P-155

Long-term changes on lymphoscintigraphy and their association with clinical parameters in secondary lymphedema after breast cancer surgery

Garam Hong, MD[1]*, Koeun Lee, MD[2]*, Sangwon Han, MD, PhD[2]†, Jae Yong Jeon, MD, PhD[1]†
(†corresponding author: hswon87@naver.com, jyjeon71@gmail.com)
[1] Department of Rehabilitation Medicine, Asan Medical Center, University of Ulsan College of Medicine, Republic of Korea
[2]Department of Nuclear Medicine, Asan Medical Center, University of Ulsan College of Medicine, Republic of Korea

Introduction

- Clinical diagnosis of Breast cancer related lymphedema (BCRL) is based on physical examination and imaging studies.
- **Lymphoscintigraphy** is a first-line diagnostic imaging tool for BCRL, but the usage this modality has primarily **limited for the diagnostic purpose at initial** work-up
- Little has been reported for the **longitudinal changes** in lymphatic circulation visualized in lymphoscintigraphy

- The purpose of this study is **to investigate the relationship between long-term changes in pattern of lymphoscintigraphy and clinical features in patients with BCRL**

Methods

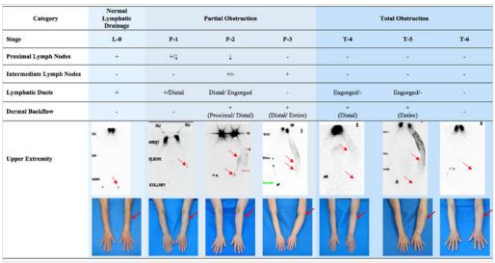
Design
- Single-center retrospective study
- Patients with BCRL who underwent lymphoscintigraphy between March 2008 and May 2022

Inclusion criteria
- Secondary lymphedema after breast cancer surgery
- Patients who underwent baseline and follow-up lymphoscintigraphy

Exclusion criteria
- Intervening axillary node dissection
- Surgical lymphovenous anastomosis and/or lymph node transplantation were performed
- Bilateral lymphedema

Arm evaluation with circumference
- The circumference of the upper limb was measured at multiple locations selected from 5, 10 cm above or 5, 10, 15 cm below elbow from the lateral epicondyle level
- The percentage of excess circumference (PEC) was calculated as follows
- PEC = ([circumference of the affected side – circumference of the unaffected side]/circumference of the unaffected side) × 100%.

Lymphoscintigraphy acquisition
- images were obtained at 1 and 2 hours after subcutaneous injection of **99mTc-pyphate**
- According to the Taiwan lymphoscintigraphy stage proposed by Cheng et al, each image was categorized into 0–6 stages.



Results

- **87 patients** were included in our analysis

Table 1. Patient characteristics

Variables	Median (IQR) or *n* (%)
Age at baseline	48 (43, 55)
Female sex	87 (100%)
BMI at baseline LSG (kg/m^2)	23.2 (21.7, 26.2)
BMI at follow-up LSG (kg/m^2)	23.5 (21.3, 26.2)
T stage (Tis/1/2/3/4)	2/18/44/14/4 (2/21/51/16/5%)
N stage (N0/1/2/3)	13/32/26/11 (15/37/30/13%)
Surgery	
Breast-conserving operation	40 (46%)
Mastectomy	47 (54%)
Axillary lymph node dissection	75 (86%)
Number of dissected lymph node†	16 (11, 19)
Nodal radiation	60 (69%)
Chemotherapy	82 (94%)
Cellulitis	23 (26%)
Poor compliance	19 (22%)
Interval between surgery and LSG (mo.)	7 (2, 14)
Interval between surgery and follow-up LSG (mo.)	78 (49, 116)

- Both lymphoscintigraphy stage and PEC showed vari**able change during the study period, with overall increases in their severity** (median PEC: 3.8–13.4%; median lymphoscintigraphy stage: 1 to 4).

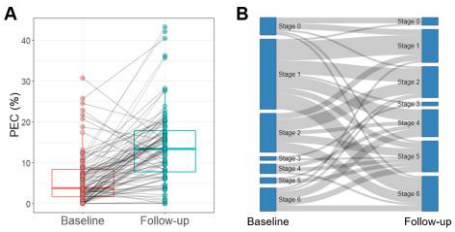


Fig. 1 Boxplot showing changes in PEC (A) and a Sankey plot illustrating changes in lymphoscintigraphic stage (B) between baseline and follow-up.

- PEC and lymphoscintigraphy stage showed **positive correlations** at baseline (rho = 0.27, P=0.001) and follow-up (rho = 0.50, P<0.001).

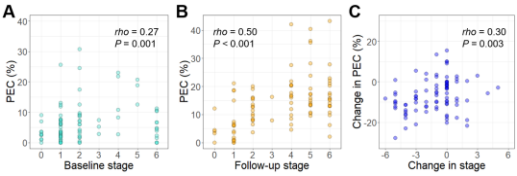


Fig. 2 Scatter plots comparing PEC and lymphoscintigraphic stage at baseline (A), follow-up (B), and change in PEC and change in stage between baseline and follow-up (C).

- Stepwise multivariable analysis revealed **cellulitis** (adjusted β: 4.34; 95% confidence interval [CI]: 0.77–7.91) and **lymphoscintigraphy stage at follow-up** (adjusted β: 1.47; 95% CI: 0.67–2.28) to be **independent variables for PEC at follow-up.**

Table 2. Results of univariable and multivariable linear regression analyses for prediction of PEC at follow-up lymphoscintigraphy

	Univariable		Multivariable	
Variables	Crude β (95% CI)	*P*	Adjusted β (95% CI)	*P*
Interval between surgery and lymphoscintigraphy (mo.)	0.04 (0.01, 0.07)	0.024	Not included	
BMI (kg/m^2)	0.11 (−0.41, 0.64)	0.673		
ALND (vs SNB)	4.88 (−0.44, 10.19)	0.072	Not included	
Nodal radiation (vs none/non-nodal)	5.19 (1.4, 8.97)	0.008	Not included	
Chemotherapy (vs none)	7.11 (−1.35, 15.57)	0.098	Not included	
Bandage compression at follow-up (vs not)	4.28 (0.7, 7.86)	0.020	Not included	
Cellulitis (vs none)	4.97 (1.04, 8.89)	0.014	4.34 (0.77, 7.91)	0.018
Poor compliance (vs not)	5.68 (1.5, 9.86)	0.008	2.96 (−0.57, 6.49)	0.099
Lymphoscintigraphy stage at baseline	0.98 (0.05, 1.9)	0.039	0.63 (−0.17, 1.43)	0.121
Lymphoscintigraphy stage at follow-up	1.98 (1.19, 2.78)	<0.001	1.47 (0.67, 2.28)	0.001
Change in lymphoscintigraphy stage	−0.84 (−1.61, −0.07)	0.033	Not included	

Conclusion

- Clinical courses and patterns of lymphoscintigraphy and clinical features varied over time in patients with BCRL.

- In addition to initial lymphoscintigraphy for the diagnostic purpose, follow-up lymphoscintigraphy can objectify and visualize diverse changes in functional lymphatic system, which may help categorize the clinical severity and guide the optimal management plan in patients with BCRL.

Acknowledgement

This research was supported by a grant from the Korea Health Technology R&D Project through the Korea Health Industry Development Institute (KHIDI), funded by the Ministry of Health & Welfare, Republic of Korea (grant number: HR18C0016). The authors have no potential conflicts of interest.