

Growing Insights into Breast Cancer-Related Lymphedema

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AS WE ENTER 2018, lymphedema of the arm remains, unfortunately, a vexing problem associated with breast cancer, one that significantly impacts the quality of survivorship for those affected by this complication.

Several of the articles in this issue of *Lymphatic Research and Biology* address aspects of this vexing and unsolved problem.

Sen and colleagues acknowledge the natural history of lymphedema, in which the interstitial fluid-laden, affected limb progresses to a state of increasing accumulation of adipose tissue. They discuss the existing difficulty in assessing relative volumes of these edema components. In their investigation, patients with breast cancer-associated lymphedema underwent routine bilateral magnetic resonance imaging before and after liposuction for advanced disease. They measured volumes of fat, muscle, fluid, and bone, utilizing the threshold-based level set segmentation method. Their findings suggest that, while bone and muscle volumes remain relatively fixed, appropriate reductions in fat and fluid volumes were able to be detected. This represents a potentially useful clinical tool in the serial assessment of these patients.

In a related article, Bok *et al.* address the problem of stiffness assessment in breast cancer-associated lymphedema. Specifically, they sought to assess the impact of intermittent pneumatic compression (IPC) on the limb utilizing acoustic radiation force impulse imaging (ARFI). They assessed three different levels of applied pressure with pneu-

matic compression, observing that arm circumference and subcutaneous tissue thickness were significantly decreased after IPC at each pressure level (25, 35 and 45 mm Hg). However, only those treated with 35 mm Hg achieved a reduction in subcutaneous tissue thickness and shear wave velocity; higher pressures do not yield additional improvement. These insights might certainly guide future therapeutic decision-making.

Certainly, risk assessment plays an integral role in the management of breast cancer-related lymphedema. Erdogan Iyigun and colleagues correctly assert that determination of lymphedema and related risk factors in patients prior to a surgical intervention may provide protection for patients and early treatment. In their preoperative investigation of 277 breast cancer patients, bioimpedance spectroscopy played a central role in prospective lymphedema risk assessment. Lymphedema was found in 21.3% of patients with no detected differences in arm circumferences. A significant relation was found between presence of lymphedema and body mass index (BMI), number of positive lymph nodes, and capsule invasion of the tumor. BMI and the number of positive lymph nodes were independent variables. The statistical analysis suggested an increased risk of preoperative lymphedema when the number of positive lymph nodes was ≥ 8 . This study sheds important light upon the previously under-recognized problem of preoperative subclinical lymphedema, particularly in association with obesity.