



# New perspectives in breast ultrasound imaging

## More information to enhance diagnoses and monitor therapy

The Breast Center at Södersjukhuset is a team of radiologists, surgeons, oncologists, and cytopathologists and nurses who work together against breast cancer and other types of breast pathology. The Breast Center invites 200 asymptomatic women to join the screening program each day, and another 25 to 30 are sent as clinical patients from their referring physicians.

### Who/where

Ariel Saracco, MD  
Breast Center, Södersjukhuset,  
Stockholm, Sweden

Södersjukhuset has the largest emergency care unit in the Nordic region, treating nearly 90,000 people each year. The high number of admissions ensures consistent refinement of staff skills as well as providing excellent opportunities for clinical and oncological research and teaching.

### Challenge

Difficulty in making an ultrasound diagnosis in women with dense breasts; the need for additional ultrasound information in characterizing breast lesions; and the need to monitor patient response to therapy.

### Solution

Philips iU22 with Vision 2009 is improving image quality to give radiologists, surgeons and oncologists in the Breast Center at Södersjukhuset better tools for imaging fatty, dense breasts—potentially leading to earlier and better diagnoses and improvements in monitoring treatment.

### Challenge of imaging through dense or fatty breast tissue

As the most frequently diagnosed cancer in women, breast cancer is increasingly difficult to diagnose in women whose breast tissue is dense, meaning suspicious lesions may be overlooked. Mammography has been the most used modality in diagnosing breast cancer, generally providing better assessment of the tumor. However, there are challenges with mammograms in imaging through dense breast tissue in assessing: the size of the tumor, the tumor itself, and evaluating the disease process (multifocality and multicentricity, lymph node status, staging of the process).

### New imaging perspectives aid tumor assessment through improved image quality

In Sweden, physicians encounter fatty breast tissue in approximately 35 percent of patients. Ultrasound imaging through fatty

breast tissue is problematic as there are similarities between fatty tissue and some special types of small lesions (both benign and malignant).

“Sometimes we were having problems imaging through fatty breast tissue to diagnose small isoechogen tumors, for example,” said Ariel Saracco, MD, senior radiologist at the Breast Center, Södersjukhuset, Stockholm, Sweden.

“We would find small lesions of about 3 to 6 mm during a mammogram, but when we went to perform an ultrasound exam on the patient, we could not get enough penetration of the ultrasound. Therefore, there was just not enough definition between the fatty tissue and small isoechogen lesions (like special types of cancer or papillary tumors), which was very frustrating.

# PHILIPS



Dr. Ariel Saracco is a senior radiologist at the Breast Center, Södersjukhuset, Stockholm, Sweden.

Using Philips iU22 Vision 2009 with tissue aberration correction, Dr. Saracco says they now have more complete diagnostic information as a result of the improved image quality.

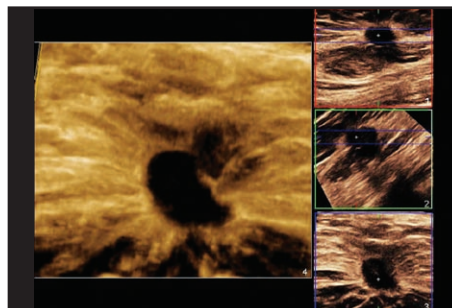
Philips has addressed these challenges through its unique user-selectable tissue aberration correction algorithms. Available on Philips Healthcare's L12-5, L17-5 and VL13-5 transducers on the iU22 system, tissue aberration correction compensates for alterations in the speed of high frequency soundwaves through breast tissue with an increased sharpness and clarity in patients with a wide array of fatty and dense breast architecture.

"Using Vision 2009, we get greater definition to distinguish between fatty tissue and the tissue of all different types of lesions," said Dr. Saracco. "On my first patient I scanned using Vision 2009, I remember being able to clearly distinguish between fatty tissue and a small normal intramammary lymph node which was displayed in two different echogenicities. It's this difference that makes a good diagnosis."

### Improvements in imaging microcalcifications

Despite ultrasound's many benefits, it is not used in routine breast cancer screening due to difficulty, among some others, in detecting microcalcifications. Dr. Saracco lauds the ability of Philips iU22 with Vision 2009 in helping clinicians better visualize microcalcifications for sample taking (biopsy).

"In dense breast diagnosis, when we mention malignant calcifications to the surgeon or the oncologist, they automatically think DCIS (ductal carcinoma in situ). This means that the cancer is probably still in the milk duct and there is no infiltration to the tissue around. But if in mentioning calcifications, the core biopsy done by stereotaxia might show just DCIS, the surgeons, sometimes, do not do



the sentinel node procedure in the axilla, especially if the core biopsy shows DCIS low grade and the area of calcifications described by mammography is small—less than 1 cm in diameter. Here is where the ultrasound might have an important role allowing us to see infiltration (not just DCIS). Then we take a core biopsy in that area, improving the assessment of the malignant process with the purpose of improving the surgical treatment."

"In any case, we don't want to characterize the calcifications with ultrasound because we've already established a diagnosis with mammography," continued Dr. Saracco. "But we put the patient in ultrasound to see the real extension of the disease (without calcification) that was not clearly seen on the mammogram. For example, the mammogram might reveal a 2 by 3 cm area of malignant calcifications, so we know the patient has a 2 by 3 cm cancer from the mammogram. When we put the patient in ultrasound we discover that the area of malignant calcifications by mammography is actually a 7 cm multifocal malignant process, with even lymph node metastases in the axilla (staging). We now get a much clearer picture."

### Volume imaging and the need for more data

Volume imaging is giving clinicians access to a whole new level of information in viewing and assessing masses.

"The c-plane images give a new dimension of tumoral growth patterns," said Dr. Saracco. "With volumetric imaging, we're seeing the

tumor from the top to the bottom and then we can see the real behavior of the infiltration of the tumor at every angle—anterior, posterior, lateral. With this information we can see all the processes of the tumor, which is a lot of great information.”

The iU22 Vision 2009’s 3D imaging enhancement is improving diagnostic certainty by enabling clinicians to better distinguish between benign and cancerous tumors, as well as view breast cancer spread with greater accuracy. Dr. Saracco says that using Philips VL13-5 transducer has been a tremendous asset in allowing clinicians to acquire a volume data set to better characterize a lesion; and therefore reduce the number of unnecessary biopsies of benign ones.

“Using the iSlice feature, we get good information for the oncologist. If we are planning to give chemotherapy to a patient with a tumor we can take the image of that tumor and slice to see inside it to assess the affect of treatment on that tumor (necrosis). The impact of the c-plane is giving the oncologist much more information. We also know how much distance there is from the main focus point to the end of the satellite lesion, which is information the surgeon needs. And when we can see inside the structure of the tumor, we can better distinguish between cancerous and benign tumors.”

### **Contrast-enhanced ultrasound in therapy monitoring**

Using the contrast-enhanced feature of Vision 2009, radiologists and oncologists at Södersjukhuset can see firsthand the effect of treatment on the mass, and quickly assess treatment by evaluating the metabolic activity of a tumor.

“A patient may have a 4 cm tumor, though the oncologist may feel a 6 cm lump due to the edema around the tumor. New therapy protocols recommend in those cases chemotherapy before surgery. By reducing lesion size or backstaging it, surgery is reduced and outcomes are improved.

“The oncologists, during further clinical controls in this group of patients, may then feel for the lump to determine the effectiveness of chemotherapy and presume treatment is working. However, they send patients to us for ultrasound confirmation and we may still see the same size tumor as before. (Clinically the tumor is diminished in size, but for radiologists it’s just the edema around it that disappeared.) Using contrast-enhanced ultrasound, we now have a functional method that can determine whether there is a decrease in blood flow, which means the tumor is becoming necrotic. This might be a good way to evaluate treatment.”

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Ariel Saracco, MD, Senior Radiologist, Breast Center; Södersjukhuset, Stockholm, Sweden

### **Final words**

“I feel the future of ultrasound in monitoring tumor response to therapy will be the utilization of volume ultrasound and contrast-enhanced ultrasound. It will provide a way to assess changes in tumor volume, internal structures and flow, and to assess whether cancers are getting larger or shrinking during pre-operative chemotherapy.” Philips iU22 with Vision 2009 is giving Dr. Saracco and his staff a valuable tool that helps clinicians better characterize breast lesions to improve breast cancer diagnoses, and monitor tumor neoadjuvant therapy.

“In comparing mammography and ultrasound, what we saw with the mammogram was the tip of the iceberg. With the ultrasound, we see the rest of the iceberg and some other ones hidden under the water, that were never seen before. The images are much clearer now. It is a much more complete picture.”

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