

The fluid movement and changes in tissue stiffness in lower limb lymphedema under IPC

Marzanna T. Zaleska, PhD, DSc

Medical Research Institute, Polish Academy of Sciences, Warsaw, Poland, National Medical Institute of the Ministry of Interior and Administration, Warsaw, Poland,

Juzo Competence Center, Warsaw, Poland

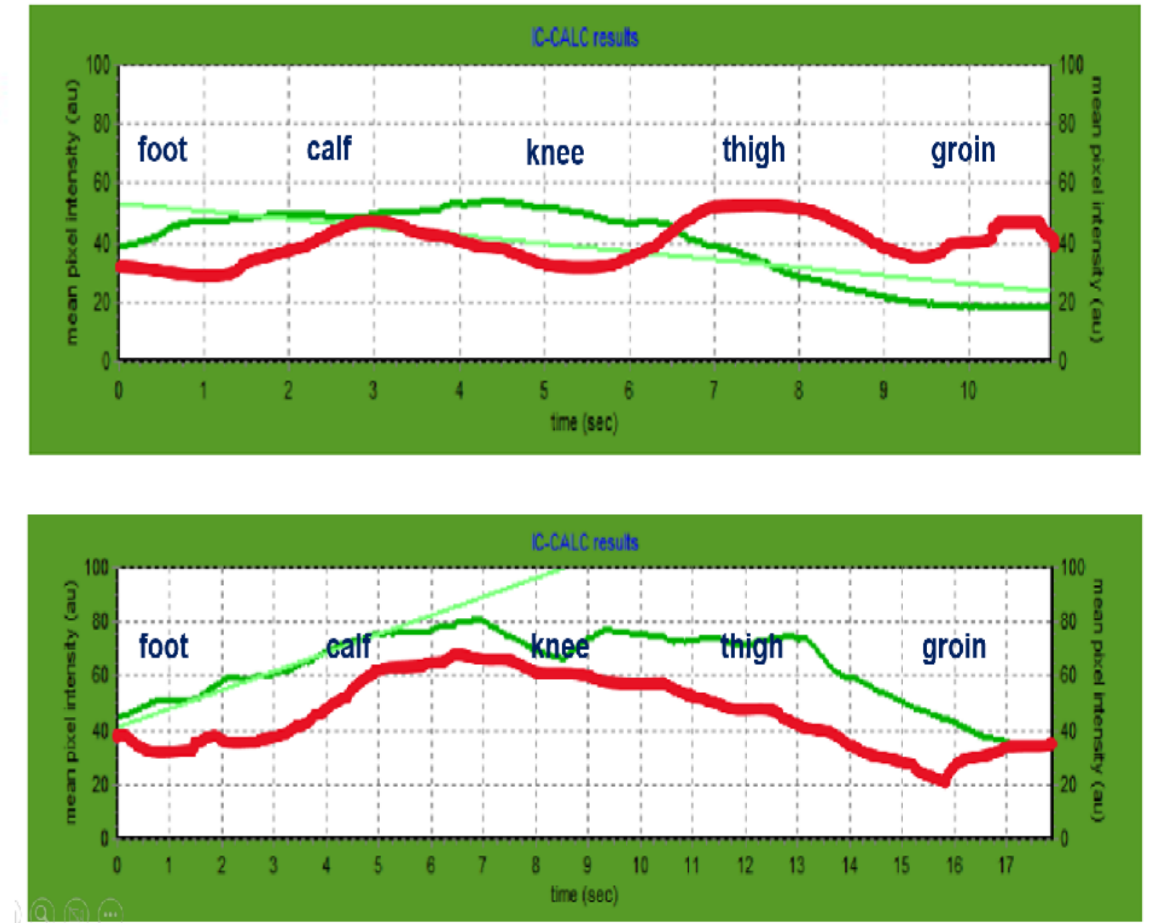
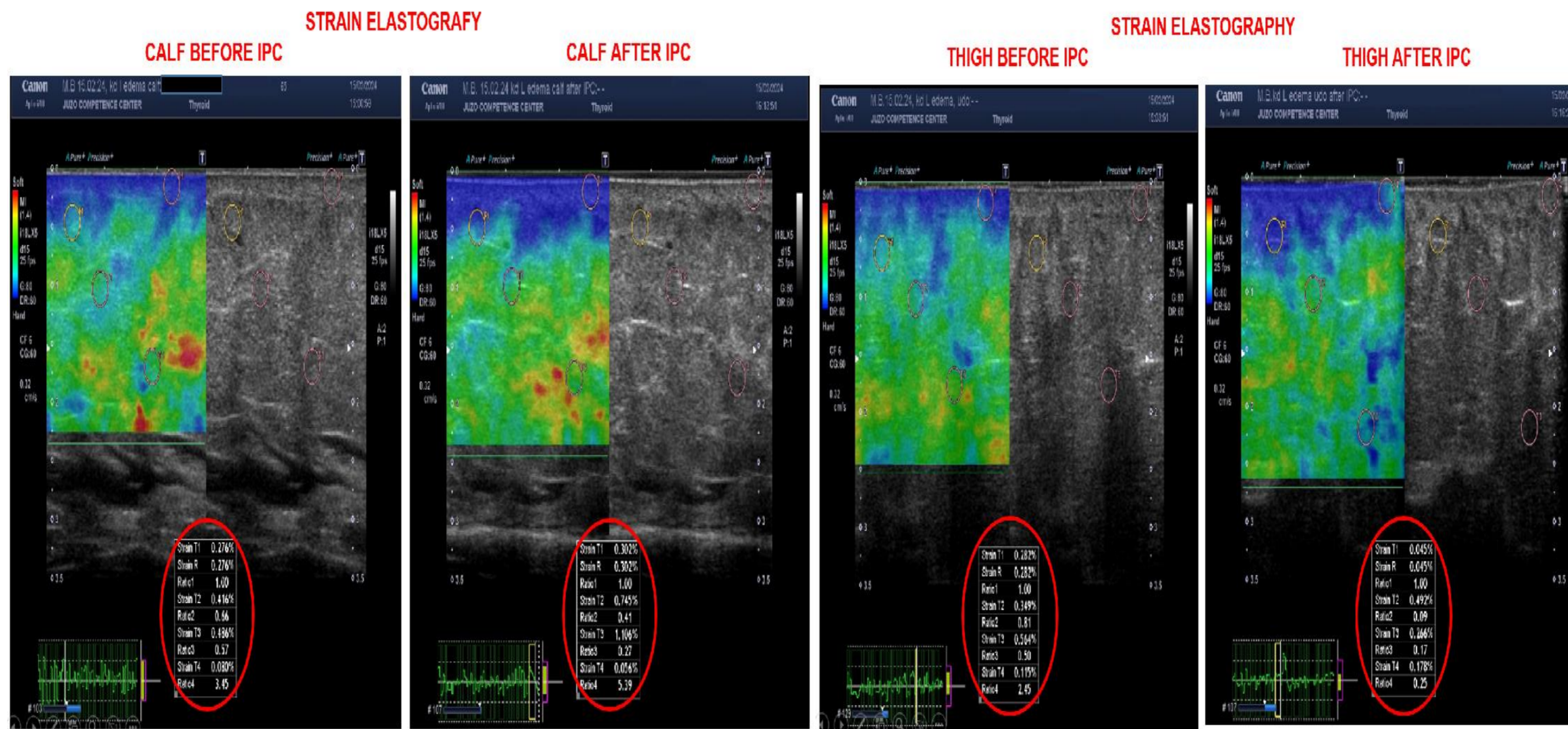
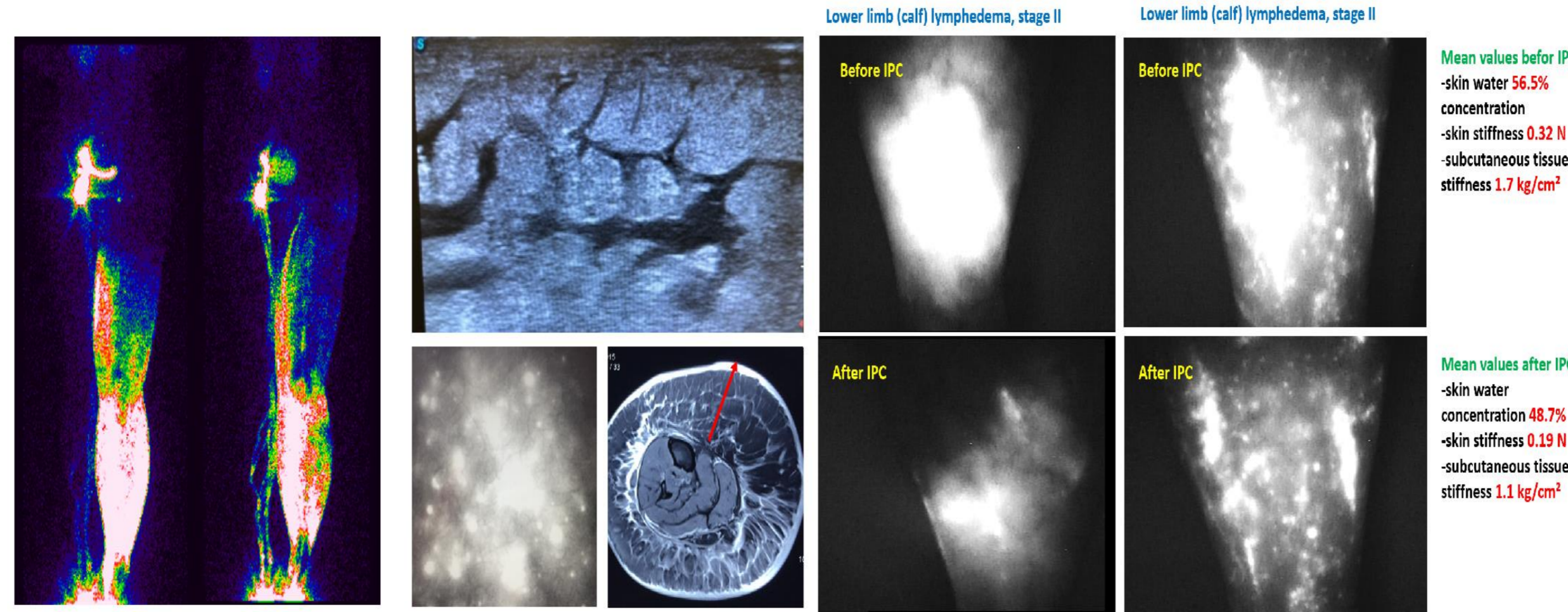
Lower limbs lymphedema stage III, after prostatectomy
Green line- Fluorescent Intensity before IPC, red line-Fluorescent Intensity after IPC (45 min, 80 mmHg)

Background. The most common causes of lower limb lymphedema are tissue inflammation, cancer therapy with lymphadenectomy and radiation, obesity, and venous insufficiency. Consequently, tissue fluid with biologically active factors accumulates in tissue spaces. Not evacuated regularly leads to cell proliferation and tissue remodeling, making lymphedema challenging to treat. The primary conservative methods for tissue fluid evacuation are different types of compression, including IPC.

Aim. We aimed to evaluate the effect of Intermittent Pneumatic Compression on fluid movement along the entire limb on ICG lymphography and how it influences tissue elasticity.

Materials and Methods. We investigated 16 patients with lower limbs of different etiology in stage II-III. In all patients, we did ICG lymphography. The observation and recording were done immediately after injection and after a one-hour walk. Then, the IPC was applied for 45 minutes with a pressure of 80 mmHg, and the recording was repeated. In selected regions in the middle calf and thigh, we measured skin water concentration, skin and subcutaneous tissue stiffness, and skin stiffness in USG Strain elastography (SE).

On ICG lymphography, we concentrated on fluorescent intensity along the entire limb with a correlation in changes in water concentration and skin and subcutaneous tissue stiffness.



Results. After an hour's walk, we observed the accumulation of fluid (dermal backflow) covering entire limbs in 9 patients, in 5 patients, in the feet and the calf without visible lymph vessels above, in one only in the foot and one the dilated lymphatic vessels were seen. After 45 min IPC, we observed a decrease in fluorescent intensity (10-30%) in 13 patients (80%) and no visible changes in the remaining patients. The changes in strain ratio were seen in most patients in both measured limb areas. The skin water concentration and skin and subcutaneous tissue stiffness decreased even in patients without visible fluorescent intensity.

Conclusions. Intermittent Pneumatic Compression can effectively evacuate edema fluid from most distal parts of the limbs and reduce tissue stiffness and prevent development of advanced tissue fibrosis and ulceration.