Advanced Technologies in Breast Ultrasound

The Italian-based company Esaote has been involved for more than thirty years in the research and development, manufacturing and marketing of technological solutions for healthcare applications. Esaote is particularly active in the breast imaging field and has this year introduced the brand new BreastNav technology which has been designed to support clinicians in the follow up of breast lesions. The new tool further expands the scope of the company's range of breast ultrasound technologies dedicated to the breast application.

Breast cancer is one of the most common cancers in women. Increasingly, a multimodality imaging approach is being used in the detection and monitoring of early stage cancer disease, with the aim of initiating appropriate treatment in order to decrease mortality.

Thus, breast ultrasound, together with mammography, tomosynthesis and MRI, are playing crucial roles in the current routine in diagnostic and breast screening procedures.

BREAST ELASTOGRAPHY

The evaluation of breast elasticity is one of the most important procedures in the detection and characterization of breast pathologies. Further to traditional palpation performed as a standard procedure to detect and quantify differences in stiffness of tissues, elastosonography has become the gold standard imaging modality for visualization, scoring and analysis of breast parenchyma and lesion elasticity. Differences in elasticity and the presence of particular patterns of varying homogeneity can be associated with well defined groups of benign or malignant pathologies.

Strain Elastography

Esaote's ElaXto technology uses strain elastography and combines the benefits of ultrasonography with those of the classical palpation procedure, so providing a real-time and non-invasive assessment of tissue stiffness, that is easily interpretable, thanks to a color-coded qualitative stiffness mapping [Figure 1].
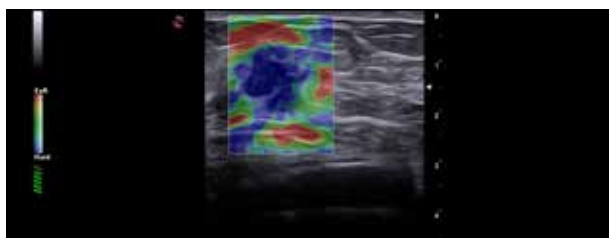

Figure 1. A malignant breast lesion depicted on the ultrasound system combining Elaxto, Esaote strain elastography and traditional B-Mode imaging.

Shear Wave Elastography

QElaXto 2D is the Esaote Shear Wave Elastrography technology, which provides quantitative information of elasticity, expressed in kiloPascals (kPa) or m/s, together with a color-coded map representing tissue stiffness. A dispersion map is also displayed on the screen to help the clinician position the region of interest (ROI) and increase the reliability of the measurements [Figure 2].
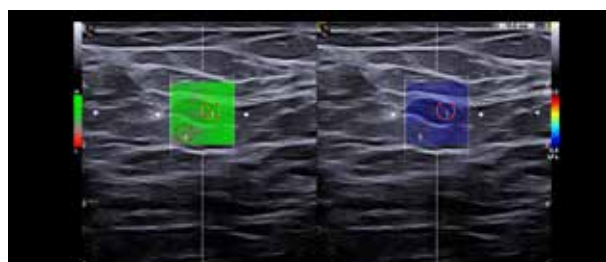

Figure 2. QElaXto 2D on a benign breast lesion

MULTIMODALITY AND FOLLOW UP FUNCTION

The "Follow Up with Multimodality" function allows additional imaging modalities such as mammograms or MRI to be displayed on the monitor, so providing in real-time a direct comparison with the ultrasound examination [Figure 3].
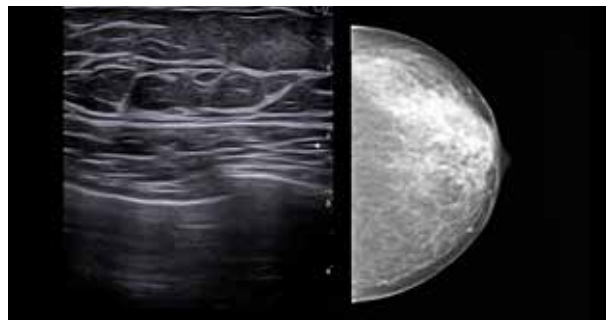

Figure 3. The Multimodality and Follow Up functions allow the simultaneous display of images from several modalities. Above, ultrasound and mammography.

BREASTNAV TO FOLLOW-UP BREAST LESIONS WITH 3D LOCALIZATION

The BreastNav solution was designed using a model-adaptive algorithm and 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. The main characteristics of BreastNav are:

- **Speed:** in two sweeps the model automatically adapts to the breast shape to provide in real-time a 1:1 correlation with ultrasound
- **Ease-of-use:** The technology tracks and records the probe's sweeps, and provides a visual display of the area being covered by the probe [Figure 4].
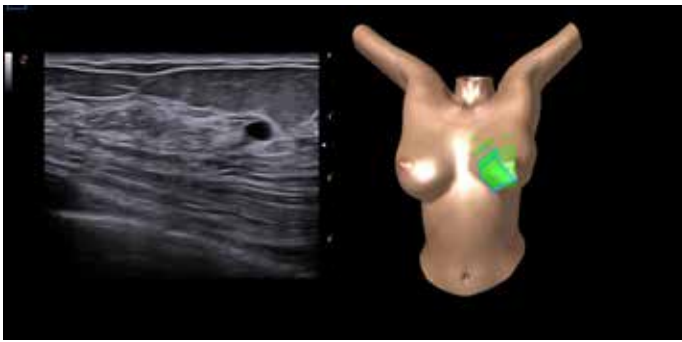
Figure 4. A visual representation of the area being covered by the probe is displayed.

• **Lesion localization**: if a suspicious lesion is identified, its spatial position can be easily marked with a virtual target and saved together with a 3D localization rendering in the patient's ultrasound file [Figure 5].
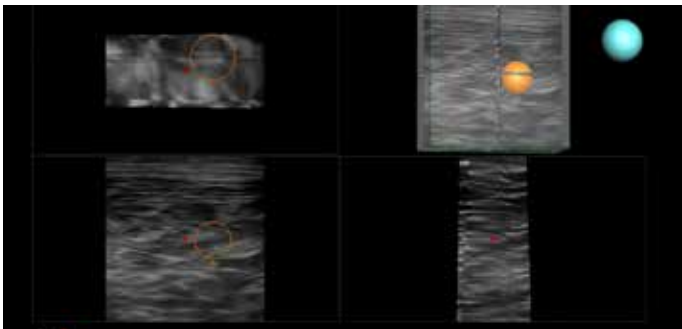

Figure 5. Suspicious lesions are identified and saved in a 3D localization rendering

• **Efficiency:** In follow-up examinations, the BreastNav technology shows the previously saved target lesion as the ultrasound reference image and the corresponding virtual-model probe position in order to rapidly re-locate and re-identify the targeted lesion. This is facilitated by a traffic light feedback indicating when the precise spatial position of the transducer that is required is reached [Figure 6].
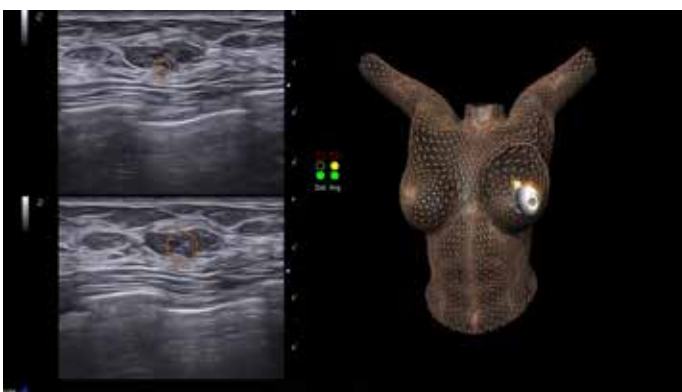

Figure 6. BreastNav follow-up of previously identified lesion with traffic light feedback

• **Complete:** for a comprehensive analysis of breast lesions, the new BreastNav environment can also integrate several

other advanced technologies such as: the microV tool for the assessment of tissue micro vascularization; the microE tool for the enhancement of hyperechoic spots [Figure 7]; as well as ElaXto and QElaXto 2D for evaluation of tissue stiffness. Esaote systems also integrate a dedicated report template, realized according to the BI-RADS categorization.
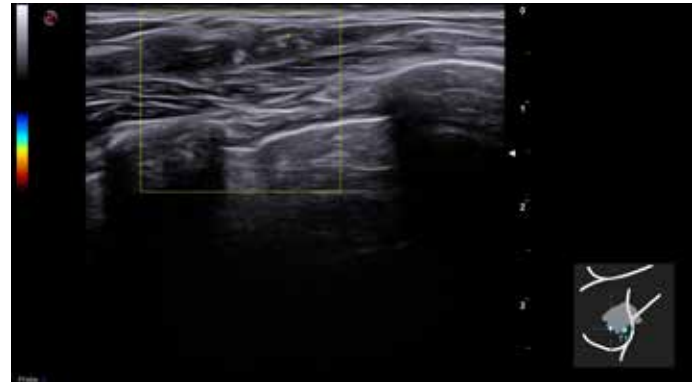

Figure 7 BreastNav combined with the microE tool

INNOVATION AND RESEARCH

The underlying philosophy of research and development in Esaote is based on open innovation involving external expertise in a valuable co-operative network which includes research centers and highly experienced physicians and their patients:

"*BreastNav is a very promising technology which helps better identification and follow-up breast lesions*"
— Dr. Camilla Fachinetti, Director of Breast Diagnostic Unit, Valduce Hospital, Como, Italy.

"*We're working side by side with Esaote to optimize the innovations and technologies in the breast ultrasound field, which really make the difference in our daily routine*".
— Dr. Enrico Cassano – Director of Breast Radiology Department, IEO, European Institute of Oncology, Milan, Italy.

More info:
Esaote Breast Ultrasound Solutions - Leaflet
Esaote BreastNav: Breast Ultrasound Advanced Solution

ESAOTE S.p. A.
GENOA, ITALY
www.esaote.com