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Case Report

Chronic mastitis manifest as complex breast cyst in ultrasound and the role of elastography: A case series ☆

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ABSTRACT

This case series aims to describe the clinical presentation of mastitis, the conventional sonography and elastography findings, and histopathological features in the diagnosis of chronic mastitis. We present 3 cases of breast swelling in young ladies with one of the cases is related to breastfeeding with similar imaging appearance of complex breast cyst and the histopathology finding of chronic mastitis. We will describe the role of elastography in evaluating and differentiating the benign and malignant complex breast cyst.

Introduction

Conventional ultrasound is the first-line imaging modality in the evaluation of breast swelling in young patients. Patients with acute mastitis typically present with fever, painful breast swelling, and accompanied by skin changes. Conversely, chronic mastitis does not have typical presentation related to inflammation or infection. Acute and chronic mastitis also differ in the imaging appearance on sonography. Chronic

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mastitis can manifest as an irregular hypoechoic mass with internal echo or a circumscribed thick wall cystic mass. Occasionally, the mass may show peripheral hyperaemia [1]. In addition to conventional ultrasound, ultrasound elastography is a technique evaluating the elasticity/ stiffness of the breast mass. Malignant masses tend to be harder than benign masses. Thus, they have increased stiffness in elastography evaluation. There are 2 techniques in ultrasound elastography, namely strain elastography (SE) and shear wave elastography (SWE) [2].

Case 1

A 26-year-old female presented with painless left breast swelling for a month. She was lactating for 2 years. No overlying skin changes. She had no family history of breast cancer. Upon physical examination, she was afebrile. There was a palpable lump at left breast 10 o'clock which was mobile, firm in consistency and nontender. Ultrasound of left breast revealed a circumscribed round anechoic mass with posterior enhancement at 10 o'clock 3 cm from nipple (Fig. 1). The measurement of the mass was 17 × 23 × 24 mm. This mass had thick wall of 3 mm and internal echogenic debris. No increased in vascularity of the wall. On SE, it exhibited trilaminar or blue-green-red (BGR) pattern (Fig. 2A). The SWE value was 2.9kPa at its centre and 4.5kPa at its wall (Fig. 2B). The findings were concluded as complex breast cyst. Subsequently biopsy was performed. The histopathology examination revealed a lobulocentric mixed inflammatory infiltrate composed of lymphocytes, macrophages, scattered cystic spaces rimmed by neutrophils and vague granulomas consistent with cystic neutrophilic granulomatous mastitis (Fig. 3). Pus was aspirated from the lesion and sent for culture and sensitivity. Gram-positive bacilli, corynebacterium species was isolated.

Case 2

A 34-year-old female complained of left breast swelling for 2 months duration. There was no fever, nipple discharge or overlying skin changes. She had family history of breast cancer from third degree relative. Breast examination revealed mobile left breast lump which was firm in consistency. Ultrasound showed circumscribed oval anechoic mass with internal soft tissue component, echogenic debris and thick wall at 9 o'clock 1 cm from nipple (Fig. 4). The mass was 15 × 35 × 28 mm and the thickened wall was 3 mm. No hyperaemia. On SE, there was BGR pattern (Fig. 5A). The SWE value was 2.9kPa at its centre and 7.2kPa at its thickened wall (Fig. 5B). This mass was categorised as BI-RADS 4a due to its appearance as complex breast cyst and biopsy was performed on the same day. The histopathological examination showed a diffuse marked inflammatory cells infiltrate predominantly foamy macrophages mixed with lymphocytes and neutrophils, with vague granuloma formation. There were scattered cysts rimmed by neutrophis observed. These acute on chronic inflammation with cysts formation compatible with cystic neutrophilic granulomatous mastitis (Fig. 6).

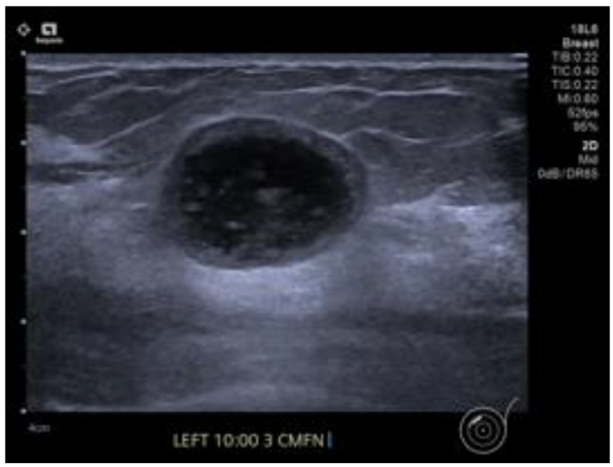

Fig. 1 – Ultrasound showed a circumscribed round anechoic mass with internal echogenic debris with thick wall at 10 o'clock 3cm from nipple. Posterior enhancement was appreciated.

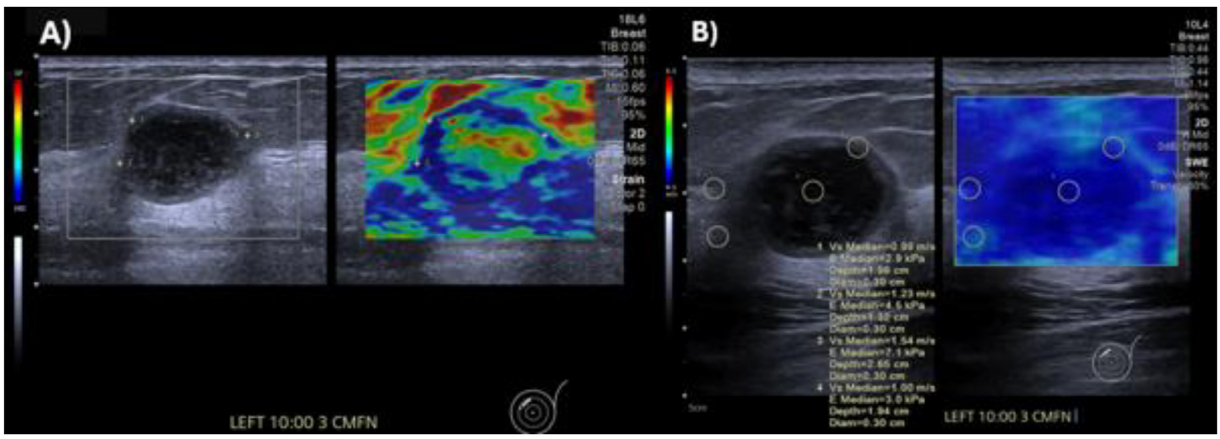

Fig. 2 – Ultrasound elastography. (A) Strain elastography showed BGR pattern centrally and blue rim peripherally. (B) Shear wave elastography showed normal reading of the thickened wall which was 4.5kPa.

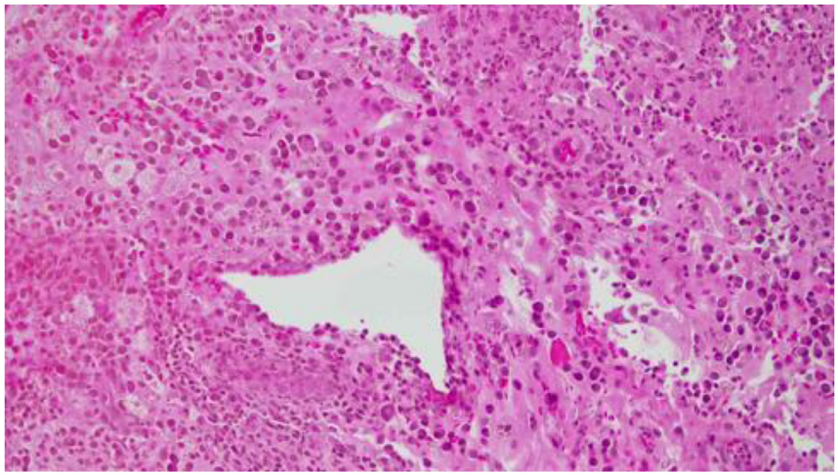

Fig. 3 – The histopathological examination showed breast tissues markedly infiltrated by mixed inflammatory cells mainly neutrophils, foamy macrophages, lymphocytes and plasma cells. In areas there were few cystic spaces lined by neutrophils. Vague granuloma was also appreciated. (H&E staining, x200).

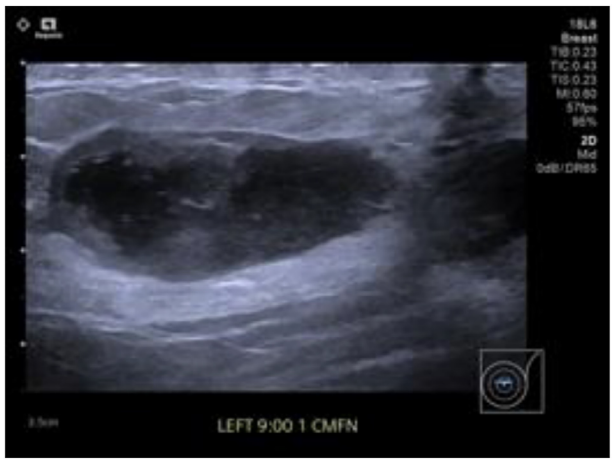

Fig. 4 – Ultrasound showed circumscribed oval anechoic mass with internal soft tissue component, echogenic debris and thick wall at 9 o'clock 1 cm from nipple. Posterior enhancement was appreciated.

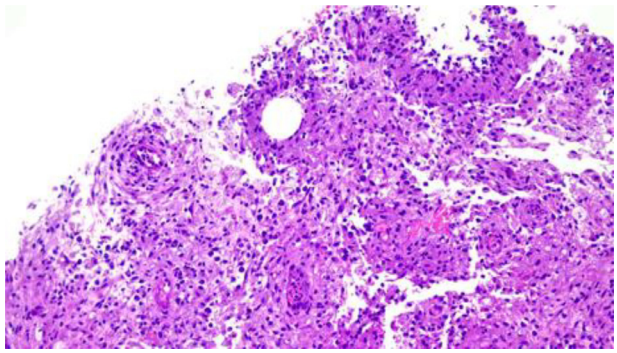

Fig. 6 – The histopathological examination showed dense infiltration by mixed inflammatory cells neutrophils, lymphocytes and plasma cells, and areas of vague granulomas composed foamy histiocytes aggregates. (H&E, x200).

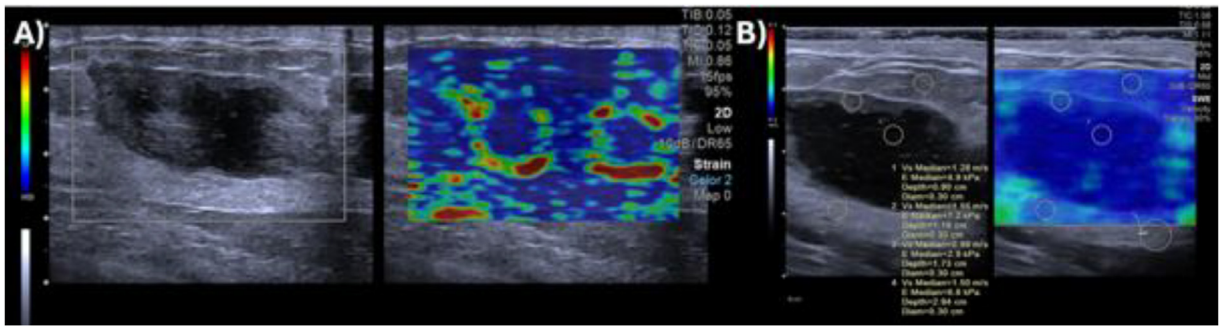

Fig. 5 – Ultrasound elastography. (A) Strain elastography showed BGR pattern. (B) Shear wave elastography showed normal reading of the thickened wall which as 7.2kPa.

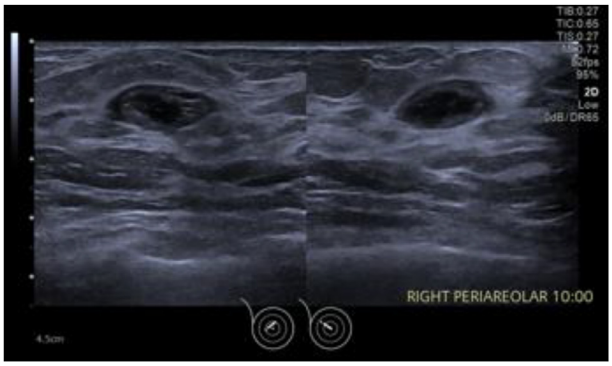

Fig. 7 – Ultrasound showed a circumscribed oval anechoic mass with thick wall at 10 o'clock periareolar region. No posterior features.

Case 3

A 37-year-old female presented with right breast lump for a month which associated with pain occasionally, however no fever. No family history of breast cancer. Breast examination revealed a palpable firm lump at retroareolar region. Ultrasound showed a circumscribed oval anechoic mass with thick wall at 10 o'clock periareolar region (Fig. 7). The mass measured 8 × 19 × 16 mm with its wall measured 2 mm. Minimal surrounding vascularity demonstrated on Colour Doppler. On SE, the mass showed mosaic pattern indicate Tsukuba score 2 (Fig. 8A). The readings of SWE value were not elevated which were 2.5kPa and 3.1kPa at its central part and thickened wall respectively (Fig. 8B). The mass was concluded as complex breast cyst and was biopsied in the same setting. Histopathological examination showed fibrocollagenous tissue composed of ducts and lobules lined by 2-tiered epithelium with areas of adenosis. The stroma showed dense lymphoplasmacytic infiltration (Fig. 9) with periductal and

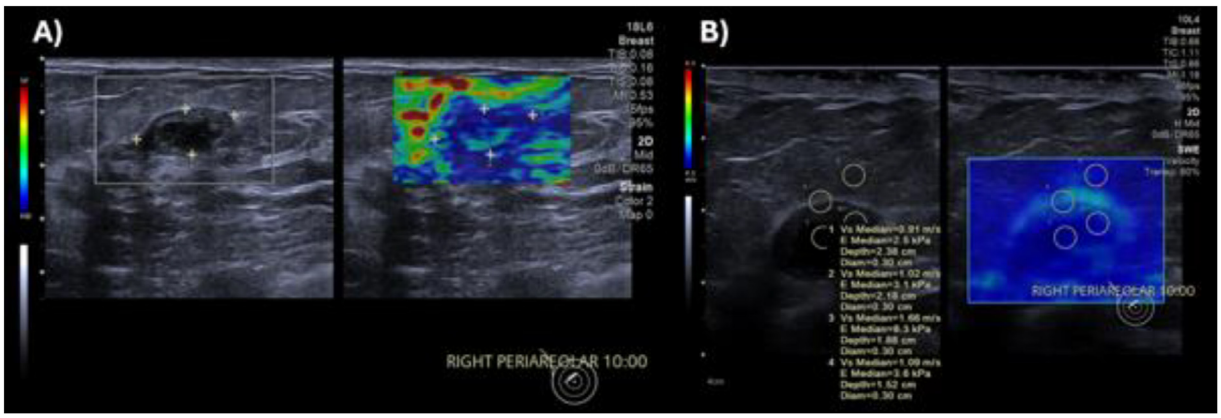

Fig. 8 – Ultrasound elastography. (A) Strain elastography showed mosaic pattern with Tsukuba 2 score. (B) Shear wave elastography showed normal reading of the thickened wall which as 3.1kPa.

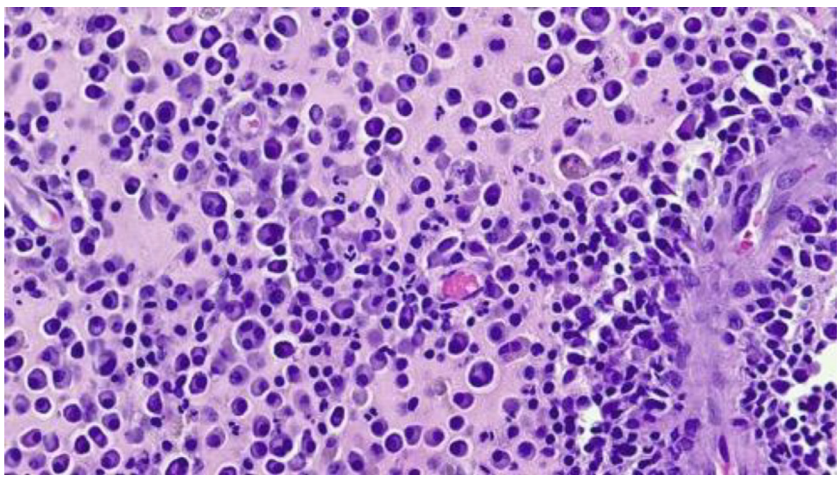

Fig. 9 – Histopathological examination showed dense lymphoplasmacytic infiltration with periductal and perivascular inflammation. Scattered neutrophils were present. (H&E staining, x400).

perivascular inflammation. Focal areas of neutrophilic infiltration were identified. No epithelioid granuloma, microorganism or fungal bodies were seen. Features are consistent with chronic mastitis and periductal inflammation.

Discussion

Mastitis is the inflammation of the breast. It can be puerperal or nonpuerperal mastitis in which puerperal mastitis is related to lactating woman during postpartum period. The incidence of lactational mastitis is estimated about 2% to 33% of breastfeeding women. Nonpuerperal mastitis does not show typical symptoms of infection [1]. Sousaris described the typical appearance of mastitis with abscess formation as central soft area and stiff outer rim representing abscess cavity and peripheral oedema/ inflammation respectively [1].

The causes of complex breast cysts are diverse, including benign and malignant conditions. Fat necrosis, collection such as haematoma, seroma or lymphocele, breast abscess, and galactocele are among the common benign causes of complex breast cysts. The malignant conditions manifest as complex breast cysts include encapsulated intracystic papillary carcinoma, medullary carcinoma, certain ductal carcinoma in situ, and invasive ductal carcinoma [3].

Thick wall of more than 0.5 mm, thick septa more than 0.5 mm, intracystic mass, or solid cystic mass are the features of complex breast cysts [4]. Owe to the imaging appearance of complex breast cyst on conventional ultrasound, complex breast cyst is also described as complex solid cystic mass and considered indeterminate in nature with positive predictive value for malignancy between 2% and 95% [5]. Thus, tissue biopsy is required for definite diagnosis [3].

Traditionally, conventional ultrasound is the first-line imaging tool to assess breast masses along with mammography. However, ultrasound elastography is an emerging technique that evaluates the stiffness of breast mass in addition to conventional ultrasound and mammogram [1,2,6–8]. It has 86.5% sensitivity, 89.8% specificity, and 88.3% diagnostic accuracy in differentiating between benign and malignant masses. Overall, the sensitivity and specificity in diagnosing different breast masses are increased when ultrasound elastography is used in combination with conventional ultrasound [6].

There are 2 main techniques of ultrasound elastography which are SE and SWE [1,2,7,9,10]. In SE, the amount of breast mass deformation relative to the surrounding breast tissue is measured by applying repeated external manual compression or intrinsic movement such as breathing. This method gives qualitative estimation of the tissue stiffness and subjects to operator factor. SE images of breast can be interpreted semi-qualitatively by elastogram to B-mode length ratio (El/B ratio), 5-point colour scale (Tsukuba score) (Fig. 10), and strain ratio by comparing the stiffness of the mass to the stiffness of fat [8,11,12]. Meanwhile, SWE provides quantitative information and relatively less operator dependent. In SWE, the tissue stiffness is assessed by the speed of shear wave propagation in tissues. Shear wave, also known as the transverse wave is generated by the acoustic radiation force of a focused ultrasound beam passing into the breast. The propagation of the shear wave captured in an image produces the elastogram. The image obtained with colour overlay is either measured as the speed of shear wave in meters per second (m/s) or tissue stiffness in kilopascals (kPa) [10].

SWE has a good differentiation of medium elasticity measured in adipose tissue (3kPa), dense parenchyma (45kPa), benign lesions (<80kPa) and malignant lesions (>100kPa) [10]. According to the study by Lee BE et al., they applied a cutoff value of 108.5 kPa, above which the lesion is characterised as malignant. This cutoff value has led to higher specificity and a reduction in benign biopsy rate, false negative, and false positive rates [7].

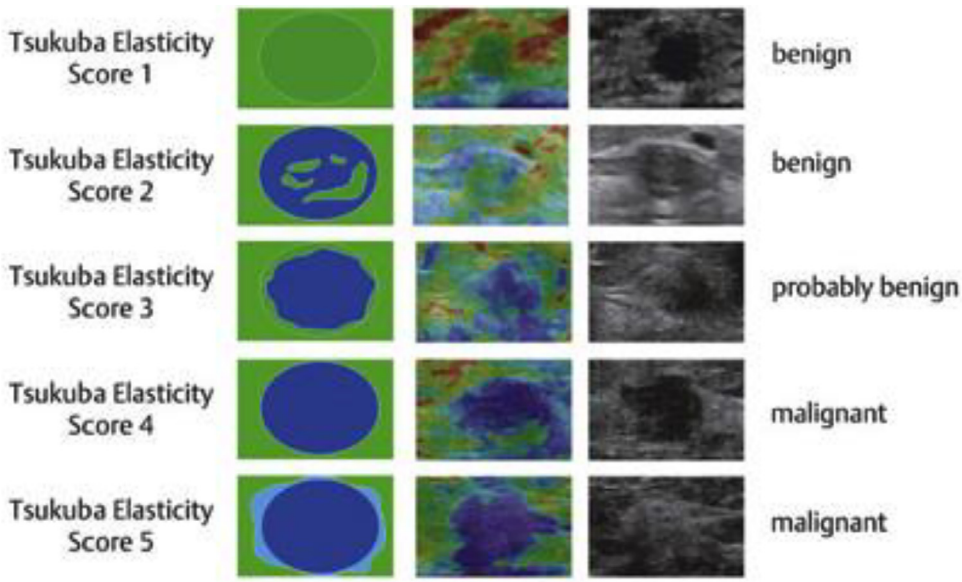

Fig. 10 – Tsukuba scoring system is a 5-point scoring system based on strain image patterns. The softest part is red and the hardest part is blue. Score 1 and 2 are considered benign, score 3 is probably benign, and score 4 and 5 are considered malignant [12].

Chronic mastitis with abscess formation manifests as thick-wall complex cysts, as illustrated in these 3 cases. Similar findings of SE are relative stiffer rims as the rims are illustrated as blue in strain image. The centre of the lesions is illustrated with blue-green-red (BGR) or trilaminar pattern, indicating the lesions are cystic in nature. However, in SWE, the quantitative readings of the rim are all within normal range, signifying the entire lesion is soft with no increase in tissue stiffness. These findings help to differentiate the complex breast cyst of benign origin from the malignant cause. It is rare for cancers to have very soft central area in ultrasound elastography as central liquefied necrosis is uncommon in breast cancer [1].

Based on the sonographic features on conventional ultrasound, these 3 cases of complex breast cysts are categorised as BI-RADS 4a and biopsy was performed. However, in combination with features of ultrasound elastography, it is possible to convert the category of these lesions from BI-RADS 4a to BI-RADS 3. Downgrading BI-RADS 4a lesions with low stiffness from biopsy to follow-up may increase the specificity and positive predictive value for biopsy. Low stiffness is considered with E max below 30kPa and it showed increase in specificity without missing cases of malignancy [13].

In conclusion, ultrasound elastrography is a complementary technique to conventional ultrasound. Ultrasound elastography should be performed and interpreted along with conventional ultrasound in case of abnormality identified in conventional ultrasound. SE and SWE both improve the characterisation of breast lesions and may enhance the confidence in distinguishing benign and malignant lesions. It is possible that BI-RADS 4a lesions could be downgraded to BI-RADS 3 and changes the decision of biopsy to follow-up, avoiding unnecessary diagnostic biopsy [6,11,13].

Patient consent

Written consent was obtained from the patient for the publication of this case report. According to the Medical Research and Ethics Committee and Institute for Clinical Research Malaysia, research and ethics committee approval for case reports is not a requirement.

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