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# Lymphedema: Responding to Our Patients' Needs

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**L**ymphedema is greatly misunderstood in every possible circle—from healthcare providers to patients at risk. Lymphedema is a collection of excess water, interstitial fluid, plasma proteins, bacteria, and cellular waste products in the interstitial tissues as a result of an impaired lymphatic system (Cheville, McGarvey, Petrek, Russo, Taylor, et al., 2003; International Society of Lymphology [ISL], 2003). Ninety percent of interstitial fluid is removed by the circulatory system with the remaining 10% managed by the lymphatic vessels (Ridner, 2002). The lymphatic system is extensive throughout each of us. It begins as a fine network just under the skin surface and converges to become larger vessels deeper in the tissue. Fluid from the lower extremities moves up through the thoracic duct, running up the abdomen, and is affected by diaphragmatic pressures. Lymphatic fluid moves up through the nodal beds and dumps into the vascular system at the entrance of the superior vena cava.

Fluid exchange occurs at the blood capillary-interstitial-lymphatic vessel interface. Fluid exchanges requires blood circulation, tissue channels, proteolytic cells in the tissues, and initial lymphatics. Each of these “systems” interacts with and regulates the others to preserve the extracellular and intracellular environments. Muscular contractions, respiration, and external pressure changes cause pumping and filling of lymph fluid from the tissue into the initial lymphatics via the many openings between the endothelial cell junctions, which, in turn, connect to collecting lymphatics or lymph angions. Lymphatic flow proceeds in the direction of the heart with numerous lymph-venous communications, including the thoracic duct and right lymph duct, with the great veins of the neck.

## Causes

Secondary lymphedema results from damage to lymphatic structures leading to congestion when the amount of fluid requiring removal from the tissue exceeds the transport capacity of the lymphangions (ISL, 2003). Transport capacity, the capability of the lymphatics to remove fluid from the tissue, reflects how much fluid volume it can manage.

Altering the lymphatic anatomy through trauma, surgery, radiation therapy, or scarring from infection results in a mechanical problem, in that even the usual amounts of fluid in the tissue are in excess of the transport capacity. In addition to altered mechanics, any activity that causes increased skin temperatures leads to vasodilatation and movement of the fluid out of the vasculature into the tissue. This will lead to a greater

volume needing removal back into the circulatory system (Leitch et al., 1998; Mortimer, 1998; Pressman, 1998). Examples of heat-producing activities are being exposed to direct sun, taking hot showers or baths, soaking in a hot tub, and making repetitive movements to the point of muscle strain.

In people diagnosed with cancer, the two major causes of altered lymphatics and subsequent fluid exceeding the capacity of the lymphatics are lymph node removal or radiation therapy to the lymph nodes. Therefore, in patients with cancer, those diseases most commonly requiring lymph node sampling are at highest risk for lymphedema development. Cancer surgery also results in scarring superficially. Scars inhibit lymphatic flow across them so that fluid collects proximally to the scar. Although sentinel node biopsy is growing in practice, the risk of lymphedema development in patients with breast cancer is still significant if they receive radiation therapy to the nodal basins. It is believed that lymphatic vessels in the radiation field are constricted following radiation because the resultant fibrotic tissue constricts the vessels. Because the risk of lymphedema is lifelong, follow-up is still needed for those patients undergoing limited lymph node dissections, with or without radiotherapy (Hull, 2000; Meek, 1998; Rockson, 1998).

Lymphedema can occur in any quadrant that is drained by the affected nodal bed. Truncal lymphedema is often noted when a patient is examined posteriorly, but it can occur anteriorly as well. Breast lymphedema frequently is accompanied by truncal lymphedema or supraclavicular fullness. Upperlimb lymphedema can be limited to just the arm from wrist to axilla; the posterior side of the elbow, which is dependent and more prone to gravity; or the hand alone. Lower-extremity lymphedema almost always includes the foot but not necessarily the toes and can also be limited to the genitals and buttocks, depending on the extent of the surgery, scarring, radiation field, or past history of compression pump use. There are



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