# BREAST IMAGING

## Innovative Workflow Solution Built on Artificial Intelligence in Digital Breast Tomosynthesis at Prestigious French Cancer Center

*Situated in Villejuif, south of Paris, the Institut Gustave Roussy (IGR) is France's largest cancer center, an international referral center for oncology, and an integrated center for patient care, research, and teaching. IGR is designated as a Comprehensive Cancer Center by the French National Cancer Institute and has an objective of developing more individualised and less invasive medicine, in part through investment in up-to-date technology. In line with this policy, the breast imaging section of the radiology department has recently evaluated a computer-aided detection system (CAD). We wanted to find out more about IGR in general and CAD in particular so we spoke to Dr. Corinne Balleyguier, a radiologist specialized in breast imaging.*

*Corinne Balleyguier, M.D., Ph.D. is head radiologist, specialized in Women's Health in the Department of Radiology, Institut Gustave Roussy, Villejuif, France email: balleyguier@igr.fr*

**Q** *Let's start at the beginning. Please tell us about Institut Gustave Roussy*

Well, as you said in the introduction, our institute is indeed highly considered in the field of oncology, not just for the all-important aspect of diagnosis and patient care, but also thanks to its many active research programs and teaching commitments. IGR is an international referral center for oncology, and we are a member of several European collaborative programs with top cancer centers in other European countries.



*IGR is one of the leading European anticancer centres, and is staffed by more than 2,500 healthcare professionals  The hospital has more than 400-beds  and admits  over 11,000 new patients per annum, 130,000 patients attend its clinics and 42,000 patients receive treatment for their cancers.*

My own special interest is in breast imaging, but the center itself deals with all cancers. Most of our patients come from the Paris area, but thanks to the reputation of the institute we have referrals from all over France, other European countries and also the Middle East (in particular Kuwait). The patients are all confirmed or suspected cases of cancer.

**Q** *Now let's turn to radiology and mammography. What imaging modalities do you have available?*

We are well equipped in this respect, although given the number of examinations we carry out, our imaging systems never stand idle. We perform 20 000 X ray exams per year, 12 000 breast exams per year,  including Mammography, Ultrasound, Contrast Enhanced Spectral Mammography (CESM) and Digital Tomosynthesis.

As for equipment, we have three mammography/digital breast tomosynthesis (DBT) systems, two of which are also equipped to carry out Contrast - Enhanced Spectral Mammography (CESM) as well as three ultrasound systems dedicated to breast imaging, and a stereotactic biopsy system. In addition, we have two MRI systems (1.5T and 3T), two CT scanners, two X-Ray and four general ultrasound systems. The principal supplier is GE Healthcare but for the ultrasound we have Samsung, Siemens and Toshiba equipment. The X-rays machines are from Philips and Primax.
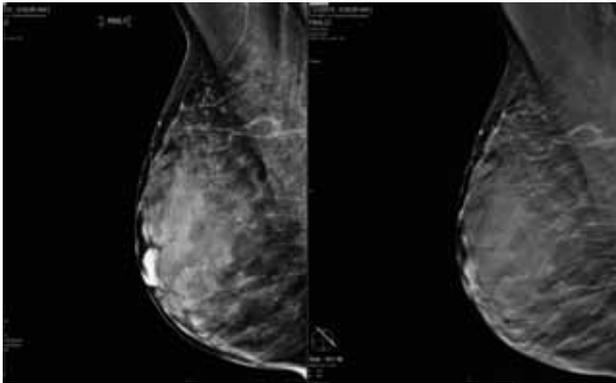
In breast tomosynthesis, the x-ray tube moves in an arc over the compressed breast capturing multiple images of each breast from different angles. These digital images are then reconstructed into a set of three-dimensional images by a computer. These three dimensional image sets help minimize the tissue overlap that can hide cancers or make it difficult to distinguish normal overlapping breast tissue from tumors. Thus, breast tomosynthesis overcomes some of the limitations of standard mammography. However, DBT has some disadvantages, one of which is the longer time needed by the radiologist to read the images. The rationale for the use of Computer-aided detection (CAD) is to help the radiologist in this respect

In the process of breast image interpretation, it is important to detect even the most subtle lesions, including clustered microcalcifications, spiculated and non-spiculated masses as well as architectural distortions and asymmetries. CAD can serve as a "second reader," assisting clinicians by drawing their attention to suspicious areas in mammograms that require further review.

iCAD's PowerLook Tomo Detection, built on the latest deep learning technology, is being used at IGR to improve digital breast tomosynthesis reading workflow and assist radiologists in finding cancers quickly. The advanced Tomo Detection deep learning algorithm detects potential cancers by scanning each DBT plane and blending those regions onto GE's V-Preview 2D synthetic image creating an Enhanced V-Preview image. The detected regions visible in the Enhanced V-Preview 2D synthetic image are linked back to the DBT planes where they were detected creating an efficient and effective navigation tool for radiologists when reading tomosynthesis exams. iCAD's PowerLook Tomo Detection is CE marked and being used by multiple mammography facilities throughout Europe. The product is also approved for sale in Canada.

To operate all this equipment and provide the service expected of us, we have a staff of 30 technicians, 13 Full Time Equivalent radiologists and six resident radiologists.

One unique innovation that we have introduced in the breast cancer unit of IGR is the *"One-Stop Shop"*. The rationale behind this concept is to address a frequent problem that arises when women are referred to us for further investigation, when they are understandably anxious about what the outcome of the investigation will be. Many women want to get a reliable diagnosis as soon as possible with the minimum of additional visits to the hospital, so, on one day a week, we reorganize our workflow so that all the various disciplines needed to provide such a definitive diagnosis in just a single day can be called upon there and then. Thus, on the same day, a clinical exam, preliminary imaging exam, followed if necessary by a supplementary imaging exam using a different modality, a biopsy (fine needle aspiration) and pathological analysis of the FNA sample will be carried out and all the protocols/observations recorded appropriately. At the end of the day the patient can go home with either an "all-clear" or a confirmed diagnosis, with an already established treatment programme.

**Q** *Let's focus in on tomosynthesis. You have recently been using GE's Enhanced V-Preview powered by the PowerLook Tomo Detection solution from iCAD for your breast tomosynthesis studies. How has your experience of this been?*

*B*reast tomosynthesis is currently attracting a great deal of attention in the breast imaging world — there have been a number of studies published which show that, compared to straightforward mammography, tomosynthesis can detect significantly more tumors or suspicious lesions, particularly in dense breasts. However, since tomosynthesis involves the acquisition of several images at different angles through the breast, one key downside of tomosynthesis is that the reading of the images by the radiologist inevitably takes more time.

We find that using Enhanced V-Preview with the PowerLook Tomo Detection solution from iCAD not only enables us to reduce the reading time but also makes the whole reading process easier and more precise.

Before we had Enhanced V-Preview, it would take us on average 90 seconds per case. Now this is significantly reduced, particularly with routine cases. In turn, this enables us to focus more on essential, more complex cases. We use tomosynthesis for all our diagnostic cases (as opposed to screening), except for women with BRCA 1 & 2 genetic mutations.

From a workflow perspective, the CAD-enhanced image hanging protocol is easily incorporated into the tomosynthesis reading workflow. We participated in a reader study that showed a significant reduction in reading time for radiologists with no negative impact on radiologist performance relative to sensitivity and specificity. I also believe Enhanced V-Preview with Tomo Detection can decrease the general fatigue associated with reading tomosynthesis cases for a full day.

All in all, we do find it to be a very useful technology.

**Q** *So what would your advice be to others who are thinking about investing in Enhanced V-Preview with Power Tomo detection ?*

We believe it is a very valuable tool, particularly if the current interest in breast tomosynthesis ends up with the method being widely accepted as a general screening modality. Anyone investing in tomosynthesis should consider its impact on reading time and radiologist productivity. Enhanced V-Preview with iCAD's PowerLook Tomo Detection is a powerful tool that can significantly help off-set the increased reading time and make reading tomosynthesis a much more positive experience for radiologists.