



ORIGINAL ARTICLE

Characterization and guided-procedures of breast suspicious microcalcifications: can MicroPure ultrasound do it?

Sahar Mahmoud Mansour ^{*}, Lamia Adel

*Radiology Department (Women's Imaging Unit), Faculty of Medicine, Cairo University, Egypt
Wadi El-Neel Hospital, Radiology Department, Breast Imaging Unit Incorporation with Institute Gustave-Roussy (IGR),
Dusseldorf Breast Cancer Center, Helsinki Breast Cancer Center and Institute Curie (Saint Cloud), France*

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Abstract Objective: To assess the diagnostic value of high-frequency (MicroPure) ultrasound in evaluating suspicious microcalcifications and to determine its capability in biopsy guidance.

Subjects and methods: Sixty-two cases with suspicious microcalcifications detected on mammographic examination had been re-evaluated by MicroPure US. The studied cases underwent true cut tissue/surgical excision biopsy. Histopathology revealed 25 benign and 37 malignant lesions and was considered the gold standard of reference.

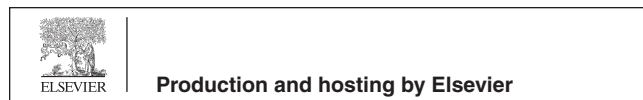
Results: Malignant microcalcifications were easier to be visible at MicroPure US, as they were detected in 86.5% ($n = 32/39$) compared to only 68% ($n = 17/25$) of the benign lesions. US depicted more breast masses associated with malignant microcalcifications in 78% ($n = 29/37$) than those associated with benign ones seen in 36% ($n = 9/25$).

Visibility of suspicious microcalcifications at US was aided by preliminary mammogram. Given known mammography location of these microcalcifications had made their visualization accessible by MicroPure US in 79% ($n = 49$) of the cases.

Conclusion: MicroPure ultrasound cannot discriminate benign from malignant breast microcalcifications. MicroPure can be useful in detecting clustered microcalcifications that are not accessible by B-mode ultrasound; provided knowledge of their mammographic location and thus can provide better guidance for pre-surgical wire localization and ultrasound-guided biopsies.

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^{*} Corresponding author. Address: Kasr ElAiny Hospital, Cairo University, Egypt. Tel.: +20 1006029047.
E-mail address: sahar_mnsr@yahoo.com (S.M. Mansour).
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1. Introduction

Detection of breast cancer is conducted by means of two most widely used diagnostic methods, i.e., mammography and ultrasonography (US) imaging. These two methods are best suited for unveiling different types of cancer (1).

Clustered microcalcifications may be the only detectable manifestation of early breast cancer (2,3).

Table 1 Mammography detected microcalcifications.

Mammography detected calcifications	No. (%)
<i>Shape</i>	
Round	3 (4.8)
Punctate	5 (8)
Amorphous	13 (21)
Coarse heterogenous	33 (53.2)
Linear	8 (13)
<i>Distribution</i>	
Clustered	53 (85.5)
Segmental	9 (14.5)

Note-Data are reported as number (percent).

Microcalcifications cannot be depicted with US when they are located inside echogenic, fibroglandular breast tissue because of the difficulty in differentiating them from the echogenic interfaces among tissues (4).

Mammography currently has a significant advantage over ultrasound in terms of its clinical usefulness for the diagnosis of microcalcifications in breast examinations. The main reason is that in mammography, the probability of malignancy can be assessed using established categories that are based on the shape (small round, amorphous, pleomorphic, or fine linear) and distribution pattern (clustered, segmental, linear, regional, or diffuse) of microcalcifications (5).

After using a high-frequency transducer, some investigators have reported that US depicted clustered microcalcifications in breast cancers. A hypoechoic background of tumor enhances the ability of US to enable identification of the hyperechoic punctate calcifications (6,7).

MicroPure is an image processing function that is designed to improve the visualization of microcalcifications that can be detected but are difficult to visually identify in B-mode images due to the presence of speckle noise and surrounding tissues (8).

In this study we will focus on the capability of MicroPure US to evaluate suspicious microcalcifications and if it is possible to be used for differentiating between benign and malignant clustered microcalcifications using a mammography-based approach and thus assess whether it is able to guide biopsy for such lesions.

2. Subjects and methods

2.1. Subjects

This study is a prospective analysis approved by the Ethics committee in Wadi El-Neel Hospital, Cairo, Egypt, where radiological examination of the study cases had been performed in a well-equipped and organized breast imaging unit incorporation with Institute Gustave-Roussy (IGR) – the leading European anticancer centre.

Sixty-two breast lesions that showed suspicious clusters of microcalcifications were evaluated by B-mode and MicroPure US provided known location from preliminary performed digital mammography from May 2010 to September 2011.

Median age of the study cases was 38 years (range 31–72).

They presented either for assessment of sensible breast lumps that needed diagnostic sonomammogram or were candidates of screening mammogram with accidentally discovered breast lesions. Such cases had a dominant suspicious microcalcific cluster on mammogram.

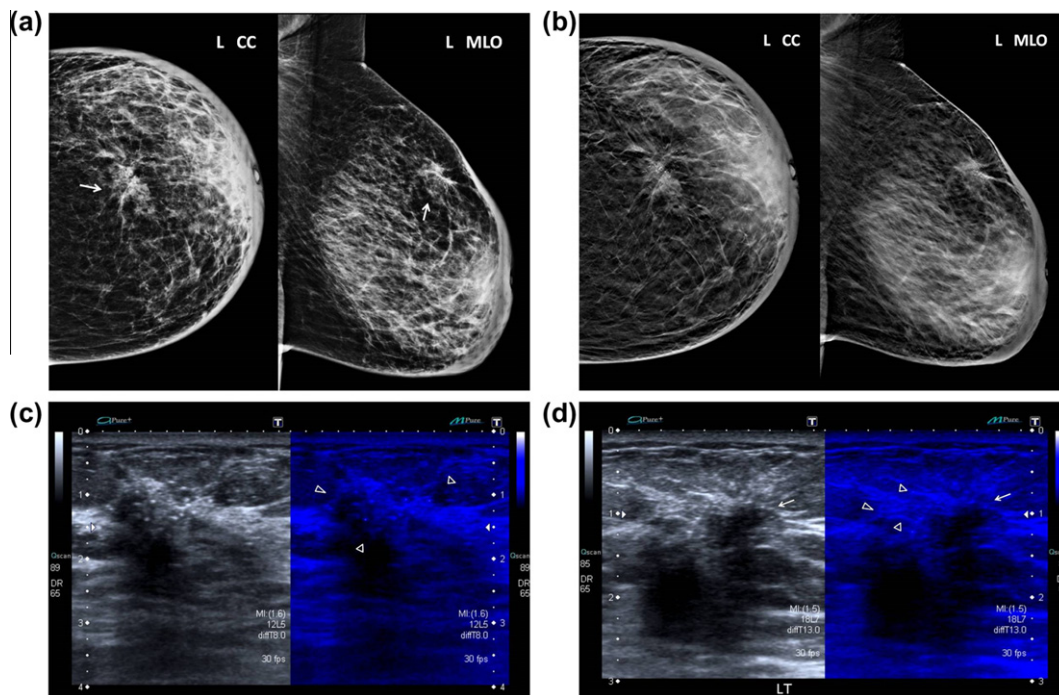


Fig. 1 Invasive duct carcinoma (IDC) in 57-year-old patient. (a) Digital mammography of the left breast MLO and CC views show upper central focal area of architectural distortion (arrow) with related suspicious cluster of microcalcifications. Note: associated skin thickening and parenchymal edematous changes. (b) Tomosynthesis slices show more clarified vision of the suspicious calcifications shapes. (c & d) MicroPure US, clearly visualizes the clustered calcifications (arrow heads). A tiny hypoechoic mass could be detected adherent (arrow) that was not identified in the mammogram.

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