adjacent recipient blood vessels.
2. Laparotomy, mobilization of the greater omentum along with the gastroepiploic lymph nodes and closure of the abdomen after detachment of the omentum preserved in a sterile gauze moistened with normal saline.
3. Performance of microvascular anastomoses (end-to-side) after fixation of the omentum in the recipient bed.

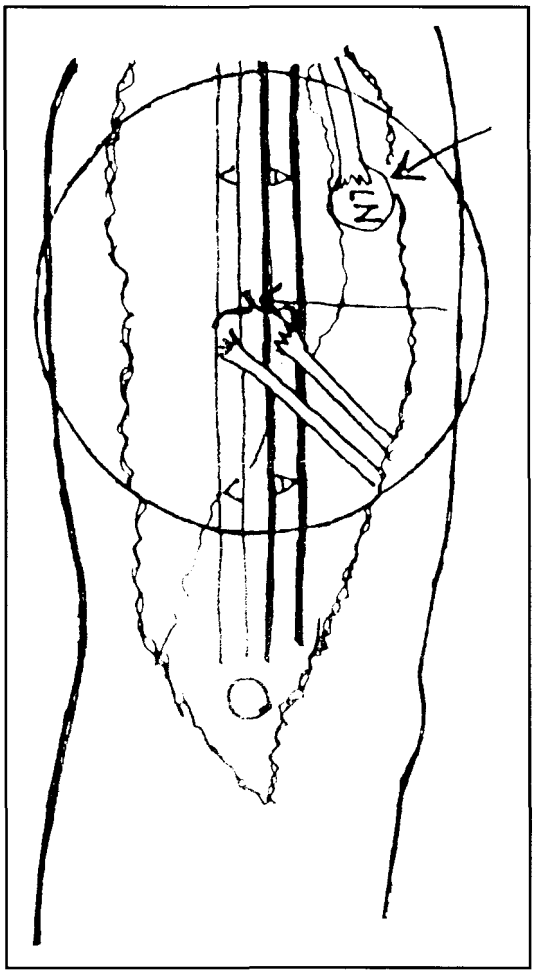

Fig. 3. Intraoperative view (above) and schematic diagram (right) of microanastomoses under magnification (x10). 1—blood vascular anastomoses; 2—lymph nodal-venous anastomosis.
A—Femoral artery; V—Femoral vein; O—greater omentum

4. Construction of a lymph nodal-venous anastomosis with a tributary of the femoral or axillary vein of the lymphedematous limb.
5. Closure of the recipient wound with or without a skin graft and closed suction drainage of the peripheral wound.

The operation also entailed excision of considerable fibrotic tissue including the edematous deep fascia so that the revascularized omental transplant was placed in close proximity to the underlying muscles to facilitate vascular connections. Attention to careful hemostasis was essential as edematous tissue readily bled which in turn favored later fibrosis. The lymph nodal anastomosis was done by making a tiny incision in the node capsule to expose the marginal sinus and the end of the venous tributary was anastomosed to the defect created (7). A lymph nodal anastomosis was performed only after the blood vascular attachment was completed and hence the blood circulation had been reestablished. Only 4 patients required skin grafting. Pre- and postoperative lymphscintigrams were performed to assess lymphatic function after omental transplantation. 0.4-0.6mCi of 99mTc-labeled antimony sulfur colloid was injected into the subcutaneous tissue of the interdigital spaces. Studies were carried out up to 3 hours.

TABLE 1
Clinical Outcome in 19 Patients With Lymphedema

Outcome	Follow-Up Time (in months) 3	6	9	12	18	24	Total Number of Patients
Good*	1	2	3	4	3	1	14
Satisfactory**	1	1	1	2	-	-	5
Total	2	3	4	6	3	1	19

*A reduction of limb swelling more than 50%
**A reduction of limb swelling between 25% and 50%

RESULTS

Of the 21 patients, 2 were lost to follow-up. The other 19 were followed from 3 months to 2 years. In 14, lymphedema improvement was good (>50% reduction in swelling) and in 5 the results were satisfactory (25-50% reduction) *(Table 1)*. *Fig. 4* shows 2 patients with left leg lymphedema before and 14 and 18 months after omental transposition and omental lymph-nodal venous shunt. Not only was limb swelling reduced but it continued to decrease with time. Lymphscintigraphy, however, showed similar uptake of tracer in regional nodes on the lymphedema limb before and after operation.

Complications of the procedure included partial necrosis of the omental transplant (2 patients), groin wound infection (1 patient), prolonged lymphorrhea (2 weeks) in 2 patients, and dyspepsia (2 patients). These latter symptoms consisted of bloating, post-prandial, fullness and vomiting probably related to temporary motor dysfunction of the gastric pylorus. Partial necrosis (1/3 of the omental transplant) occurred in the distal leg in one patient and 1/4 of the transplant in a child became necrotic in the dorsum of the hand. The latter complication required coverage with a cutaneous flap. Both probably resulted from excessive tension on the skin during wound closure as the microvascular anastomoses appeared to remain patent. The postoperative wound infection occurred in a patient in whom preoperative eradication of smoldering infection was unsuccessful. Skin stitches were usually removed by 8-12 days and patients were usually discharged within 2-3 weeks. Before hospital discharge, significant reduction of edema were uniformly noted *(Fig. 5)*. In the patient in whom lymphedema of the genitalia and right leg had developed following excision of a groin lymphangioma, one year after omental transplantation, papillomatous growths appeared along parts of the incision in the scrotum. A free micro-vascular transplant using a thoracodorsal myocutaneous flap was successfully used to cover the defect after excision of the papillomata.

DISCUSSION

The idea of using the greater omentum as a biological drain for the treatment of lymphedema was first suggested by Sokolovsky (8). Twenty years later, Cannady (9) resurrected the idea of omental transposition by disconnecting the abdominal feeding vessels and covering the transplanted omentum with a skin graft. About a decade later, Vas (10) published his experience using this technique but it was Goldsmith et al (11) who popularized the use of the greater omentum in the treatment of chronic lymphedema. In a relatively long-term follow-up (1-7 years) of 22

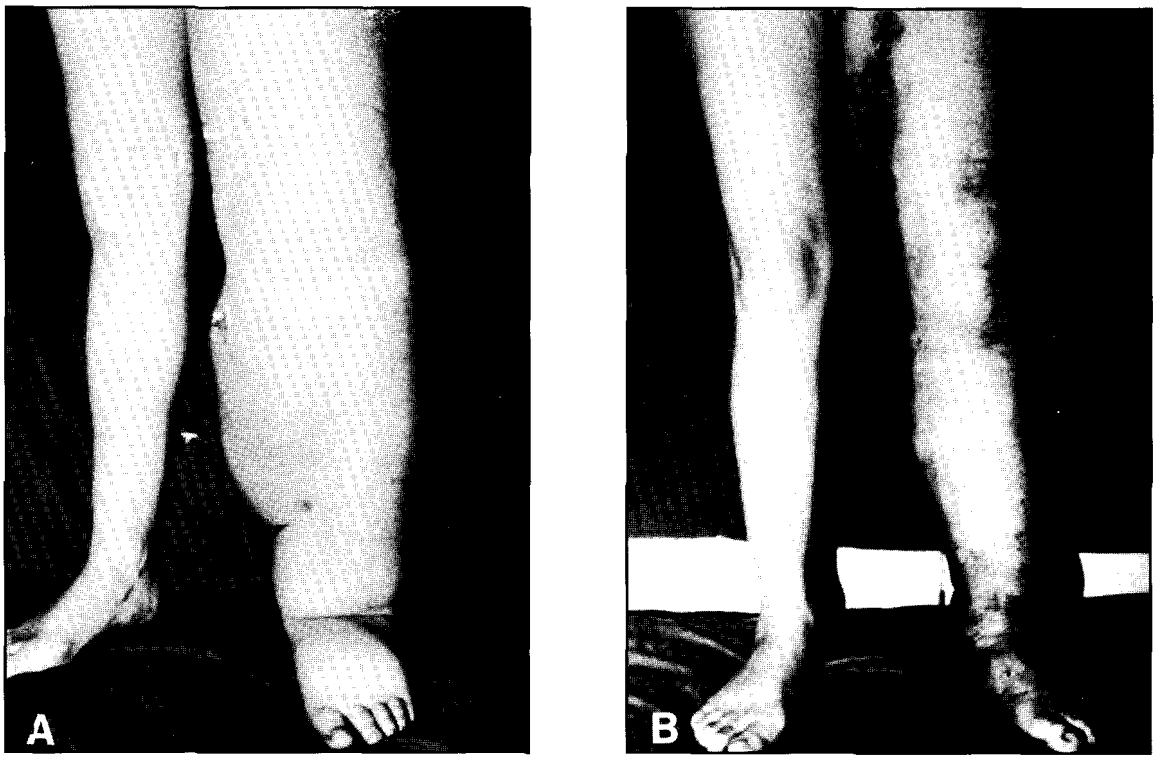

Fig. 4. Photograph of patient shown in Fig. 2 before (A) and more than 18 months (B) after operation.

patients, Goldsmith claimed that improvement in lymphedema can be expected in 1/3 to 1/2 of patients (12). Kiricuta (13) after using omental transposition in 5 patients achieved only moderate success in 3 and a poor outcome in 2. Nonetheless, he considered transposition of the omentum to be useful and attributed the poor results to the choice of patient, technical errors, and post-operative infection. Complications of omental transposition have included pulmonary embolism, intestinal obstruction, inguinal and Spigelian hernias, recurrent and persistent lymphedema, and even perioperative death (12,14,15). Others after obtaining poor results with omental transposition in small groups of patients condemned its use (17,18). Criticisms directed to the use of omental transposition have been 1) a limited absorptive capacity of the mammalian omentum (18), 2) lack of objective evidence for establishing lymphatic continuity between the lymphedematous extremity and the transposed omentum (19), 3) encapsulation of the omental flap and scar tissue (19,20), and 4) concomitant excision of subcutaneous tissue and fascia accounting for the improved clinical appearance (21). Despite these criticisms, the experiments of O'Brien et al (22) showed that transplanted omentum maintains its lymphatic function. Although sclerosis, increase of collagen deposition and replacement fibrosis of adipose tissue were noted in 10 of 11 dogs with experimental lymphedema, lymphatic connections were demonstrated between the transplanted omentum and the lymphedematous limb.

Microsurgical one-stage transfer of omentum in patients has been performed previously with mixed results (6,23,24), but as we show in this study the results are encouraging predominantly in patients with primary lymphedema. Indeed, despite the

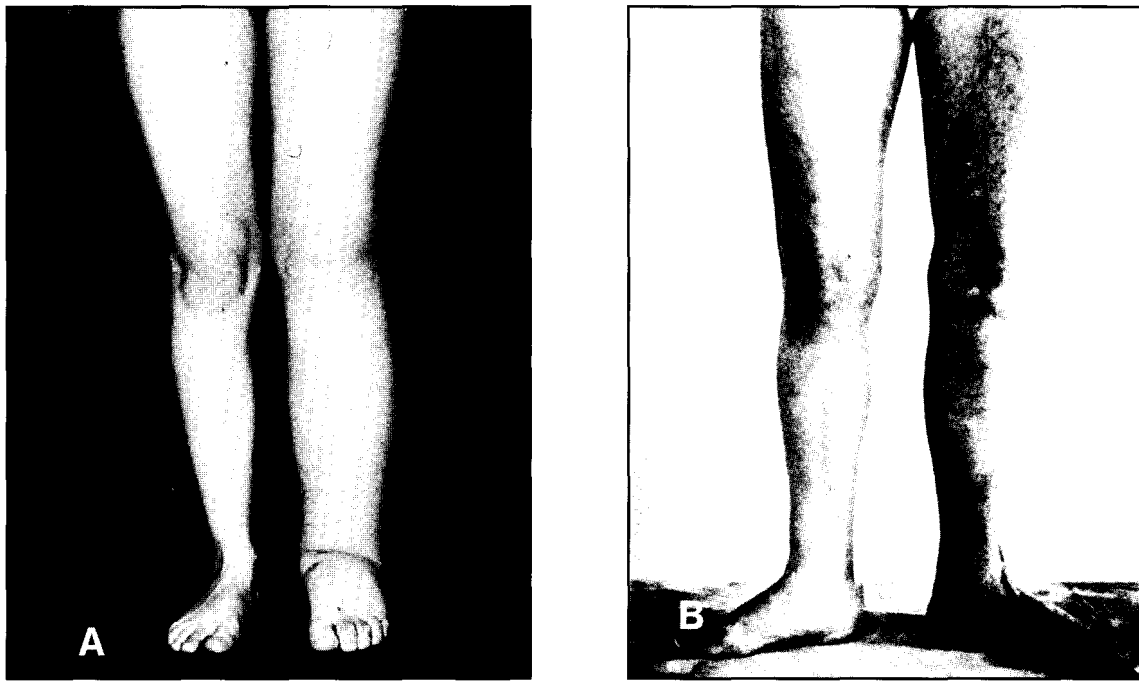

Fig. 5. Photograph of patient before (A) and 14 days after (B) omental transplantation with omental nodal-venous shunt.

extensive nature of the dissection and preoperative recurrence of cellulitis, the incidence of postoperative infection was low suggesting inherent resistance of the omentum (? milky spots) to local infection (25). It needs to be emphasized, however, that adherence to the proper method of omental elongation to avoid interruption of the lymphatic collectors and use of a concomitant omental lymph nodal-venous anastomosis likely contributed to the successful outcome.

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