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# AMIC TECH EDUCATION NEWSLETTER

## Mammography

**SPECIAL EDITION : BREAST CANCER AWARENESS MONTH**


### Digital Breast Tomosynthesis (DBT)

Digital breast tomosynthesis (DBT), or 3D mammography, has been a subject of research in the breast imaging community, as well as topic of conversation in the media and public, for several years. The ability to obtain "3D" reconstructed images from conventional mammography data sets has been possible for over a decade, but it was only with the advent of large digital detectors that it became realistic to incorporate these technologies into routine clinical practice. In February 2011, the Hologic Dimensions 3D was the first tomosynthesis system approved for clinical use by the United States Food and Drug Administration (FDA). A second system received FDA approval in August 2014, GE Healthcare's Seno-Claire DBT system. Current procedural terminology codes for DBT were released in the fall of 2014.

DBT reduces the effect of tissue superimposition by providing a series of 1-mm thin slices that are reconstructed from a series of low-dose images obtained by rotating the x-ray tube in an arc above the compressed breast. The 1 -mm thin slices in effect provide greater visibility and allow radiologists to see "through" breast tissue by decreasing tissue overlap and summation artifacts.

A tomosynthesis-equipped mammography unit can perform routine 2D digital mammography, digital breast tomosynthesis, and a combination of both 2D and 3D images during a single compression.

The Hologic Dimensions system performs the DBT run by sweeping the x-ray tube across the breast over a 15-degree arc while taking 15 low-dose images. The x-ray tube then returns to the center position and takes a full-dose 2D image. This imaging is

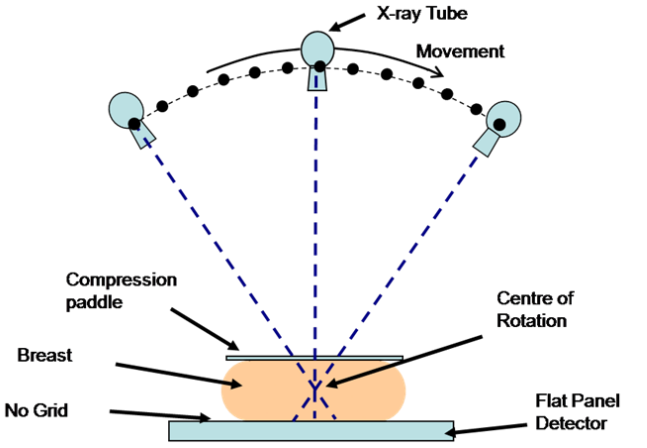



Image 1: Typical configuration for a digital breast tomosynthesis system. *Image courtesy of NCCPM.*

# Digital Breast Tomosynthesis (DBT) Cont...

**Advantages of DBT imaging**

- improved detection of architectural distortions – of note, low-grade invasive ductal carcinoma typically presents as a distortion.
- Lesion location information from a single acquisition.
- Increased mammographic sensitivity and specificity. In other words, DBT increases cancer detection while decreasing recall rates.
- Better delineation of mass borders which can often allow the patient to proceed directly to diagnostic ultrasound without the need for additional mammographic images.

performed for both standard projections (cranial-caudal and mediolateral-oblique) during the screening examination. There is an increased radiation dose of about 60% over that of the routine 2-view screening digital mammography; however, the dose is still less than the MQSA limit of 3 mGy/single view.

GE's SenoClaire system takes 9 low-dose images in each projection (cranial-caudal and mediolateral-oblique) over a 25-degree arc in a "step-and-shoot" manner. This technique is reported to create generally sharper images than "continuous" image acquisition. There is also a calcification artifact correction algorithm on GE's system which improves visualization of calcifications and reduces associated artifacts. SenoClaire does not deliver an increased dose of radiation to the breast when compared with routine 2-view digital mammography.

General advantages of DBT imaging include:

- improved detection of architectural distortions – of note, low-grade invasive ductal carcinoma typically presents as a distortion.
- Lesion location information from a single acquisition.
- Increased mammographic sensitivity and specificity. In other words, DBT increases cancer detection while decreasing recall rates.
- Better delineation of mass borders which can often allow the patient to proceed directly to diagnostic ultrasound without the need for additional mammographic images.

The available scientific data indicate that the addition of DBT to standard 2-view digital mammography improves radiologists' breast cancer detection rates, increasing cancer detection 27-35% depending on the study. Two large studies with over 25,000 combined participants, the Oslo trial and a study by Rose and colleagues, also demonstrated a 40-53% increase in the detection of ***invasive*** cancers compared with traditional 2-view digital mammography. Importantly, earlier stage breast cancers may be discovered. In 2 multicenter series, 91% of cancers seen only with DBT were invasive cancers with 82% of these cases node negative.

DBT has also been shown to reduce false positive rates (ie, decreases the recall rate for additional views) by 15-40% and increases the positive predictive value of recalls two-

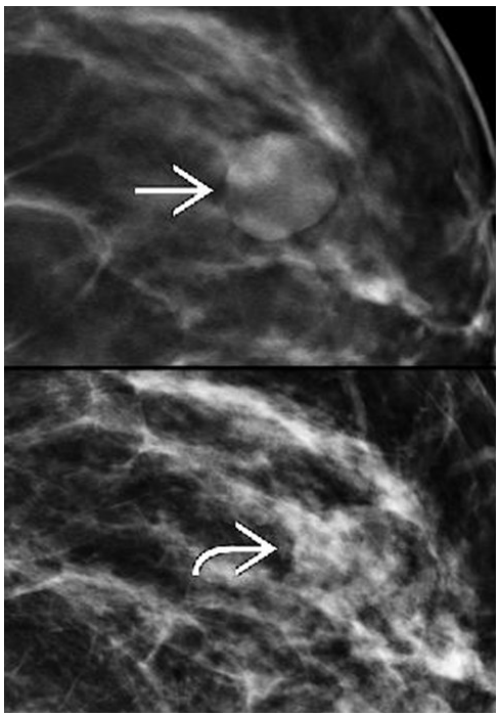


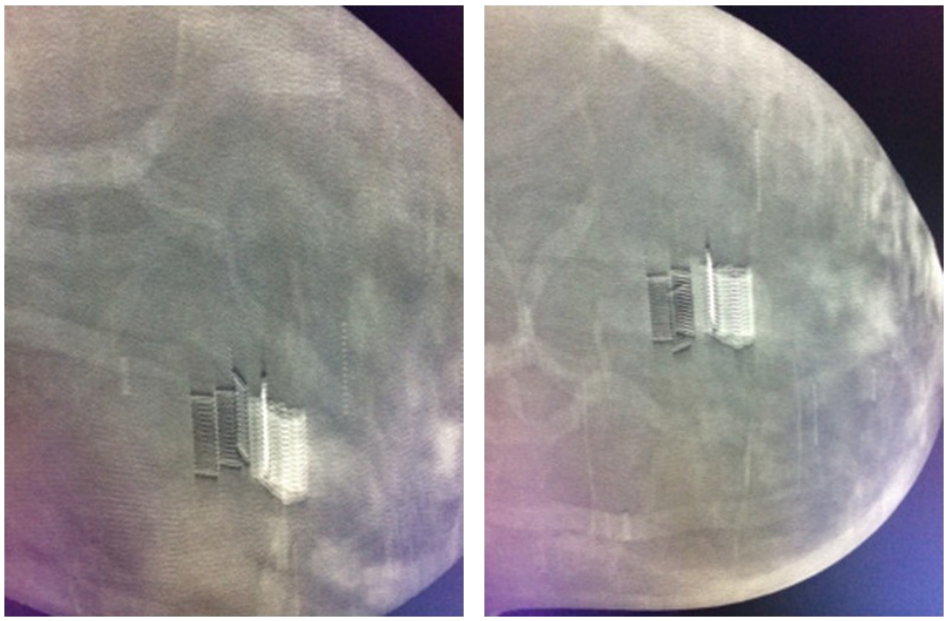
Image 2: Top DBT image demonstrates a well-circumscribed oval mass which was a fibroadenoma. Bottom full-field digital CC view show an obscured mass whose margins are not well characterized.

# Digital Breast Tomosynthesis (DBT) Cont...

fold. No study to date has shown a decrease in cancer detection rate or an increase in recall rate for any participating radiologist. DBT may be used in both screening and diagnostic settings. Spot compression DBT images can be obtained in the diagnostic setting, but magnification images cannot.

The downsides to DBT include increased time to acquire the study, meaning the breast is compressed for a longer period of time. Motion artifact can occur and is often difficult to detect. Metallic skin markers, biopsy markers or post-surgical clips ("slinky" artifact), and large breast calcifications result in artifact on many DBT images. Finally, due to the increased number of images to review, radiologists in the Oslo trial spent twice as long reading 2D mammography plus DBT compared to 2D mammography alone.

It is important to remember that ultrasound can detect some cancers not seen on DBT. If there is a clinical finding, but no correlate on DBT, diagnostic ultrasound is still indicated. Additionally, indeterminate calcifications will still need work



"Slinky" artifact caused by a surgical clip in the left breast on a DBT image may obscure adjacent tissue.

-up with spot magnification images in the CC and ML projections.

Jeri Sue Plaxco, DO

The Oslo trial and a study by Rose and colleagues, also demonstrated a 40-53% increase in the detection of *invasive* cancers compared with traditional 2-view digital mammography.

## DID YOU KNOW ?!?

The American Cancer Society's estimates for breast cancer in the United States for 2015 are:

- About 231,840 new cases of invasive breast cancer will be diagnosed in women.
- About 60,290 new cases of carcinoma in situ (CIS) will be diagnosed (CIS is non-invasive and is the earliest form of breast cancer).

# Ultrasound

## Labeling and Measuring Requirements in Breast Ultrasound

The American College of Radiology publishes documents dealing with parameters for performance for all imaging modalities, including breast ultrasound. The breast ultrasound document (ACR Practice Parameter for the Performance of a Breast Ultrasound Examination http://www.acr.org) addresses topics including indications for breast ultrasound examination, qualifications and responsibilities of the physician and medical sonographer, equipment requirements, quality control and safety. The document also specifies labeling requirements. The AMIC radiologists who interpret breast ultrasound exams expect that the images submitted by medical sonographers be labelled in accordance with these standards.

Each image in a breast ultrasound study should contain the following information:

1. Facility name and location(city, state and zip). Some ultrasound units do not currently support including the location information, but newer units should do so.
2. Examination date.
3. Patient's first and last name.
4. Identifying number and/or date of birth
5. Designation of right or left breast.
6. Sonographer's and/or physician's identification number, initials, or other symbol.
7. Anatomic location using clock face notation or a labeled diagram of the breast

When a potential lesion is found by the sonographer, that lesion should be documented in 2 perpendicular projections. Transducer orientation (ie. radial/antiradial, sagital/transverse) and distance from the nipple to the abnormality, if present, are required. The location of the lesion should be recorded using clock face notation and distance from the nipple, and/or shown on a diagram (or icon) of the breast. The length of the transducer face (footprint), usually between 3.5 cm and 5 cm, can be used to estimate the distance from the nipple. Measurements should not be made from the edge of the areola, as areolar width is widely variable.

Lesions recorded on a breast ultrasound exam should be shown both with and without calipers. To make the caliper measurements, record the dimensions to the nearest mm. For example, 4.5 to 4.9 mm rounds up to 5 mm (0.5 cm); 4.1 to 4.4 mm rounds down to 4 mm ( 0.4 cm).

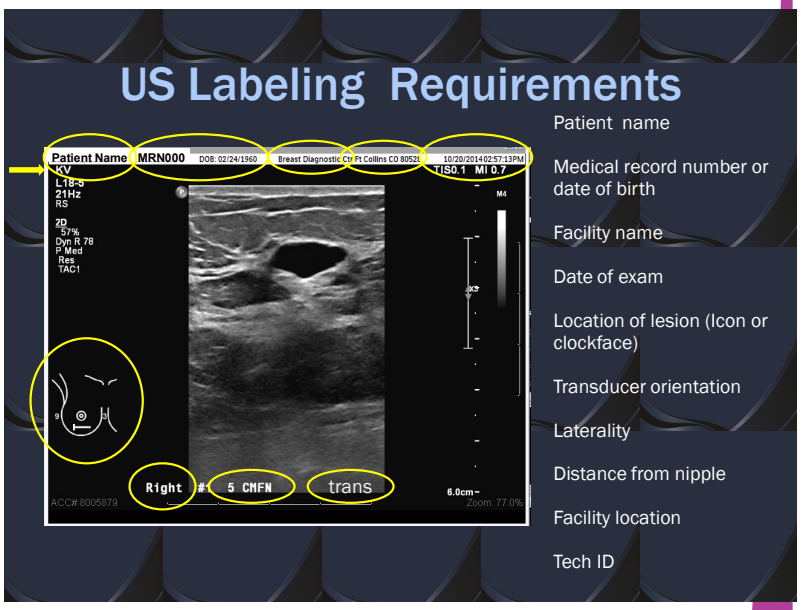



Figure 1. Labeling an image. Each of the recommended labels listed on the right are included and circled on the US image .

Provide the long axis measurement (image showing the longest diameter of the lesion) along with its perpendicular measurement. Note that the scan plane of the lesion's longest diameter may not correspond to the radial or anti-radial scan planes.

Jean Paquelet, MD

"When a potential lesion is found by the sonographer, that lesion should be documented in 2 perpendicular projections. "

# Evaluation of the Male Breast

Breast cancer is very uncommon in men. Male breast cancer accounts for less than 1% of all cancers diagnosed in men and approximately 0.5% of all breast cancers. When a male patient presents to the imaging center for mammography, it is usually for a unilateral breast lump or focal pain behind the nipple. For patients over the age of 20, we start with standard bilateral CC and MLO views.

Most male patients presenting with these symptoms have gynecomastia, which is a benign enlargement of the male breast tissues. It results from an imbalance between the estrogen and androgen levels and usually occurs in older men. In gynecomastia, we see tissue centered behind the nipple, which is flame shaped and extends posteriorly, blending into the fat. In 80% of cases, it is asymmetric and bilateral; 15% of the time, it is unilateral.

There are multiple causes of gynecomastia, including idiopathic, medications, drugs and medical conditions. An incomplete list includes:

| Medications | Drugs | Medical Conditions |
|---|---|---|
| Antihypertensives | Marijuana | Liver cirrhosis |
| Anti-androgen/estrogen therapy ( for prostate cancer) | Alcohol | chronic kidney failure |
| Tricyclic antidepressants | anabolic steroids | hyperthyroidism |
| Steroid hormones | opioids | Neoplasms including: hepatocellular carcinoma, testicular cancer, adrenal cancer |


Case courtesy of Dr Frank Gaillard, Radiopaedia.org, rID: 8894

Bilateral MLO views (Figure One) of a male patient with complaint of lump behind the left nipple. This is gynecomastia, with tissue centered behind the nipple and radiating posteriorly in a flame shape. Notice it is bilateral and asymmetric, left greater than right.

For patients whose mammograms confirm gynecomastia, we generally do not proceed to sonographic evaluation. Shadowing prominent hypoechoic ducts are commonly seen in gynecomastia. This can simulate a shadowing mass and lead to unnecessary biopsy.

Male patients with breast cancer present with similar symptoms to those with gynecomastia, however their mammographic findings demonstrate high density circumscribed tissue that is usually eccentric to the nipple. These findings more typically appear as a mass on mammogram, as opposed to fibroglandular tissue seen on mammogram.

# Evaluation of the Male Breast Cont…

Left MLO image (Figure Two) of a male patient with complaint of left breast lump. There is a high density solid mass behind the left nipple. These findings were suspicious and prompted further evaluation with ultrasound.

Figure Two

Targeted sonographic images (Figures 3&4) behind the left nipple demonstrate a complex cystic and solid mass with color flow. This was intracystic papillary carcinoma on pathology.

The incidence of male breast cancer increases with age, with the median age of 67 years at diagnosis. About 25% of men diagnosed with breast cancer are carriers of the BRCA2 mutation. If a man is diagnosed with breast cancer or if a woman has a first degree male relative with cancer, they are generally referred for genetic counseling.

Case courtesy of Dr. Kimberly Ray, San Francisco General Hospital


Figure Three

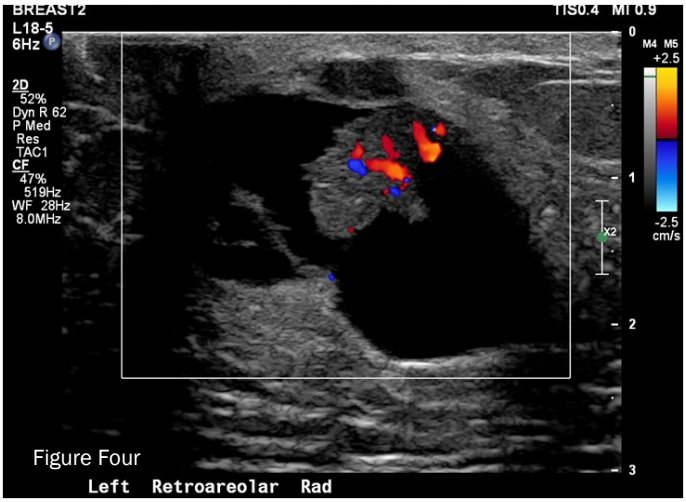



Figure Four

## DID YOU KNOW ?!?

*BRCA1* and *BRCA2* are human genes that produce tumor suppressor proteins. These proteins help repair damaged DNA and, therefore, play a role in ensuring the stability of the cell's genetic material. When either of these genes is mutated, or altered, such that its protein product either is not made or does not function correctly, DNA damage may not be repaired properly. As a result, cells are more likely to develop additional genetic alterations that can lead to cancer.

http://www.cancer.gov/about-cancer/causes-prevention/genetics/brca-fact-sheet#q1

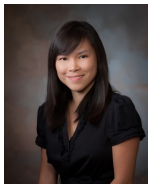
# Evaluation of the Male Breast Cont…

Not all palpable breast lumps in men are secondary to gynecomastia or cancer. Next to gynecomastia, the second most common reason men are referred for mammographic imaging are for evaluation of lipomas. These are completely fat containing masses which are benign.

LCC view (Figure Five) of a male patient with complaint of a medial breast lump. No mammographic abnormality is seen.

Ultrasound (Figures 6 & 7) demonstrates an avascular, oval, circumscribed, isoechoic mass compatible with a lipoma.

Janice Hsu, MD



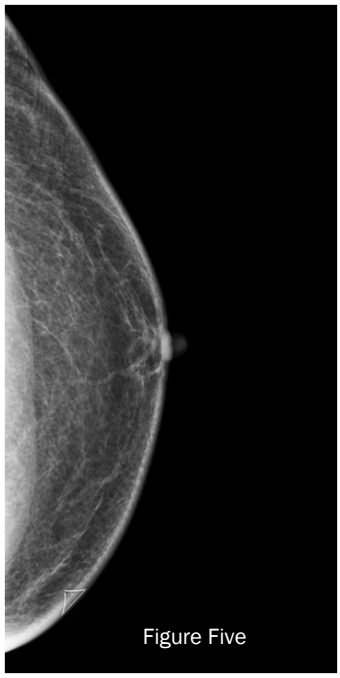


Figure Five

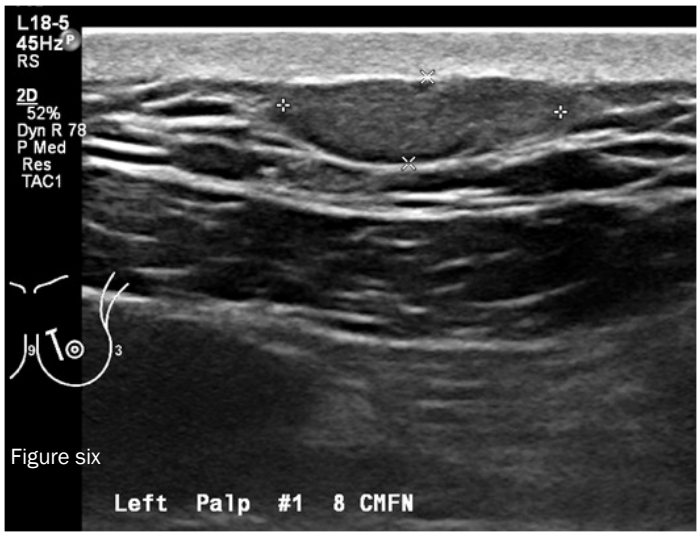



Figure six

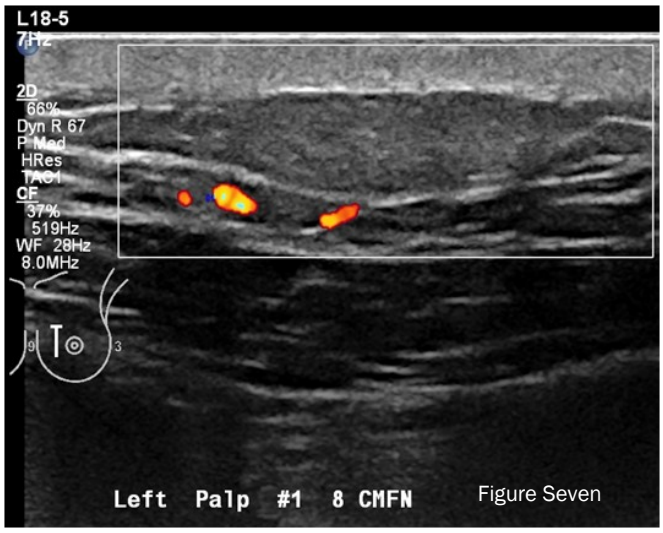



Figure Seven

**The incidence of male breast cancer increases with age, with the median age of 67 years at diagnosis.**

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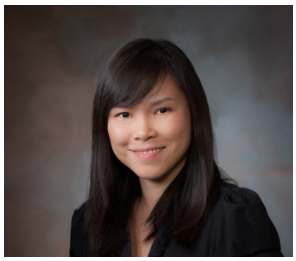
Trusted Radiology Experts

**Featured Columnists:**

Advanced Medical Imaging Consultants, P.C.
is pleased to welcome

## Janice Hsu, M. D.



Dr. Janice Hsu comes to Colorado from San Francisco, CA. Dr. Hsu received her medical degree from the University of Illinois at Chicago College of Medicine, Chicago, IL. She completed her residency at Loyola University Medical Center Department of Radiology, Maywood, IL, and received Women's Imaging and Ultrasound fellowship training at the University of California at San Francisco Medical Center Department of Radiology, San Francisco, CA.

Advanced Medical Imaging Consultants, P.C.
is pleased to welcome

## Jeri Sue Plaxco, D. O.

Dr. Jeri Sue Plaxco comes to Colorado from Houston, TX. Dr. Plaxco received her medical degree from University of Health Sciences College of Osteopathic Medicine, Kansas city, MO. She completed her Diagnostic Radiology Residency at the University of Kentucky, Lexington, KY, and received Breast Imaging fellowship training at University of Texas MD Anderson Cancer Center, Houston, Texas. Dr. Plaxco is joined in Fort Collins by her husband Jay, and her son Oscar

## Jean Paquelet, M.D.

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