White Paper

Breast ultrasound
Advanced technologies

Her Health
Our Commitment

esaote

“BreastNav™ is a very promising technology which helps to better identify and follow-up breast lesions”

Dr. Camilla Fachinetti – Director of Breast Diagnostic Unit, Valduce Hospital (Como, IT)

Breast cancer represents the most common oncological disease for women, and a multimodality approach is becoming increasingly important to detect early stage disease and decrease mortality.

Breast ultrasound, together with mammography/tomosynthesis and magnetic resonance imaging (MRI), plays a crucial role in the current medical routine.

Constantly searching for innovative solutions, Esaote’s value proposition for Breast US is very wide and keeps growing.

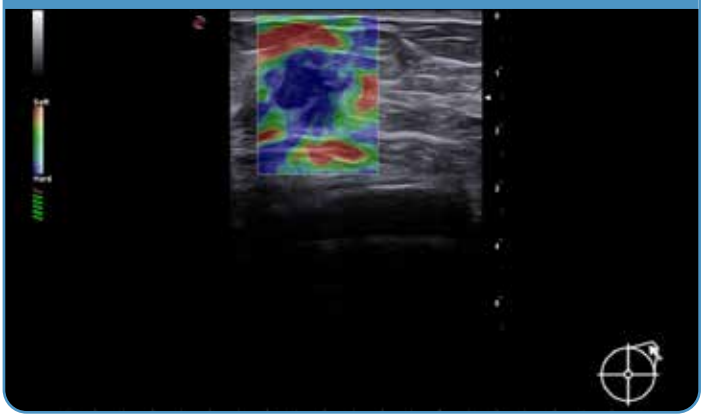
Breast Elastography: ElaXto and QElaXto 2D

Breast elasticity scoring is one of the most important steps in breast pathology detection and characterization.

Besides traditional palpation performed as a standard procedure to detect and quantify the differences in stiffness of tissues, both strain and shearwave methods, have been evaluated for improving the generally high sensitivity and specificity of the Breast Imaging Reporting and Data System (BIRADS) and it is recommended that they are used as add-ons to the regular B-mode examination. Differences in elasticity and the presence of particular patterns that are more or less homogeneous, can be linked to well defined groups of pathologies, benign or malignant.

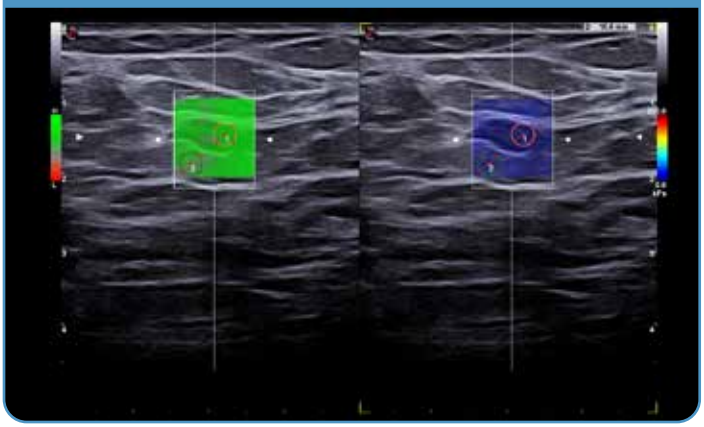
Esaote’s ElaXto, a strain elastography technique, combines the benefits of using ultrasonography with the benefits of the palpation maneuver, providing a real-time and non-invasive assessment of tissue stiffness, thanks to a color-coded qualitative stiffness mapping (Fig. 1).

Fig. 1: ElaXto color map representation



Esaote’s QElaXto 2D, a Shear Wave elastography technique, can provide some quantitative information expressed in kPa or m/s, together with a color coded map representing tissue elasticity. A dispersion map displayed on the left side of the screen, helps the clinician to position the ROI in order to improve the measurements workflow (Fig. 2).

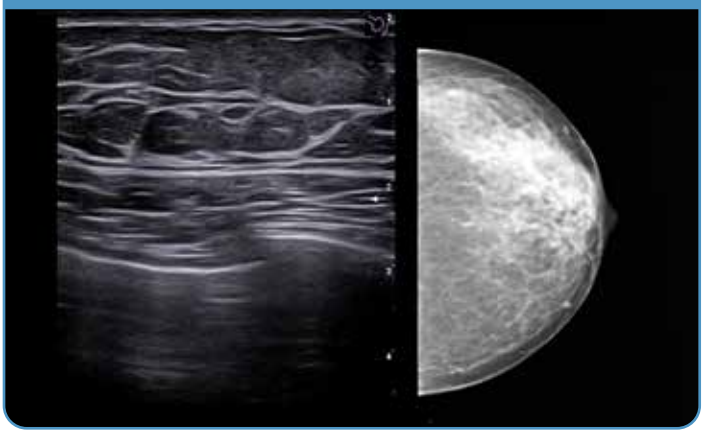
Fig. 2: QElaXto 2D with corresponding dispersion map



Multimodality and Follow Up

Follow Up with Multimodality Esaote solutions allows to display on the monitor a second modality such as mammogram or MR, providing a real-time comparison with the US examination (Fig. 3).

Fig. 3: Multimodality US and mammogram



"We're working side by side with Esaote in order to optimize the innovations and technologies in the breast ultrasound field, which can really make the difference in our daily routine".

Dr. Enrico Cassano – Director of Breast Radiology Department, IEO (European Institute of Oncology - Milan, IT)

MicroV

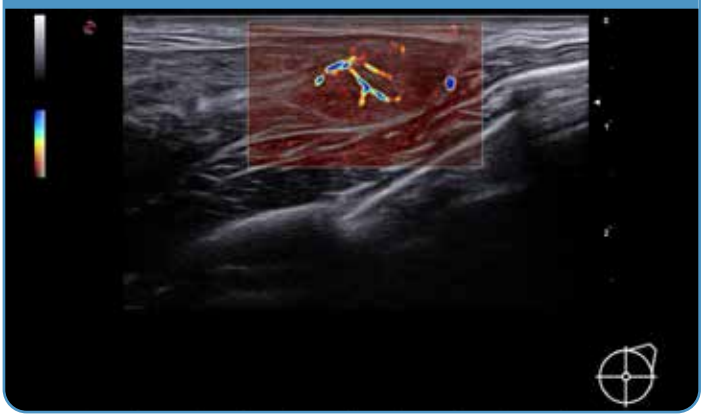
Novel Doppler technologies with significantly improved vessel detection sensitivity are important to detect breast lesions vascularization, thus facilitating a more accurate differentiation and classification of breast lesions, if associated to the traditional B-Mode imaging and Bi-Rads scoring.

MicroV is Esaote response to advanced clinical hemodynamics needs with :

- Top performance for not invasive real-time micro-vascularization study in terms of sensitivity and spatial resolution (clutter free)
- No hyper-echoic structure interference
- Very limited background noise

MicroV adaptive algorithm effectively separates flow signals from overlaying tissue motion artefacts and background noise, thus allowing the hemodynamic analysis for micro-vascularization in tissue perfusion with high sensitivity, high spatial resolution and high frame rate (Fig. 4).

Fig. 4: microV enhancing lesion's micro-vascularization



MicroE

Calcifications are small deposits of calcium that show up on mammograms as bright white specks or dots on the soft tissue background of the breast.

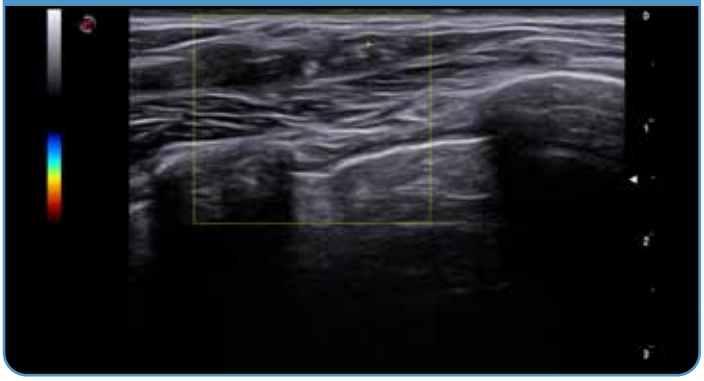
They are especially common after menopause, but they can also be a marker of underlying cancer development, in particular either ductal carcinoma in situ or invasive ductal carcinoma.

Mammogram is the gold standard for the microcalcification, detection while Ultrasound is considered unreliable for this kind of diagnosis. Traditional B-mode imaging is unable to delineate most microcalcifications due to contrast limitations and the complicated structure of mammary glands.

However, US can help as additional info, and different approaches (besides traditional B-Mode) are under evaluation.

MicroE is an imaging technology that allows to highlight small, hyperechogenic and roughly rounded structures. These are highlighted with a color scale and can be superimposed to a usual BW 2d image, inside a ROI (Fig. 5).

Fig. 5: microE color map superimposed on B-Mode to enhance hyperechoic spots

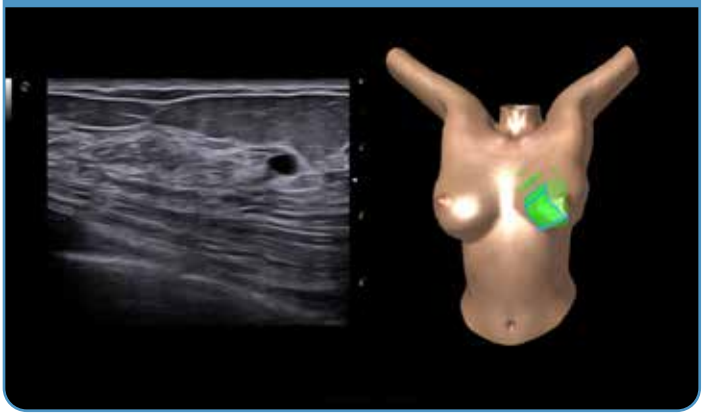


BreastNav™

BreastNav™ solution, designed on a model-adaptive algorithm, represents on a virtual model the real shape and morphology of the patient's breast, in order to help the detection and follow up of breast lesions. BreastNav™ main characteristics are:

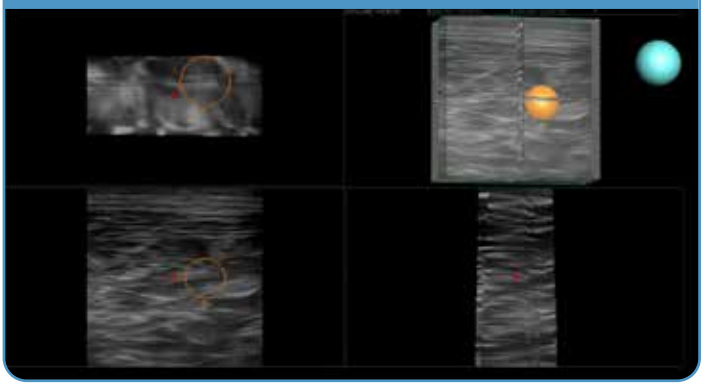
- **Immediacy**: with two sweeps the model automatically adapts breast shape to provide 1:1 correlation in real- time with ultrasound
- **Easy-of-use**: BreastNav™ technology can track and record the probe's sweeps, providing a visual feedback on the area covered by the probe (Fig. 6)

Fig. 6: BreastNav™ - visual feedback on the area covered by the probe



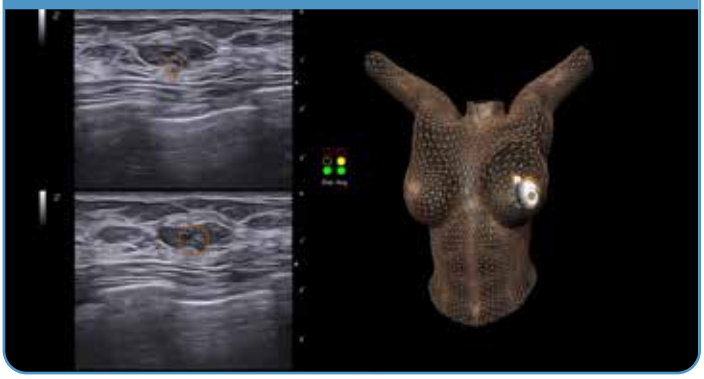
- **Lesion localization**: if a suspicious lesion is identified, it can be marked with a virtual target and saved within the patient's ultrasound study, including a **3D localization** rendering. (Fig. 7)

Fig. 7: BreastNav™ 3D lesion localization



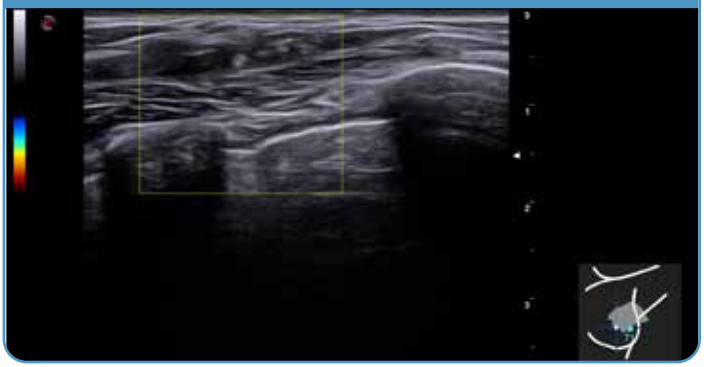
- **Efficiency**: BreastNav™ technology, during **follow-up** examination, shows the target previously saved, ultrasound reference image and the corresponding virtual-model probe position in order to quickly re-localize and re-identify the targeted lesion, backed up by a traffic light-feedback to identify the exact transducer spatial position (Fig. 8)

Fig. 8: BreastNav™ Follow Up



- **Completeness**: BreastNav™ environment can integrate other advanced technologies as microV for the assessment of the tissue micro vascularization, microE to enhance hyperechoic spots (Fig. 9), ElaXto and QElaXto 2D to evaluate the tissue stiffness, for a complete analysis of breast lesions.

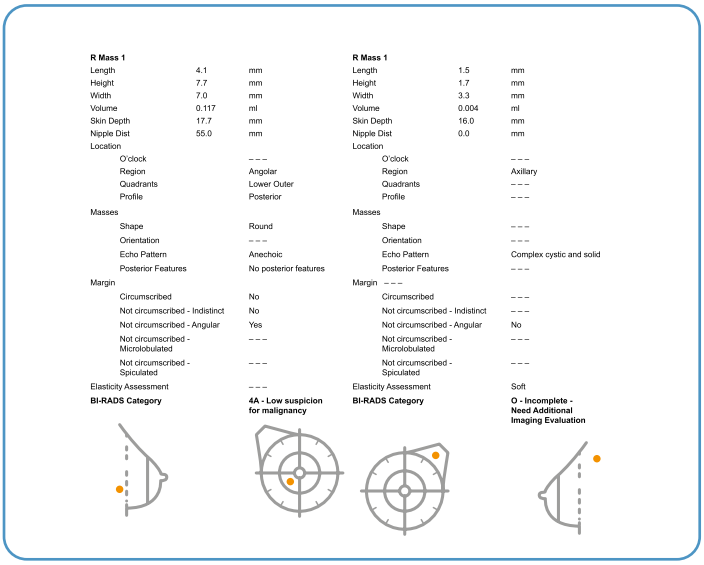
Fig. 9: BreastNav™ combined with microE



BI-RADS® standard report format

Esaote systems integrates also a dedicated report template, realized accordingly to the BI-RADS® scoring and cathegorization.

"BI-RADS reporting enables physicians to communicate results clearly and consistently, with a final assessment and specific management recommendations."



Innovation and research

The research style of Esaote is based on open innovations by conveying external knowledge that, creates a valuable network which includes research centers, high-level experienced physicians and patients. Integrate Breast Multimodality starts to become possible, thanks to technology evolution.

A further implementation of BreastNav™ technology is now under development, aimed to correlate the supine US with prone MRI examination, thus allowing the physicians to leverage on the clinical value of a multimodality real-time correlation during second-look US examinations, managing the deformation induced by patient's different positions between US and MRI.

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