The use of bioimpedance analysis to evaluate lymphedema.

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BACKGROUND: Lymphedema, a chronic disfiguring condition resulting from lymphatic dysfunction or disruption, can be difficult to accurately diagnose and manage. Of particular challenge is identifying the presence of clinically significant limb swelling through simple and noninvasive methods. Many historical and currently used techniques for documenting differences in limb volume, including volume displacement and circumferential measurements, have proven difficult and unreliable. Bioimpedance spectroscopy analysis, a technology that uses resistance to electrical current in comparing the composition of fluid compartments within the body, has been considered as a cost-effective and reproducible alternative for evaluating patients with suspected lymphedema.

PATIENTS AND METHODS: All patients were recruited through the Beth Israel Deaconess Medical Center Lymphedema Clinic. A total of 15 patients (mean age: 55.2 years) with upper-extremity or lower-extremity lymphedema as documented by lymphoscintigraphy underwent bioimpedance spectroscopy analysis using an Impedimed SFB7 device. Seven healthy medical students and surgical residents (mean age: 26.9 years) were selected to serve as normal controls. All study participants underwent analysis of both limbs, which allowed participants to act as their own controls. The multifrequency bioimpedance device documented impedance values for each limb, with lower values correlating with higher levels of accumulated protein-rich edematous fluid.

RESULTS: The average ratio of impedance to current flow of the affected limb to the unaffected limb in lymphedema patients was 0.9 (range: 0.67 to 1.01). In the control group, the average impedance ratio of the participant's dominant limb to their nondominant limb was 0.99 (range: 0.95 to 1.02) (P = 0.01). CONCLUSIONS: Bioimpedance spectroscopy can be used as a reliable and accurate tool for documenting the presence of lymphedema in patients with either upper- or lower-extremity swelling. Measurement with the device is quick and simple and results are reproducible among patients. Given significant limitations with other methods of evaluating lymphedema, the use of bioimpedance analysis may aid in the diagnosis of lymphedema and allow for tracking patients over time as they proceed with treatment of their disease.

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