Pneumatic Compression–Assisted Lymphoscintigraphy for Quantitative Evaluation of Breast Cancer–Related Lymphedema

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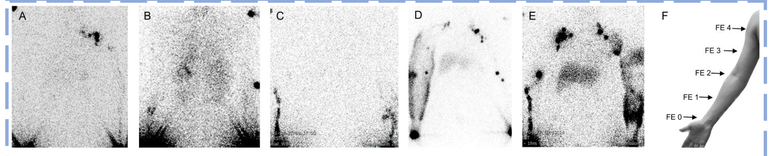
Introduction

- Acquired lymphedema of upper extremity is a chronic pathologic status that frequently occurs after breast cancer treatment.
- Reliable and quantitative evaluation of lymphedema is crucial for successful management of patients.
- Although lymphoscintigraphy is the primary investigation for the confirmation and evaluation of lymphedema, the specific protocol of stress intervention is not well established.
- This study aims to introduce intermittent pneumatic compression (IPC) as a part of stress lymphoscintigraphy and compare the effectiveness of conventional stress lymphoscintigraphy(CSL) and pneumatic compression–assisted lymphoscintigraphy (PCAL).

Method

- Our study was designed as a retrospective analysis of 85 breast cancer patients with lymphedema who underwent lymphoscintigraphy utilizing either IPC device or conventional stress maneuver and received complex decongestive therapy.
- The flow extent of the lymphatic fluid (FE) was evaluated using a 0- to 4-point scale based on lymphoscintigraphic images.
- The visualization of lymph nodes was also assessed.
- The clinical outcomes were evaluated by changes in side-to-side circumferential and volume differences of upper extremities and compared between groups.

Figure 1. Lymphoscintigraphic findings of the FE

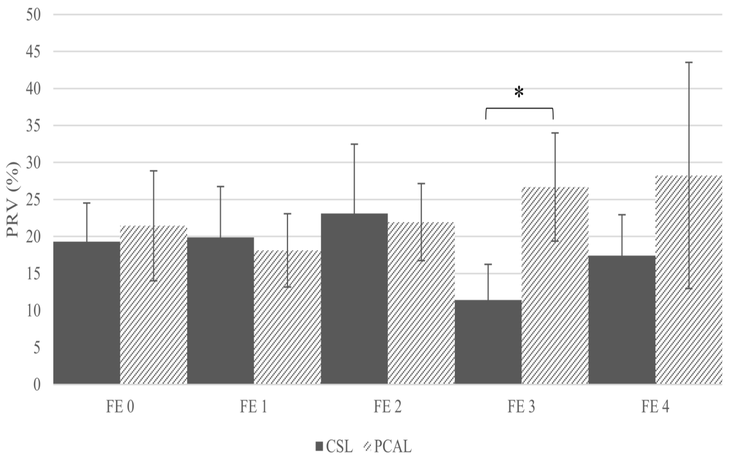


Lymphoscintigraphic findings of the FE 0, NV group (A); the FE 1, NV group (B); the FE 2, NV group (C); the FE 3, V group (D); the FE 4; V group (E). All images represent the anterior-posterior (AP) projection images of the participants. F, The flow extent of lymphatic fluid was defined based on anatomical landmarks of the upper extremity: below the wrist (FE 0), above the wrist and below midlevel of the forearm(FE 1), abovemidlevel of the forearmand belowthe cubital crease (FE 2), above the cubital crease and below midlevel of the upper arm (FE 3), and above midlevel of the upper arm (FE 4). FE, flow extent of lymphatic fluid; NV, lymph node nonvisualized group; V, lymph node visualized group. Arrow (→) serves as an imaginary demarcation line for grading of lymphatic fluid flow extent.

Result

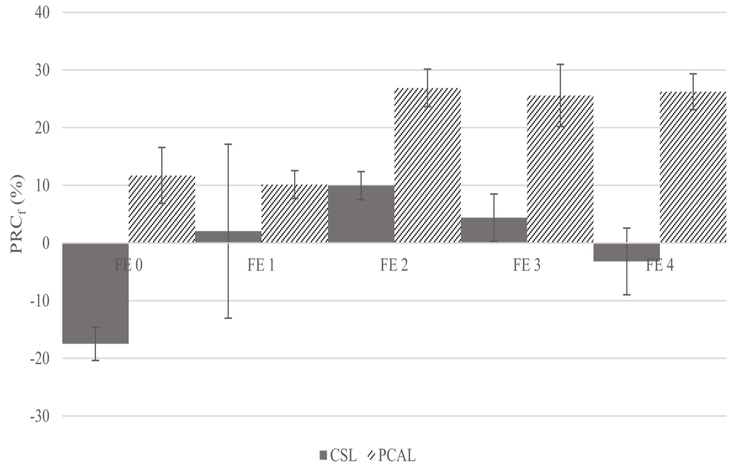
- Of 85 patients, 47 underwent CSL, and 38 underwent PCAL.
- Participants with relatively preserved flow extent of the lymphatic fluid (FE 3) showed a significant difference in percentage reduction of volume (PRV) between CSL and PCAL groups (P = 0.036).
- In the other groups,CSL and PCAL demonstrated comparable differences in PRV without statistical significance.

Figure 2. Percentage reduction of volume (PRV, %)



Comparison of PRV (%) between the CSL group and the PCAL group. CSL, conventional stress lymphoscintigraphy; FE, flowextent of lymphatic drainage; PCAL, pneumatic compression–assisted lymphoscintigraphy; PRV, percentage reduction of volume. Statistical difference between the CSL group (11.43 ± 9.59) and the PCAL group (26.68 ± 14.60) was observed among the participants with FE 3 (P = 0.036). Values are mean ± SD.

Figure 3. Percentage reduction of forearm circumference (PRC_f, %)



Comparison of percentage reduction of forearm circumference (%) between the CSL group and the PCAL group. CSL, conventional stress lymphoscintigraphy; FE, flow extent of lymphatic drainage; PCAL, pneumatic compression–assisted lymphoscintigraphy.

Conclusion

- Our study suggests that participants in the PCAL group with relatively preserved lymphatic flow extent (FE 3) had better PRV compared with those in the CSL group. The use of IPC devices in lymphoscintigraphy with the novel stress maneuver can help in the quantitative description of lymphedema status and the selection of an appropriate treatment method.