Biophysical Lymphedema Assessments of Patients with Breast Cancer prior to and one year after Breast Cancer Surgery

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Introduction/Background: In women with breast cancer (BC) treatment-related lymphedema (BCRL), tissue dielectric constant (TDC) values, which are indices of local skin tissue water, are significantly greater in affected arms than in contralateral arms. Because these were obtained at various times after surgery the extent of side-to-side differences before and sequentially after surgery is unclear. Although pre-surgery evaluations with periodic follow-ups are the best approach to early BCRL detection, often patients are initially evaluated after surgery. It is thus useful to know if BC presence or natural variation patterns between affected and contralateral body sides alter side-to-side values of biophysical parameters that might be used to detect BCRL.

Aims of the Study: To determine body side differences in lymphedema assessment parameters before and one year after surgery.

Methods: With Institutional Review Board approval, 70 newly diagnosed BC patients were evaluated before surgery and 30 reevaluated 12 months after surgery. Bilateral TDC values (2.5 mm depth) were determined at forearm, biceps, axilla and lateral thorax. Arm volumes and bioimpedance values were concomitantly determined.

Results: Pre-surgery values (mean±SD) for affected and contralateral sides and their ratio (in parenthesis) are as follows. Arm volumes: 2271±670 vs. 2296±668 ml(0.988±0.049), Arm bioimpedance: 290.9±41.6 vs. 290.4±42.8(0.999±0.052), TDCforearm: 25.2±3.7 vs. 24.9±3.7(1.019±0.117), TDCbiceps: 22.1±3.1 vs. 22.0±3.6(1.019±0.139), TDCAxilla: 35.1±7.0 vs. 34.8±8.1(1.037±0.203), TDCthorax: 26.4±4.6 vs. 26.7±5.2(1.001±0.115). All side-to-side differences were statistically insignificant. At 12 months after surgery a significant increase only in thorax affected/contralateral ratio was detected (0.998±0.010 vs. 1.072±0.022, p=0.004).

Conclusion: Similarity of pre-surgery side-to-side values suggests that when pre-surgery measurements are not available, subsequent differentials between sides that exceed defined thresholds may be diagnostically useful. Further, the first indication of incipient lymphedema may occur in thorax tissue.