LOCAL TISSUE WATER ASSESSED BY TISSUE DIELECTRIC CONSTANT: 
ANATOMICAL SITE AND DEPTH DEPENDENCE IN WOMEN PRIOR TO BREAST 
CANCER-RELATED SURGERY

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Background: Assessing local tissue water (LTW) from measurements of tissue dielectric constant 
(TDC) is useful to assess edema/lymphedema features and their change. Knowledge of anatomical site 
and tissue depth dependence of TDC values could extend the utility of this method. Thus our goal was 
to determine and compare TDC values obtained at anatomically paired sites and to investigate tissue 
depth dependence.

Methods: In 21 women (11 awaiting surgery for breast cancer and 10 cancer-free control subjects), 
three sites (mid-forearm-F, mid-biceps-B and lateral thorax-T) on both body sides were measured in 
triplicate with a probe having an effective sampling depth of 2.5mm. In addition, at F, four different 
probes with sampling depths of 0.5, 1.5, 2.5 and 5 mm were used. For reference, TDC values range 
from 1 for zero water to 78.5 for all water within the sample volume.

Results: Body side comparisons showed no significant dominant-nondominant TDC differences 
(p>0.10) for any site. Differences (mean +/- SD) between sides were +0.01 +/- 2.29, +0.63 +/- 1.73 and 
+0.49 +/- 3.00 for F, B and T respectively. Analysis of variance showed that TDC values at F and T 
were not different from each other (24.3 +/- 4.0 vs 24.8 +/- 5.1, p>0.8), but were both slightly greater 
than at B (21.8 +/- 3.4, p<0.05). At F, for depths 0.5 to 5.0, TDC values were each different from each 
other (p<0.001) being 36.3 +/- 4.9, 34.4 +/- 5.0, 24.4 +/- 4.4 and 21.5 +/- 4.0 respectively.

Conclusions: TDC values as an index of LTW show minor differences between corresponding sites on 
opposite body sides. These features are consistent with its potential use to assess edema/lymphedema 
and its change at various body sites. The depth dependence feature may provide new ways to 
investigate the lymphedematous condition and its progression.