

First experience with fused ultrasound / freehand SPECT system for hybrid lymphatic mapping in breast cancer patients

A. Okur¹, C. Gerngroß¹, A. Schnelzer², A. Ehlerding², M. Keicher³,
S. Wiesner³, S. Paepke², K. Scheidhauer¹, T. Wendler^{3, 4}

¹ Technische Universität München, Nuklearmedizin, München, DE

² Technische Universität München, Frauenklinik, München, DE

³ SurgicEye GmbH, R&D, München, DE

⁴ Leiden University Medical Center, Radiology, Leiden, NL

AIM

Today no image-based staging of axillary nodes in breast cancer patients is possible due to the lack of a proper ultrasound (US) / SPECT combination. Goal of this work is to evaluate the feasibility of hybrid lymphatic mapping using novel prototype of fused US / freehand SPECT (fhSPECT).

METHODS

A US device (LOGIQ E9, GE, USA) including an electromagnetic positioning system was modified to register and display fhSPECT (declipseSPECT, SurgicEye, Germany) images overlaid on the US plane. Since the fhSPECT uses an optical positioning system, a combined optical electromagnetic reference was constructed, which enabled an automatic registration of the two modalities. 5 breast cancer patients with indicated lymphatic mapping using Tc-99m-nanocol (88-144 MBq) were imaged with the combined system (first fhSPECT, then US) shortly after planar imaging. Findings of all imaging modalities were analyzed.

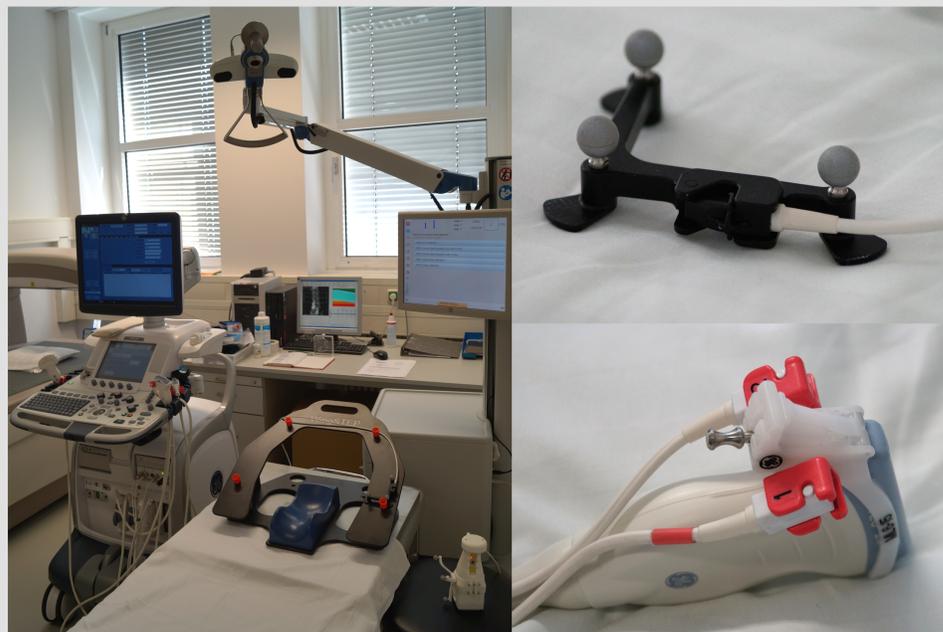


Figure 1. Devices used in this study (left). Reference target used for the fusion of the two modalities (top right). Electromagnetically tracked US probe (bottom right).

RESULTS

6 axillary sentinel nodes (SNs) were depicted in planar and fhSPECT images (1 patient with 2 SNs, all other 1 SN). Registration of fhSPECT images and US succeeded in 4 of 5 cases. The failure was due to a significant movement of the patient between the fhSPECT and the US scans. Combined images allowed distinguishing SNs from non-SNs in all 4 registered patients.

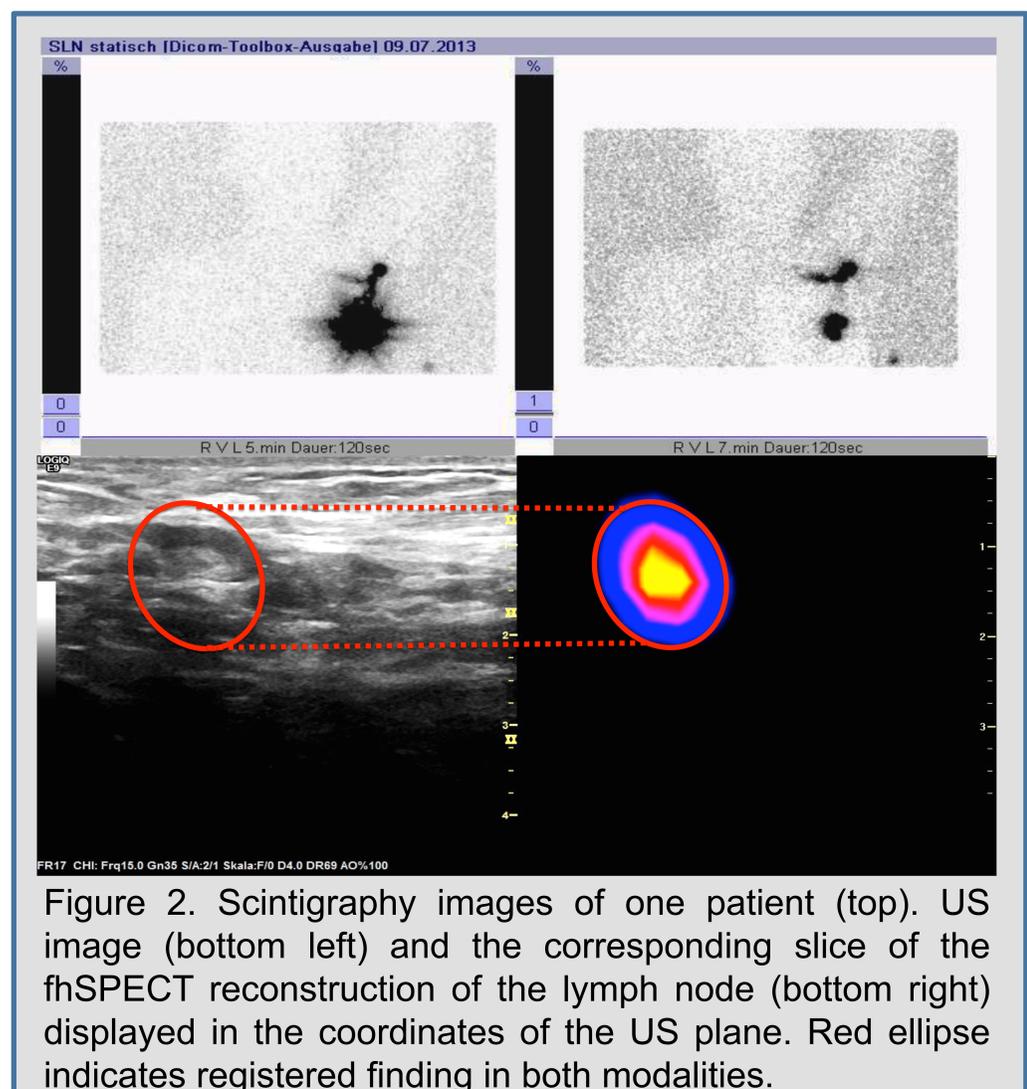


Figure 2. Scintigraphy images of one patient (top). US image (bottom left) and the corresponding slice of the fhSPECT reconstruction of the lymph node (bottom right) displayed in the coordinates of the US plane. Red ellipse indicates registered finding in both modalities.

CONCLUSION

Fused US / fhSPECT imaging is feasible in lymphatic mapping of the axilla in breast cancer patients. The fact that the fhSPECT and the US are not acquired simultaneously requires a fixed position of the patient during the whole procedure. For the first time the presented system is capable of acquiring dynamic hybrid images of SNs inside the human body. This system may avoid a significant number of unnecessary surgical biopsies of SNs [1, 2].

LITERATURE

[1] van Rijk MC, Deurloo EE, Nieweg OE, Gilhuijs KG, Peterse JL, Rutgers EJ, Kröger R, Kroon BB. Ann Surg Oncol. 2006 Jan; 13(1):31-5.

[2] Voit C, Kron M, Schäfer G, Schoengen A, Audring H, Lukowsky A, Schwürzer-Voit M, Sterry W, Winter H, Rademaker J. Ann Surg Oncol. 2006 Dec;13(12):1682-9.