Should Geriatric Radiology Be a Separate Discipline?

*Geriatric Radiology -- A Proto-Manifesto.*

Stephen R. Baker, MD

Keywords: Geriatric Radiology

Print Tag: Refer to original journal article

Geriatrics refers to diseases particularly common in those age >65 years.

Radiology has become a congeries of subspecialties. It is now the focus of training, and more and more it defines the organization of practice. We have subspecialties devoted to organ systems, imaging techniques, and pediatric radiology with a stage in life. What is missing from this categorization is geriatric radiology. Is there enough that is distinctive about the imaging concerns and radiographic appearances of conditions distinct to the elderly to make this a separable discipline? I believe so, especially if we disaggregate its concerns to issues of gerontology and geriatrics. The former relates to the normal changes of aging and managerial modifications to meet the special needs of old people, especially those who are frail or more specifically disabled. The latter refers to diseases particularly common in those age >65 years. (Reviewer-).
Hepatocellular Adenoma vs Focal Nodular Hyperplasia -- What Is Role of MRI?

Hepatocellular Adenoma and Focal Nodular Hyperplasia: Value of Gadoxetic Acid-Enhanced MR Imaging in Differential Diagnosis.
Grazioli L, Bondioni MP, et al:

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Gadoxetic acid-enhanced MRI is useful in differentiating between hepatocellular adenoma and focal nodular hyperplasia.

Objective: To determine if gadoxetic acid-enhanced hepatic MRI is helpful in differentiating hepatocellular adenoma from focal nodular hyperplasia.

Design: Retrospective analysis.

Participants/Methods: This study was comprised of 82 patients. There were 111 nodules (68 focal nodular hyperplasia and 43 hepatocellular adenomas). All patients underwent gadoxetic acid-enhanced hepatic MRI. Patients were excluded for lack of histopathologic confirmation, <2-year follow-up, or inadequate MRI examination. MRI examinations were performed using a 1.5-T system. Sequences included T2-weighted and dual-echo T1-weighted gradient echo. Three-dimensional T1-weighted gradient echo dynamic images were acquired before and after IV contrast administration during arterial, portal venous, and late phases at 20 to 35, 80, and 180 seconds, respectively. Hepatobiliary phase images were acquired at 20 minutes. The images were reviewed by 2 radiologists who evaluated lesions for predominant signal intensity to hepatic parenchyma as well as the presence of fat, central scar, capsule, necrosis, and hemorrhage. The degree of arterial enhancement of lesion was graded on 4-point scale: 0 = no enhancement; 1 = greater than liver and less than portal vein; 2 = greater than portal vein and less than aorta; and 3 = similar to aorta. Contrast enhancement ratio, lesion-to-liver contrast ratio, and signal intensity ratio of each lesion on arterial and hepatobiliary phase were calculated.

Results: A significant difference was noted in imaging appearance between focal nodular hyperplasia and hepatocellular adenoma. None of the hepatocellular adenomas contained a central scar; 54% of the hepatocellular adenomas demonstrated dropout on out-of-phase images. The majority of focal nodular hyperplasia demonstrated marked arterial phase enhancement and isointense to hyperintense signal on late phase. Meanwhile, the majority of hepatocellular adenomas demonstrated mild arterial phase enhancement and hypointense signal on late phase. On the hepatobiliary phase, 93% of hepatocellular adenomas were hypointense, while 97% of focal nodular hyperplasia were isointense to hyperintense. The greatest difference between mean contrast enhancement ratios of the 2 lesions was observed during the hepatobiliary phase. The mean lesion-to-liver contrast ratios of focal nodular hyperplasia during enhanced phases were significantly higher than those of hepatocellular adenomas. The mean signal intensity ratios of focal nodular hyperplasia during arterial and hepatobiliary phases were significantly higher than those of hepatocellular adenomas.

Conclusions: Gadoxetic acid-enhanced MRI is useful in differentiating between hepatocellular adenoma and focal nodular hyperplasia.

Reviewer's Comments: The results of this study demonstrate that the hepatobiliary phase of gadoxetic acid-enhanced hepatic MRI is very useful, and complements the conventional dynamic phases, in the differentiation between focal nodular hyperplasia and hepatocellular adenoma. One of the limitations in this study was that the only lesions assessed were focal nodular hyperplasia and hepatocellular adenoma. This would differ from clinical practice in that these lesions would most likely need to be differentiated from other hepatic lesions. (Reviewer-John C. Sabatino, MD).
**Diffusion-weighted MRI can be helpful in differentiating between hepatocellular adenoma and focal nodular hyperplasia.**

**Objective:** To determine if diffusion-weighted MRI is helpful in differentiating between hepatocellular adenoma and focal nodular hyperplasia.

**Design:** Retrospective analysis.

**Participants/Methods:** This study was comprised of 67 patients; 46 patients had 54 focal nodular hyperplasias, and 21 patients had 36 hepatocellular adenomas. MRI examinations were performed using 1.5-T system. A diffusion-weighted sequence used $b$ values of 0, 150, and 600 sec/mm$^2$. The 3D T1-weighted fat-suppressed gradient echo dynamic images were acquired before and after IV contrast administration during hepatic-arterial dominant, portal venous, and late phases at 20 to 25, 60 to 70, and 180 to 200 seconds, respectively. The apparent diffusion co-efficient (ADC) value for each lesion was measured. The images were reviewed by 2 radiologists. The lesion signal intensity to the adjacent hepatic parenchyma was graded on a 4-point scale: 1 = strongly hyperintense; 2 = moderately hyperintense; 3 = isointense; and 4 = hypointense. The degree of lesion signal intensity was classified as increased if the lesion-to-liver contrast increased with a $b$ value of 600 sec/mm$^2$ compared to 0 sec/mm$^2$. The lesion was considered benign on diffusion-weighted images if it was hyperintense on $b$ value 0 sec/mm$^2$ images, with a strong decrease on $b$ value 500 sec/mm$^2$ images and ADC subjectively higher than that of the liver. The lesion was considered malignant on diffusion-weighted images if it was mild to moderately hyperintense on $b$ value 0 sec/mm$^2$ images, if it remained hyperintense compared to the liver on $b$ value 500 sec/mm$^2$ images, and if the ADC was subjectively lower than in the liver.

**Results:** The mean ADC of focal nodular hyperplasia and hepatocellular adenoma was significantly lower than that of the adjacent liver. The mean ADC of focal nodular hyperplasia was significantly higher than that of hepatocellular adenomas. The sensitivity and specificity for differentiating hepatocellular adenoma from focal nodular hyperplasia were 70% and 76%, respectively, when an ADC cut-off value of 1.37 x 103 sec/mm$^2$. 87% of focal nodular hyperplasia and hepatocellular adenomas showed an increase in signal intensity with increase in $b$ value. In addition, when applying MRI diffusion-weighted signal intensity changes, approximately 50% of focal nodular hyperplasia and hepatocellular adenomas would have been considered benign, and the other 50% would have been considered malignant.

**Conclusions:** Diffusion-weighted MRI can be helpful in differentiating between hepatocellular adenoma and focal nodular hyperplasia.

**Reviewer's Comments:** The results of this study are useful in demonstrating that the diffusion-weighted MRI can be helpful in differentiating hepatocellular adenoma from focal nodular hyperplasia. However, both lesions can have restricted diffusion that could mimic malignant lesions, although hepatocellular adenomas and focal nodular hyperplasia have ADC values comparable to those of the normal liver. One of the limitations in this study was that the only lesions assessed were focal nodular hyperplasia and hepatocellular adenomas. This would differ from clinical practice that these lesions would most likely need to be differentiated from other hepatic lesions. (Reviewer-John C. Sabatino, MD).

**Keywords:** Liver, MRI, Hepatocellular Adenoma, Focal Nodular Hyperplasia

**Print Tag:** Refer to original journal article
How to Determine Depth of Myometrial Invasion of Endometrial Cancer

Evaluation of Depth of Myometrial Invasion and Overall Staging in Endometrial Cancer: Comparison of Diffusion-Weighted and Dynamic Contrast-Enhanced MR Imaging.


The accuracy of diffusion-weighted MRI in the diagnosis of myometrial invasion of endometrial carcinoma is superior to that of dynamic contrast-enhanced imaging.

Objective: To determine if diffusion-weighted MRI is as accurate as dynamic contrast-enhanced imaging for evaluating the depth of myometrial invasion of endometrial carcinoma.

Design: Retrospective analysis.

Participants/Methods: This study was comprised of 48 women with a diagnosis of endometrial carcinoma. MRI was performed with a 1.5-T system. Sequences included T2-weighted and T1-weighted images. An axial oblique diffusion-weighted sequence using b values of 0 and 800 sec/mm² was followed by 3D T1-weighted fat-suppressed gradient echo dynamic images acquired before and after IV contrast administration in the sagittal plane at 25, 60, and 120 seconds and in the axial plane at 240 seconds. The images were reviewed by 2 radiologists. The standard images and diffusion-weighted images were evaluated for the presence of the following: depth of myometrial invasion, cervical stromal invasion, adnexal extension, vaginal or other organ invasion, pelvic lymphadenopathy, and metastases. Invasion up to 50% myometrial thickness was scored as superficial invasion, and >50% myometrial thickness was scored as deep invasion. Confounding factors relating to the accurate estimation of the depth of myometrial invasion included leiomyomas, adenomyosis, loss of junctional zone definition, poor tumor-to-myometrium contrast, and extension into the uterine cornua.

Results: Surgical specimens revealed the following histologies: endometrioid adenocarcinoma in 36 patients, adenocarcinoma with serous papillary differentiation in 5 patients, clear cell differentiation in 4, and mixed endometrioid and serous papillary differentiation in 3 patients. The mean diagnostic accuracy, sensitivity, and specificity of the 2 readers for assessing depth of invasion on diffusion-weighted images were 87.5%, 84%, and 94%, respectively. When evaluating the dynamic contrast-enhanced images, the mean diagnostic accuracy, sensitivity, and specificity of the 2 readers for assessing depth of invasion were 75%, 69%, and 85%, respectively. Leiomyomas, adenomyosis, loss of junctional zone definition, poor tumor-to-myometrium contrast, and extension into the uterine cornua did not affect the assessment of depth of myometrial invasion endometrial carcinoma on diffusion-weighted images. The presence of neoplasm extension into the uterine cornua and loss of junctional zone definition did affect the assessment of depth of myometrial invasion on dynamic contrast-enhanced images for reader 1 and reader 2, respectively.

Conclusions: The accuracy of diffusion-weighted MRI in the diagnosis of myometrial invasion of endometrial carcinoma is superior to that of dynamic contrast-enhanced imaging.

Reviewer’s Comments: The results of this study are useful in demonstrating the improved accuracy, sensitivity, and specificity of diffusion-weighted MRI compared to standard dynamic contrast-enhanced images in evaluating the depth of myometrial invasion of endometrial carcinoma. One of the limitations reported here was the use of only 1 plane for diffusion-weighted images as opposed to 2 planes for the dynamic contrast-enhanced images, which may affect the staging accuracy of diffusion-weighted images. (Reviewer-John C. Sabatino, MD).

Keywords: Endometrial Cancer, Myometrial Invasion, Staging, Uterus, MRI

Print Tag: Refer to original journal article
CT-derived tumor volume in patients with malignant pleural mesothelioma can be used to stratify survival of patients who undergo extrapleural pneumonectomy.

Background: Malignant pleural mesothelioma (MPM) is a tumor that is asbestos related and over time encases the lung and mediastinal structures by direct extension. The prognosis is dismal. Patients with disease confined to one hemithorax and who undergo multi-modality therapy (including surgical resection to remove all gross tumor with either radiotherapy and/or chemotherapy) generally have longer survival times.

Objective: To evaluate the prognostic significance of CT-derived preoperative tumor volume in patients with MPM who have undergone extrapleural pneumonectomy (EPP) as part of tri-modality treatment.

Design: Retrospective analysis.

Participants: 88 patients with MPM who underwent EPP. All patients had mesothelioma with epithelial histologic features on pathology, unilateral disease, and a negative mediastinoscopy. Patients also had information regarding whether radiotherapy and/or chemotherapy was administered, and all patients had preoperative CT.

Methods: On CT, the MPM was identified and selectively segmented with a 3D volume feature of external software (Vitrea Enterprise suite 6.0, Vital Images). Adjacent atelectasis, pleural effusion, and chest wall musculature were not included in the selective segmentation. Discontiguous tumor and extrapleural tumor were also selectively segmented and added to total tumor volume.

Results: The median tumor volume was 319 cm³. Fifty-nine patients with a tumor volume of ≤500 cm³ had a significantly longer survival period than the 29 patients with tumor volume >500 cm³ (24.4 vs 12 months; \( P <0.0001 \)). The median overall survival for the entire group was 18.7 months. Tumor volume >500 cm³ (HR, 2.02), anemia (HR, 1.99), and provision of adjuvant radiotherapy or chemotherapy (HR, 0.30) were independently associated with the overall survival period.

Conclusions: CT-derived tumor volume in patients with MPM can be used to stratify survival of patients who undergo EPP.

Reviewer's Comments: This is a very nice article that details how incorporating some advanced CT post-processing tools can yield valuable information for clinicians that may affect treatment decisions and one day may be used for staging purposes. (Reviewer-Vineet R. Jain, MD).

Keywords: Mesothelioma, CT

Print Tag: Refer to original journal article
Combining dual-source coronary CT angiography (CTA) and CT myocardial perfusion imaging has increased the diagnostic value for the detection of significant coronary stenoses compared with only dual-source CTA.

**Objective:** To evaluate combined dual-source coronary CT angiography (CTA) and CT myocardial perfusion imaging (MPI) with dual-source coronary CTA alone using conventional invasive coronary angiography as the reference standard.

**Design:** Prospective study.

**Participants:** 54 patients who had coronary artery disease as seen on dual-source CTA. All patients subsequently underwent adenosine-induced stress dual-energy CT as well as conventional angiography.

**Methods:** The adenosine-induced stress dual-energy CTs were performed in dual-energy mode using the same parameters as the dual-source CTA. Adenosine was given intravenously, and retrospective ECG-gated images were obtained. Evaluation by 2 radiologists was performed as follows: (1) classifying the degree of coronary stenosis using the dual-source CTA; (2) evaluating myocardial perfusion defects using rest and stress MPI with dual-source CTA and adenosine-induced stress dual-energy CT; and (3) reclassifying the severity of coronary stenoses according to the combination of dual-source CTA and CT MPI. Cardiac perfusion defects were categorized as fixed or reversible. The rest and stress images were evaluated side by side in the short axis view using MPR reconstructions. Dual-energy CT-based iodine maps were evaluated, and dual-energy CT-based color-coded iodine maps were superimposed on gray-scale MPRs. A significant stenosis was considered ≥50% luminal narrowing.

**Results:** 9 patients had to be excluded primarily because of poor-quality images from irregular or high heart rate or because of multiple stenoses in different coronary territories limiting evaluation of myocardial perfusion defects. Dual-source CTA demonstrated 87 significantly stenotic vessels in 45 patients; conventional angiography demonstrated 73 significantly stenotic vessels in 42 patients; and CT MPI demonstrated myocardial perfusion defects in 81 vascular territories in 43 patients. Reclassification of stenoses after CT MPI without knowing the results of conventional angiography resulted in 77 significantly stenotic vessels in 42 patients. The sensitivity, specificity, positive predictive value, and negative predictive value of dual-source coronary CTA on a per-vessel basis before CT MPI were 91.8%, 67.7%, 73.6%, and 87.5%, respectively. After CT MPI, these rates were 93.2% (from 91.8%), 85.5% (from 67.7%), 88.3% (from 73.6%), and 91.4% (from 87.5%), respectively. In addition, the area under the receiver operating characteristic curve significantly increased from 0.798 to 0.893 (P =0.004).

**Conclusions:** Combining dual-source CTA and CT MPI has increased diagnostic value for the detection of significant coronary stenoses compared with only dual-source CTA.

**Reviewer’s Comments:** The authors indicated that the average effective radiation dose for dual-source coronary CTA and adenosine-induced stress dual-energy CT was 10.8 ± 2.5 mSv and 5.7 ± 0.5 mSv, respectively, which is equivalent to SPECT MPI. (Reviewer-Vineet R. Jain, MD).
CT has a high clinical utility in the detection of radiographically missed or occult fractures of the hip, and a negative CT is near perfect in excluding a hip fracture requiring surgery.

**Background:** Prior studies have indicated that 2% to 9% of radiographs have been reported to have missed hip fractures or be suspect for hip fractures.

**Objective:** To evaluate CT versus radiography in diagnosing missed or occult hip fractures.

**Design:** Retrospective analysis.

**Participants:** 193 elderly patients (72 men, 121 women) who had negative or equivocal radiographs of the hip in an emergency department trauma center and had a CT within 24 hours.

**Methods:** All CTs had multi-planar reconstructions with 2- to 3-mm thickness in at least 3 orthogonal planes. CTs were scored as no fracture, suspect fracture, or definite fracture independently by 3 radiologists in a blinded fashion. Corroboration of CT findings was based on MRI (if performed) and surgery. A negative follow-up based on chart review and imaging was considered to have ruled out fracture.

**Results:** The median age of the patients was 83 years (range, 60 to 98 years). Of the 193 patients, 84 (44%) had no fracture on CT. Two of these 84 patients had false-negative CTs as follow-up MRI demonstrated a cervical hip fracture in 1 patient who was operated on with parallel screws, and a follow-up MRI demonstrated an incomplete trochanteric fracture in 1 patient who was operated on with a dynamic hip screw. Two other patients underwent surgery: 1 was due, in part, to an incorrect preliminary CT report indicating fracture when no fracture was seen on image review, and 1 was due to motion artifact simulating a fracture. Of the 41 patients (21%) who had a cervical hip fracture noted on CT, 39 had findings corroborated by MRI or surgery. Two patients did not have follow-up MRI or surgery due to week-old trauma and moderate symptoms. Sixty-eight patients (35%) had trochanteric fractures; 31 of these fractures were considered complete, with the rest being incomplete or avulsions. Of these 68 fractures, 29 were confirmed surgically. In total, there were 2 false-negative CTs and no false-positive cervical hip fractures. Other findings seen on CT included pubic ramus fractures, acetabular fractures, sacrum fractures, and soft-tissue hematomas.

**Conclusions:** CT has a high clinical utility in the detection of radiographically missed or occult fractures, and a negative CT is near perfect in excluding a hip fracture requiring surgery.

**Reviewer’s Comments:** This article clearly demonstrates the very high utility of CT in demonstrating radiographically missed or occult hip fractures. However, it is not a perfect exam, and MRI can be very helpful for cases in which you are still not sure. (Reviewer-Vineet R. Jain, MD).

**Keywords:** Occult Hip Fracture, CT, Radiographs

**Print Tag:** Refer to original journal article
Yttrium-90 therapy for patients with hepatic RCC metastases may have promise; however, more data are needed.

**Background:** Although the survival rate for patients with renal cell carcinoma (RCC) is very high after nephrectomy, the 5-year survival rate in patients with metastatic RCC is historically only 10%. Treatment with systemically delivered targeted therapies, including tyrosine kinase inhibitors and anti-angiogenic agents, increases the 5-year survival rate to 20%. Radioembolization using the beta particle emitter yttrium-90 (Y-90) can deliver high-dose intra-arterial radiation brachytherapy, capitalizing on the dual blood supply of the liver and the hypervascularity of most neoplasms.

**Objective:** To investigate the safety and efficacy of Y-90 hepatic radioembolization treatment of patients with liver-dominant metastatic RCC refractory to immunotherapy and targeted therapies.

**Design/Methods:** This retrospective study involved 6 patients with unresectable liver-dominant RCC metastases who underwent 8 radioembolization treatments with Y-90 labeled resin microspheres between March 2006 and December 2010. All patients had bilobar disease and required whole-liver treatment with Y-90. Clinical and biochemical toxicities were recorded, and tumor response was assessed every 2 to 3 months after treatment by cross-sectional imaging.

**Results:** After catheter-directed Y-90 treatment, grade 1 and 2 toxicities (primarily fatigue) were noted in all patients. Follow-up imaging was available for 5 patients. In follow-up periods from 2 to 64 months (mean, 25 months), 3 patients showed complete responses, and 1 patient showed a partial response by standard imaging criteria; these patients were alive at 64 months, 55 months, 17 months, and 7 months after treatment. Two patients with rapid progression of disease died within 2 months of treatment, although hepatic malignancy or failure was not the cause of death in either patient.

**Conclusions:** Y-90 radioembolization is a promising option for liver-dominant metastatic RCC with the potential for providing long-term survival in patients refractory to or intolerant of targeted therapies.

**Reviewer's Comments:** This article is more of a case series than a retrospective study because of its small sample size. However, there is at least proof of the concept in the results of this article, and it offers an option for treatment in the table. I look forward to the authors publishing a follow-up article with a larger sample size or a multi-institution study. (Reviewer-Waseem A. Bhatti, MD, MS).

Keywords: Radioembolization, Liver, Renal Cell Carcinoma

Print Tag: Refer to original journal article
Antibiotic prophylaxis is not necessary before placement of venous infusion ports.

**Background:** Guidelines for adult antibiotic prophylaxis published by the Society of Interventional Radiology in 2004 supported the empiric use of antibiotic prophylaxis for placement of totally implantable venous access devices (TIVADs). However, the updated 2010 guidelines indicated that the benefit of antibiotic prophylaxis for central venous access was unproven and acknowledged a lack of consensus on the use of routine prophylaxis. Antibiotic administration has risks such as *Clostridium difficile* infection and allergic reaction and increases patient preparation time and costs.

**Objective:** To determine the rate of early infection of TIVADs placed without antibiotic prophylaxis.

**Design:** This retrospective study involved 1167 patients who had 1183 ports placed over a 1-year period.

**Methods:** Patients who underwent port removal within 30 days of placement were identified from the records. Central line-associated bloodstream infections (CLABSIs) were identified using U.S. Centers for Disease Control and Prevention criteria. Data including demographics, laboratory data, and any concomitant antibiotic and chemotherapy administration within 30 days were recorded.

**Results:** There were 1183 ports placed and 13 removed. CLABSIs occurred in 7 patients (0.6%) within 30 days of placement. At the time of TIVAD placement, 81 patients (7%) were receiving antibiotics incidental to the procedure. One patient who received an antibiotic the day of implantation developed a CLABSI. Chemotherapy was administered to 148 patients (13%) on the day of placement.

**Conclusions:** The rate of early infection without antibiotic prophylaxis before TIVAD placement in the interventional radiology suite was 1%. No significant difference was noted in the rates of TIVAD removal secondary to CLABSIs in patients who received antibiotics before the procedure versus those who did not ($P < 0.59$). Based on these data, the authors do not recommend the use of prophylactic antibiotics for TIVAD placement.

**Reviewer's Comments:** This is a retrospective study from a cancer center with a large population receiving ports. There is value in the results since prophylactic antibiotic administration is not a completely benign event. Of course, technique and attention to sterility play an important part in preventing CLABSIs. This article should be an impetus to change guidelines regarding antibiotic administration for ports, most of which are based on the literature from surgical port placements. (Reviewer: Waseem A. Bhatti, MD, MS).

**Keywords:** Venous Access Device, Placement, Antibiotic Prophylaxis

**Print Tag:** Refer to original journal article
Abnormal lymph nodes found in patients with known malignancies may represent metastatic disease or a second primary, or they may be nonmalignant.

**Background:** When patients are diagnosed with a malignancy, they are also often found to have enlarged lymph nodes at the time of staging or during follow-up; treatment and prognosis usually depend on whether these nodes are involved. Little work has been done on the utility of lymph node biopsy in patients with a single known malignancy. Nodal metastatic disease often changes the prognosis and treatment.

**Objective:** To evaluate the utility of image-guided biopsy in this setting by determining how often one would be correct in assuming that enlarged lymph nodes are metastatic disease by the known malignancy.

**Design:** Retrospective review.

**Methods:** The authors identified all lymph node biopsies performed in a 5-year period on a patient with a confirmed single malignancy at the time of biopsy. A lymph node was considered suspicious if it was >10 mm in short-axis diameter, was increased in size, or was the only finding in a patient with increasing tumor markers. Pathology of the lymph nodes was recorded; if it showed no malignancy, stability, or decrease in size, repeat biopsy confirmed the result. Outcomes were divided into lymph nodes that underwent biopsy and were proved to be involved by the known malignancy versus lymph nodes not involved by the known malignancy.

**Results:** 193 biopsies were evaluated. In 77% of these biopsies, the outcome was nodal involvement by the known malignancy. In almost 10% of these biopsies, the outcome was a newly diagnosed second malignancy. In 13.5% of the biopsies, the outcome was no malignancy. The mean size of the lymph node that underwent biopsy was 12.3 mm in patients with no malignancy identified, 35 mm in patients with the known malignancy identified, and 33 mm in patients with newly diagnosed malignancy; however, this failed to reach statistical significance. New or enlarging nodes more often represented metastatic disease from a known malignancy compared to stable lesions.

**Conclusions:** “Biopsy of a suspicious abdominal or pelvic lymph node in patients with known malignancy reveals a newly diagnosed malignancy or no evidence of malignancy in 23% of cases, emphasizing the importance of biopsy.”

**Reviewer’s Comments:** Lymph nodes that are identified in a patient with a known malignancy are often assumed to represent nodal involvement by that malignancy. According to this study, in almost one fourth of the patients, that assumption would have been incorrect. In almost one half of these cases, the enlarged lymph nodes represented new malignancies. In 89% of these patients, lymphoma was the newly diagnosed malignancy. These researchers believe that image-guided biopsy in his population is justified because the presence of a second malignancy or the absence of nodal metastases influences treatment and prognosis, rather than the assumption that enlarging lymph nodes are simply metastatic disease. The smaller the size of the lymph node, the less likely it is involved with a malignancy at all. (Reviewer-Sharon Gonzales, MD).
Catheter-directed embolization may be needed to control bleeding from breast biopsy if compression alone fails.

**Background:** Breast cancer is diagnosed in >180,000 cases annually in the United States. In most of these women, a suspicious finding on imaging is referred for breast biopsy. Vacuum-assisted breast biopsy (VABB) is a relatively safe procedure; however, in rare cases, it is associated with vascular complications. Bleeding that does not stop after sustained compression presents a unique challenge.

**Objective:** The authors present the first 2 cases of bleeding after VABB unresponsive to manual compression that were treated with embolization. **Case 1:** A 35-year-old woman with an MRI had multiple enhancing masses bilaterally with an 8-mm lesion in the left breast. MRI vacuum-assisted core biopsy using a 9-gauge system was performed. The pathology was reactive lymph nodes. Pulsatile bleeding after the procedure did not stop after 30 minutes of compression. Angiography was performed, and access was obtained into the left subclavian artery, then subsequently into the left lateral thoracic artery. An area of active extravasation was noted and embolized successfully with gel foam slurry. **Case 2:** A 43-year-old woman seeking further evaluation of loosely grouped microcalcifications in the right breast, a BI-Rads 4 lesion, underwent VABB targeted on digital stereotactic imaging using an 8-gauge system. The findings were consistent with fibrocystic change. Post-procedure, pulsatile bleeding was noted from the biopsy site. Two hours of compression failed to halt the bleeding. The patient was transferred to interventional radiology. A right subclavian angiogram was performed, then a right internal thoracic artery was catheterized. Digital subtraction of this artery demonstrated pseudo-aneurysm off of the distal anterior intercostal branch. Using a microcatheter, embolization using glue was performed until hemostasis was noted.

**Reviewer's Comments:** VABB has become the main modality for breast biopsies. This is because a single probe is used for insertion, there is rapid collection of samples, and accurate targeting of lesions is performed on those <10 mm. These needles range in size from 8 to 11 gauge. Complications are rare, despite the large needles. These complications include hematoma, bleeding, and vasovagal responses. In the study of almost 3000 patients, only 25 patients developed hematomas >4 cm. Only 4 patients required hospitalization and intervention related to bleeding. The vascular supply to the breast includes the lateral thoracic artery, the internal thoracic artery (aka, the internal mammary artery), the thoracoacromial artery, vessels from the serratus anterior, and branches of the intercostal arteries. Failure of compression can be due to body habitus and the inability to adequately compress at the biopsy site. With the increased use of this technology and the larger gauges of the biopsy devices, embolization therapy is safe and reasonable to perform in order to control this select group of patients with bleeding complications from breast biopsy. (Reviewer-Sharon Gonzales, MD).

**Keywords:** Vacuum-Assisted Breast Biopsy, Embolization, Arterial Bleeding

**Print Tag:** Refer to original journal article
Objective: To compare MDCT arthrography with MR arthrography in cases of anterior shoulder instability.

Participants/Design: 30 men and 10 women with anterior shoulder instability were included in this prospective study.

Methods: All patients were scheduled to undergo arthroscopic treatment. For arthrography, 10 to 12 mL of iopamidol, gadoteridol, and saline were first injected intra-articularly under fluoroscopic guidance. MDCT arthrography was performed with a 16-slice scanner, followed by MR arthrography with a 1.5-T MR machine. Two interpreters reviewed the images. They were blinded to any clinical data and worked in consensus. There was a 4-week interval between reviewing a CT and its corresponding MR. Arthroscopy was performed within a month from the time of imaging. Findings from arthroscopy served as the reference standard in this study.

Results: Arthroscopy revealed 39 humeral head fractures and 12 glenoid rim fractures; 22 glenoid cartilage lesions were also seen. There were 28 anterior labral periosteal sleeve avulsion (ALPSA) lesions and 2 humeral avulsion of the inferior glenohumeral ligament (HAGL) lesions. There were 4 sublabral foramina and one Buford complex. MDCT showed better agreement at depicting operative findings than MR for glenoid rim fractures, glenoid cartilage lesions, ALPSA lesions, and HAGL lesions. There was better agreement between arthroscopy and MR arthrography in the diagnosis of middle glenohumeral ligament tears. Both CT and MR were 100% sensitive and specific for the diagnosis of glenoid rim fractures versus 67% sensitivity and 100% specificity for MR. For glenoid cartilage lesions, CT was 82% sensitive and 89% specific versus 73% and 94% for MR, respectively. The specificity of ALPSA lesions by MR was 67% versus 100% for CT.

Conclusions: MDCT arthrography is a method of choice for preoperative planning in patients with anterior shoulder instability. CT arthrography was better at detecting glenoid rim lesions than MR arthrography; these lesions are important because their preoperative characterization can play an important role in surgical planning.

Reviewer's Comments: There are several limitations to this study. Arthroscopy was chosen as the gold standard, but it may not always be correct. Imaging results were known to the surgeon, who may have paid more attention to note the findings predicted by the scans. Interobserver variability was not studied. Despite these drawbacks, this is a very good study with the potential to affect clinical decision making. (Reviewer-John Hochhold, MD).

Keywords: Anterior Shoulder Instability, MDCT Arthrography, MR Arthrography

Print Tag: Refer to original journal article
An increased epiphyseal torsion angle may play a role in the development of femoroacetabular impingement syndrome.

**Objective:** To determine whether the epiphyseal torsion angle (ETA) on MR arthrography is greater in patients with clinically suspected femoroacetabular impingement (FAI).

**Participants/Methods:** 68 patients clinically suspected of having FAI and 25 healthy volunteers were included in this study. MR arthrography was performed on the 68 subjects using a 1.5 Tesla scanner. The 25 volunteers underwent MR of both hips without contrast material. The ETA, the angle between the femoral neck and epiphyseal axis, was measured on axial oblique T1-weighted images. Alpha angles were also measured on axial oblique T1-weighted sequences. Angle measurements were performed independently by 3 radiologists. MR arthrographies were interpreted in consensus.

**Results:** The mean ETA in the control group was 8.1°; in the study group, it was 12.1°. The difference in ETAs was statistically significant for all 3 readers. The intraclass correlation coefficient was 0.74, suggesting substantial agreement among the readers. Two of the 3 readers achieved statistically significant differences between the study and control groups in measurement of the alpha angle, with only moderate agreement among the readers. The authors did not find any association between increased ETAs and increased alpha angles. ETAs in the control group did not go above 20°. Labral abnormalities were detected in 51 of 68 patients. Defects of acetabular cartilage were seen in 25 of 68 patients. However, ETAs were not significantly different in the patients with these abnormalities.

**Conclusions:** The mean ETA was higher in patients with clinical FAI than in a control group of healthy subjects. The authors suggest that an increased ETA may play a role in the development of FAI.

**Reviewer's Comments:** There are some limitations in this study. This was a retrospective analysis. The authors took a technique used on plain film, namely measurement of the ETA, and translated it to MR. They did not calculate sensitivity or specificity. However, their work does suggest that an ETA >20° should be considered abnormal, while a number <20 may be either normal or abnormal. (Reviewer-John Hochhold, MD).

Keywords: Femoroacetabular Impingement Syndrome, Epiphyseal Torsion Angle
In a patient with an unstable anterior cruciate ligament tear, the presence of anterior tibial translation, uncovering of the posterior horn of the lateral meniscus, or a hyper-buckled posterior cruciate ligament on MR are highly suggestive that the tear is unstable.

**Objective:** To determine if there are MR signs that can classify anterior cruciate ligament (ACL) tears as stable or unstable.

**Design/Participants:** 97 patients were included in this retrospective study, including 41 with acute trauma and 56 with chronic knee pain and disability.

**Methods:** All patients underwent MR imaging on either a 1.5- or 3.0-T scanner. Images were reviewed in consensus, with blinding to the physical examination and arthroscopic results. All patients underwent arthroscopy between 1 and 80 days following imaging. All had surgically confirmed partial or complete tears of the ACL. Ligaments considered stable were either elliptical or attenuated, or had abnormal signal intensity on axial images without any clear discontinuity. A ligament was considered unstable if there was any discontinuity, if the cloud-like mass or isolated bundle signs were present, or if there was non-visualization of the ACL. Clinical examination and arthroscopy findings served as the reference standard for determining stability.

**Results:** By MR, there were 47 stable and 50 unstable ACLs; based on arthroscopy and clinical examination, there were 36 stable and 61 unstable ACLs. While anterior tibial translation, uncovering of the posterior horn of the lateral meniscus, and a hyper-buckled posterior cruciate ligament (PCL) were only seen in unstable ACLs, bone contusion around the lateral knee compartment was seen in both unstable and stable ACL tears. The sensitivity and specificity of MR for predicting unstable tears using primary MR signs of tears were 77% and 92%, respectively. When the secondary signs were evaluated, the sensitivity and specificity dropped to 59% and 81%. The MR signs that showed the highest accuracy were discontinuity of the ACL and abnormal orientation of the ACL. In addition to discontinuity and orientation, the cloud-like mass sign, a non-visualized ACL, bone bruise, anterior tibial displacement, and uncovering of the posterior horn of the lateral meniscus were all significantly more associated with unstable ACL tears.

**Conclusions:** MR imaging is not sufficiently accurate to determine whether an ACL tear is stable or unstable. However, the presence of anterior tibial translation, uncovering of the posterior horn of the lateral meniscus, and a hyper-buckled PCL were 100% specific in this study for the presence of an unstable ACL tear.

**Reviewer’s Comments:** There are some limitations to this study. The analysis is retrospective. Arthroscopy may be a less than perfect gold standard for distinguishing stable from unstable tears. There is also a selection bias in that only patients who ultimately had surgery were chosen for this study. Still, the results are quite interesting and would seem applicable to daily clinical practice. (Reviewer-John Hochhold, MD).

Keywords: Anterior Cruciate Ligament Tears, MRI

Print Tag: Refer to original journal article
Paget disease of bone can be associated with hereditary disorders, such as Valosin-containing protein myopathy.

**Objective:** To describe the radiographic features of Paget disease (PD) of bone in subjects with Valosin-containing protein (VCP) mutations.

**Participants/Methods:** 33 members from 9 families with VCP mutations were included in this study. Seventeen patients had clinical manifestations of the disease; 6 had mutations but were devoid of symptoms and classified as carriers; and 10 had neither mutations nor symptoms. Radiographs taken included plain films of the skull, spine, chest, pelvis, hips, humerus, and femur. Images were initially interpreted with the reviewer blinded to the clinical status of the participants. A second review was conducted with knowledge of clinical data. The laboratory information collected included serum creatinine phosphokinase (CK) concentration, serum alkaline phosphatase (ALP) concentration, and urine concentrations of pyridinoline (PYD) and deoxypyridinoline (DPD).

**Results:** Of the 17 patients with clinical manifestations of disease, 7 had only myopathy; 8 had myopathy and PD; 1 had myopathy, PD, and dementia; and 1 had only PD. One of the 6 carriers also had radiographic evidence of PD. None of the 10 subjects without symptoms or VCP mutations had PD radiographically. Pagetoid changes were seen in the cervical spine in 1 patient, in the thoracic spine in 4, and in the lumbar spine in 6. There was thickening of the iliopectineal line in 3 patients. The skull was involved in 5 patients, the humerus in 2, and the femur in 3. The spectrum of changes included sclerosis and picture framing in the spine; coarsening of the trabeculae in the spine, pelvis, femur, and humerus; lucency of the ileum and greater trochanter; sclerosis of the calvarium; widening of the diploic space; and osteolysis of the skull. Serum ALP was significantly more elevated in patients with PD, but there were no differences in serum ALP levels between carriers and controls. Eleven of 26 subjects with radiographically evident PD had a normal serum ALP. There were no statistically significant differences in the levels of CK concentration and urine concentrations of PYD and DPD between the groups.

**Conclusions:** All persons at risk for VCP mutations should undergo screening for PD with serum ALP followed by bone scan or radiographs. VCP myopathy can present with any combination of myopathy, PD, or cognitive impairment.

**Reviewer's Comments:** The main thrust of this article is to raise awareness of VCP myopathy. The authors did not discuss if neuropsychiatric testing was performed to evaluate for cognitive impairment. The bony changes they describe are all in keeping with the known radiographic features of PD of bone. The sample size is small because the disease is rare, which could limit statistically strong conclusions about the distribution and patterns of pagetoid lesions. The article also nicely summarizes some of the pathophysiology behind PD of bone and its radiographic findings. (Reviewer-John Hochhold, MD).

Keywords: Paget Disease of Bone, VCP Myopathy

Print Tag: Refer to original journal article
Ultrasound elastography and MicroPure imaging can be useful in helping differentiate between nodules that are likely malignant and those that are likely benign.

**Objective:** To evaluate the utility of ultrasound elastography and MicroPure imaging in predicting the presence of malignancy in thyroid nodules.

**Design/Participants:** Prospective study of 74 consecutive patients (65 women and 9 men; age range, 21.0 to 80.0 years; mean, 51.0 ± 12.7 years) who were referred for fine-needle aspiration (FNA) of indeterminate thyroid nodules between February and April of 2010.

**Methods:** All patients were examined by using gray-scale ultrasound, MicroPure imaging, and real-time sonographic elastography with a 10-MHz linear transducer. For real-time sonographic elastography, compression was performed repeatedly in a vertical direction with light pressure and was followed by decompression. The strain value ratio (strain index) of thyroid nodule to muscle was calculated. Color coding of elastographic images was classified into 5 groups according to the Ueno classification. A score of 1 indicated strain for the entire lesion; a score of 2 indicated strain in most of the lesion with some areas of no strain; a score of 3 indicated strain at the periphery of the lesion, with sparing of the center of the lesion; a score of 4 indicated no strain in the entire lesion; and a score of 5 indicated no strain in the entire lesion or in the surrounding area. Subsequently, all patients underwent FNA of the lesions.

**Results:** At ultrasound examination, 74 nodules were identified. Using MicroPure imaging, 17 of 65 (26.6%) benign thyroid nodules, and 3 of 9 (33.3%) malignant thyroid nodules revealed microcalcifications. The sensitivity, specificity, negative predictive value, positive predictive value, and accuracy rate of MicroPure imaging was 42.9%, 80.6%, 93.1%, 18.8%, and 77.0%, respectively. Of the 65 benign nodules, elastographic images revealed that 41 nodules (63%) had a score of 1 or 2. Of the 9 malignant nodules, 8 (88.8%) had a score of 4 or 5. Only 1 of the malignant lesions (11.1%) had a score of 3, and none of the malignant nodules had a score of 1 or 2. The sensitivity, specificity, negative predictive value, positive predictive value, and accuracy rate of strain index values were 85.7%, 82.1%, 98.2%, 33.3%, and 82.4%, respectively.

**Conclusions:** Ultrasound elastography and MicroPure imaging can be useful in helping differentiate between nodules that are likely malignant and those that are likely benign.

**Reviewer’s Comments:** I agree with the authors of this article that elastography and MicroPure imaging characteristics of thyroid nodules can help radiologists in differentiating benign from malignant lesions. It must be stressed, however, that at present these techniques should only be used as an adjunct to other sonographic features in guiding the radiologist's decision before biopsy. More robust studies need to be undertaken to determine the performance of these techniques in a larger population. (Reviewer-Sebastian Sadowski, MD).

**Keywords:** Neuroradiology, Thyroid Elastography

**Print Tag:** Refer to original journal article
**Can BRAF Mutation Status Augment Sonography, FNA Cytology for PTC Diagnosis?**

*BRAF Mutation Analysis and Sonography as Adjuncts to Fine-Needle Aspiration Cytology of Papillary Thyroid Carcinoma: Their Relationships and Roles.*

Moon W-J, Choi N, et al:

AJR Am J Roentgenol 2012; 198 (March): 668-674

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*BRAF* mutation analysis can increase the sensitivity of preoperative diagnosis for malignancy in papillary thyroid carcinoma.

**Objective:** To evaluate the relationship between *BRAF* mutation status, sonography findings, and fine-needle aspiration (FNA) cytology in patients with papillary thyroid carcinoma (PTC).

**Design/Participants:** Retrospective study involving 524 patients with 553 thyroid nodules (437 women, 87 men; mean age, 50 years; range, 17 to 81 years) who underwent sonography, sonography-guided FNA, and *BRAF* analysis between March 2006 and June 2008.

**Methods:** All patients included in the study underwent either surgery after thyroid sonography and FNA, FNA at least twice with a 1-year interval for a benign thyroid lesion, or FNA and sonography follow-up (>12 months after FNA cytology diagnosis) for a benign thyroid lesion. Two radiologists with 11 and 8 years of experience with thyroid ultrasound and FNA performed all sonography examinations and FNA procedures. Sonography characteristics and sonography diagnoses were recorded. Final assessments were categorized as suspicious for malignancy, indeterminate, or probably benign. When a single thyroid nodule was found on sonography, FNA of the suspicious nodule was performed. Finally, cytology slides were retrieved for *BRAF*V600E analysis.

**Results:** *BRAF*V600E was detected in 141 of 170 malignant thyroid nodules (82.9%). Of these, 140 were conventional PTCs and 1 was a follicular-variant PTC. None of the 383 benign thyroid nodules harbored *BRAF*V600E. Only an irregular shape was found to have a negative association with *BRAF*V600E status (*P* =0.004). Of all 164 PTC nodules, none was diagnosed as benign on cytology. An indeterminate cytology finding was more frequent for *BRAF*V600E-negative PTCs than for *BRAF*V600E-positive PTCs. The rates of sensitivity and specificity of sonography for diagnosing malignant thyroid nodules were 94.1% and 93.2%, respectively. When sonography and cytology were considered in combination, they showed significantly higher sensitivity than sonography alone (97.6% vs 94.1%, respectively; *P*=0.014) but no significant difference in terms of specificity than sonography alone (*P*=1.0). The specificity of *BRAF*V600E status was 100%. By adding *BRAF*V600E analysis to cytology, the sensitivity for malignancy significantly increased (94.1%) compared to cytology alone (81.8%; *P* <0.001). Finally, the triple combination of sonography, cytology, and *BRAF*V600E status showed higher sensitivity than *BRAF*V600E and cytology (98.2% vs 94.1%, respectively; *P* =0.023).

**Conclusions:** The combination of sonography, *BRAF* mutation analysis, and FNA cytology can increase the sensitivity of preoperative diagnosis for malignancy in PTC.

**Reviewer's Comments:** I agree with the authors in that the addition of *BRAF* mutation analysis to sonographic and FNA cytologic assessment of thyroid nodules can increase the sensitivity of detecting PTC. It is a promising adjunct that may play an important role, especially in cases in which FNA yields indeterminate results. The implications are important because this can help radiologists decide whether surgery should be recommended and, therefore, help in patient management. (Reviewer-Sebastian Sadowski, MD).

**Keywords:** Neuroradiology, Papillary Thyroid Cancer, *BRAF*Mutation

Print Tag: Refer to original journal article
CT fluoroscopy is an effective approach for performing cervical interlaminar epidural steroid injections.

**Objective:** To describe the proper technique for interlaminar epidural steroid injections in the cervical spine under CT fluoroscopic guidance.

**Design:** This is a single-institution experience review for performing steroid injections in the cervical spine under CT fluoroscopic guidance. **Discussion:** The patient is positioned prone on the table of the CT scanner. Scout images of the neck are obtained, and axial images limited to the level to be injected are obtained. A posterior oblique approach is planned from the axial images, and the proposed entry site is marked on the patient's skin. Using a sterile technique, cutaneous anesthesia is administered and then a spinal needle is advanced a short distance through the skin, taking care to advance only far enough to allow it to stand upright, but not deep enough to approach the spinal canal. The needle trajectory and position are confirmed with a CT fluoroscopic spot-check image. In general, tube current values in the 20 to 70 mA range provide adequate visualization. The needle is advanced in short increments, with repeated spot images, to the posterior margin of the ligamentum flavum, which is visible on fluoroscopic images. A syringe is filled with contrast agent and attached to the needle via appropriate tubing. Extreme care must be taken not to unintentionally advance the needle during attachment. A small amount (approximately 0.2 mL) of diluted contrast agent is injected to evaluate the position of the needle tip. The needle can be advanced with very slight incremental advances followed by test injections of contrast agent and CT fluoroscopic spot checks until the epidural space is reached. Once in the epidural space, the anterior margin of the ligament will be outlined by contrast agent, and contrast agent will spread along the epidural space. After contrast agent is confirmed within the epidural space, a second fluoroscopic spot image is obtained to evaluate for delayed washout of contrast agent that could be seen in a slower-flowing vein. Aspiration before injection to evaluate for intravascular placement is also recommended. Once epidural positioning is confirmed, the contrast syringe is disconnected and replaced with a syringe containing steroid preparation. The steroid is injected into the epidural space. The patient is observed for approximately 10 to 20 minutes before discharge.

**Conclusions:** CT fluoroscopy provides an alternative method to perform cervical interlaminar epidural steroid injections.

**Reviewer's Comments:** The article provides a concise overview of the appropriate technique when using CT fluoroscopy for placing steroid injections into the cervical epidural space. It also outlines some of the important pitfalls one might encounter while performing the procedure. I agree with the authors that CT fluoroscopy is a feasible alternative method to perform these injections that allows the operator good visibility of the needle tip while minimizing patient radiation exposure. (Reviewer-Sebastian Sadowski, MD).

**Keywords:** Neuroradiology, Interlaminar Epidural Injection

**Print Tag:** Refer to original journal article
Mammography Results in Lower Mastectomy Rates in Women Aged 40 to 49 Years


Malmgren JA, Parikh J, et al:

Radiology 2012; 262 (March): 797-806

A large retrospective study analysis of almost 2000 women aged 40 to 49 years diagnosed with breast cancer demonstrates a benefit for mammography screening in terms of lower cancer stage at diagnosis.

**Background:** Of all the breast cancer cases diagnosed in women between the ages of 20 and 85 years, approximately 18% occur in women between age 40 and 49 years.

**Objective:** To assess temporal trends in the diagnosis and treatment of breast cancer in women aged between 40 and 49 years.

**Design/Methods:** A retrospective review was performed at a single high-volume institution. Only those studies performed in patient populations between 1990 and 2008 were included, and data that had been prospectively acquired over those years were reviewed. From a single institution's breast cancer registry, detailed information regarding diagnosis, patient characteristics, clinical presentation, and demographics was obtained. Registry follow-up had been updated on an annual basis. Further information was obtained via chart review. If the patient was lost to follow-up at this single institution, a local geographic cancer registry was searched to obtain the patient's status. Initial breast cancer detection method information was obtained and categorized as either occurring via mammography, physician examination, or patient detection. Mammography-detected cancers did not include those patients with clinical findings.

**Results:** 1977 breast cancer cases in women aged 40 to 49 years were diagnosed over the retrospective study period, which represented 24% of the total breast cancers diagnosed. The number of cases of Stage 0 breast cancers comprised 17% of the study cohort, and 83% of those cases had been detected on mammography. Of those cases that were treated with lumpectomy, 67% had been detected on mammography and 48% had been detected clinically. The data analyzed indicated a greater likelihood of undergoing modified radical mastectomy if the cancer had been diagnosed clinically rather than via mammography. The mortality rate for those patients diagnosed via mammography was approximately one third of that for those diagnosed clinically. Over the retrospective study period, a significant increase in the percentage diagnosed by mammography was noted, with a steady rise from 28% in the 1990s to 58% in more recent years.

**Conclusions:** From 1990 to 2008, there was an increase in the proportion of breast cancers detected via mammography that coincided with lower-stage disease and reduced rates of mastectomies in women aged between 40 and 49 years.

**Reviewer's Comments:** Although the data presented are from a single institution's experience, there are important conclusions to take away. The apparent improvement in mammographic detection of breast cancers in women aged 40 to 49 years over the retrospective study period suggests improvement in mammographic performance in more recent years. Perhaps this reflects the benefit of digital mammography, although this factor was not evaluated by the authors and cannot be concluded definitively. (Reviewer-Basil Hubbi, MD).

Keywords: Screening Mammography, Cancer Detection Rate

Print Tag: Refer to original journal article
Although overall trends indicate that breast density is inversely proportional to patient age, there are enough exceptions to preclude generalization.

**Background:** Mammographic breast density is described as the ratio of relatively radiodense fibroglandular tissue to radiolucent fat tissue. Prior studies have demonstrated a statistically significant increase in risk of development of breast cancer correlated with increased breast density. As part of a pattern of post-menopausal changes, the expectation is that breast density decreases with increasing patient age.

**Objective:** To evaluate the trend between breast density and increasing age and to evaluate the relationship with risk for the development of breast cancer.

**Design/Methods:** Over a 1-year retrospective period, all screening mammography examinations performed at a single institution were identified. Radiographic breast density was documented on all cases and categorized based on the 4 BI-RADS definitions as follows: predominantly fatty, scattered fibroglandular tissue, heterogeneously dense, and extremely dense. Statistical analysis was employed to evaluate the relationship between breast density and age.

**Results:** >7000 women underwent screening mammography over the study period and 55% of them were between the ages of 40 and 59 years. Evaluation revealed that 8% were classified as predominantly fatty; 37% had scattered fibroglandular elements; 46% were heterogeneously dense; and 9% were extremely dense. There was a statistically significant inverse relationship between age and breast density. For women aged <40 years, 19% were judged to have low to average breast density, and for those women aged >80 years, 41% had heterogeneously or extremely dense tissue.

**Conclusions:** Although there is an overall inverse relationship between a woman's age and density of breast tissue on mammography, there is a sizeable percentage of older patients with dense breasts, which may affect the sensitivity of breast cancer detection.

**Reviewer's Comments:** In the discussion and conclusion, the authors of this study raise the potential role of screening MRI or ultrasound for those older patients presenting with dense breast tissue. Although I feel that this is a valid issue, this article serves as another step in the overall trend of medicine -- the personalized approach to patient care. It's becoming more likely that the future of screening will be based on a thorough understanding of the variables that may be specific to an individual patient and how particular screening modalities may be utilized for those with particular profiles. (Reviewer-Basil Hubbi, MD).

Keywords: Screening Mammography, Breast Density, Patient Age

Print Tag: Refer to original journal article
Recent data parallel the performance of prior studies regarding computer-aided detection and its influence on interpretation of mammograms with increased sensitivity coming at the cost of increased recall.

**Background:** Computer-aided detection (CAD) as an adjunct to radiologist interpretation of mammography has been around for a little while now, with multiple studies yielding mixed results. A safe overall conclusion that can be made is that CAD may detect more cancers but results in a higher recall rate.

**Objective:** To assess the efficacy of CAD in detecting cancers missed by the radiologist at screening.

**Design/Methods:** In this observer study, 300 cases performed at a single institution were originally retrospectively identified as per an institutional review board-approved protocol. Each case consisted of a standard 4-view screening mammogram, and prior examinations were also obtained when available. Of 300 cases, 69 cancers were present in 66 women; all of those cancers had been missed on initial interpretation but were determined to be retrospectively identifiable by at least 1 of 2 radiologists. The remaining cases consisted of normal mammograms. A total of 8 radiologists were tasked with reviewing the images. They individually interpreted the images and marked all suspicious lesions. For each marked lesion, the radiologists rated their suspicion on a 9-point scale, with a lower number indicating no evidence for recall and a higher number indicating overwhelming evidence for recall. The radiologists interpreted the images with and without CAD over 4 separate reading sessions.

**Results:** The overall sensitivity across all readers was determined to increase by 9.9% when CAD was used as compared with interpretation without CAD; this was statistically significant. Averaged across all readers, 9.3 additional recalls were made with CAD than without, which corresponded with a 12% increase in recall. Since the readers were given the option of ignoring some of the findings made by CAD, it was determined that the radiologists ignored 71% of the lesions that were correctly flagged by CAD to be malignant. Statistical analysis demonstrated that radiologists with the least experience in breast imaging relied more on CAD for help and ignored fewer correct CAD flags, suggesting that CAD benefited those radiologists the most.

**Conclusions:** As with most results in the radiology literature, this study demonstrates that CAD increases sensitivity of screening mammography but also corresponds with an increase in recall rate.

**Reviewer's Comments:** A notable finding in this study is that the radiologists rejected 71% of the findings identified by CAD that correlated with biopsy-proven cancers. The authors calculate that if these lesions had not been rejected, the increase in overall reader sensitivity would be 35.0%, not the 9.9% reported. If we can somehow find a correlation between those lesions rejected by the radiologists or perhaps cater the threshold for flagging findings based on individual radiologist performance, there may be a bright future for CAD. (Reviewer-Basil Hubbi, MD).

**Keywords:** Screening Mammography, Computer-Aided Detection, Breast Cancer

**Print Tag:** Refer to original journal article
A Foundation for Recommending Screening Mammography for Women in Their 40s

Mammography Screening: A New Estimate of Number Needed to Screen to Prevent One Breast Cancer Death.

Hendrick RE, Helvie MA:

AJR Am J Roentgenol 2012; 198 (March): 723-728

The number of women needed to undergo screening mammography in order to save one life is markedly lower than that needed to be invited to undergo screening, a notable distinction.

**Background:** In 2009, the U.S. Preventive Services Task Force published revised guidelines for screening mammography that sparked a nationwide debate on the merits of the recommendations and the studies that were used to derive them. The recommendations had been based, in part, on analysis of the benefit of screening mammography based on the number of women invited to undergo screening as compared with those women who were not invited to undergo screening. Since only a certain percentage of those women who are invited for screening actually undergo screening, it is suggested that using numbers of women who are invited rather than number of women actually screened introduces a bias that underestimates the benefit of screening.

**Objective:** To evaluate the estimates of the number of women needed to undergo mammography screening and compare them to the number needed to be invited for screening.

**Methods:** Data were mined from the Cancer Intervention and Surveillance Modeling Network, which is known by its acronym CISNET. CISNET is a consortium of National Cancer Institute-supported investigators that model many types of cancer and the effects of prevention, screening, and treatment on incidence and mortality. The number of women screened was derived from the CISNET results, which can be estimated directly from the CISNET data, and estimates were derived for annual and biennial screening. Furthermore, estimates were derived for life-years gained per 1000 women and data were correlated with age decades between 40 and 79 years and per 5-year intervals between 80 and 84 years.

**Results:** Based on CISNET results averaged over multiple screening models for women between the ages of 40 and 49 years, 746 needed to be screened in order to save 1 life. This decreases to 351 women between the ages of 50 and 59 years who needed to be screened in order to save 1 life, and 233 women between the ages of 60 and 69 years who needed to be screened in order to save 1 life. Over all ages ranging from 40 to 84 years, 11.9 lives were saved per 1000 women, and 84 women needed to be screened in order to save 1 life. Of note, these numbers assume a lifetime of screening with complete follow-up.

**Conclusions:** The number of women needed to undergo screening mammography to save 1 life is markedly lower than the number invited to screen, which has been used by the USPSTF to establish guidelines for screening mammography.

**Reviewer’s Comments:** The distinction the authors make between the number of women needed to be invited to undergo screening mammography versus the number of women who actually need to undergo screening mammography in order to save 1 life sets the stage for a data-driven rejoinder to the USPSTF recommendations. (Reviewer-Basil Hubbi, MD).

Keywords: Screening Mammography, U.S. Preventive Services Task Force, Number Needed to Invite to Screen

Print Tag: Refer to original journal article
In adapting the iPad to their daily routine, physicians face 2 main concerns: bandwidth when downloading images and device security. As technology improves, the iPad will be used more frequently as an image viewer.

According to a recent survey, approximately 80% of health care providers use the iPad® (Apple, Inc) professionally. Whether the iPad’s use is beneficial to the imaging community is being debated. Many radiology-related iPad applications assist members of the radiology community by providing after-hours and remote access to cases/images by allowing review of cases/images with referring physicians and by providing the ability to share educational materials and images to patients. The iPad offers a platform to access current literature and online journals, many of which offer iPad applications (apps) containing full content. Using the iPad for image sharing increases transmission of information from the referring physician to the radiologist, and ultimately to the patient. Although the iPad has many relevant and beneficial uses, the Food and Drug Administration (FDA) has approved only 1 app that enables radiologists to interpret MRI, CT, and nuclear medicine images directly on the device. However, despite FDA approval, many radiologists prefer to view images on workstations where they know the quality is sufficient to make diagnoses. The 2 main concerns physicians face in adapting the iPad as part of their daily routine are (1) bandwidth when downloading images and (2) device security. As a result of these concerns, the iPad most likely will not replace workstations anytime soon, but instead, it will likely supplement daily practice. The American College of Radiology is currently working with vendors to address these concerns while stimulating research and development focused on the needs of imaging physicians. As technology continues to improve and people become more comfortable with it, the iPad will be used more frequently as an image viewer. Areas expected to use the iPad the most are in telemedicine and in foreign countries with limited resources.

**Reviewer's Comments:** I find it difficult to believe that 4 of 5 health care providers actually own an iPad, but it is very likely that they use some wireless device professionally. The younger generation (the digital generation) is so comfortable and accustomed to getting their information online that it is simply a matter of time -- and probably not much more time -- before scan reading goes exclusively digital and increasingly mobile. Nonetheless, for nuclear medicine reads, mobile is not a plus. Scintigraphic studies frequently benefit from physician-patient interaction and careful correlation with images from other studies. Both are enhanced by workstations located in the imaging suite. Additionally -- and I believe this is easily quantifiable -- patient satisfaction is enhanced substantially by interaction with the physician interpreting the study. (Reviewer-C. Richard Goldfarb, MD).

**Keywords:** Mobile Devices for Image Interpretation, iPad

**Print Tag:** Refer to original journal article