A Method to Measure Local Tissue Water and its Application to Evaluate Breast Cancer Treatment-Related Lymphedema HN Mayrovitz, D Brown-Cross, E. Washington, Colleges of Medical Sciences, Allied Health and Nursing, and Medicine, NSU

Postmastectomy Lymphedema



"Recognizing lymphedema early • If untreated, gets and treating it promptly is the progressively worse best way to manage the condition'

Judith R. Caslev-Smith & J.R. Caslev-Smith





Develops secondary to surgery and/or

radiation therapy • Occurs in 20-40% of persons treated for breast cancer Onset can be from

months to years after surgery

Limb Volume or Girth Assessments Mainly for Tracking and Documenting

Available Assessment Methods



Tissue Property Changes

if volume difference > Y ml



Principle of Operation

0.5 1.5 2.5 5.0 mm



about 80 Calibrated for each probe from 1 - 80



12 women with unilateral arm lymphedema (74 ± 16 yrs) 12 premenopausal women $(25.5 \pm 3.7 \text{ vrs})$ 12 postmenopausal women (61.0 ± 6.7 yrs)



- Triplicate dielectric values on each arm with each probe
- Segment volumes determined based on frustum model
- Segmental percentage edema $V_A - V_C$ 100 x

Measurements on lymphedema patients prior to treatment Measurements on premenopausal 4 days after menses

RESULTS

40

30

20

Right or Control Arm

Premenopausal

Right or Control Arm

Left or Affected Arm

Relative Tissue Water (1.5 mm)





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RESULTS (cont) **Depth Variation**





CONCLUSIONS

This local tissue water method can serve as a rapid quantitative way to document edema/lymphedema

May also have utility for early detection of incipient lymphedema not vet clinically seen Criteria as of now for the limited data set For at-risk unilateral cases: Arm TDC ratio > 1.2

 For bilateral cases or using absolute values: Threshold depends on depth (+3 sd)

Depth 0.5 mm 1.5 mm	2.5 mm 5.0 mm
TDC >42 >37	>37 >32

Relative Tissue Water (0.5 mm)



Relative Tissue Water (2.5 mm)

40

20



Postmenonausal Lymphedema Premenonausal

Relative Tissue Water (5.0 mm)