

Wednesday, October 21, 2015
St Mary's Hospital; Livonia, Michigan

Lecturer: Sunil Bajaj; Radiologist~ Karmanos Cancer Institute; Breast Sonography

Sponsor: Steve Wegel; Supersonics Inc.

Interesting Case Presentation: Nancy Heberer, RDMS/RVT ~~Topic: Phyllodes Breast Tumor

Introduction: Liz Lawrence, President~Michigan Sonographers Society

Liz thanked our sponsor Steve Wegel; Supersonics and also our Guest Speaker Dr. Sunil Bajaj for giving us the opportunity to learn about new technology that Supersonics has to offer in the field of sonography, and to be educated on the topic of breast sonography by Dr. Bajaj.

Liz also thanked everyone for attending the October MSS Monthly Meeting, and asked that attendees inform the MSS if they do not receive their CMEs by Oct 31, 2015. We realize that MSS Education Co-Chairs Nancy Heberer and Sandra Mamou make every effort to submit the CME's to the SDMS for immediate credit to our attendees. However, some attendees are having difficulty downloading their SDMS credits once they are received. Please remember to check "junk mail" and "spam" for your SDMS approved MSS CMEs. There will be a \$5 charge for any duplicate CME requests after the last day of the same month of the MSS Meeting.

Sponsor:

Steve Wegel spoke about Supersonics new US system "Imagine/Aixplorer." ShearWave Elastography. This technological achievement gives additional, important quantitative information about tissue elasticity to ultrasound imaging.

Unlike conventional elastography methods, which rely on manual compression and measure tissue displacement, ShearWave Elastography requires no manual compression and computes true tissue elasticity by measuring the velocity of shear waves as they propagate in tissue. ShearWave propagation speed in tissue is directly related to tissue stiffness. This technology relies upon the generation of a shear wave and its subsequent capture, only made possible with patented UltraFast™ Imaging. Shear wave propagation speed is calculated and a color-coded, real-time ShearWave Elastography map is produced showing quantitative (kilopascals), local tissue stiffness. (source: www.supersonicimagine.com)

ShearWave Elastography is a safe, non-ionizing technique that is well below the thermal and mechanical indexes of the FDA and CE regulations. In fact, conventional Doppler imaging uses the same thermal and mechanical energy as ShearWave

Elastography. Shear wave elastography is a reproducible technology that assesses the stiffness of tissue in kilopascals, a unit of pressure. The propagation speed of a shear wave is faster in harder tissues.

At RSNA 2005, Richard G. Barr, MD, PhD, of Northeastern Ohio Universities College of Medicine in Rootstown and Radiology Consultants, Inc in Youngstown, reported having high sensitivity and high specificity for breast lesion probability of benign or malignant with elastography. "Since then the technology has continued to improve," he says, and it's now a routine part of breast ultrasounds in his practice. (The FDA approved the technology in 2006.) Multiple manufacturers, including Siemens, Philips, GE, and Toshiba, offer this elastography software, Barr says. In addition, a company based in Aix-en-Provence, France, SuperSonic Imagine, has developed another elastography technology, which was approved by the FDA in 2009, called ShearWave Elastography.

SuperSonic's Aixplorer uses two types of waves: an ultrasound wave that creates a high-quality B-mode image and a shear wave that can be measured as it propagates in tissue, rendering a quantitative, color-coded map of tissue stiffness, says Cofounder and Chief Scientific Officer Claude Cohen-Bacrie, who had worked in ultrasound for Philips in the United States for many years before returning to France.

Steve showed us a video clip from Dr. Kathy Schilling Boca Raton Regional Hospital (RSNA 2013) about Breast US and Elastography and how Aixplorer is making a clinical difference in breast imaging. she spoke about BIRADS classification. Shearwave Elastography (SWE) is transducer generated acoustic radiation; it induces transversely oriented shear waves; higher shear wave speed in stiff tissue; the elastography color map is red=stiff; blue=soft. With elastography the stiffest tissue is not within the lesion but in the surrounding tissues; possibly due to the increase in interstitial pressure of the tumor induced neovascularity and the leakage of proteins and liquids from the tumor.

Interesting Case Presentation:

Nancy Heberer spoke about Breast US; specifically highlighting Phyllodes tumor. Phyllodes tumors (Greek word derivative for leaf-like) are rare breast tumors that, like fibroadenomas, contain two types of breast tissue: stromal (connective) tissue and glandular (lobule and duct) tissue. They are most common in women in their 30s and 40s, but they may be found in women of any age (source: www.americancancersociety.org.)

Phyllodes tumors (unlike fibroadenoma) are rare, grow quickly and are prevalent in age 40s; and require surgical intervention. Phyllodes tumors (even benign ones) can sometimes reoccur in the same location in the breast if they are removed without taking enough of the normal tissue around them. For this reason, they are treated by removing the tumor and at least a 1 cm area of normal breast tissue around the tumor.

Malignant phyllodes tumors are treated by removing them along with a wider margin of normal tissue, or by mastectomy if needed. Malignant phyllodes tumors are different

from the more common types of breast cancer. They do not respond to hormone therapy and are less likely than most breast cancers to respond to radiation therapy or the chemotherapy drugs normally used for breast cancer. Phyllodes tumors are usually not cancerous, but in rare cases they may be. Although as many as a third of these tumors are classified as malignant based on how they look under the microscope, less than 5% of phyllodes tumors overall are clearly true cancers based on spread to other areas, such as the lungs (www.americancancersociety.org.)

Guest Lecturer:

Our featured speaker was Dr. Sunil Bajaj; Radiologist; Karmanos Cancer Institute. Dr. Bajaj spoke about the important role that breast sonography plays in the diagnostic field of women's health. US uses no radiation; the cost of breast ultrasound is 1/6 what a breast MRI can cost. Breast MRI is not clinically indicated in all breast imaging situations; therefore insurance will not reimburse for breast MRI for every patient.

About 1 in 8 U.S. women (about 12%) will develop invasive breast cancer over the course of her lifetime. In 2015, an estimated 231,840 new cases of invasive breast cancer are expected to be diagnosed in women in the U.S.; along with 60,290 new cases of non-invasive (in situ) breast cancer. About 2,350 new cases of invasive breast cancer are expected to be diagnosed in men in 2015. A man's lifetime risk of breast cancer is about 1 in 1,000.

Breast cancer incidence rates in the U.S. began decreasing in the year 2000, after increasing for the previous two decades. They dropped by 7% from 2002 to 2003 alone. One theory is that this decrease was partially due to the reduced use of hormone replacement therapy (HRT) by women after the results of a large study called the Women's Health Initiative were published in 2002. These results suggested a connection between HRT and increased breast cancer risk. About 40,290 women in the U.S. are expected to die in 2015 from breast cancer, though death rates have been decreasing since 1989. Women under 50 have experienced larger decreases. These decreases are thought to be the result of treatment advances, earlier detection through screening, and increased awareness. For women in the U.S., breast cancer death rates are higher than those for any other cancer, besides lung cancer. (Source: www.americancancersociety.org.)

Dr. Bajaj spoke about the importance of knowing the anatomy of the human breast in order to be able to identify sonographically the normal and abnormal findings in breast tissue. Specifically, The breast is an apocrine (modified sweat gland) composed of glandular, fatty, and fibrous tissues positioned over the pectoral muscles of the chest wall and attached to the chest wall by fibrous strands called Coopers ligaments. A layer of fatty tissue surrounds the breast glands and extends throughout the breast.

Most breast cancers arise from the terminal duct and are thought to result from faulty DNA/mutation. First degree relatives (Mother, sister) play a role in factoring the probability of breast cancer in a woman's lifetime. However, 60% of breast cancer diagnoses have no family history. The percentage likelihood for female breast cancer are: 0.2% < age 30; 15% >age 40; 50% > age 80. Hormones are known to play a role in breast cancer likelihood as follows: early menarche (i.e. < age 16) equal a 4% increase in likelihood each year before age 16. Menopause is thought to play a role in breast cancer likelihood: 3% increase for each year menopause occurs after age 45. Nulliparous women have a slightly higher incidence of breast cancer; theoretically because pregnancy and lactation suppress ovulation and therefore decrease the risk of hormone driven breast cancers.

Malignant lesions are commonly hypoechoic lesions with ill-defined borders. Typically, a malignant lesion presents as a hypoechoic nodular lesion, which is 'taller than wide' and has spiculated margins, posterior acoustic shadowing and may contain microcalcifications that can sometimes be seen on US. Other malignant features on US include: thick hyperechoic halo; angular margins; markedly hypoechoic nodule; sonographic posterior acoustic shadowing; branching pattern; multiple projections from the nodule within or around ducts extending away from the nipple~usually seen in larger tumors; and punctate calcifications. Duct extension is seen as projection from a nodule which extends radially within or around a duct towards the nipple. Other important US findings include compressibility or not. In general terms, benign lesions compress with transducer pressure~~malignant lesions are difficult to compress with the transducer.

In all cases of lesions other than absolutely benign, real time review by the Radiologist is mandatory. Review of the mammogram is essential when interpretation of an ultrasound is done. In those under 30 year old, ultrasound is the primary imaging modality. In those over 40, both modalities are performed and interpreted. Any lesion classified as benign must be benign on both modalities. If there is a single malignant feature: consider biopsy; if there are no malignant features: then look for benign features; if there are no malignant features or any benign features: indeterminate: consider biopsy. Dr. Bajaj spoke about the importance of BI-RADS classification in breast imaging.

BI-RADS US Category	Assessment and Management
0	Incomplete: additional imaging evaluation needed
1	Negative
2	Benign
3	Probably benign: short-interval follow-up recommended
4	Suspicious: biopsy
4A	Low suspicion
4B	Intermediate suspicion
4C	Moderate suspicion
5	Highly suggestive of malignancy: biopsy
6	Known malignancy: treatment ongoing

Although BI-RADS category 0 is used frequently at screening mammography, it is less relevant for US, a modality that commonly completes the diagnostic work-up. However, in some instances, additional imaging, such as MR imaging, may be necessary before a final assessment is rendered.

If an abnormality is not seen at US, BI-RADS category 1 can be assigned, assuming that no suspicious findings are seen with mammography. Negative findings at US do not exclude breast cancer in the setting of a suspicious mammographic finding; and ultimately, BI-RADS categorization should be based on mammographic and US findings.

Category 2 is used when findings have been documented but the results of the evaluation are negative for malignancy. In the ACR BI-RADS atlas, the suggestion is to use this category for simple cysts, breast implants, stable postsurgical changes, and probable fibroadenomas noted to be unchanged at successive US studies. Normal intramammary lymph nodes can be categorized as BI-RADS 1 or 2.

BI-RADS 3 (Probably Benign)

As stated in the BI-RADS US lexicon, a solid mass with circumscribed margins, an oval shape, and parallel orientation can be classified as category 3. This mass should have a risk of malignancy of less than 2%.

The BI-RADS 4 category is assigned to suspicious lesions for which biopsy is recommended. This category is largely indeterminate and highly variable in outcome, with lesions having a probability of malignancy of approximately 3%–94%. Therefore, in the ACR BI-RADS atlas, the suggestion now is to subdivide category 4 into three subgroups (4A, 4B, and 4C) to better inform the referring clinicians and pathologist of the degree of concern. These subcategories also serve to accomplish a more informative internal audit, improve radiologic-pathologic correlation, and improve image-directed research.

BI-RADS 5 (Highly Suggestive of Malignancy.) BI-RADS 5 is reserved for findings that almost invariably represent breast cancer, with a likelihood of malignancy of more than 95%.

Breast cancers can be divided into two main overarching groups: the carcinomas and the sarcomas. Carcinomas are cancers that arise from the epithelial component of the breast. The epithelial component consists of the cells that line the lobules and terminal ducts; under normal conditions, these epithelial cells are responsible for making milk. Carcinomas comprise the vast majority of all breast cancers, and will be further discussed below. Sarcomas are rare cancers that arise from the stromal (connective tissue) components of the breast. These stromal component cells include myofibroblasts and blood vessel cells, and cancers arising from these "supportive" cells include phyllodes tumors and angiosarcoma. Sarcomas account for less than 1% of primary breast cancers.

Within the large group of carcinomas, there are many different types of breast cancer. The first major division is between in situ and invasive carcinoma. In situ carcinoma is "pre-invasive" carcinoma that has not yet invaded the breast tissue. These in situ cancer cells grow inside of the pre-existing normal lobules or ducts. In situ carcinoma has significant potential to become invasive cancer, and that is why it must be adequately treated to prevent the patient from developing invasive cancer. Invasive cancers have cancer cells that infiltrate outside of the normal breast lobules and ducts to grow into the breast connective tissue. Invasive carcinomas have the potential to spread to other sites of the body, such as lymph nodes or other organs, in the form of metastases.

Approximately 80% of breast carcinomas are invasive ductal carcinoma, followed by invasive lobular carcinomas, which account for approximately 10-15% of cases. Invasive ductal carcinomas and invasive lobular carcinomas have distinct pathologic features. Specifically, lobular carcinomas grow as single cells arranged individually, in single file, or in sheets, and they have different molecular and genetic features that distinguish them from ductal carcinomas. Ductal and lobular carcinomas may have different prognoses and treatment options, depending upon all of the other features of the particular cancer.

The remaining cases of invasive carcinoma are comprised of other special types of breast cancer that are characterized by unique pathologic findings. These special types include colloid (mucinous), medullary, micropapillary, papillary, and tubular. It is important to distinguish between these various subtypes, because they can have different prognoses and treatment implications. (source: [Johns Hopkins University; pathology.jhu.edu/breast/types.php](http://JohnsHopkinsUniversity/pathology.jhu.edu/breast/types.php).)

Dr. Bajaj showed some interesting US cases that featured malignant breast lesions and their sonographic appearances. Some of his case presentations will be featured on our website: www.mss1.org.

Meeting Conclusion:

Liz concluded the meeting by thanking all of the attendees and by reminding us of the next MSS Meeting: St. Johns Hospital 22101 Moross Ave; Detroit on Wednesday November 18, 2015 . Our Speaker will be Dr. Dan Gill; Topic: Musculoskeletal Sports Medicine; our Sponsor Gary Harris—Philips Ultrasound Inc.



Respectfully Submitted,

Julie Atkinson, MPA; BBA; RDMS/RVT~~MSS Secretary