To maintain and even augment the special expertise that we, as radiologists, possess, we must provide better interpretations, more coordinated service, and a closer spatial, temporal, and intellectual relationship with our referrers.

The words and terms we use to describe observations and render conclusions that are not definite can be judged both by the astuteness of our interpretations and the style through which we articulate them. Phrases that are vague in expression not only do not help the referrer, but they also damage our ethos (the esteem by which we are assessed as experts by other clinicians who have not been subjected to the special education we have received). Our conclusions, even if not certain, should not reflect subjective disquiet, nor should they be so all inclusive of possibility that they provide no guidance. Even in the absence of a specific answer, our dictated narratives and verbal consults should be seen as authoritative. Hence, we must choose our words wisely, offering our capability as image interpreters and, at the same time, engendering in our referrers the perception that we exercise a distinctive competence in each report we render. (Reviewer-).
Hemangiomas Exhibit Heterogeneous Enhancement on Multiphase MDCT

Contrast Enhancement of Hepatic Hemangiomas on Multiphase MDCT: Can We Diagnose Hepatic Hemangiomas by Comparing Enhancement With Blood Pool?

Oto A, Kulkarni K, et al:
AJR Am J Roentgenol 2010; 195 (August): 381-386

Enhancing peripheral nodules of hepatic hemangiomas may not have the same density as vessels during the arterial and portal venous phases on contrast-enhanced MDCT.

**Objective:** To determine if the peripheral nodular enhancement found in hepatic hemangiomas is of similar density as the blood pool on multiphase MDCT.

**Design:** Retrospective analysis.

**Participants:** 28 patients with 58 hepatic hemangiomas.

**Methods:** Unenhanced, arterial, portal venous, and delayed phase images were obtained then reviewed by 2 abdominal radiologists. Hemangiomas were evaluated, and degree of enhancement of nodules during each enhanced phase was categorized as either homogeneous or heterogeneous. The degree of nodule enhancement was compared to the density of vessels such as the aorta, inferior vena cava, hepatic vein, and portal vein at the same or closest slice to the lesion. The degree of enhancement was judged to be similar to, less than, or greater than that of the vessel. A maximum of 3 nodules in each lesion was included in the analysis. If a lesion had >3 enhancing nodules, then 1 with lowest visible enhancement, 1 with maximal enhancement, and 1 with the most representative density were selected. Maximal lesion diameters, as well as nodule region-of-interest attenuation values on all phases, were recorded.

**Results:** Mean diameter of hemangiomas in this study was 2.9 cm. Lesions were confirmed either by a minimum 2-year stability in size and appearance on CT or MRI or by surgical resection. Aside from 1 or 2 flash-filling hemangiomas, the majority demonstrated typical discontinuous nodular enhancement. Of lesions, 53% to 79% were judged to be heterogeneously enhancing on arterial and portal venous phases; 27% to 40% were heterogeneous on the delayed phase. Consequently, there was a statistically significant difference between the percentage of heterogeneously enhancing hemangiomas at the arterial phase and delayed phase. Regarding the specific nodule enhancement with lesions, there were less than one third of enhancing nodules that subjectively enhanced to a similar degree to that of vessels during arterial and portal venous phases. The greatest difference between enhancing nodules of hepatic hemangiomas and upper abdominal vessels was seen during the arterial phase. There was a 204-HU attenuation difference between hemangioma nodules and the aorta. There was a smaller difference of 37 to 47 HU during the portal venous phase and 20 to 25 HU during the delayed phase. These differences were all statistically significant.

**Reviewer's Comments:** The results of this study demonstrate that the principle of discontinuous peripheral nodular enhancement of similar density as the upper abdominal vasculature is not as reliable as that of progressive and continued enhancement without washout in characterizing hemangiomas. One of the limitations reported in this study was that the results apply only to the more common hemangiomas with characteristic enhancement patterns, not to those with atypical imaging findings. (Reviewer-John C. Sabatino, MD, MSD).

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Keywords: Hepatic Hemangiomas, MDCT, Contrast Enhancement

Print Tag: Refer to original journal article
The central scar found in focal nodular hyperplasia does not typically display delayed enhancement during MRI with hepatocyte-specific contrast.

**Objective:** To evaluate the enhancement pattern of the central scar found in focal nodular hyperplasia during MRI with hepatocyte-specific contrast.

**Design:** Retrospective analysis.

**Methods:** This study was comprised of 6 female patients with a total of 7 focal nodular hyperplasias with a central scar. All 6 patients underwent MRI using Gadoxetate Disodium, while 4 of 6 had also undergone a prior study using Gadobenate Dimeglumine within the previous year. Lesions without a central scar were excluded from the study. Lesions were diagnosed on the basis of imaging criteria. MRI criteria used in the diagnosis were as follows: iso- to slight hyperintensity to the liver on T2-weighted images, iso- to slight hypointensity to the liver on T1-weighted images, T1 hypointense and T2 hyperintense central scar, homogeneous arterial phase enhancement, iso- to slight hyperintensity to the liver on portal venous and equilibrium phases, and iso- to slight hyperintensity to the liver on the hepatobiliary phase 20 minutes following Gadoxetate Disodium administration. MRI examinations were performed on a 1.5-T system. Both contrast agent protocols consisted of routine unenhanced sequences, as well as 3D spoiled gradient echo contrast enhanced images acquired during the hepatic-arterial dominant phase, at 1, 2, 3, and 10 minutes. The Gadoxetate Disodium protocol also included an additional enhanced acquisition at 20 minutes. Images were reviewed by 2 abdominal radiologists who were asked to evaluate for presence or absence of scar enhancement.

**Results:** Mean diameter of the focal nodular hyperplasia was 4.2 cm. There was no enhancement of the central scar of focal nodular hyperplasia during the hepatic-arterial dominant phase, at 1, 2, 3, and 10 minutes on the Gadoxetate Disodium-enhanced studies. However, all 4 lesions imaged using Gadobenate Dimeglumine showed enhancement of the central scar after a 3-minute delay.

**Reviewer's Comments:** The results of this study are helpful in demonstrating that the enhancement pattern of the central scar of focal nodular hyperplasia is different when using extracellular fluid gadolinium contrast agents compared to hepatocyte-specific contrast. One of the limitations of this study was the small sample size. (Reviewer-John C. Sabatino, MD, MSD).

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Keywords: Focal Nodular Hyperplasia, Central Scar Enhancement Pattern, Gadoxetate Disodium

Print Tag: Refer to original journal article
The 10-minute delayed scan has decreased sensitivity in differentiating lipid-rich from lipid-poor adrenal adenomas, compared to previously reported findings using a 15-minute delay.

Objective: To determine if a 10-minute delayed scan can help differentiate lipid-rich from lipid-poor adrenal adenomas.

Design: Retrospective analysis.

Participants: 314 patients (201 women and 113 men) with 323 adrenal lesions.

Methods: All patients had incidental adrenal lesions detected on a previous study for other clinical reasons, who subsequently underwent dedicated adrenal CT study comprised of unenhanced, dynamic contrast-enhanced, and 10-minute delayed images for further characterization. A reference standard for adenomas was presence of a lesion with an attenuation value of <10 HU on an unenhanced CT study or no change in size for ≥6 months. Non-adenomas were defined as showing interval growth at serial CT or confirmed at histopathology. Non-adenomas included metastases, lymphoma, pheochromocytomas, and ganglioneuroma. CT examinations included unenhanced as well as enhanced images following scan delays of 75 seconds and 10 minutes, and regions of interest (ROIs) were placed over the lesion. Cystic, calcified, necrotic, and hemorrhage portions of a lesion were excluded from the ROI. The absolute percentage washout (APW) was calculated as (enhanced – delayed)/(enhanced – unenhanced) x 100%, and the relative percentage washout (RPW) as (enhanced – delayed)/enhanced x 100%.

Results: There were 307 adenomas; 173 were lipid-rich and 134 lipid-poor. There were 16 non-adenomas. The mean attenuation of all adenomas was 10 HU; the mean unenhanced CT attenuation was 31 HU for non-adenomas. The sensitivity for the relative percentage washout for adenomas at a threshold of 50% was 56%, which is poor compared to a previously reported finding of 98% (Peña et al, 2000). Therefore, this is not sufficiently sensitive to apply in clinical practice. The sensitivity for the relative percentage washout for adenomas at a threshold of 40% was 77%, and at a threshold of 35%, it was 81%. The sensitivity for the absolute percentage washout at a threshold of 60% was 52%; at 55%, it was 63%; and at 50%, it was 71%. The sensitivities of relative percentage washout values for lipid-rich adenomas at a threshold of 60%, 50%, and 40% were 62%, 75%, and 91%, respectively, and for lipid-poor adenomas were 39%, 31%, and 59%, respectively.

Reviewer's Comments: The results of this study illustrate that the 10-minute delayed adrenal enhancement washout has reduced sensitivity for characterizing adrenal adenomas compared to previously reported studies. One of the limitations noted in this study was that there was a small sample of the non-adenomatous lesions. (Reviewer-John C. Sabatino, MD, MSD).

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Keywords: Incidental Adrenal Lesions, Washout MDCT, Delayed Imaging, Accuracy

Print Tag: Refer to original journal article
Is Antegrade Cooling During RF Ablation Protective Against Thermal Injury?

Protection of the Renal Collecting System During Radiofrequency Ablation With Antegrade Cold Dextrose Infusion.

Hwang SI, Cho JY, et al:

Radiology 2010; 256 (September): 759-766

Antegrade cooling of the renal collecting system, performed during radiofrequency ablation of more centrally located renal lesions, may confer protection of the urothelium against thermal injury.

**Objective:** To evaluate antegrade renal cooling to protect the renal collecting system during radiofrequency (RF) ablation.

**Methods:** Using ultrasound guidance and an inferior approach, a 7-gauge nephrostomy catheter was placed through a 12-gauge arterial sheath into both kidneys of 10 anesthetized adult domestic pigs. Right kidneys of half the pigs, and left kidneys of the other half, were preselected for antegrade cooling. Pre-cooled D5W was infused into the pigtail catheter by hand and drained passively through the side port of the arterial sheath. A 17-gauge internally cooled tip electrode was advanced into the renal sinus fat using ultrasound guidance. An antegrade pyelogram assisted in placement of the electrode near the collecting system without inadvertent perforation. RF ablation was performed at 140 watts, for 15 minutes, with a target of 105°C. CT was performed on post-procedural days 1 and 7 with a 16 MDCT with pre-contrast and delayed IV contrast images. On day 7 after the pigs were sacrificed, kidneys and ureters were removed en bloc, and retrograde pyelography was performed to further evaluate for a leak. Gross specimens and histologic sections were evaluated.

**Results:** There were fewer post-procedural fluid collections around cooled kidneys compared to non-cooled kidneys on follow-up CT, which was statistically significant on the day-7 scan ($P=0.35$). The 2 cooled kidneys had only perirenal extension of fluid, whereas 5 of 8 non-cooled kidneys had pararenal extension of fluid. Ex vivo retrograde pyelography further demonstrated contrast leakage in 5 of 8 non-cooled kidneys that had associated collections and in none of the cooled kidneys. There was no statistically significant difference in the mean maximal diameter of the RF ablation area and the mean distance of this area to urinary tract in both cooled and non-cooled kidneys. Histologically, the mean quantified damage to the urothelium was significantly lower in cooled kidneys. The results of this study demonstrate that antegrade infusion of cold D5W into the renal collecting system during RF ablation effectively protects the urothelium without compromise of target RF diameter, as demonstrated with a porcine model.

**Reviewer's Comments:** Noteworthy limitations of this study, as listed in the article, were as follows: (1) Normal renal parenchyma was ablated, not tumor, as no porcine renal cell tumor line has been established for experimental purposes. (2) Since only the cooled tip of the electrode was near the collecting system, thermal injury to the collecting system was much lower than if the lesion required the entire active portion of the electrode to be in the proximity of the renal pelvis. (3) The diameter of the ablated area was used as the only parameter, not viability of the ablated tissue. (Reviewer-Deborah Feldman, MD).

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Keywords: Antegrade Cold Dextrose Infusion, Radiofrequency Ablation, Renal Collecting System

Print Tag: Refer to original journal article
Isolated pelvic free fluid detected on MDCT in male patients with blunt trauma is not thought to be of clinical importance if it is small in amount, fluid in attenuation, and located in the deep region of the pelvis.

**Objective:** To determine the frequency and importance of a small amount of isolated pelvic free fluid seen on MDCT in male patients who have blunt trauma without an identifiable cause.

**Design:** Retrospective review.

**Participants/Methods:** 1123 male patients had a CT for trauma from January 2004 to June 2006. Patients excluded from the study had penetrating trauma, a laparotomy, peritoneal lavage, or >6 hours between admission and imaging; 1000 patients constituted the study group. Abdominal/pelvic MDCT at 5-mm sections with IV and oral contrast was performed. Twenty-six patients did not receive IV contrast, and 2 did not receive oral contrast. Two blinded abdominal radiologists looked for free fluid and visible traumatic or nontraumatic causes of free fluid. A small amount of free fluid was defined as fluid identified on ≤5 contiguous 5-mm CT sections. Interobserver differences were resolved by consensus. Measurements of the volume, attenuation, and location of the free fluid, determining if it was at, below, or above the level of the third sacral vertebral body were performed. CTs of patients with a small amount of pelvic fluid were compared to those of patients with surgically proven bowel or mesenteric injury. Differences in volume and attenuation of fluid were analyzed.

**Results:** Pelvic free fluid was found in 102 (10.2%) of 1000 patients. No identifiable causes were found in 49 of these patients. The pelvic fluid in patients with no identifiable cause was simple (average density, 8 HU), small in quantity (average volume, 2.3 cc), and located below the third sacral body. Thirteen (1.3%) of 1000 patients had surgically proven bowel and/or mesenteric injury. These patients had ascites that was greater in density (average density, 34.8 HU), greater in quantity (average volume, 41.5 cc), and located at or above the third sacral body. None of the 49 patients without an apparent etiology of free fluid developed signs or symptoms of bowel or mesenteric injury. Specifically, of this group, there was 1 negative exploratory laparotomy, 1 patient demonstrated a decrease of fluid, and fluid resolved in a second patient on a repeat CT 48 hours later. Five patients had no signs or symptoms during a prolonged hospital stay, and the remaining 41 patients were admitted for 23 hours of uneventful observation. After discharge, these patients remained symptom free when evaluated at 2 weeks or 2 months.

**Reviewer's Comments:** The results of the study assist in the management of male patients who have experienced blunt trauma and have small, simple, and deep pelvic ascites of unknown etiology. This fluid is not likely the result of occult mesenteric or bowel injury. Beware of pitfalls when measuring the attenuation of pelvic fluid such as streak artifact from a urinary bladder filled with contrast or partial volume averaging artifact. (Reviewer-Deborah Feldman, MD).

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Keywords: Blunt Trauma, Ascites, Pelvic Fluid

Print Tag: Refer to original journal article
In pregnancy, CT angiography and perfusion scanning both have excellent clinical negative-predictive values, and perfusion scanning is preferable if chest x-ray is negative and there is no suspicion for an alternative diagnosis because of reduced radiation to breasts.

**Background:** During pregnancy, a low-dose perfusion scan gives a dose of 0.1 to 0.37 mGy to the fetus. A CT pulmonary angiogram gives a dose of 0.1 to 0.66 mGy to the fetus. Perfusion imaging gives an approximate dose of 0.11 to 0.31 mGy to breast tissue. A CT pulmonary angiogram gives a dose of at least 20 mGy to each breast.

**Objective:** To evaluate image quality of both CT pulmonary angiography and perfusion scanning in pregnant patients.

**Design:** Retrospective study. **Participants:** 199 pregnant patients who either underwent CT pulmonary angiography or perfusion scanning to evaluate for pulmonary embolism (PE) for clinical indication.

**Methods:** Objective criteria for image quality on CT was average attenuation in the left lower lobe pulmonary artery where ≤169 HU was poor enhancement, 170 to 209 HU was acceptable enhancement, and ≥210 HU was good enhancement. Respiratory motion artifact was evaluated subjectively, and an overall quality assessment was also made. Perfusion scanning was performed after 1.0 to 1.5 mCi of 99mTC-labeled macroaggregated albumin, half the usual dose to nonpregnant patients, was given. The PIOPED I criteria were used to evaluate perfusion scans. A high probability scan was considered positive. A normal, very low probability, or low probability scan was considered negative. An indeterminate scan was considered diagnostically not sufficient.

**Results:** PE was diagnosed in 4 of 106 patients (3.7%) who had CT pulmonary angiography. Image quality was considered good in 76.4% of patients, acceptable in 17.9%, and insufficient in 5.6% (6 patients). Of these 6 patients, 3 had follow-up perfusion scanning that was normal, and none had PE on follow-up imaging. None of the perfusion scans were positive for PE. Two of 99 patients (2.02%) were intermediate probability, and no PE was seen on follow-up CT pulmonary angiography. One patient had an incomplete study, and PE was subsequently seen on CT pulmonary angiography. One patient had a PE diagnosed 9 weeks after a negative CT pulmonary angiogram. Overall, there was a 99% clinical negative-predictive value (NPV) for CT pulmonary angiography and a 100% clinical NPV for perfusion scanning. This difference was not statistically significant. Outside of PE, CT demonstrated clinically significant findings not seen on chest radiography in 5 of 199 patients (2.5%).

**Conclusions:** In pregnant patients, CT pulmonary angiography and perfusion scanning both have excellent clinical NPVs, and the choice of which exam to be used should be based on other factors such as radiation burden and clinical concern for alternative diagnoses.

**Reviewer's Comments:** The authors' assertion that perfusion scanning is preferable to CT pulmonary angiography if chest radiography is negative and there is not a clinical suspicion for alternative diagnoses is valid because of the preference to reduce radiation to breast tissue. (Reviewer-Vineet R. Jain, MD).
Detection of chronic myocardial infarction on dual-energy CT using color-coded iodine distribution analysis is hampered by artifact from metallic hardware such as sternal wires; these patients benefit more from blended grayscale imaging.

**Background:** In 2006, a newly invented CT scanner (a dual-source system) was introduced. With this new type of scanner, it is possible to scan the same voxel with 2 different energy levels. Some matter demonstrates changes in attenuation or Hounsfield units, depending on the x-ray spectrum it is exposed to. Because of this, iodine can be separated, and myocardial perfusion from retrospectively gated coronary CT is possible.

**Objective:** To compare dual-energy CT with cardiac 3-T MRI for evaluation of chronic myocardial infarction.

**Design:** Prospective study.

**Participants:** 36 patients who underwent both studies. All patients had a history of severe chronic coronary artery disease, and all had undergone prior coronary artery bypass grafting.

**Methods:** The dual-energy CT scanner used a triphasic injection protocol. Three image series for every reconstruction set were made: 1 for the low-kilovoltage (100 kV) technique, 1 for the high-kilovoltage (140 kV) technique, and 1 blended series combining the high contrast of the low-kilovoltage series and the resolution of the high-kilovoltage series in a 30%/70% ratio in order to generate a series similar to a 120-kV scan. All MRIs were performed with 0.1 mmol/kg of gadolinium. Twelve minutes after injection, 2-dimensional phase-sensitive inversion recovery sequences were obtained in both the short-axis and 2- and 4-chamber view to assess for abnormal delayed enhancement. For the purposes of this study, MRI was considered the gold standard for assessment of chronic myocardial ischemic damage, also known as scarring. CT datasets were evaluated for myocardial areas that appeared low in density, compared with surrounding myocardium, and demonstrated a subendocardial or transmural distribution. In addition, myocardial iodine content and distribution were displayed as a color map and were superimposed on grayscale images, and this map was analyzed for perfusion defects visually.

**Results:** 17% of myocardial segments in 61% of patients demonstrated abnormal delayed enhancement on MRI. The blended virtual 120-kV images that had relatively low noise and high resolution had the best diagnostic accuracy (77% sensitivity, 97% specificity, 85% positive-predictive value, 96% negative-predictive value, and 94% accuracy.) The highest sensitivity for detection of myocardial scarring occurred with the 100-kV grayscale images (80% sensitivity). The myocardial iodine mapping had 70% sensitivity and suffered from artifact due mostly to sternal wiring.

**Conclusions:** The detection of myocardial scarring on color-coded iodine distribution analysis is hampered by artifact from metallic hardware in the chest such as sternal wires. These patients seem to benefit more from blended grayscale imaging. Further advancements will be necessary to improve the sensitivity of iodine distribution mapping.

**Reviewer's Comments:** It will be interesting to see whether these new complicated techniques will ever make it into clinical practice. (Reviewer-Vineet R. Jain, MD).

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Keywords: Chronic Myocardial Infarction, Dual-Energy CT

Print Tag: Refer to original journal article
Mandatory chest radiography in a pre-employment tuberculosis-screening program in the United States is of very low yield in detecting active tuberculosis.

**Objective:** To evaluate chest radiography (CXR) findings in asymptomatic persons who have positive tuberculin skin test (TST) results.

**Design:** Retrospective study.

**Participants:** Persons who were evaluated by the Employee and Occupational Health Service (EOHS) from 2003 to 2007 at a large hospital who underwent CXR because of positive TST results as part of a pre-employment evaluation.

**Methods:** All persons studied underwent posteroanterior and lateral CXR. Findings supporting active tuberculosis were cavitation, consolidation, or pleural effusion. Findings supporting prior tuberculosis infection were apical or basal pleural thickening, fibrous scarring, calcified granulomas, calcified lymph nodes, and noncalcified nodules. All CXRs originally interpreted as positive were reanalyzed. Any discrepancy between the original reading and the new reading was resolved by a third independent reading. All follow-up CXRs and CTs obtained as a result of the original reading were also analyzed. Starting in late 2006, the EOHS also began to use an in vitro diagnostic laboratory test, called the QuantiFERON-TB Gold test, to aid in the diagnosis of tuberculosis infection. All persons with a positive TST test also underwent this new test.

**Results:** There were 2586 people who had positive TST results; 159 (6.1%) had CXRs that were considered abnormal. None of these abnormal CXRs had findings suggesting active tuberculosis. There were 92 cases of either calcified nodules, calcified lymph nodes, or both. There were 25 cases of apical pleural thickening. There were 16 cases of fibrous scarring, all involving an area <2 cm². There were 31 cases of noncalcified nodules. All these nodules were ≤4 mm in diameter, with the exception of 1 that turned out to be a primary lung cancer and 1 necrotizing granuloma that grew Mycobacterium kansasii on culture. There were 135 persons who had a positive in vitro QuantiFERON-TB Gold test. Eight of these patients (5.9%) had findings again suggestive of prior tuberculosis such as calcified granulomas or lymph nodes, apical pleural thickening, fibrous scarring, or noncalcified nodules. Of 517 persons with a negative in vitro test, 40 (7.7%) had an abnormality again suggesting prior tuberculosis. This proportion of positive abnormal CXR did not significantly differ from that in the group with a positive in vitro test.

**Conclusions:** Mandatory CXR in a pre-employment tuberculosis screening program in the United States is of very low yield in detecting active tuberculosis or increased latent tuberculosis reactivation risk.

**Reviewer’s Comments:** It will be interesting to see whether routine CXR in people with positive TST results who are asymptomatic will be recommended in the future. (Reviewer-Vineet R. Jain, MD)

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Keywords: Tuberculosis, Chest Radiography

Print Tag: Refer to original journal article
Objective: To characterize the extent of retropulsion, the size of the spinal canal, the vertebral body height, and the wedge angle 1 year following percutaneous vertebroplasty.

Participants/Methods: 27 patients with a combined total of 52 osteoporotic vertebral body compression fractures were included in this prospective study. All patients underwent CT imaging of the spine 3 times: once prior to vertebroplasty, once within 1 hour of vertebroplasty, and once at a follow-up visit approximately 1 year after vertebroplasty. All patients also received 3 MRIs of the thoracolumbar spine: prior to treatment, within 2 days following treatment, and at a return visit. Parameters that were measured on each scan included the extent of retropulsion, cross-sectional area of the spinal canal, vertebral body height, and the wedge angle. Patients with a fracture cleft, defined as fluid or gas in the fracture, or as the unenhancing portion of an unhealed fracture, were noted.

Results: Compression fractures extended from the T5 to L4 levels. Mean decrease in wedge angle between pretreatment and 1-year follow-up scans was 1.1° (P >0.05). There was no significant change in retropulsion, average vertebral body height, or spinal canal cross-section on 1-year follow-up scans. In 36 vertebrae with retropulsion of bone into the spinal canal, there was a mean decrease of 2.1° (P <0.05) in wedge angle at 1-year follow-up. There was no statistically significant change in the degree of retropulsion. In 36 vertebrae with a fracture cleft, mean wedge angle increased by 2.1°, while in 16 vertebrae without a fracture cleft, mean wedge angle decreased by 1.2° (P <0.05). There were no other statistically significant differences between groups with or without fracture clefts.

Conclusions: 1 year following vertebroplasty for osteoporotic compression fractures, the authors noted no or minimal change in the extent of retropulsion of bone, the cross-sectional area of the spinal canal, the vertebral body height, and the wedge angle.

Reviewer's Comments: This study shows that 1 year following vertebroplasty for osteoporotic compression fractures, the morphology of the affected vertebral body level remains generally stable. The group with a fracture cleft actually had a small increase in the wedge angle at 1-year follow-up. However, measurements in this group could be skewed as the patient excluded from the study had a large fracture cleft. Symptomatic improvement at 1 year would have been interesting to note as well, although it was not part of the study design. A control group of patients with osteoporotic compression fractures but who did not undergo vertebroplasty would have been interesting to have included in this study, but might not have been practical. (Reviewer-John Hochhold, MD).

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Keywords: Vertebroplasty, Spine

Print Tag: Refer to original journal article
PET-CT Found to Alter Management of Foot Pain of Unclear Etiology


Fischer DR, Maquieira GJ, et al:

Skeletal Radiol 2010; 39 (October): 987-997

PET/CT imaging with 18F-labeled fluoride can reveal findings not depicted on MRI that can lead to alterations in therapeutic management.

**Objective:** To determine whether PET/CT imaging with 18F-labeled fluoride will change therapeutic management in patients with foot pain of unclear etiology.

**Design/Methods:** Patients with foot pain were enrolled in this prospective study if the cause of their foot pain was still uncertain after physical examination and imaging with MRI and/or CT. Patients then underwent PET/CT imaging with 18F-labeled fluoride. Two foot and ankle surgeons were asked to determine therapeutic management for each patient twice -- once without PET/CT data and once integrating it.

**Results:** 28 patients were included in this study. In 13 of these patients, there were 15 findings on PET/CT that led to changes in management. New working diagnoses included the following: os trigonum syndrome; os trigonum syndrome with plantar fasciitis; sinus tarsi syndrome; subtalar osteoarthritis and plantar fasciitis; osteoarthritis of the talotibial joint; osteoarthritis of the talonavicular joint; osteoarthritis of the talotibial and subtalar joints with os tibiale externum syndrome; osteoarthritis as well as insertional tendinopathy of the anterior fibulotalar ligament; a non-consolidated fragment of the left anterior calcaneal process; non-union after a distal tibial fracture; nonspecific increased activity at the lateral calcaneal bone; a calcaneo-navicular coalition; and proximal intermetatarsal neoarticulations. In the 11 patients who had had previous MRI studies, 9 of 15 findings were considered new. Therapeutic changes included beginning or re-targeting joint infiltrations, initiation of orthotics, surgery, and pain management.

**Conclusions:** PET/CT imaging with 18F-labeled fluoride can reveal findings not depicted on MRI that can lead to alterations in therapeutic management.

**Reviewer's Comments:** This study has several limitations, many of which the authors themselves note. The time between MRI examination and PET/CT ranged from 2 days to 6 months. The longer the time interval between studies, the more problematic a comparison becomes. The authors studied changes in management. They did not look at the patient outcomes following management changes. Nor did they study the accuracy of their PET/CT diagnoses, which would have been hard without using some gold standard, such as histopathologic sampling. The study does not comment on the reproducibility of results from PET/CT, as there was a single interpreter of PET/CT images. There was no discussion of intensity or quantification of tracer uptake and its value in diagnosis. Despite these drawbacks, the findings are promising that PET/CT imaging can guide therapeutic interventions in patients with foot pain of unclear etiology. (Reviewer-John Hochhold, MD).

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Keywords: PET/CT, 18F-Fluoride PET, Foot Pain

Print Tag: Refer to original journal article
Microwave ablation is less affected by heat sink effects, and can produce ablation through desiccated, burned tissues. Excessive heat from the shaft and power cables limits the power that can be used.

Discussion: Ablation of tumors has become standard of care for unresectable tumors of the liver, kidney, and other organs. A new type of thermal ablation available is microwave ablation. Like other modalities, microwave ablation has advantages and disadvantages. **Mechanism:** Microwave ablation starts by placing a probe into a target tumor, much like other local ablation techniques. Heating occurs in a specific volume around the antenna. Multiple probes can be used at the same time, unlike radiofrequency ablation (RFA). Tissues with a high amount of water respond best, but microwaves can heat tissues with high impedance or low electrical or thermal conductivity such as bone or lung. **Components:** The basic microwave system consists of 3 parts: a generator, a power distribution system, and antennae or probe. A cooling system is essential to control needle shaft heating, which can cause skin burns. The distribution system usually consists of coaxial cables. The antennae are usually 17 g up to 6 mm in size. **Advantages of Microwave:** Microwave ablation can produce faster heating over a larger volume of tissue when compared with RFA. The microwave ablation times are much shorter at 2 to 5 minutes versus 15+ minutes with RFA. It is not as susceptible to heat sink effects. The heating can occur through charred or desiccated tissue. No grounding pads are needed and multiple applicators can be used at the same time. In liver specifically, heating occurs effectively around vessels as large as 10 mm. It is effective in tumors >3 cm and in treating colorectal metastases. In the kidney, larger ablation zones can be created with uniform cell death compared with RFA. Preliminary clinical studies show microwave safe and effective to treat lung tumors. In bone, the microwaves are able to penetrate deeply and can treat painful bone tumors, preliminary studies show. **Disadvantages:** Microwave is more difficult to generate and deliver compared with RFA. The energy must be delivered in large coaxial cables that are large and cumbersome, and more prone to heating. The shaft size of the probe or needle must also be larger to mitigate the heating. An efficient and powerful shaft cooling mechanism must be in place to decrease the risks of shaft burn. The problems with cooling limit the amount of power that can be delivered, which leads to long, thin ablation zones. There is also some unpredictability of the size and shape of the zone of ablation. In the U.S., there is only one FDA-approved system for commercial use -- the Evident™ system. Several other systems with probe sizes ranging from 12 to 16 gauges are in preclinical trials in the U.S. **Reviewer’s Comments:** Microwave ablation has been used widely in Japan and China, and multiple systems in all configurations are available there. (Reviewer-Sharon Gonzales, MD).
Patients With Poorer Renal Function Benefit Most From TIPS Creation

Effect of Transjugular Intrahepatic Portosystemic Shunt Placement on Renal Function: A 7-Year, Single-Center Experience.

Anderson CL, Saad WE, et al:

J Vasc Interv Radiol 2010; 21 (September): 1370-1376

Transjugular intrahepatic portosystemic shunt creation in patients with renal insufficiency improves renal function and Model for End-Stage Liver Disease score.

Background: Renal insufficiency usually accompanies the liver failure responsible for ascites or variceal bleeding. Portal decompression by transjugular intrahepatic portosystemic shunt (TIPS) has been shown to improve renal function in several small studies that looked at specific populations and disease processes.

Objective: To review the effect of TIPS on renal function in the authors’ institution across a wide spectrum of disease processes.

Design/Methods: Retrospective review of patients who had TIPS creation over the course of 7 years. Patients who had end-stage renal failure at the time of the procedure, or who expired during the same hospitalization were excluded. The total amount of contrast used and the use of nephroprotective maneuvers was recorded, chronic kidney disease (CKD) stage was assigned, and the Model for End-Stage Liver Disease (MELD) scores were calculated for each patient. The patients were also analyzed by dividing patients according to their level of renal impairment.

Results: 129 patients had sufficient data to be included in the evaluation. Patients with creatinine >1.2 mg/dL before TIPS creation exhibited a decrease in the creatinine level that was more pronounced in patients with creatinine >2.0 mg/dL. There was a statistically significant correlation between improvement in renal function and refractory ascites. There was no correlation between the amount of contrast used and the change in renal function. Patients with no significant renal dysfunction before TIPS showed a significant increase in the MELD score, whereas patients with a creatinine >2.0 mg/dL or CKD level 4, had a significant decrease in MELD score. There was a significant increase in bilirubin and international normalized ratio after TIPS to all groups. Across all indications, there was a trending increase in MELD score after TIPS creation.

Conclusions: TIPS creation improves renal dysfunction in chronic liver disease. Patients with poorer renal function benefit the most from TIPS creation.

Reviewer's Comments: This study demonstrated an improvement in renal function after TIPS creation, but also showed an increase in the MELD score as well. The improvement in renal function was greater in patients with worse renal function. It is difficult to separate those patients with purely organic renal disease and functional renal disease in the setting of liver disease because of so many comorbidities. Patients with hepatic hydrothorax and ascites were more likely to have renal dysfunction, and in this study showed improvement in renal function after TIPS. The lack of an effect of contrast on renal function most likely is because only small amounts of contrast were used, a mean of 125 mL. The change in the MELD score correlates well with change in mortality risk. The increase in the MELD score after TIPS in general is most likely related to worsening liver function. In patients with the worst renal function, improvement in the MELD score reflects the improvement in renal function, thus suggesting a survival benefit of TIPS for patients with renal dysfunction. (Reviewer-Sharon Gonzales, MD).

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Keywords: Transjugular Intrahepatic Portosystemic Shunt, Renal Insufficiency

Print Tag: Refer to original journal article
There is no evidence that adjunct inferior vena cava filter placement in patients who are anticoagulated for pulmonary embolism decreases morbidity.

**Background:** Inferior vena cava (IVC) filters are sometimes placed as an adjunct to full anticoagulation in patients with a large pulmonary embolism (PE), especially in patients with right heart strain. This practice is largely empiric since there is essentially no evidence demonstrating clinical efficacy.

**Objective:** To determine the prevalence of adjunctive IVC filter placement in individuals diagnosed with PE, as well as the effect of adjunct filter placement on in-hospital mortality in patients with right heart strain associated with PE.

**Design/Methods:** Retrospective study of 248 adult patients admitted to a single academic medical center over 2.75 years with acute PE treated with full anticoagulation. Data were abstracted from patient charts, which included the presence or absence of right heart strain and of deep vein thrombosis, and whether or not an IVC filter was placed. The end point was in-hospital mortality. Patients with chronic PEs, previously placed IVC filters, or on concomitant thrombolytic therapy were excluded.

**Results:** Of 248 patients diagnosed with acute PE, there was an in-hospital mortality rate of 4.4%. The prevalence of adjunctive IVC filter placement was 13.3% (33 of 248), and the prevalence of documented right heart strain was 27.0% (67 of 248). In-hospital mortality was 10.2% in the nonfilter-treated group (5 of 49), whereas there were no deaths in the filter-treated group (0 of 18); however, the difference was not statistically significant ($P=0.37$). Both the presence of deep vein thrombosis and of right heart strain increased the likelihood that an adjunctive IVC filter was placed.

**Conclusions:** This single-center study found that IVC filters were placed as an adjunct to anticoagulation in 13.3% of cases of acute PE. The study did not discern a beneficial effect on survival of adjunctive IVC filters in patients with right heart strain. Also, right heart strain itself was not statistically associated with greater in-hospital mortality.

**Reviewer’s Comments:** The sample size was relatively small and the study was severely weakened by a retrospective design. Patients were only observed for morbidity during their inpatient stay. The purpose of this study raised an interesting question that should be answered with a large prospective study or clinical registry, as the authors acknowledged. For now there is little evidence that adjunct IVC filter placement improves patient outcomes. (Reviewer—Waseem A. Bhatti, MD).

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Keywords: Pulmonary Embolism, Inferior Vena Cava Filters

Print Tag: Refer to original journal article
Radiofrequency ablation shows promise for treatment of small intrahepatic cholangiocarcinoma tumors.

**Background:** Surgical resection is the treatment of choice for patients with intrahepatic cholangiocarcinoma (ICCA). However, many patients have unresectable tumors because of disease stage, anatomic conditions, poor hepatic reserve, and medical comorbidities. At the time of presentation, resection is possible in only 20% of patients. Radiofrequency ablation (RFA) has been shown to be effective in the treatment of patients with hepatocellular cancer and liver metastasis. According to the authors, clinical efficacy in the treatment of ICCA has been reported only in a few case reports and small series in literature.

**Objective:** To evaluate both the safety and efficacy of percutaneous ultrasound (US)-guided RFA in ICCA and to show the results in a small series of patients.

**Methods:** This is a small series of 6 patients with biopsy-proven ICCA with a mean age of 69.8 years who underwent percutaneous US-guided RFA. None of the patients were suitable for surgery. Two were of advanced age and had comorbid conditions, 2 had poor hepatic reserve, and 2 patients had a central localization of their tumors. Tumor size ranged from 1.0 to 5.8 cm. In 2 patients, RFA was performed after transarterial embolization (TAE) to decrease heat dispersion during RFA in order to increase the area of ablation. The efficacy of RFA was evaluated using a contrast-enhanced dynamic CT 1 month after treatment and then every 3 months. Tumor markers CEA and CA19-9 were measured before and after the procedure.

**Results:** 9 RFA sessions, with a duration ranging from 10 to 20 minutes, were performed for 6 solid hepatic tumors in 6 patients. Three patients were treated in a single session, whereas the other 3 underwent 2 treatment sessions because post-procedure US or CT showed a residual lesion. Post-treatment CT showed total necrosis in 4 of 6 tumors (66%). Residual tumor was observed in 2 patients with larger tumors (5.0 and 5.8 cm in diameter). Tumoral marker values decreased after treatment in patients with elevated pre-therapy levels.

**Conclusions:** Since there is no curative medical therapy for ICCA and most tumors are unresectable at the time of presentation, RFA is an attractive option. According to recent literature, intra-arterial chemotherapy for ICCA represents another therapeutic option that seems to have achieved promising results. No ICCA tumor <3 cm in size had residual or recurrent tumor on follow-up CT scans in this small series. Heat loss can also decrease effectiveness of RFA treatment; therefore, pre-therapy embolization may be effective in reducing this negative effect.

**Reviewer’s Comments:** Overall, I found the data presented in this small series to be encouraging. If efficacy and safety can be demonstrated, many patients with unresectable intrahepatic cholangiocarcinoma can be treated with RFA therapy in the future. (Reviewer-Waseem A. Bhatti, MD).

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Keywords: Cholangiocarcinoma, Radiofrequency Ablation

Print Tag: Refer to original journal article
Changes to Expect on Breast MRI After Conservation Therapy

Breast MRI After Conservation Therapy: Usual Findings in Routine Follow-Up Examinations.
Li J, Dershaw DD, et al:
AJR Am J Roentgenol 2010; 195 (September): 799-807

Although MRI-evident changes in the breasts are most striking in the first 6 months after breast conservation treatment, findings such as presence of a seroma and surgical bed enhancement may persist for at least 5 years.

Background: Recurrence of breast cancer after conservation surgery has traditionally been assessed on mammography with ultrasound acting as a sporadic adjunct. The earlier recurrence is diagnosed, the better the survival rates of the patient. With this goal in mind, MRI has been utilized to follow patients after treatment in the interest of detecting recurrence earlier than would be detected on mammography.

Objective: To characterize the normal changes in the breast on MRI after conservation therapy.

Methods: Over a 6-year retrospective period, women who had undergone breast conservation treatment were identified in a surgical database. Those who had pre- and post-treatment MRI examinations were noted and only women who had at least 2 post-treatment studies were included. The post-treatment studies had to be at least 12 months apart. Medical records were reviewed and factors recorded included time of diagnosis, date of surgery and radiation treatment, histopathologic diagnosis, and menstrual status at the time of imaging. Patients who ultimately developed tumor recurrence were excluded, as the goal was to define normal evolutionary changes. All MR examinations were retrospectively reviewed by 4 experienced breast radiologists who documented the following: background parenchymal enhancement, cystic change, presence of seroma at the surgical site, and enhancement at the lumpectomy site.

Results: 248 women were included in the study with a mean age of 49.7 years. When compared with the pretreatment MRI, the overall background parenchymal enhancement decreased over time, with the most rapid decrease demonstrated on the MRI performed 6 months after the pretreatment MRI. Similar changes were seen when assessing cystic changes, which decreased over the post-treatment period. Postoperative seromas were seen in 36% of women on the first post-treatment MRI with almost 10% containing pure fat. Of those patients with immediate post-treatment seromas, nearly 43% still had fluid within the lumpectomy bed at the last post-treatment MRI reviewed. Rim enhancement was seen in 81% of seromas. Enhancement of the lumpectomy site even without seroma formation was seen in 37% of patients on initial MRI follow-up and 43% of those had continued enhancement ≥5 years after treatment. This finding was most prevalent in those with fat-containing seromas.

Conclusions: Although changes in this population were greatest in the treated breast, parenchymal enhancement and cystic alteration decrease bilaterally indicating a systemic influence. Edematous changes, seroma, focal enhancement, and skin thickening were seen only in the treated breast. All post-treatment MRI findings decrease progressively, and all may persist. Lumpectomy site enhancement is most persistent in women with fat necrosis.

Reviewer’s Comments: This is a great article with practically applicable conclusions. The most useful finding is presence of persistent enhancement of the lumpectomy site even 5 years after initial treatment. Until now, conventional wisdom has been to suggest tumor recurrence if there was enhancement 18 to 24 months after treatment, especially in the absence of prior studies. (Reviewer-Basil Hubbi, MD).

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Keywords: MRI, Cancer, Lumpectomy, Breast Conservation Therapy

Print Tag: Refer to original journal article
No statistically significant MRI characteristic reliably predicts whether a high-risk lesion found on core biopsy will be upgraded to carcinoma on surgical excision.

**Background:** High-risk breast lesions are those lesions found on core biopsy that warrant surgical excision due to the "upgrade" of a certain percentage of these lesions to carcinoma after excision. Those widely considered to be "high risk" include atypical ductal hyperplasia (ADH), atypical lobular hyperplasia (ALH), and lobular carcinoma in situ (LCIS).

**Objective:** To determine the frequency, upgrade rates, and imaging features of high-risk lesions initially detected on breast MRI.

**Design:** Retrospective review of a pathologic database using a 53-month time frame.

**Methods:** Lesions diagnosed as ADH, ALH, LCIS, or radial scar on core biopsy were included. Those lesions that contained multiple high-risk pathologies as well as ADH were simply classified as ADH. Only those lesions that had originally been detected on breast MRI were included in the study. Patient age, clinical indication for breast MRI, BI-RADS lesion features, and type of imaging guidance for biopsy were reviewed. Final pathologic diagnosis at surgical excision was documented. The original mammographic interpretation was used to determine lesion features.

**Results:** 61 lesions that had originally been detected on MRI were diagnosed as high-risk lesions on core biopsy. This comprised 12.7% of the total lesions that underwent tissue sampling. Of those lesions, 39 comprised the study set since these were the lesions that had pathology available after surgical excision and also could be directly correlated with the MRI abnormality. The most common indication for MRI was to evaluate the extent of newly diagnosed breast cancer. Of all the high-risk lesions, upgrade to malignancy occurred in almost 31% with no dependence on biopsy technique. There was no malignant upgrade of LCIS or radial scar. No specific MRI characteristics correlated with those high-risk lesions that were upgraded to carcinoma on surgical excision.

**Conclusions:** There are no specific imaging features that predict upgrade for high-risk lesions when detected with MRI. Therefore, surgical excision is recommended because upgrade to invasive carcinoma or ductal carcinoma in situ can occur in up to 31% of cases, regardless of biopsy technique.

**Reviewer's Comments:** Unfortunately, MRI has not proven to be useful in avoiding surgical excision when faced with pathology compatible with a high-risk lesion. Moreover, the diagnosis of LCIS in particular remains frustrating since screening MRI has not been endorsed as an effective method in following these patients in the interest of early detection of breast cancer. (Reviewer-Basil Hubbi, MD).
Ultrasound survey of the axillary lymph nodes in conjunction with ultrasound-guided fine-needle aspiration or core biopsy can accurately stage lymph node status prior to definitive treatment.

**Background:** Across many practices, ultrasound surveys of the axillary lymph nodes in patients who are at a high suspicion of primary breast cancer are conducted. The purpose is to evaluate the lymph node status for suspicion of metastatic disease and possibly avoid a sentinel lymph node excisional biopsy prior to axillary lymph node dissection. Those lymph nodes suspected to be metastatic based on morphologic criteria are then targeted for ultrasound-guided fine-needle aspiration (FNA) or core biopsy for pathologic confirmation prior to proceeding to breast surgery.

**Objective:** To evaluate the diagnostic accuracy of ultrasound examination of axillary lymph nodes in women suspected to have a primary breast malignancy.

**Methods:** Over a 39-month period, all women who were worked up for suspected breast cancer also underwent survey of the axillary lymph nodes. If ≥1 lymph nodes were characterized as suspicious, these were targeted for FNA or core biopsy under ultrasound guidance prior to definitive breast surgery. Suspicious lymph node features included cortical thickening >2 mm, replacement of the fatty hilum, and increased peripheral blood flow. Pathology noted on FNA and core biopsy was compared with the pathology at surgical excision, which was held as the standard.

**Results/Conclusions:** 653 women underwent axillary lymph node ultrasound evaluation. Using the morphologic criteria as stated in the methods, the sensitivity and specificity of axillary ultrasound assessment with FNA or core biopsy of suspicious lymph nodes was 59% and 100%, respectively. The positive-predictive value was 100% and the negative-predictive value was 79%. The overall accuracy of this modality was 84%.

**Reviewer’s Comments:** This study serves as the largest audit of ultrasound examination of the axilla in women suspected of having breast cancer to date. Whether or not the lymph node was clinically evident was irrelevant, as the women were subjected to ultrasound survey nonetheless. The study is powerful and corroborates much of current practice. It is a simple formula: a lymph node with a cortex of >2 mm or loss of the expected fatty hilum in a woman with a suspected primary breast malignancy deserves FNA or core of the primary lesion in question as well as the axillary lymph node. These women can then be better served by the surgical oncology service to avoid the possibly redundant sentinel lymph node biopsy and proceed to axillary lymph node dissection. Alternatively, PET/CT may be pursued for staging with neoadjuvant chemotherapy tailored as needed. (Reviewer-Basil Hubbi, MD).

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Keywords: Cancer, Axillary Lymph Nodes, Fine-Needle Aspiration, Ultrasound, Core Biopsy
Who interprets the follow-up images after screening mammograms show abnormal findings does not appear to be an important factor influencing the wide variability in positive predictive value among radiologists.

**Background:** Various research has been performed to evaluate the recall rates, false-positive rates, false-negative rates, and positive and negative predictive values of mammographic interpretation. Published results demonstrate a wide variability among radiologists with no clear understanding as to why this may be so.

**Objective:** To evaluate whether there is a difference in positive predictive value of abnormalities found on screening mammography when the same or a different radiologist completes the additional imaging workup upon recall.

**Methods:** A mammography registry was mined to identify all screening mammograms performed in women aged ≥40 years over a 10-year period. Those cases that were interpreted as having at least one abnormality were included. Those women who had followed up within 3 months of the screening mammogram that was assessed to be abnormal were followed. Screening mammograms were considered positive if a BI-RADS assessment of 0, 3, 4, or 5 was given. Since the registry is part of the National Breast Cancer Surveillance Consortium, data on which radiologist interpreted the study were available. Furthermore, the mammographic data are linked with a pathologic database and a state cancer registry allowing for correlation. Final assessment was based on the original screening mammogram, the follow-up diagnostic mammogram, and the ultrasound assessment, if performed. If on diagnostic workup the abnormality was recommended for biopsy, the final assessment was judged to be positive. Patient data collected included patient age, breast density, time interval between mammograms, family history of breast cancer, history of breast biopsy, and whether the patient was on hormone therapy. Data analysis was performed and comparison was made between those studies where the same radiologist interpreted the screening and diagnostic examinations and those studies where a different radiologist performed the additional imaging.

**Results:** 6291 cases were included in the study. In total, 36.5% were diagnostic studies that were interpreted by the same radiologist who read the screening, and the remaining 63.5% were interpreted by a different radiologist. There were no statistically significant differences in patient factors between the 2 groups. The positive predictive value after recommendation for biopsy was also not statistically significant, with values of roughly 27% to 28% determined for both.

**Conclusions:** Who interprets the follow-up images after screening mammograms show abnormal findings does not appear to be an important factor influencing the wide variability in positive predictive value among radiologists.

**Reviewer's Comments:** The study is reassuring in demonstrating a consistency among practice. One could surmise that if the same radiologist who read the screening mammogram also read the additional imaging workup, there may be a slight bias toward recommending more biopsies. This does not bear out in the data. (Reviewer-Basil Hubbi, MD).

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Keywords: Mammography, Screening Mammogram, Interobserver Variability

Print Tag: Refer to original journal article
What Is the Best Cutoff for Renal Uptake Changes?

A 7% Decrease in the Differential Renal Uptake of MAG3 Implies a Loss in Renal Function.

Taylor A, Manatunga A, et al:

Urology 2010; August 12 (): epub ahead of print

When relative renal uptake changes by ≥7%, the change can be assumed to be statistically valid.

Background: MAG3 is the most commonly used radiopharmaceutical for renography.

Objective: To estimate what decrease in relative renal uptake is needed to imply a definite loss of renal function, and not just a random variation.

Design: Prospective study.

Participants: 24 adult males seen at the Veterans Affairs Medical Center with stable renal function were evaluated. Patients had a mean age of 66.5 ± 7.9 years and mean serum creatinine was 1.38 ± 0.57 mg/dL. Eleven patients had creatinine ≥1.3 mg/dL. Four patients could not be completely studied.

Methods: 2 studies were performed on each patient with 2 to 29 days separation (11 ± 8 days) using relatively standard equipment and techniques. Whole kidney, cortical, and background regions of interest were drawn using semi-automated techniques. Relative MAG3 uptake, time to peak counts, and the 20 minimum to maximum count ratios were calculated for the whole kidney and cortical regions. Measurement error was defined as the first measurement subtracted from the second measurement. Other measures of the error distribution and of trending were derived.

Results: Standard deviations of relative function values were relatively large due to the heterogeneous study population. There was no bias in change in sequential measurements with respect to the initial value. There was a high correlation between the baseline and repeat measurements. The 95% confidence limits, representing 1.96 standard deviation of the mean of the error function, were 5.64% for the right kidney and 6.01% for the left. Change in differential function of ≥7% therefore has a high degree of probability of representing a real decrease in differential function.

Conclusions: Ability to characterize significant changes in renal function is important, in that deterioration in function may prompt intervention. Results are quite similar to those found in a study of normal subjects, where a 9% difference was required to exceed 95% confidence. The 9% cutoff value could serve as a more conservative cutoff.

Reviewer’s Comments: For every diagnostic procedure, it is critical to understand precision of the test. Sources of variation that may affect these measurements include both biological and technical factors. A third major source, which the authors seem to have assiduously avoided discussing, is effect of inter-operator variability, ie, processing by different operators. We have not been informed whether all patients or repeat studies were processed by the same individual. This is clearly a very practical issue that needs to be understood before these cutoff values are applied in the clinic. Assuming the studies were all processed by one operator, this would represent a best-case scenario that cannot be generalized to studies processed by several operators. Furthermore, can we even assume that the precision of a test performed by one operator will be the same precision of the test performed by a different operator? (Reviewer-Lionel S. Zuckier, MD).

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Keywords: MAG3, Renal Scintigraphy, Renal Function

Print Tag: Refer to original journal article
A higher dose of radiation therapy (79 Gy) provides better local control for prostate cancer than does a lower dose (70 Gy), without increasing toxicity.

**Objective:** To test the hypothesis that an increased dose of irradiation (79.2 Gy vs 70.2 Gy) is both tolerable and effective for prostate cancer.

**Design:** Prospective randomized trial (the Proton Radiation Oncology Group [PROG]/American College of Radiology [ACR] 95-09) that used protons to conformally increase the radiation dose to the prostate.

**Participants:** 393 eligible patients treated at either Loma Linda University Medical Center or Massachusetts General Hospital from 1996 to 1999 had T1b-T2b (1992 AJCC Staging) tumors, prostate-specific antigen (PSA) levels of ≤15 ng/mL, and no evidence of metastases by bone scan and abdominopelvic CT, which was done only if the PSA was >10 or Gleason score ≥7 or T2b. Any Gleason score was allowed.

**Methods:** For follow-up, a biopsy was recommended for any patient whose PSA did not decrease below 1 ng/mL by 2 years. Patients were stratified by PSA (cutoff being 4) and N0 versus NX. Low-risk patients had PSAs of <10 and Gleason scores of ≤6. Medium risk comprised a PSA of 10 to 15 or Gleason score of 7 or T2b. High-risk patients had a Gleason score of 8 to 10.

**Interventions:** Radiation was given in 2 phases, and no androgen suppression was used. Phase I was to the prostate alone, and protons were used but corrected to a photon equivalent using a ratio of 1.1. Either 19.8 GyE or 28.8 GyE was given, depending on randomization. The upfront "boost" was delivered in 11 or 16 fractions of 1.8 GyE to the prostate only, with a margin of 5.0 mm. Phase II was the same for all patients and was 50.4 Gy delivered with photons using 1.8-Gy fractions to the prostate and seminal vesicles.

**Results:** Median follow-up was 8.9 years; there were 58% in the low-risk group, 37% in the intermediate-risk group, and 4% in the high-risk group. Looking at local failure, patients randomized to a higher dose had a hazard ratio of only 0.57 ($P < 0.0001$). This improvement in local control was present in the low- and intermediate-risk subgroups. The 10-year ASTRO (American Society for Therapeutic Radiology and Oncology Consensus) biochemical failure rates (ie, 3 consecutive increases in PSA or initiation of salvage therapy) were 32.3% versus 16.7% for conventional and increased doses, respectively. This held for the low-risk subgroup, and there was a strong trend for the intermediate-risk subgroup. Using Phoenix criteria (PSA nadir +2), the same conclusions were found. There was no significant improvement in survival (78.4% vs 83.4%). Therapy was well tolerated, with 3% of conventional treatment patients and 2% of high-dose patients having grade 3 genitourinary toxicity; 1% has experienced late grade 3 gastrointestinal toxicity.

**Conclusions:** There are significant and durable advantages for using high-dose radiation, with no increase in toxicity.

**Reviewer's Comments:** I believe we have known for some time that 70 Gy is not enough. This is not a trial proving the benefit of protons! No hormones were used. Too early for survival data. (Reviewer-Jonathan J. Beitler, MD, MBA).

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Keywords: Adenocarcinoma, Radiation Therapy, Dose Escalation

Print Tag: Refer to original journal article
Background: The FDA mandates MRI screening of patients with silicone implants every 2 years beginning 3 years after initial breast augmentation with silicone implants. MRI has been shown to be the most accurate monitoring technology available in asymptomatic patients for screening.

Objective: To look at the effectiveness of MRI scans to diagnose silicone implant issues in patients with all grades of capsular contracture.

Design: Retrospective review.

Participants/Methods: 171 patients were studied over an 8-year period. All patients had physical exams (PE) performed documenting Baker grading of the capsular contracture. In total, 73% also had mammograms performed. MRI with a dedicated breast coil was obtained in 85 patients. The group of patients who had PE plus mammograms was compared to the group that had MRIs. Subsequent operative exploration was used to determine the accuracy of preoperative assessments. Duration of implantation was similar between groups, with a mean of 20 years. Gel bleed was not considered an implant rupture.

Results: 65% of PE plus mammogram patients (group I) had Baker III and IV capsular contracture as opposed to 55% of the MRI group (group II). Nearly 80% of group I patients also had symptoms as opposed to 60% of group II. The preoperative accuracy between groups in detecting rupture was calculated to be 78% versus 76%. Diagnostic test parameters of sensitivity, specificity, positive-predictive value, negative-predictive value, and false-positive and false-negative rates were calculated. Higher sensitivity for rupture was demonstrated for patients who underwent MRI scans but lower specificity and high false-positive rates.

Conclusions: Beyond PE and mammograms, MRI scans are of limited value in helping determine treatment options for symptomatic patients with capsular contractures.

Reviewer's Comments: True rates of capsular contracture and implant rupture are notoriously difficult to accurately assess. Biased reporting, loss of patients to follow-up, and implant revisions for other reasons can make data difficult to compare from one study to the next. That's why use of an objective study like an MRI was thought to help truly assess implant rupture rates moving forward. But these authors show that, in patients with capsular contractures, MRI scans really add nothing in their ability to detect rupture rates over the less costly methods of PE with mammography. With time, more patients will develop contractures and symptoms. Since implants have limited longevity, why bother with an MRI if a patient has implants that are more than a few years old, has symptoms, and has capsular contracture. The patient should probably just proceed to have a capsular procedure and an implant exchange. (Reviewer-Robert T. Grant, MD).