Lymphostatic edema associated with malignancies of the pelvis and abdomen is caused by treatment. Fundamentally, the treatment produces lymph transport impairment. While this is not usually associated with removal of the primary malignancy, it is associated with the accompanying lymphadenectomy and radiation therapy. This produces unilateral or bilateral lymphedema with or without genital edema. The localization of the lymphedema depends upon the extent of the lymphatic lesions produced by therapy.

While interruption of lymph flow may occur because of lymph node blockage by malignancy, in fact, severance or ligation of lymph vessels, as well as lymph node extirpation, will produce the lymphatic obstruction. Furthermore, structural changes due to radiation cause transport impairment in the afferent lymphatics.

**Surgery and Radiation**

In a study from the University Hospital at Linkoping, Sweden, 54 women (53 of whom had radiation, as well as surgery) were followed. All had total hysterectomy and excision of the pelvic lymph nodes for uterine malignancy. Twenty-two of the patients (41%) had unilateral increase in volume of one lower extremity. A group of 15 healthy controls were examined and the differences in volume between their limbs did not exceed 4%. Fifteen of the patients with a degree of limb enlargement had >5% volume increase. Three had >10% volume increase and four had >15% volume increase. The lymphedema was symptomatic in 12 of the patients. Clearly, the combination of surgery with pelvic node excision produced significant lower extremity lymphedema.

**Laparoscopic Surgery**

Laparoscopic pelvic lymph node removal theoretically could decrease the incidence of lymphedema by limiting complications in the retroperitoneum. However, the learning curve on laparoscopic operations is steep.

At Loma Linda, the Division of Urology reported their experience with the first 100 consecutive laparoscopic pelvic lymph node dissections. While their results only are applicable to lymph node excision in prostate or bladder cancer, their observations may be helpful to gynecologists who wish to decrease the incidence of lower extremity lymphedema in patients with gynecologic malignancies. At Loma Linda, the complication rate of the first 50 consecutive laparoscopic pelvic lymph node dissections was 14%. In the second 50 cases, the complication rate was 4%. These surgeons concluded that modification of the operative technique and changes in patient management resulted in a lower complication rate in the second 50 patients. They concluded that the operation had a significant learning curve, but was a viable surgical staging option for patients with pelvic malignancies.

Kavoussi and colleagues from the Harvard Medical School, Brigham and Women’s Hospital, accumulated statistics from eight medical centers. They were able to tabulate the intraoperative and postoperative complications in the first 372 patients undergoing laparoscopic pelvic lymph node dissection. Their experience revealed that 16 patients could not have the operation completed due to their body habitus or due to technical difficulties with the procedure. Interestingly, 14 of the aborted procedures occurred during the initial eight operations at each institution. Ultimately, tabulation showed that 55 complications (15%) occurred. Fourteen of these were noted in the intraoperative period and 41 in the postoperative period. A total of 13 patients required open surgical intervention for treatment of a complication. The complications included vascular injury in 11, viscus injury in eight, genitourinary problems in 10, functional or mechanical bowel obstruction in seven, lower extremity deep venous thrombosis in five, infection or wound problems in five, anesthetic problems in two and obturator nerve palsy in two. Of importance to those of us who are interested in lymphedema, only five patients experienced early-onset lymphedema. These workers concluded, with the surgeons at Loma Linda, that there was, indeed, a significant learning curve associated with performing the operation, but that with experience and adherence to laparoscopic surgical principals, the complications could be minimized.

**Ilioinguinal Node Dissection and Lymphedema**

Results of pelvic node removal cannot be compared to results of ilioinguinal node removal. Not only are the malignancies being treated differently, but also the lymphatic territories differ. James, reporting in the *Scandinavian Journal of Plastic and reconstructive Surgery* presented the results of 90 consecutive cases of ilioinguinal lymph node dissection. His study focused on early healing complications related to development of postoperative lymphedema. Overall, healing complications occurred in 54.5% of the 90 consecutive cases. Postoperative edema occurred in 55.5% of cases. The 37 patients surviving treatment into the long term all were examined at a special review clinic. Of patients with wound healing complications, 80% developed postoperative edema. This contrasted with the 42% incidence of edema in patients with no healing complications. In patients with postoperative and post-complication edema, 30% had severe edema, 50% only detectable edema and 20% had no edema. The natural history of the edema was that, if it appeared early, it was worse in the first six months and gradually improved. Nevertheless, the edema persisted despite passage of time and treatment. The chief conservative treatment applied was elastic support bandages.

**Evaluation of Lymphedema Following Pelvic Node Dissection**

At the Ehime University School of Medicine, Japan, lymphoscintigraphy using 99-Tcm human serum albumin was used in evaluation of patients. There were 26 patients with...
uteroscopic evaluation to be done in limbs with lymphedema. Both CT and MRI have shown that the subcutaneous fat layer exhibits changes in lymphedema. In normal limbs, the subcutaneous fat layer is homogeneous; in limbs in patients with obesity, the fat layer is increased, but retains its homogeneity. In patients with lipedema, the fat layer also is increased, but remains homogeneous. In lymphedematous limbs, however, the lymphedema fluid collects in interstitial spaces and these become very prominent, both on MR and CT images. A honeycomb pattern is seen as a result of increased lymphatic fluid in the interstitial tissues and this is outlined clearly due to the fibrosis within the tissues themselves.

Perhaps the first noninvasive evaluation to be done in patients with suspected lymphedema is the duplex imaging using Doppler ultrasound. In using Doppler ultrasound, three techniques can be utilized. The first is routine ultrasound screening for chronic venous obstructive disease or chronic venous insufficiency. The second is venous reflux examination with the patient sitting or vertical to evaluate reflux in superficial and deep venous systems. The third possibility in utilization of duplex ultrasound is that the edematous area itself can be scanned. Imaging of lymphedematous areas reveals the presence of dilated superficial lymph channels in all patients. Normal nondilated lymph channels are too small for discrete detection by duplex ultrasound. Lymphedema may occur with or without the presence of chronic venous insufficiency and this venous insufficiency can be detected by the reflux examination, as well as standard evaluation, for deep venous thrombosis. There is no doubt that duplex imaging is helpful in differentiating lymphedema from chronic venous insufficiency and it provides a cost-effective alternative to invasive procedures, formerly used in evaluating lymphedema.

Both CT and magnetic resonance provide complimentary images in evaluation of lymphedema. These can reveal edema limited to the subcutaneous tissue as seen in lymphedema or may show edema in the subfascial space, particularly in the posterior compartments which will be characteristic of venous edema. MR has been used in evaluation of post-arterial reconstructive edema and has shown that the appearance of lymphedema and postoperative edema is similar.

The Arizona group has used whole body lymphoscintigraphy to evaluate patients with lymphedema. They have used technetium-99m injected intradermally into the digital web space of the hand or foot. They have used a digital gamma camera which permits a sweep of the torso with serial extremity and whole body lymphoscintigraphy. This technique has shown obstructive patterns characterized by discrete peripheral lymphatic trunks, delayed or absent regional lymph node depiction, and delayed but extensive soft tissue tracer extravasation. In patients with primary lymphedema, hypoplasia characterized by poorly defined lymphatic trunks has been demonstrated. These patients also show a delayed visualization of regional lymph nodes and early and extensive extravasation of the tracer. The Arizona group has advocated lymphoscintigraphy as being technically simple to perform, requiring no special training, and that radiation exposure to patient is minuscule.

**Conclusions**

Clinical examination may confirm the diagnosis of lymphedema, but imaging techniques, including lymphoscintigraphy, MRI, or CT scan may be helpful. Similarly, duplex Doppler ultrasound may rule out associated venous impairment. Any of the malignancies being treated may be associated with venous obstruction, as well as lymphedema. Therapy will depend upon the status of the primary disease. If tumor recurrence is the cause, oncologic treatment will be necessary. Lymphovenous shunts and lymph vessel transplantation have been utilized, but those treatments can be viewed as experimental and should be used only in special cases. Otherwise, conventional techniques, including complex lymphedema therapy, manual lymphatic drainage, sequential intermittent external compression and external support have proven most useful.

**Bibliography**


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