

Shear-Wave Elastography Features of Primary Non-Hodgkin's Lymphoma of the Breast: A Case Report and Literature Review

YUDDONG KIM¹, KYUNG HEE KO², HAE KYOUNG JUNG³, HYUN JU LEE⁴

ABSTRACT

Lymphoma is a rare malignancy of the breast, comprising approximately 0.04 to 0.5% of breast malignancies. Because the clinical findings of breast lymphoma are nonspecific and similar to those of breast carcinoma, it is important to distinguish breast lymphoma from other breast disease on the basis of radiologic findings. Elastography is an interesting imaging tool that reflects the tissue stiffness, increasingly being used in the evaluation of breast tumours. However, only a limited number of studies have focused on the elastographic findings of breast lymphoma. In this report, we review the radiologic characteristics of primary breast lymphoma including elastographic feature. A 57-year-old woman presented with a painless palpable mass of the left breast. Ultrasonography revealed an irregular-shaped complex cystic and solid mass with increased vascularity in upper outer breast. On shear wave elastography, the mass was relatively stiff with maximum elasticity value (E_{max}) of 100.5 kilopascal (kPa). The mass was confirmed as diffuse large B-cell lymphoma by US-guided core needle biopsy.

CASE REPORT

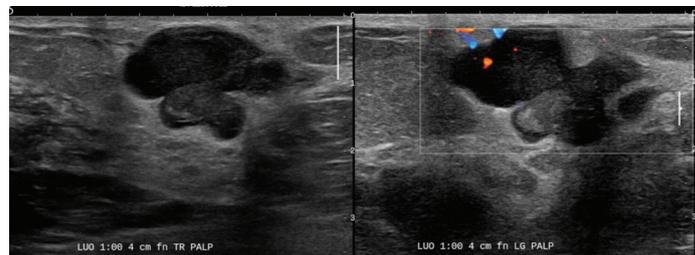
A 57-year-old woman presented with a painless palpable mass of the left breast. This lesion was first recognized by the patient 2 months ago and has shown recent enlargement. Other than a history of total laparoscopic hysterectomy 5 years ago for cervical cancer, she had no remarkable medical history. The physical examination confirmed a palpable soft mass in the left upper outer breast. There was no skin retraction or redness at the overlying skin and there was no ipsilateral axillary lymphadenopathy.

Mammography showed an irregular-shaped hyperdense mass with indistinct and partially obscured margin at the left upper outer breast [Table/Fig-1]. Conventional B-mode ultrasound (US) and Shear-Wave Elastography (SWE) were performed using Aixplorer ultrasound system (SuperSonic Imagine, Aix en Provence, France) with a 4 to 15 MHz linear array transducer. US revealed a 3.5cm sized complex cystic and solid mass with a partially indistinct and angular margin. It showed mainly posterior acoustic enhancement with parallel orientation. Colour Doppler image showed vessels in peripheral portion of the mass and rim [Table/Fig-2]. SWE showed

Keywords: B-cell lymphoma, Breast, Stiffness, Ultrasonography

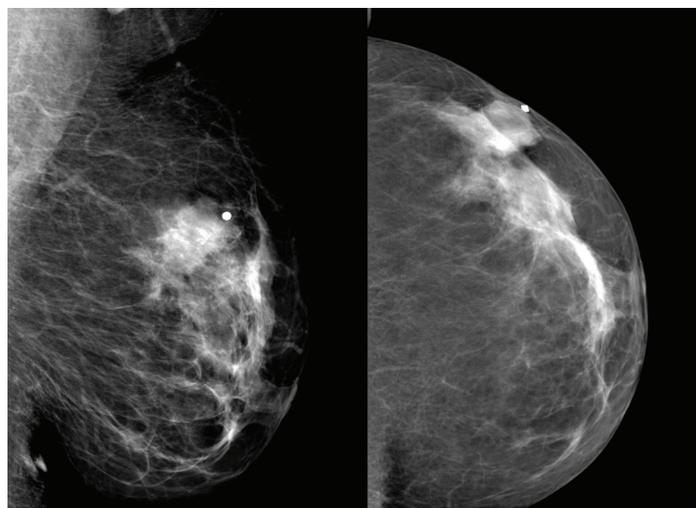
that the periphery of the mass was relatively stiff, with maximum elasticity value (E_{max}) of 100.5 kilopascal (kPa). The mean elasticity value (E_{mean}) was 93.6 kPa and median elasticity ratio which is the ratio of the E_{mean} in the stiffest portion of the lesion to the E_{mean} in the similar Region of Interest (ROI) in fat, was 24.52 [Table/Fig-3].

The mass was categorized as Category 4b by Breast Imaging

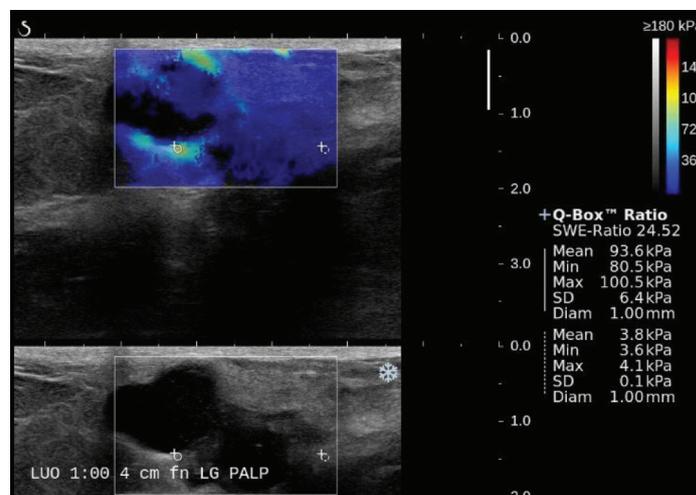


[Table/Fig-2]: Ultrasonography of a 57-year-old woman with primary non-Hodgkin's lymphoma of breast.

a. Conventional ultrasonography showed a complex cystic and solid mass with focal indistinct and angular margin and posterior acoustic enhancement.
b. Colour flow image shows vessels in peripheral portion of the mass and rim.



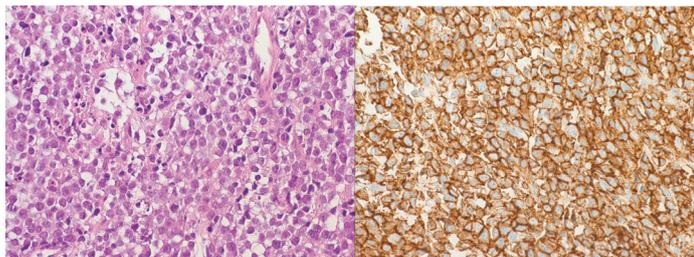
[Table/Fig-1]: Mammography of a 57-year-old woman with painless palpable mass. Lt mediolateraloblique (MLO) view (a) and craniocaudal (CC) view (b) show an irregular-shaped hyperdense mass with obscured margin in the left upper outer breast (arrows).



[Table/Fig-3]: The colour overlay of SWE image with underlying B-mode image showed that the periphery of the mass is relatively stiff (arrows), with E_{max} of 100.5 kPa and E_{mean} was 93.6 kPa. The median elasticity ratio which is the ratio of the E_{mean} in the stiffest portion of the lesion to the E_{mean} in the similar region of interest (ROI) in fat was 24.52.

Reporting and Data System (BI-RADS) lexicon and US guided core needle biopsy was performed with 14 gauge-needle. It was confirmed as diffuse large B-cell lymphoma on pathology [Table/Fig-4].

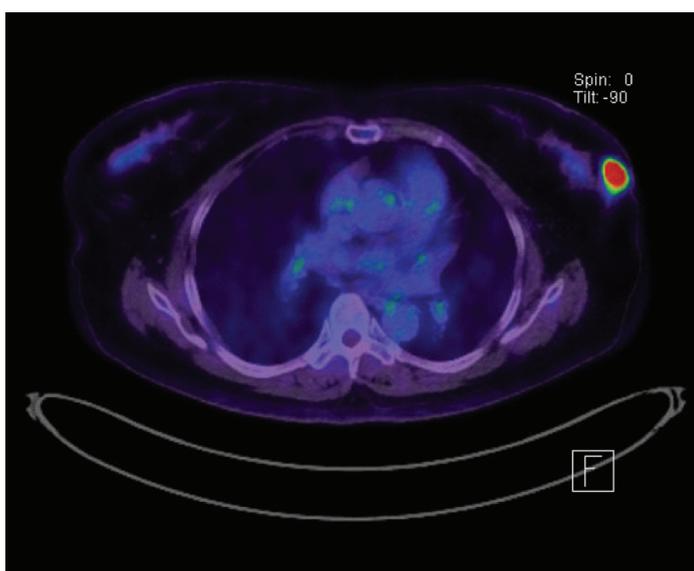
For evaluating extra mammary origin involvement, fluorine 18 (18F) Fluorodeoxyglucose (FDG) Positron Emission Tomography (PET) CT was performed. Focal avid uptake was noted at her left breast mass with a maximum Standard Uptake Value (SUV) of 25.1 [Table/Fig-5]. In addition, another hypermetabolic focus was also noted at the gallbladder with SUV of 10.7. The gallbladder was removed by laparoscopic radical cholecystectomy and confirmed as adenocarcinoma invading the gallbladder muscular layer without lymph node metastasis. The patient is being treated with chemotherapy using the rituximab-cyclophosphamide, doxorubicin hydrochloride, vincristine sulphate and prednisone (R-CHOP) regimen.



[Table/Fig-4]: Photomicrograph of a biopsy specimen of the solid portion of breast mass.

a. Tumour cells have a diffuse growth pattern, large nuclei, open chromatin, and prominent nucleoli (H&E, x400).

b. On immunohistochemical staining, the tumour cells show diffuse surface positivity for CD20 (x400).



[Table/Fig-5]: On PET-CT, focal avid uptake was noted at her left breast mass with a maximum standard uptake value (SUV) of 25.1.

DISCUSSION

Up to 94% of breast lymphomas are of B-cell origin. Most of the B-cell lymphomas of the breast present as painless palpable masses as in this case, whereas the less common T-cell lymphomas of the breast are associated with skin changes, edema, or localized pain [1].

Because the clinical findings of breast lymphomas are nonspecific and similar to those of breast carcinoma, it is important to distinguish breast lymphoma from other breast disease on the basis of radiologic findings.

The predominant imaging findings of breast lymphoma are variable among different studies. In this case, the mammography showed solitary irregular shaped hyperdense mass without internal calcification, and the US showed irregular complex cystic and solid mass with indistinct margin and mixed posterior acoustic

attenuation. These features are consistent with the previous study by Yang et al., [2]. Differentiating breast lymphomas from other breast malignancies such as invasive ductal carcinoma could be challenging due to the variable imaging findings of both entities. However, like in this case, features such as calcification, spiculations, or architectural distortion which are commonly noted in invasive ductal carcinoma are extremely rare in breast lymphoma and therefore can be useful in differential diagnosis [1].

Breast elastography can evaluate tumour or tissue stiffness in addition to morphology and vascularity, which can be assessed by conventional ultrasound. Among the various methods for performing elastography, the SWE is considered most reproducible and objective, which allows measurement of the propagation speed of shear-wave within the tissue to locally quantify its stiffness in kilopascals or meters per second [3]. Many recent studies have reported that additional SWE improves the diagnostic accuracy in differential diagnosis of breast masses and reduce unnecessary biopsies [4]. Moreover, several studies reported about the relation between mean stiffness and the different tumour subtypes or immunohistochemical profile [5].

To the authors' knowledge, this is the first published case to report on the SWE findings of breast lymphoma, although there is one published case using acoustic radiation force impulse imaging on a B-cell lymphoma of the breast [6]. Another case report used strain elastography for evaluation of T-cell lymphoma of the breast [7]. In those cases, they showed typical stiffness on elastography.

In our case, the SWE images showed that the mass was relatively stiff (yellow) with E_{max} of 100.5 kPa and E_{mean} of 93.6 kPa. Comparing with previous reported studies, these values were included in elasticity range of breast malignancies (79.2kPa~182.2kPa), but not as high as an average of invasive ductal cancers (144.50) [3]. This might be affected by the complex cystic echogenicity of this case. In addition, our case had no architectural distortion from desmoplastic response with fibrosis which can produce surrounding tissue stiffness. On the contrary, the subacute panniculitis like T-cell lymphoma of the breast reported by Uematsu [7] showed typical stiffness on static elastography with Tsukuba elasticity score 4, because the mass had irregular, ill-defined margin with associated fibrotic reaction. Breast cancers can have a broad variety of stiffness according to the tumour size, tumour grade, amount of necrosis or fibrosis, and histologic tumour types [5,8].

CONCLUSION

We described features of rare case of primary B-cell lymphoma of breast, exhibiting internal complex cystic and solid echogenicity with irregular indistinct margin. On SWE, the mass was relatively stiff but not as stiff as typical invasive ductal cancers because of histologic characteristics. To analyse SWE characteristics of primary breast lymphoma, large scale prospective study should be necessary.

REFERENCES

- [1] Shim E, Song SE, Seo BK, Kim YS, Son GS. Lymphoma affecting the breast: a pictorial review of multimodal imaging findings. *Journal of breast cancer*. 2013;16(3):254-65.
- [2] Yang WT, Lane DL, Le-Petross HT, Abruzzo LV, Macapinlac HA. Breast lymphoma: imaging findings of 32 tumours in 27 patients. *Radiology*. 2007;245(3):692-702.
- [3] Lee EJ, Jung HK, Ko KH, Lee JT, Yoon JH. Diagnostic performances of shear wave elastography: which parameter to use in differential diagnosis of solid breast masses? *European Radiology*. 2013;23(7):1803-11.
- [4] Berg WA, Cosgrove DO, Dore CJ, Schafer FK, Svensson WE, Hooley RJ, et al. Shear-wave elastography improves the specificity of breast US: the BE1 multinational study of 939 masses. *Radiology*. 2012;262(2):435-49.
- [5] Evans A, Whelehan P, Thomson K, McLean D, Brauer K, Purdie C, et al. Invasive breast cancer: relationship between shear-wave elastographic findings and histologic prognostic factors. *Radiology*. 2012;263(3):673-77.
- [6] Gkali CA, Chalazonitis AN, Feida E, Giannos A, Sotiropoulou M, Dimitrakakis C, et al. Primary non-hodgkin lymphoma of the breast: ultrasonography, elastography, digital mammography, contrast-enhanced digital mammography, and pathology findings. *Ultrasound quarterly*. 2015;31(4):279-82.

- [7] Uematsu T, Kasami M. 3T-MRI, elastography, digital mammography, and FDG-PET CT findings of subcutaneous panniculitis-like T-cell lymphoma (SPTCL) of the breast. *Japanese Journal of Radiology*. 2012;30(9):766-71.
- [8] Ko KH, Jung HK, Kim SJ, Kim H, Yoon JH. Potential role of shear-wave ultrasound elastography for the differential diagnosis of breast non-mass lesions: preliminary report. *European Radiology*. 2014;24(2):305-11.

PARTICULARS OF CONTRIBUTORS:

1. 3rd Grade Resident, Department of Radiology, CHA Bundang Medical Center, CHA University, School of Medicine, Gyeonggi-do, South Korea.
2. Associate Professor, Department of Radiology, CHA Bundang Medical Center, CHA University, School of Medicine, Gyeonggi-do, South Korea.
3. Assistant Professor, Department of Radiology, CHA Bundang Medical Center, CHA University, School of Medicine, Gyeonggi-do, South Korea.
4. Fellow, Department of Radiology, CHA Bundang Medical Center, CHA University, School of Medicine, Gyeonggi-do, South Korea.

NAME, ADDRESS, E-MAIL ID OF THE CORRESPONDING AUTHOR:

Dr. Kyung Hee Ko,
CHA Bundang Medical Center, CHA University, School of Medicine,
351 Yatapdong, Bundang-gu, Seongnam-si, Gyeonggi-do 463-712, South Korea.
E-mail: yourheeya@cha.ac.kr,

Date of Submission: **Jul 12, 2016**Date of Peer Review: **Aug 04, 2016**Date of Acceptance: **Sep 17, 2016**Date of Publishing: **Dec 01, 2016****FINANCIAL OR OTHER COMPETING INTERESTS:** None.