

Background

- Lymphedema surveillance programs aim to prevent breast cancer-related lymphedema (BCRL) after high-risk interventions including axillary lymph node dissection (ALND).
- Surveillance programs utilizing indocyanine green (ICG) lymphography have demonstrated its high sensitivity in detecting lymphatic dysfunction despite otherwise normal surveillance measures, though no consensus exists in how to manage subclinical lymphatic dysfunction.
- We recruited female breast cancer survivors ≥ 2 years after ALND without a history of BCRL to obtain lymphedema surveillance measures and lymphatic imaging to inform thresholds for early intervention.

Methods

- Twenty (20) female breast cancer survivors without a history of BCRL who were treated with ALND at least two years prior to study enrollment were recruited.
- Medical and surgical treatment records were obtained.
- Volunteers underwent BCRL surveillance measures with bilateral limb volume measurements (perometry) bioimpedance measures (L-dex) to exclude BCRL diagnosis.
- Lymphatic imaging in the at-risk arm was performed with ICG lymphography and nuclear lymphoscintigraphy.

Table 1. Volunteer eligibility criteria

Inclusion Criteria	Exclusion Criteria
- Assigned female sex at birth - Identify as female - At least 18 years of age - Previous diagnosis of breast cancer - Breast cancer treated with unilateral axillary lymph node dissection (≥ 10 lymph nodes) at least 2 years prior to study enrollment	<i>Prior history of:</i> - Surgical procedures to upper extremity or axilla, other than axillary lymph node dissection - Chronic inflammatory conditions (e.g. rheumatoid arthritis) - Filarial infections - Lymphedema - Upper extremity deep vein thrombosis - Congestive heart failure - Venous thoracic outlet syndrome - Iodine allergy - Currently pregnant - Currently breastfeeding - Currently active breast cancer

Results

- The median time from ALND was 11.2 years (Q1-Q3: 4.1-14.6)
- The median number of axillary lymph nodes removed during ALND was 13.5 lymph nodes (Q1-Q3: 11-16)

Table 2. Volunteer BCRL surveillance measure and lymphatic imaging findings

BCRL Surveillance Measures	Median (Q1-Q3)
Relative Limb Volume (% Diff)	2.24 (-1.04-3.87)
At-Risk Arm L-Dex Score, Median (Q1-Q3)	-0.4 (-3.55-3.75)
At-Risk Arm Lymphatic Imaging	
Nonlinear Anatomy on ICG Lymphography, n (%)	14 (70)
Dermal Backflow on Nuclear Lymphoscintigraphy, n (%)	0 (0)

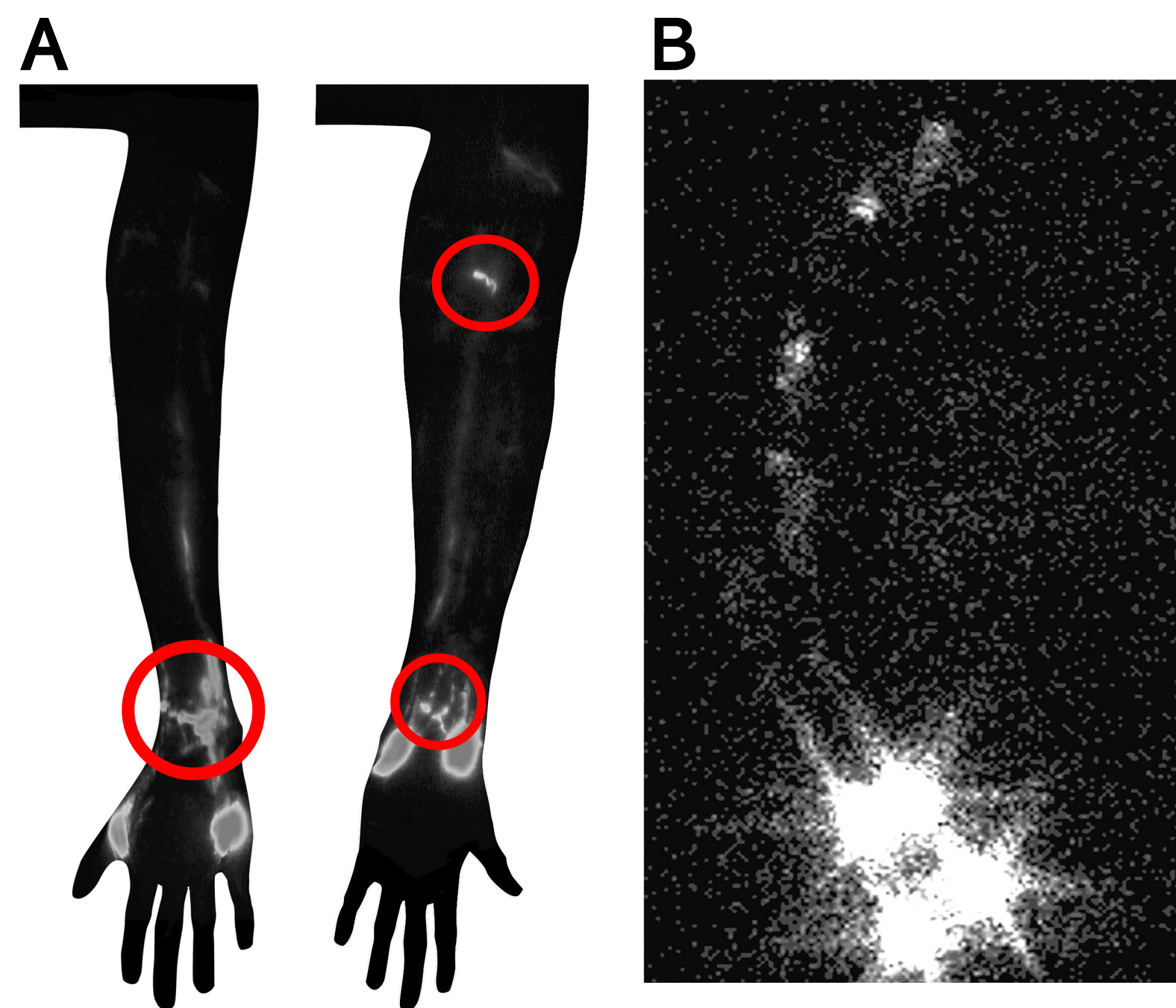


Figure 1. Lymphatic imaging of the at-risk arm of Volunteer 2020. (A) Areas of nonlinear patterns in the forearm and upper arm on ICG lymphography. (B) Drainage to twelve lymph nodes in the absence of dermal backflow on nuclear lymphoscintigraphy.

Discussion and Conclusion

- Nonlinear ICG patterns in the absence of dermal backflow on nuclear lymphoscintigram and positive BCRL surveillance measures were present in 70% of arms, suggesting they commonly develop in women without BCRL after ALND.
- Nonlinear ICG findings without positive BCRL surveillance measurements and without dermal backflow on lymphoscintigram do not warrant surgical intervention.