

## Pressure-based compression in breast tomosynthesis

*The Christine E. Lynn Women's Health & Wellness Institute in Boca Raton, FL, USA is renowned for providing a broad continuum of care addressing women's medical needs in South Florida and has a range of the most advanced imaging systems to support its mission. In keeping with its policy of offering the most-up-to-date equipment, the Institute has recently evaluated a pressure-based breast compression system from the Dutch company Sigmascreeing, for use in mammography and breast tomosynthesis examinations.*

*We wanted to find out more about the Institute in general and the new pressure-based compression system in particular, so we spoke to Dr. Kathy Schilling, radiologist and medical director of the Institute.*



Dr Kathy Schilling is Medical Director of the Christine E. Lynn Women's Health & Wellness Institute at the Boca Raton Regional Hospital in Boca Raton, FL, USA  
Email: [KSchilling@baptisthealth.net](mailto:KSchilling@baptisthealth.net)

**Q** *Before we get on to the new pressure-based breast compression system, please give us a brief description of your institute*

We have been established here in South Florida for some time now — we celebrated our 30-year anniversary in Boca Raton last year. Currently our Institute comprises a main building but we also have two satellite centers and a mobile mammography van.

The breast imaging procedures that we carry out currently include 2D and 3D screening and diagnostic mammography, screening and diagnostic ultrasound, Contrast Enhanced 2D mammography, Molecular Breast Imaging, Diagnostic breast MRI and Abbreviated MRI protocols. All told, in 2019 we performed 23,600 3D screening exams, 8428 3D diagnostic exams, 2188 2D diagnostic exams, 13,654 breast ultrasound exams, 1533 breast MRI, 30 CESM and 22 Molecular Breast Imaging procedures, giving a grand total of 49,455 procedures. From these data you can see that the breakdown of the exams we carry out is 70% screening and 30% diagnostic.

To carry out all this workload we have 11 GE Pristina mammography units providing 2D and 3D exams (with two of them able to carry out Contrast Enhanced Mammography and CEM-guided biopsies). We also have 9 Hologic SuperSonic Imaging ultrasound systems, a 3T GE MRI system and a GE Molecular breast imaging unit.

Our center is staffed with 3 radiologists per day - we provide real time reads on all our procedures except MRI. We have 14 mammography technologists, 8 US technologists, 2 MRI technologists and 4 Special procedure/NM technologists. The majority of our patients come from the surrounding area.

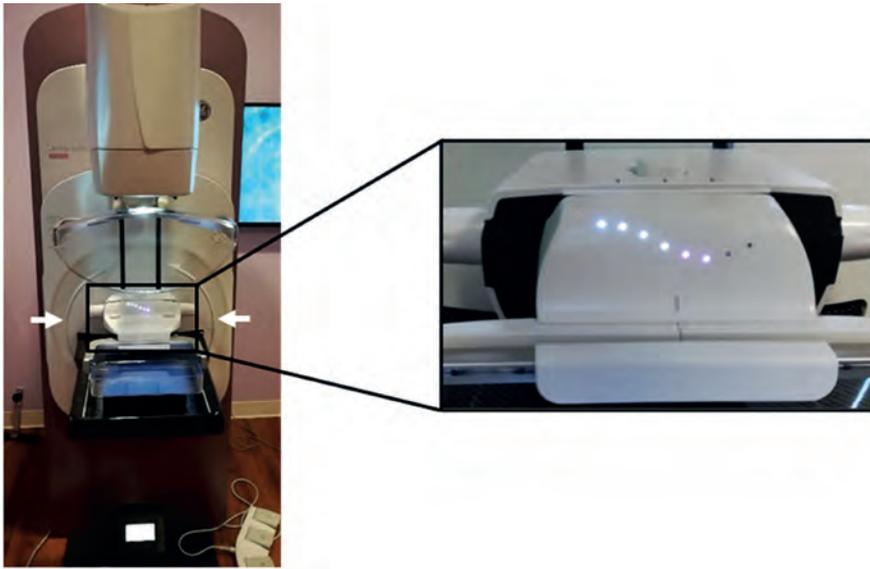
We endorse annual mammography screening in all women beginning at age 40 so long as they remain healthy

and prepared to act on any findings. Patients can self-refer and there is no out-of-pocket cost for a screening procedure. Across the U.S.A, it is estimated that about 66% women have had a screening mammogram within the last 2 years. Digital Breast Tomosynthesis (DBT) is our screening method of choice including for women imaged on the mobile mammography van.

**Q** *What about breast density?*

For every mammogram we acquire, breast density is determined by Volpara Density software and reported according to the BIRADS 5th edition recommendations. Florida is one of the states in the U.S.A. where legally we are now required to report breast density to the woman concerned — in fact we had already been doing this for years before this law was enacted. The issue of breast density is important so we spend a lot of time and effort to educate our patients and referring physicians about the significance of breast density. Currently we give each patient a form, "Know Before You Go" which informs the patient of her personal breast density as well as her NCI Lifetime Risk of developing breast cancer. Recently we also began reporting the presence of breast artery calcifications and, because of the association of such calcifications with coronary artery calcification and cardiovascular risk will, if appropriate, recommend a cardiology consultation. We also recommend smokers to consider low dose CT lung cancer screening. Navigators assist patients in seeking out supplemental screening exams.

To get back to breast density, we most commonly recommend bilateral ultrasound supplemental screening for patients with high density breasts. Alternatives include contrast mammography and, less often, MRI. These modalities are also used for patients at high risk of breast cancer.



**Figure 1.** The flexible pressure-based compression paddle from Sigmascreening, fitted to a GE Senographe Pristina mammography system. The compression system is based on pressure measurements as opposed to the usual force. As seen in the Right Panel above, eight light emitting diode (LED) lights indicate the pressure level to the technologist and the participant. LED lights #5–7 (pink) indicate the target pressure range (8–13.9 kPa). Once the target range is reached, the indicator lights, present on the patient handles (arrows in Left Panel), automatically switch off. In the above Left Panel image, the handle lights are off. Image reproduced with permission from Reference 1.

We do not double-read exams but for about a year now we have been using an artificial intelligence-derived algorithm (the ProFound AI system from iCAD) to assist in DBT interpretation. A recent reader study of ProFound AI found that it decreased interpretation time by 52%, increased the cancer detection rate by 7% and reduced recall rates by a similar amount. Currently the recall rates for our eight radiologists range from 5–13% (the recommended rate is <10%). We are currently carrying out research to determine any change in our interval cancer rates brought about through the use of the AI-derived software.

### **Q** *And now let's get on to the question of breast compression*

The discomfort related to mammography breast compression is one of the main reasons patients fail to comply with screening guidelines. We were fortunate to participate in a research protocol utilizing the pressure-based compression device developed by Sigmascreening. The details and the results of this research work have now been published [1].

The paddle system itself was easily

integrated into our Pristina mammography unit [Figure 1]. Our technologists quickly realized the benefit of standardized, consistent compression afforded by the device and easily adapted to it, so there was no learning curve involved. Importantly also, the patients readily understood the importance of the paddle.

We have only utilized the Sigmascreening compression-based paddle in the context of the research project as it is not (yet) currently commercially available for use in the US.

The results of our study showed that there was reduced variability in compression force — in particular there was less over-compression of smaller breasts and less under-compression of the larger breasts. This is important since the pain experienced by women with smaller breasts may in particular contribute to their lack of compliance with screening guidelines. With optimization and standardization of the compression, we should see improved image quality due to better compression of women with larger breasts, as well as reduced radiation dose.

We offer patient-assisted compression to our patients in general as we did to the 50 patients who participated in the Sigma

paddle project. I believe that overall these patients feel they have better control over the procedure as compared to technologist compression. However, the attitude to patient-assisted compression is a personal one — many women prefer not to participate in the patient-controlled compression process.

The main outcomes of the research project evaluating the Sigma Paddle pressure-based system included:

1. An improvement in the experience for both the technologist and patient when the pressure based compression system was used. This may increase compliance with screening guidelines but will require future study.
2. Mean breast thickness and glandular dose were significantly reduced, so improving standardization of the image acquisition.

### **Q** *How do you see future developments regarding the pressure-based compression system and screening mammography in general?*

I would anticipate utilizing pressure-based compression throughout our practice for standardization and optimization of outcomes when the system becomes available for routine clinical use in the USA.

As regards screening in general, I definitely believe that we will be moving from age-based screening to risk-based screening in the future and I think artificial intelligence together with personal genomics will become the standard method of determining risk. Algorithms will ultimately be developed which should optimize cancer detection and minimize interval cancers. As recommended by the American College of Radiology, the Society of Breast Imaging and the American Society of Breast Surgeons, every woman should undergo a personal risk assessment by the age of 30 so as to identify women for whom screening should be initiated before the age of 40.

### **REFERENCE.**

1. van Lier MGJTB, de Groot JE, Muller S, den Heeten GJ & Schilling KJ Pressure-based Compression Guidance of the Breast in Digital Breast Tomosynthesis Using Flexible Paddles Compared to Conventional Compression Journal of Breast Imaging, 2020; 2; 541. <https://doi.org/10.1093/jbi/wbaa070>