Tissue Dielectric Constant (TDC) as an Index of Skin Water in Women with and without Breast Cancer: Upper Limb Assessment via a Self-Contained Compact Measurement Device

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**Background:** Previous work showed tissue dielectric constant (TDC) measurements at 300 MHz useful to evaluate local skin water and showed a new hand-held compact version provided values similar to an original multi-probe system when assessed in healthy subjects.

**Objective:** The goals of the study were to use the compact portable device to determine its utility in assessing age-related differences between younger healthy women vs. women with breast cancer, upper-arm site differences in women with breast cancer, and its utility and limitations of a single measurement vs. averaging triplicate measurements.

**Methods:** A total of 84 women were included; 42 were young (24.0±2.4 years) self-described healthy women (group A) and 42 were older (65.5±1.6 years) women with recently diagnosed breast cancer who were awaiting surgery (group B). In both groups TDC values were assessed on the anterior forearm and in group B at the hand, forearm and biceps with all measurements bilateral and in triplicate.

**Results:** Results showed the following. 1) Forearm TDC values are similar for younger and older groups with no significant differences (NSD) between groups or between dominant and non-dominant sides or inter-arm ratios. 2) Hand TDC values are about 21% greater than forearm and biceps values but inter-arm ratios (at-risk/contralateral) are NSD among sites with values for hand, forearm and biceps of 1.027±0.180, 0.997±0.066 and 1.010±0.075 respectively. 3) Based on limits of agreement analyses, single TDC measurements are adequate for most forearm and biceps evaluations but multiple measurements are likely needed for hand measurements. 4) Theoretical detection thresholds for unilateral lymphedema using a 3SD limit of inter-arm ratios are 1.57, 1.20 and 1.24 for hand, forearm and biceps.

**Conclusion:** Forearm TDC values are similar for younger and older groups with no significant differences between groups or between dominant and non-dominant sides or inter-arm ratios, hand TDC values are 21% greater than forearm and biceps values but inter-arm ratios are not significantly different among sites, and single TDC measurements are likely adequate for most forearm and biceps evaluations but multiple measurements would be indicated for hand TDC evaluations.

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