

3D Ultrasound and Virtual Touch® in Breast Tumors - Two Clinical Cases

Claudiu V. Leonida¹, Alina Topciu²

¹Kaliophion Medical, Brăila, Romania

²CMI Dr Topciu Alina, Brăila, Romania

Corresponding author:

Claudiu Valentin Leonida, MD
Kaliophion Medical
Aleea Științei Street, no 2, Bl. 2,
Sc. 4, Ap. 63, Brăila, Romania
E-mail: claudiuleonida@yahoo.com

Rezumat

Ecografia mamară 3D și Virtual Touch în evaluarea tumorilor mamare - două cazuri clinice

Evidențierea leziunilor maligne infraclinice cu ajutorul ecografiei mamare 3D și diferențierea leziunilor benigne de cele maligne, prin tehnologia ARFI Virtual Touch®, la două paciente. Ecografia mamară 3D este utilă în evidențierea precoce a distorsiunilor arhitecturale, apărute chiar și la nivelul țesuturilor moi ale glandei mamare, iar tehnologia Virtual Touch® ARFI diferențiază cu mai multă acuratețe leziunile maligne de cele benigne, permițând reîncadrarea pacientei într-o altă clasă BiRADS (scăderea sau creșterea scorului BiRADS, în funcție de situație).

Cuvinte cheie: ecografie mamară 3D, ABVS, Virtual Touch, ARFI

Abstract

Visualization of infraclinical malignant lesions using 3D breast ultrasound, and differentiation of benign and malignant lesions using ARFI Virtual Touch® technology in two patients. 3D ultrasound is useful in early detection of architectural distortions, even in the soft tissue of the breast, and Virtual Touch® ARFI differentiates more accurately malignant vs. benign lesions, allowing the patient to be regraded in the BiRADS score (increasing or decreasing the BiRADS score, depending on the situation).

Key words: 3D breast ultrasound, ABVS, Virtual Touch, ARFI

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Introduction

The following exams were performed with a Siemens Acuson S2000 ultrasound machine equipped with ABVS – Automated Breast Volume Scanner, followed by further examination using a 9L4 linear probe capable of performing Virtual Touch® ARFI imaging and Doppler.

A standard exam is comprised of 3 scans of 65 second each for each breast, in Antero-Posterior (AP) view and both oblique planes (Lateral and Medial). After gathering the images (0.5 mm sections in High Definition), the 3D reconstruction of the breast is obtained, and can be viewed on the workstation.

After evaluating the 3D images, further examination on specific areas is done using the 9L4 probe with Virtual Touch®.

Case Series

The patient is placed in supine position, with the arm raised above the head, starting on the right side. Coupling gel (Polysonic®) is applied on the breast, and ABVS probe is locked in position. The exam starts by pressing the start button on the ABVS probe, and the HD images are acquisitioned. The procedure is repeated 3 times for each breast in different planes (AP, L, M). At the end of the acquisition for both breasts, all the images are sent to the workstation and are reviewed by the physician.

After reviewing the images, suspicious areas are further examined using the 9L4 linear probe with Virtual Touch® (ARFI) and Doppler capabilities.

Case 1.

A 54-year-old woman comes to our practice for a routine breast ultrasound, with no palpable tumor or other signs or symptoms. After reviewing the 3D ultrasound, in the left breast, SI quadrant, an area of architectural distortion is observed, but without any central visible tumor (no hypoechoic signals, no posterior attenuation of the ultrasound signal) (Fig. 1A).

Although 3D ultrasound offers exact coordi-

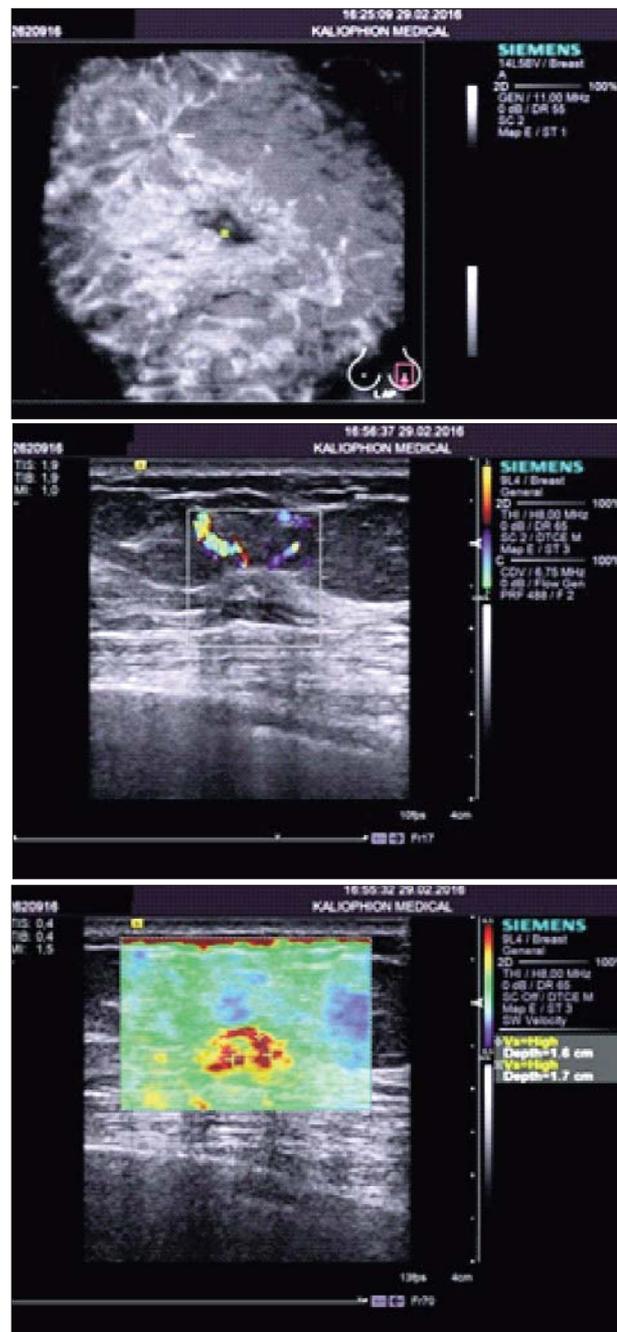


Figure 1. (A) 3D ultrasound obtained with Siemens Acuson S2000 ABVS probe. (B) Doppler ultrasound identifies the area of interest. (C) Virtual Touch® ARFI shows the stiffness of the lesion

nates by clicking on the image (angle, distance from the nipple, depth from the skin), area no lesion could be viewed. Using Doppler, an area of 4.9x4.7 mm is identified, with two blood vessels converging above (Fig. 1B).

After identifying the area of interest, Virtual Touch® ARFI is used to evaluate the stiffness of the tissue. The color map shows an intense dark red color, meaning the tissue is extremely stiff. The Virtual Touch® software, compared to elastography, offers the possibility to exactly evaluate the speed of the ultrasound beam, with two decimals, in meters per second, the higher the value the stiffer the tissue. Using the cut-off point of 5.18 m/s (1), and using the superior limit for Virtual Touch® of 6.5 m/s, the value of the speed was “HIGH”, meaning that the value is higher than 6.5 m/s (Fig. 1C). After setting the maximum speed of Virtual Touch® software to 10 m/s, the highest value obtained was 8.70 m/s. Virtual Touch Quantification shows a “X.XXm/s” value (impossible to evaluate) (2).

The sum of all the facts gave the conclusion of highly suspicious for malignancy, with an ultrasound BiRADS score of 5.

After two weeks, the patient had a mammogram, when she was given a BiRADS score of 2 (the lesion was not visible on mammogram). Three months later, the patient underwent surgery – sectorectomy. The pathology report confirmed the breast cancer – tubular carcinoma, 0.5 x 0.4 cm.

Case 2.

A 73-year-old woman comes to our practice for evaluating a palpable tumor in the left breast, in the upper side, at the limit between the upper quadrants.

The 3D ultrasound shows an oval tumor, well defined, inhomogeneous, without posterior attenuation of the signal, measuring 20.8 mm with the linear probe. The first aspect of the tumor was of fibroadenoma (Fig. 2A).

The Virtual Touch Tissue IQ (Fig. 2B) assessment shows a “HIGH” value on both speed limits (6.5 and 10 m/s) (1), and Virtual Touch Quantification (Fig. 2C) shows “X.XXm/s” (impossible to evaluate) (2).

The sum of all the facts gave the conclusion of highly suspicious for malignancy, with an ultrasound BiRADS score of 5.

Three months later, the patient underwent surgery – removal of the tumor. The pathology

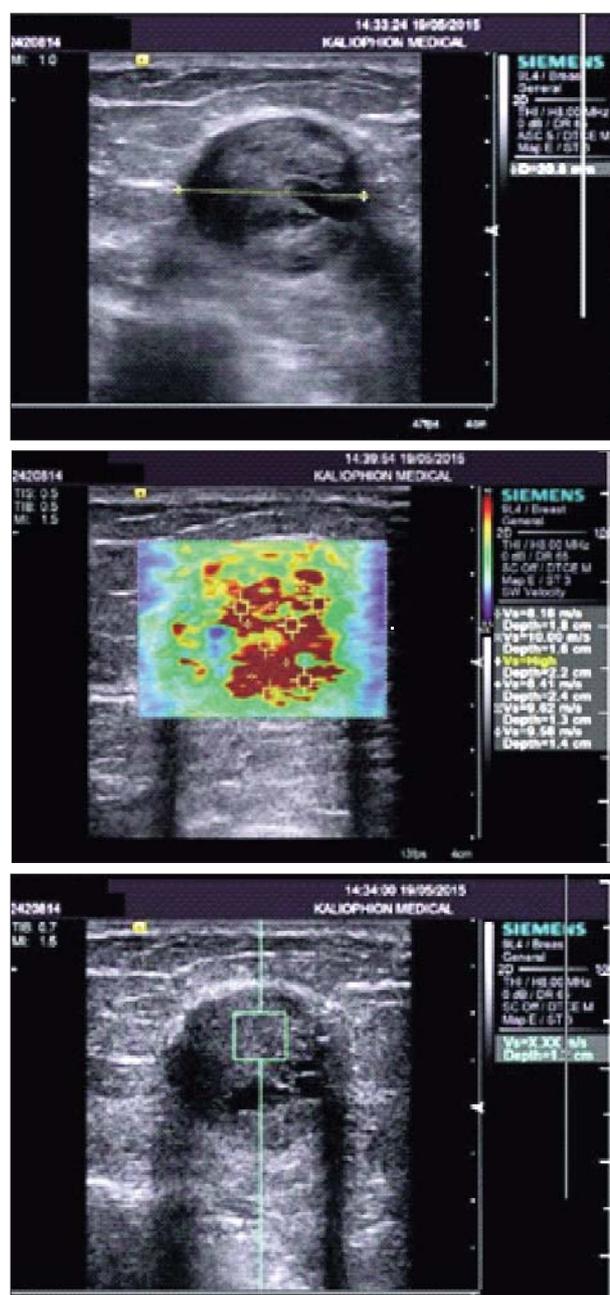


Figure 2. (A) Tumor aspect in B-mode. (B) VT Tissue Image Quantification. (C) VT Tissue Quantification

report confirmed the breast cancer – encapsulated papillary carcinoma with invasion.

Discussions

The results obtained in our study confirm the preliminary results by other authors that 3D breast ultrasound and ARFI represent a valuable technology in breast tumors.

Conclusion

3D ultrasound of the breast, together with Virtual Touch® technology implemented in Siemens Acuson S2000 with ABVS offer a new and reliable solution for evaluating and distinguishing between benign and malignant masses in the breast.

Conflicts of Interest: None declared.

References

1. Golatta M, Schweitzer-Martin M, Harcos A, Schott S, Gomez C, Stieber A, et al. Evaluation of virtual touch tissue imaging quantification, a new shear wave velocity imaging method, for breast lesion assessment by ultrasound. *BioMed Research International*. 2014; 2014(ID 960262):1-7. doi: 10.1155/2014/960262
2. Wojcinski S, Brandhorst K, Sadigh G, Hillemanns P, Degenhardt F. Acoustic radiation force impulse imaging with Virtual Touch® tissue quantification: mean shear wave velocity of malignant and benign breast masses. *Int J Womens Health*. 2013;5:619-27. doi: 10.2147/IJWH.S50953. eCollection 2013.