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Case report

Case reports of shear-wave elastography (SWE) features of lymphoma involving the breast

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ABSTRACT

Breast lymphoma is a rare malignancy that is often difficult to distinguish from other breast diseases. Elastography has been proven to facilitate the diagnosis of breast lesions. However, only few reports have focused on the elastographic features of breast lymphoma. Therefore, we herein present 2 cases of breast lymphomas with a focus on the elastographic findings.

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Introduction

Lymphoma very rarely involves the breast. Mammography, ultrasound and magnetic resonance imaging (MRI) of breast lymphoma have already been reported [1–3]. However, elastographic findings of breast lymphoma have rarely been disseminated in case reports or case series. The reports thus far have shown variable elasticity of breast lymphoma [4–8]. This report presents the elastographic features of 4 diffuse large B-cell lymphomas involving the breast in 2 patients.

Case 1

A 35-year-old woman presented with several palpable masses of the right breast. These masses had been recognized by the patient 2 weeks ago. She had no remarkable medical history. Conventional B-mode ultrasonography (US), color Doppler imaging and shear-wave elastography (SWE) were performed with an Aixplorer (SuperSonic Imagine, Aix en Provence, France) using 15 MHz transducer. US showed an 3.4 cm heterogeneous hypoechoic oval mass and partially indistinct/circumscribed margins in the upper central area of right

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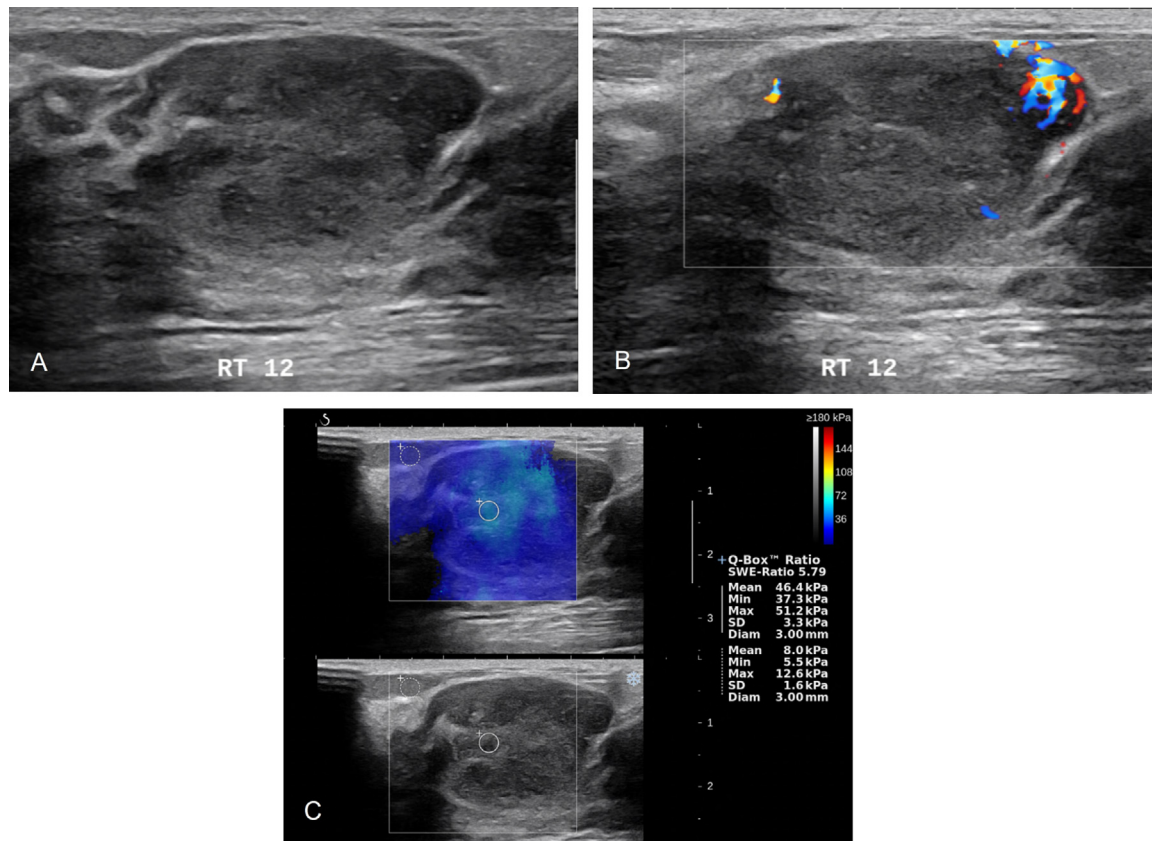


Fig. 1 – US of a 35-year-old woman with breast lymphoma. (A) Conventional US shows an oval heterogeneous hypoechoic mass with circumscribed, partially indistinct margins and posterior acoustic enhancement in upper center area of right breast. (B) Color Doppler imaging shows vessels in the peripheral portion of mass. (C) SWE image shows E_{\max} of 51.2 kPa, E_{mean} of 46.4 kPa, and mean elasticity ratio of 5.79.

breast. Color Doppler imaging showed vascularity in the peripheral portion of the mass. SWE showed a maximum elasticity (E_{\max}) of 51.2 kilopascal (kPa) and a mean elasticity value (E_{mean}) of 46.4 kPa. The mean elasticity ratio, which is the ratio of the E_{mean} in the stiffest portion of lesion to the E_{mean} in fat, was 5.79 (Fig. 1). US also revealed a 1.4 cm markedly hypoechoic oval mass with circumscribed margin and peripheral and internal vascularity in the upper inner area of the right breast. For this, SWE showed an E_{\max} of 49.2 kPa, an E_{mean} of 29.4 kPa and a mean elasticity ratio of 4.77 (Fig. 2). These masses were categorized as Category 4A according to the Breast Imaging Reporting and Data System lexicon [9]. In addition to these 2 masses, there were several oval masses with relatively circumscribed margins in the upper inner and lower portions of the right breast on US. US-guided core needle biopsy of the 2 masses in the upper center and upper inner areas of the right breast was performed with a 14 gauge

core needle. Both masses were pathologically confirmed as diffuse large B-cell lymphomas. The patient was transferred to a hospital in her hometown without further examination at our hospital.

Case 2

A 67-year-old woman presented with a palpable mass in the upper area of the right breast. This mass had been recognized by the patient 3 weeks earlier. Four years and 6 months previously, she had been diagnosed with diffuse large B-cell lymphoma in the right axilla and treated with a rituximab-cyclophosphamide, doxorubicin hydrochloride, vincristine sulphate and prednisone (R-CHOP) regimen for 6 months. After completion of chemotherapy, she showed complete remission without recurrence for 4 years. Conventional B-mode US, color Doppler imaging and SWE were performed

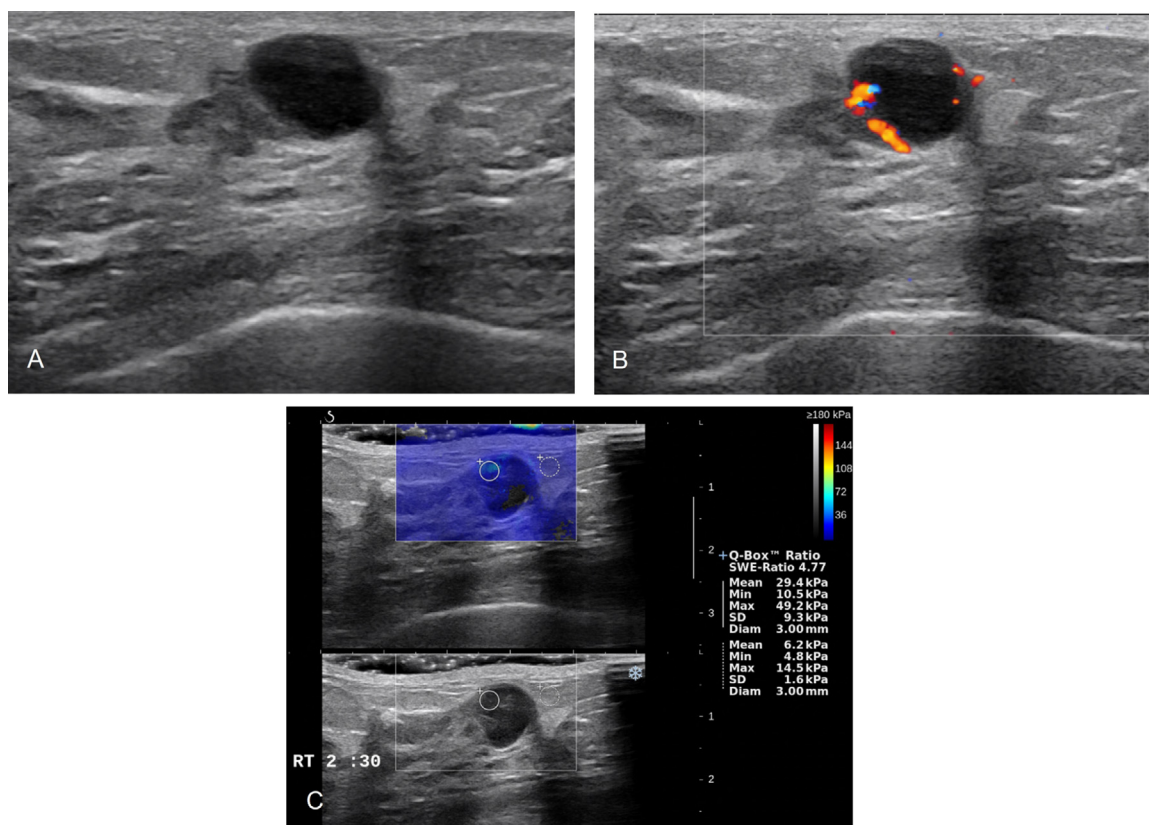


Fig. 2 – US of a 35-year-old woman with breast lymphoma (same patient as in Fig. 1). (A) Conventional US shows an oval markedly hypoechoic mass with circumscribed margins and posterior acoustic enhancement in upper inner area of right breast. (B) Color Doppler imaging shows vessels in the peripheral portion of mass. (C) SWE image shows E_{\max} of 49.2 kPa, E_{mean} of 29.4 kPa, and mean elasticity ratio of 4.77.

using an Aixplorer (SuperSonic Imagine, Aix en Provence, France) with a 15 MHz linear transducer. US demonstrated a 2.9 cm irregular, heterogeneous hypoechoic mass with partially indistinct margins in the upper outer area of the right breast. Color Doppler imaging revealed the peripheral vascularity of the mass. SWE showed an E_{\max} of 116.7 kPa, an E_{mean} of 88.7 kPa and a mean elasticity ratio of 9.0 (Fig. 3). US revealed a 4.5 cm irregular heterogeneous hypoechoic mass with partially indistinct/circumscribed margins in the upper central area of the right breast. Color Doppler imaging showed vascularity in the peripheral portion of the mass. SWE showed an E_{\max} of 113.1 kPa and an E_{mean} of 95.8 kPa. The mean elasticity ratio was 6.63 (Fig. 4). These masses were categorized as Category 4B according to the Breast Imaging Reporting and Data System lexicon [9]. US-guided core needle biopsy for the 2 masses in the upper central and upper outer areas of the right breast was performed with a 14G core needle. Both masses were confirmed as diffuse large B-cell lymphomas on

histopathology. Positron emission tomography-computed tomography (PET-CT) showed strong fluorodeoxyglucose uptake of the right 2 breast masses (maximum standard uptake value : 11.9) without any other abnormal uptake.

Discussion

The predominant imaging findings in breast lymphoma are nonspecific, its differentiation from other malignancies such as invasive ductal carcinoma is often challenging. However, commonly reported features of breast carcinoma, such as spiculation, architectural distortion, and/ or calcification are extremely rare in breast lymphoma [1].

Breast elastography can assess tumor or tissue stiffness in addition to morphology and vascularity that typically are evaluated by conventional US. Among various elastography meth-

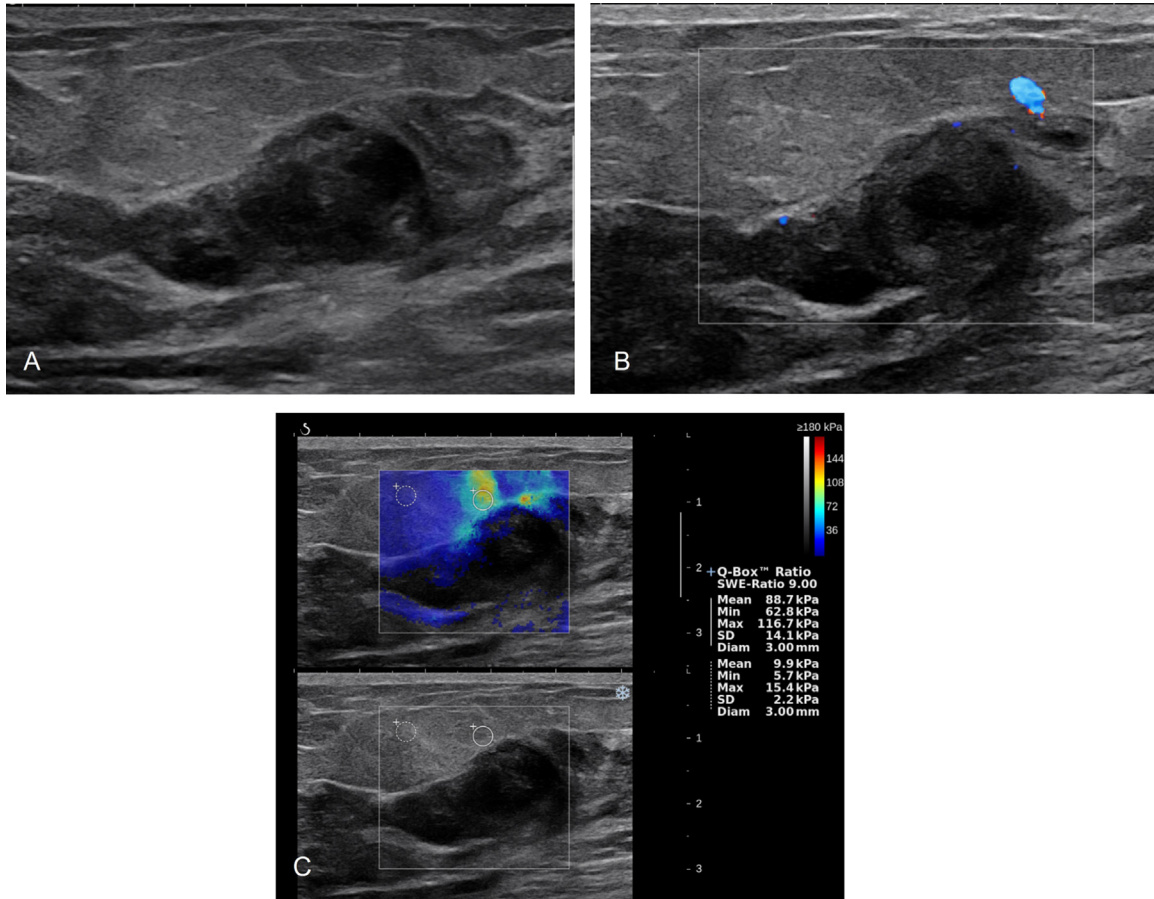


Fig. 3 – US of a 67-year-old woman with breast lymphoma. (A) Conventional US shows an irregular hypoechoic mass with circumscribed and partially indistinct margins in upper outer area of right breast. (B) Color Doppler imaging shows vessels in the peripheral portion of the mass. (C) SWE image shows E_{\max} of 116.7 kPa, E_{mean} of 88.7 kPa, and mean elasticity ratio of 9.0.

ods, SWE is thought to be the most reproducible and objective, allowing for quantification of stiffness in kilopascals or meters per second by measurement of the propagation speed of shear-waves in the tissue [10]. Also, SWE has been proven to improve diagnostic accuracy in the differential diagnosis of breast lesions, and to reduce unnecessary biopsies [11].

Only a relatively small number of reports focusing on elastography of breast lymphoma have been published, with a very small number of cases [4–8]. The reports on breast lymphoma features based on acoustic radiation force impulse or strain elastography showed stiffness [4,5,8]. Aslan et al., employing strain elastography and SWE, delineated the elastographic features of 9 cases with breast involvement by hematologic malignancies. Two lesions showed hard elasticity and the other 7, soft-to-intermediate elasticity with the shear

wave velocity ranging between 1.92 and 6.25 m/s [8]. Kim et al. reported a relatively stiff case of primary breast lymphoma based on SWE: an E_{\max} of 100.5 kPa and an E_{mean} of 93.6 kPa [6]. On the other hand, a study reported, for 5 lymphomas in 4 patients, only soft elasticity ranged from 10 to 40 kPa based on SWE [7]. Our present cases involved 4 masses that were of soft or intermediate stiffness with the E_{\max} ranging from 49.2 to 116.7 kPa, and E_{mean} , ranging from 29.4 to 95.8 kPa. These values were not as high as E_{mean} typical of invasive ductal carcinoma (144.50 kPa) [10]. One possible reason that lymphomas are “relatively soft” is that they are composed principally of cellular tissue with little fibrous tissue pathologically [7]. This correlated with the usual lymphoma imaging features, which lack architectural distortion, desmoplastic reaction and fibrosis, all of which can cause tissue stiffness [6]. The

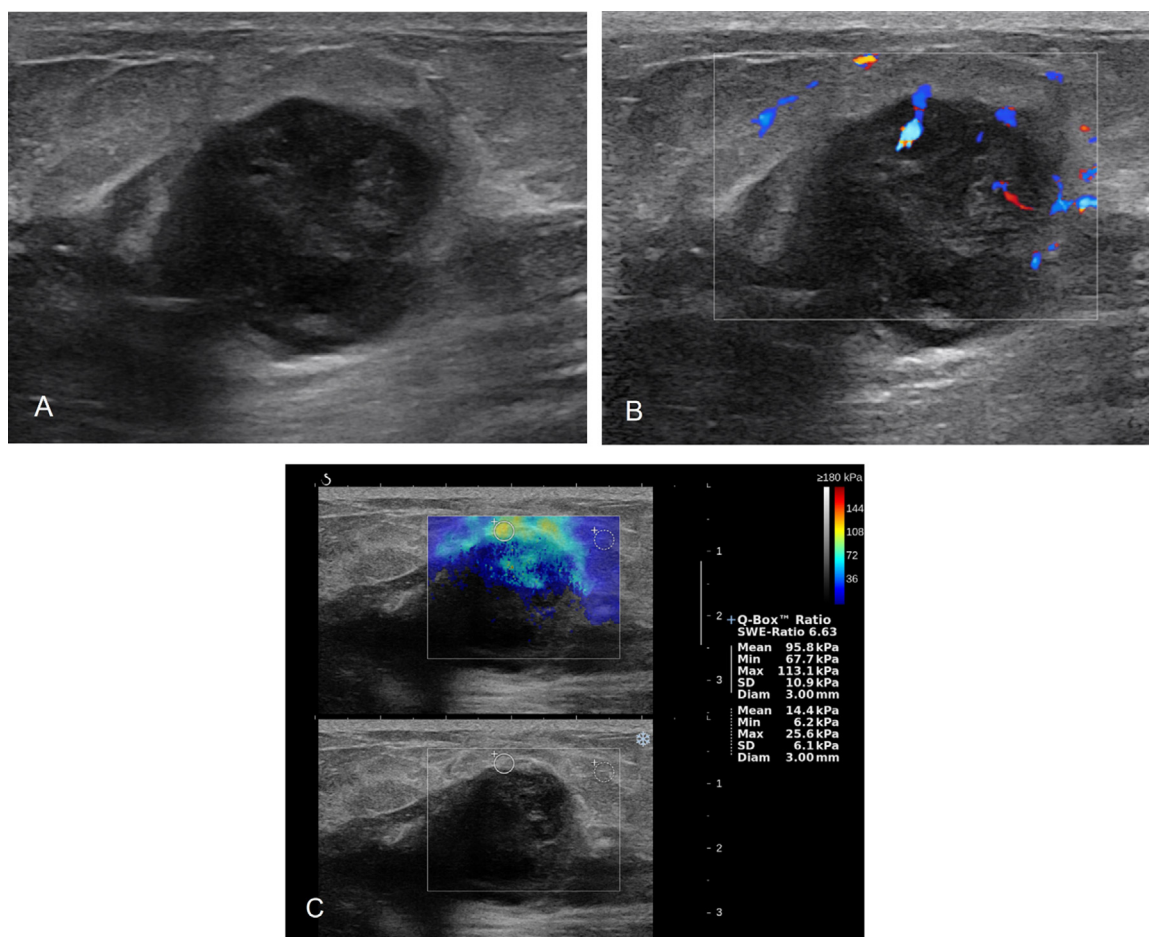


Fig. 4 – US of a 67-year-old woman with breast lymphoma (same patient as in Fig. 3). (A) Conventional US shows an irregular hypoechoic mass with circumscribed, partially indistinct margins and posterior acoustic enhancement in upper center area of right breast. (B) Color Doppler imaging shows vessels in the peripheral portion of mass. (C) SWE image shows E_{\max} of 113.1 kPa, E_{mean} 95.8 kPa, and mean elasticity ratio of 6.63.

subcutaneous panniculitis like T cell lymphoma of breast showed stiffness with a Tsukuba elasticity score 4, which may have resulted from the ill-defined margin and associated fibrotic reaction [4].

In this report, we presented the elastographic features of 4 rare lymphoma cases involving the breast. Our breast lymphomas showed soft-to-intermediate elasticity on SWE, not as stiff as typical invasive ductal carcinomas. It is important for radiologists working with elastography to recognize lymphomas involving the breast. Further studies scrutinizing the SWE characteristics of breast lymphoma in a large number of cases are needed.

Patient consent

Written informed consent was not necessary because no patient data has been included in the manuscript.

Declaration of Competing Interest

None of the authors have any conflict of interest to disclose.

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