Assessing Skin Water of Upper and Lower Extremities via Tissue Dielectric Constant (TDC):
Suitability of Single vs. Multiple Measurements
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Objective. To determine differences in absolute and relative TDC values based on one measurement per anatomical site versus averaging duplicate or triplicate TDC values.

Background. TDC measurements are used to estimate skin water content changes in breast cancer and lower extremity lymphedema. Most prior studies used triplicate averages at each anatomical site because the suitability of single measurements was unknown. If the accuracy of one measurement was adequate then much clinical measurement time could be saved.

Methods: Females (n=25) and males (n=25) participated. Average group age (mean ± SD, N=50) was 30.6±13.4 (range, 18 to 70 years). Triplicate TDC measurements were made bilaterally at five anatomical sites representative of lymphedema development areas; anterior forearm, hand palm, lateral calf, medial calf and foot dorsum. TDC values obtained with single measurements were compared to duplicate and triplicate averages at each site (N=100). TDC dominant-to-nondominant side ratios (N =50) were also compared.

Results: Triplicate average TDC values for forearm, hand, lateral calf, medial calf and foot were respectively, 31.1±4.4, 42.7±8.2, 40.1±6.7, 34.4±5.3 and 31.6±5.3. The average percentage difference between these triplicate values and those obtained with a single measurement was less than 0.75% at all sites with a maximum SD of 4.7% at the medial calf and a minimum of 2.2% at the forearm. Dominant-to-nondominant side TDC ratios using triplicate values were respectively 1.013±0.090, 1.019±0.112, 1.019±0.163, 1.052±0.134 and 1.029±0.108. Ratios using single values differed by at most 1.5%.

Conclusions: Use single TDC values if a deviation from triplicate averages of ±5% is acceptable.