Does Dynamic Sequence Add Value to Static MRI in Suspected Urethral Abnormality?

MRI of the Urethra in Women With Lower Urinary Tract Symptoms: Spectrum of Findings at Static and Dynamic Imaging.

Bennett GL, Hecht EM, et al:
AJR Am J Roentgenol 2009; 193 (December): 1708-1715

Dynamic MRI provides both structural and functional information in the evaluation of women with lower urinary tract symptoms.

Objective: To determine if a dynamic sequence is of added utility in the standard static MRI evaluation of women with lower urinary tract symptoms.

Design: Retrospective analysis.

Methods: This study was comprised of 84 women with lower urinary tract symptoms who were referred for MRI evaluation of the urethra. All patients underwent both static and dynamic imaging. None of the study group patients had a history of lower urinary tract malignancy. Study indications included recurrent urinary tract infection, pain, frequency, incontinence, and suspected urethral diverticulum or other periurethral mass. MRI examinations were performed on 1.5-T systems. A routine imaging protocol was used that included sagittal, axial, and coronal T2-weighted turbo spin-echo images through the urethra, as well as contrast-enhanced 3D fat-suppressed volumetric images. A dynamic "during straining" true fast imaging with steady-state free precession sequence was performed in the sagittal plane before the contrast-enhanced images to evaluate for pelvic organ prolapse. Images were reviewed by 2 radiologists. The static images were initially reviewed, followed by evaluation of the dynamic sequence. Images were evaluated for the presence of urethral abnormalities as well as pelvic organ prolapse including cystocele, urethrocele, and urethral hypermobility.

Results: There were 10 patients with a urethral abnormality, which included urethral diverticulum, Skene's gland cyst or abscess, and periurethral or suburethral cyst. Pelvic organ prolapse was found in 33 patients; in 29 of these patients, it was evident only on the dynamic "during straining" sequence. In addition, the dynamic "during straining" sequence showed an increase in severity of the prolapse detected on the static images in the other 4 patients. Cystoceles were statistically more likely to be present in patients with stress incontinence and urinary frequency than in those without. Urethroceles were common in patients with incontinence, and urethral hypermobility was common in patients with incontinence and voiding difficulty. MRI detected 13 cystoceles and 17 cases of urethral hypermobility that were not apparent at physical exam. Women with ≥2 pregnancies or a mean age of 47 were more likely to have cystoceles, urethroceles, and urethral hypermobility than those with fewer pregnancies or of a younger age.

Reviewer's Comments: The results of this study are useful in demonstrating that the addition of the dynamic "during straining" MRI sequence detected more cases of pelvic organ prolapse than routine static images. Therefore, it would be prudent to include such a dynamic sequence when evaluating women with lower urinary tract symptoms. One of the limitations reported in this study was that, due to its retrospective nature, the clinical impact of the dynamic MRI findings was difficult to determine. (Reviewer-John C. Sabatino, MD).

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Keywords: Urethra, MRI, Pelvic Organ Prolapse

Print Tag: Refer to original journal article
Can ADC Determine Severity of Liver Fibrosis in Cirrhosis?

Value of Diffusion-Weighted MRI for Assessing Liver Fibrosis and Cirrhosis.

Sandrasegaran K, Akisik FM, et al:

AJR Am J Roentgenol 2009; 193 (December): 1556-1560

While ADC values are significantly lower in cirrhotic livers, they are currently not reliable enough to replace liver biopsy in the staging of hepatic fibrosis.

**Objective:** To determine if diffusion-weighted MRI and apparent diffusion coefficient (ADC) values can determine the severity of liver fibrosis in cirrhotic patients.

**Design:** Retrospective analysis.

**Methods:** This study was comprised of 78 patients (55 men, 23 women) with known liver disease who underwent diffusion-weighted MRI and had a pathologically confirmed stage of liver fibrosis within 6 months of the MRI examination. Exclusion criteria included portal vein thrombosis and image artifacts precluding calculation of the ADC values. All patients had liver disease, and the causes included hepatitis B, hepatitis C, alcohol, autoimmune hepatitis, and steatohepatitis. MRI examinations were performed using 1.5-T system. Routine imaging sequences were used, including diffusion-weighted as well contrast-enhanced images. Single-shot echoplanar imaging was performed with b values of 50 and 400 s/mm², which were used to calculate ADC values. A region of interest was placed in each lobe avoiding vessels, potential masses, and the peripheral 2 cm of the liver. Liver fibrosis was staged according to results at explantation or core biopsy. The result from the biopsy performed closest in time to the MRI examination was used. Fibrosis was scored based on the METAVIR classification as follows: F0, no fibrosis; F1, portal fibrosis without septa; F2, few septa; F3, bridging fibrosis without cirrhosis; and F4, cirrhosis with architectural distortion.

**Results:** The difference between ADC values was most significant between noncirrhotic liver stage F0 and cirrhotic liver stage F4. The mean ADC value was 125.9 x 10⁻⁵ s/mm² for stage F0 and 99.1 x 10⁻⁵ s/mm² for stage F4. There was a substantial overlap of ADC values in each fibrosis group except between stage F0 and F3 or F4. There was also no significant difference in ADC values between patients with viral hepatitis and those without, or between those with alcohol-induced cirrhosis and those with nonalcoholic steatohepatitis.

**Reviewer’s Comments:** The results of this study demonstrate that while there was a significant difference in ADC values between cirrhotic and noncirrhotic livers, there was considerable overlap that would not allow reliable differentiation between stages F1 and F4 by ADC values alone. One of the limitations reported in this study was that the institution of medical therapy for fibrosis or disease progression may have led to discordance between the degree of fibrosis at biopsy and that at the time of imaging. (Reviewer-John C. Sabatino, MD).

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**Keywords:** Liver, MRI, Fibrosis, Cirrhosis

**Print Tag:** Refer to original journal article
HCC enhancement patterns differ for lesions measuring <3 cm and are dependent on the size and cellular differentiation of the lesion.

**Objective:** To determine if there are different enhancement characteristics of hepatocellular carcinoma (HCC) measuring <3 cm.

**Design:** Retrospective analysis.

**Methods:** This study involved 155 patients (126 men, 29 women) with a pathologic diagnosis of cirrhosis and HCC. The causes of the underlying liver disease included hepatitis B, hepatitis C, combined hepatitis B and C, and alcoholism. Exclusion criteria included HCC >3 cm, no preoperative multiphasic MDCT scans, mean interval between pathologic diagnosis and CT >6 weeks, and a history of previous transcatheter arterial chemoembolization, percutaneous ethanol injection, or radiofrequency ablation. Pathologically, the HCCs were categorized into 3 size groups: <1.0 cm, 1.0 to 1.9 cm, and 2.0 to 2.9 cm. Lesion cellular differentiation was categorized as good, moderate, or poor. CT examinations were performed on 4-, 8-, 16-, or 64-MDCT scanners. All patients had an unenhanced study followed by either a biphasic examination consisting of arterial and portal venous phase images, or a triphasic examination that included an equilibrium phase. The images were reviewed by 2 radiologists. Lesion attenuation was compared to the liver on each phase, and each lesion was evaluated for the presence of washout on the portal venous and equilibrium phases. Subsequently, each lesion was categorized into an enhancement pattern based on the combination of attenuation in each phase. The proportions of each enhancement pattern were analyzed according to lesion size and cellular differentiation.

**Results:** There were a total of 204 pathologically proven HCCs <3 cm in diameter in the study group. Fifty percent of the lesions measured 2.0 to 2.9 cm in diameter; 67% of the HCCs were moderately differentiated. There was a significant difference in the predominant enhancement patterns of HCC depending on the lesion size and cellular differentiation. The predominant enhancement pattern of HCCs measuring 2.0 to 2.9 cm was arterial hyperattenuation and venous washout; those measuring 1.0 to 1.9 cm had arterial hyperattenuation and venous isoattenuation; and arterial and venous isoattenuation was seen in lesions <1.0 cm in size. The predominant enhancement pattern for well-differentiated HCC was arterial hyperattenuation and venous isoattenuation, while for moderate or poorly differentiated HCC, it was arterial hyperattenuation and venous hypoattenuation.

**Reviewer's Comments:** The results of this study are useful in that the typical arterial hyperattenuation and venous washout is not the predominant enhancement pattern encountered with HCCs measuring ≤2 cm. Therefore, one should use extreme caution in discounting a small lesion as HCC if it does not follow this classic pattern of enhancement. One of the limitations reported in this study was that the equilibrium phase was not obtained in all patients; consequently, the number of lesions with washout could potentially have been underestimated. (Reviewer-John C. Sabatino, MD).

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Keywords: Liver, Hepatocellular Carcinoma, Enhancement Pattern, MDCT

Print Tag: Refer to original journal article
Evaluating noncalcified pulmonary nodule volume and volume-doubling time on baseline CT will result in less need for follow-up CT.

**Background:** This study was part of a Dutch-Belgian randomized lung cancer screening trial (Nederlands-Leuven Longkanker Screenings Onderzoek [NELSON]).

**Objective:** To evaluate noncalcified lung nodules by volume and volume-doubling time.

**Methods:** Eligible patients from the NELSON trial were randomly assigned to have either CT screening at baseline, 1 year follow-up, and 3-year follow-up or no additional screening. Patients were scanned with a 16-detector CT scanner, and images were displayed with 1-mm thickness and 0.7-mm overlap. Software was used for semi-automated volume measurements. If the automated measurements were wrong, radiologists manually measured the nodules. Every nodule had the percentage change in volume and the volume-doubling time calculated. If a nodule was partially solid, only the solid portion was measured. The diameter of the nodule was the average of the length and width. Growth of a nodule was considered a 25% increase in volume. If the nodule volume was <50 mm$^3$ (corresponding to 4.6 mm in diameter), the baseline CT was considered negative. If the nodule volume was between 50 and 500 mm$^3$ (corresponding to 4.6 to 9.8 mm in diameter) on baseline but had not grown by the time of 3-month follow-up CT, it was considered negative. If the nodule had grown on baseline but its volume-doubling time was ≥400 days, it was also considered negative.

**Results:** On baseline CT screening, 2.6% of patients had a positive test. At 1-year follow-up, 1.8% of patients had a positive test. The baseline screening CT had a sensitivity of 94.6%, a specificity of 98.3%, a positive predictive value of 35.7%, and a negative predictive value of 99.9% for lung cancer. Of the 7361 CT scans that were negative on baseline CT screening, 20 lung cancers were found with 2 years of follow-up.

**Conclusions:** In patients with a high risk of lung cancer, the volume and volume-doubling time method used to analyze pulmonary noncalcified nodules seen at baseline screening CT will miss relatively few lung cancers.

**Reviewer's Comments:** The authors note that this study examines a method of evaluating noncalcified lung nodules. This study does not evaluate the usefulness of CT screening itself for lung cancer. (Reviewer-Vineet R. Jain, MD).

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Keywords: Lung Nodules, CT

Print Tag: Refer to original journal article
Crush Injuries in Earthquake Victims--What to Look For

Crush Thoracic Trauma in the Massive Sichuan Earthquake: Evaluation With Multidetector CT of 215 Cases.

Radiology 2010; 254 (January): 285-291

During the massive Sichuan earthquake of 2008, crush injuries to the thorax were common and were manifested on CT as multiple rib fractures, fractures of the scapula and clavicles, thoracic vertebrae fractures, pulmonary contusions, and hemopneumothorax.

**Objective:** To evaluate CT findings of crush thoracic trauma in victims of the Sichuan earthquake in China in 2008.

**Design:** Retrospective study.

**Participants:** 215 patients who were victims of the earthquake were included in the study. Patients who had falls from great heights were excluded. Patients with symptoms of severe trauma to the chest (such as chest pain, dyspnea, hemoptysis, and paradoxical respiratory motion) and chest radiographic findings that did not explain all of the symptoms underwent chest CT.

**Methods:** All patients had CTs performed with a range of 1 hour to 25 days after the incident (average, 7 days). The majority of CT scans were performed without IV contrast. All CTs were interpreted on a PACs workstation. Sagittal and coronal reformatted images were also available for review. The location of rib fractures was described. Fractures of the clavicles and scapula were also evaluated, and fractures of the thoracic spine were characterized. Pulmonary contusions and lacerations were evaluated, as were pleural abnormalities such as pneumothorax and hemothorax. All cases of non-thoracic trauma were also noted.

**Results:** Bone fractures were seen in 150 of 215 patients (69.8%). Pulmonary parenchymal injuries were seen in 117 patients (54.4%), and pleural injuries were seen in 146 (67.9%); 143 (66.5%) had at least 1 rib fracture, with a mean number of fractures per patient of 11. Slightly >50% of these patients had unilateral rib fractures. The most common ribs fractured were from the third ribs to the seventh ribs, and the majority of rib fractures were posterior and lateral in location. Seventy patients had first and second rib fractures, and 45 had flail chests. Vertebral body fractures of T3 through L2 were seen in 46 patients (21.4%); 47 patients had fractures of the transverse and/or spinous processes of the vertebrae. Fractures of the sternum were seen in 12 patients (5.6%). Fractures of the scapula and/or clavicles occurred in 48 subjects (22.3%). One hundred and seventeen patients (54.4%) had pulmonary parenchymal trauma, with 96.6% of these having pulmonary contusion and 6% having pulmonary laceration; 85.5% of these patients had coexisting rib fractures. One hundred and forty-six patients (67.9%) had pleural injury, with 63.0% of these having hemothorax, 5.5% having pneumothorax, and 31.5% having hemopneumothorax. Twelve patients had pneumomediastinum, and all of these patients had pleural injury. According to clinical records, 76 patients also had non-thoracic trauma; 14 of 215 patients (6.5%) died.

**Conclusions:** Crush thoracic trauma as evaluated by CT demonstrated a large number of rib fractures, most of which were multiple fractures of the scapula and clavicles. A large number were thoracic vertebral injuries. Pulmonary contusion was common, as was hemopneumothorax.

**Reviewer's Comments:** The authors have nicely summarized the thoracic injuries to look for on CT in earthquake victims with massive crush injuries to the thorax due to building collapse. (Reviewer-Vineet R. Jain, MD).

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Keywords: Crush Injury, Thoracic, CT

Print Tag: Refer to original journal article
Delayed CE Decreases First Week After AMI

Acute Myocardial Infarction: Serial Cardiac MR Imaging Shows a Decrease in Delayed Enhancement of the Myocardium During the 1st Week After Reperfusion.

Ibrahim T, Hackl T, et al:

Radiology 2010; 254 (January): 88-97

After an acute MI that has been reperfused, the extent of delayed contrast enhancement with gadolinium seen on cardiac MRI significantly decreases during the first week after the event.

Background: Delayed contrast-enhanced (CE) cardiac MRI has been shown to demonstrate acute and chronic myocardial infarctions (MIs). The region of infarction demonstrates a delayed washout of contrast compared with normal myocardium. In chronic MI, delayed CE with gadolinium is closely related to scar tissue. In acute and subacute MI, it is less well defined.

Objective: To evaluate delayed gadolinium enhancement by serial cardiac MRI during the acute, subacute, and chronic stages of MI.

Participants: Patients had an acute myocardial infarction (AMI) and had undergone coronary reperfusion via a stent placed within 12 hours after symptoms began. AMI was diagnosed by the presence of chest pain lasting ≥20 minutes associated with ECG changes; 17 patients were studied.

Methods: Cardiac MRI was performed at 1, 7, 35, and 180 days after AMI. SPECT imaging at rest was also performed in all patients 7 days after AMI. Cardiac MRI was performed using a 1.5-T magnet. CE cardiac MRI was performed 20 minutes after injection of 0.2 mmol/kg of gadopentetate dimeglumine with a 3D segmented inversion-recovery turbo fast low-angle shot T1-weighted sequence. Short- and long-axis images were evaluated for the size of delayed enhancement as well as percentage of left ventricular (LV) myocardial volume. The transmural extent of CE was also evaluated. Endocardial and epicardial contours were manually drawn. The endocardium was considered the inner 50% and the epicardium was considered the outer 50% of the myocardial wall.

Results: The size of infarct was 18.3% of total myocardial LV volume on the first day after AMI. The size was 12.9% after 7 days, 11.3% after 35 days, and 11.6% after 180 days. The size of the infarct decreased by 57.1% in the epicardium and 6.3% within the endocardium from day 1 to day 7. There was a high correlation (r =0.84) of infarct size between cardiac MRI and SPECT on day 7.

Conclusions: The extent of delayed CE on cardiac MRI significantly decreases during the first week after reperfusion.

Reviewer's Comments: The authors have very nicely demonstrated that the timing of cardiac MRI after infarction and successful reperfusion will affect the apparent size of the infarction as seen on delayed CE sequences. This is particularly true in the first week after the event when there is a relatively large decrease in the area of delayed CE. (Reviewer-Vineet R. Jain, MD).

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Keywords: Acute Myocardial Infarction, MRI

Print Tag: Refer to original journal article
Percutaneous biopsy in the elderly is just as safe and is only slightly less accurate than biopsies in younger patients, but it leads to less initiation of cancer therapy.

**Background:** Percutaneous image-guided biopsy is a safe, efficacious procedure. In patients aged ≥80 years, there are many comorbidities that may make image-guided biopsy less safe. These same morbidities may also make the treatment of whatever pathology is found difficult to treat.

**Objective:** To evaluate (1) the safety and accuracy of percutaneous biopsy performed in patients aged ≥80 years, and (2) how much the results of these biopsies are used to initiate therapy.

**Methods:** In the authors’ institution, a retrospective review of all CT- and/or US-guided biopsies done over a 5-year period was performed. Of the almost 14,000 patients biopsied with image guidance, 722 were aged ≥80 years. The rates of complications were compared with the same rates in those aged ≤79 years (13,022 patients).

**Results:** There were no statistically significant differences in complication rates between the ≥80 years group (1.5%) compared to the ≤79 years group (1.4%). The accuracy rate was slightly higher for the younger group (96.5%) than for the elderly group (95%). The most common biopsy locations in the elderly were liver (23%), lung (17%), and soft tissue/musculoskeletal (16%). In the elderly group, 75.8% of the biopsies yielded malignant diagnoses. In this group of 467 patients with malignant diagnoses, only 58% initiated therapy for their disease. Compared to younger patients, 100% of the 60- to 70-year-old group initiated therapy. In the 70- to 80-year-old group, 95% initiated therapy. Image guidance techniques also differed between groups. In elderly patients, 57% of the procedures were performed with CT and the rest with US. In the younger patients, 30% of procedures were performed with CT and the rest with US.

**Reviewer's Comments:** Image-guided biopsy in the elderly has a high accuracy rate and is as safe as biopsy performed in those aged ≤79 years. The authors believe that the slightly lower accuracy seen in elderly patients may be related to the fact that they had a greater percentage of lung and lymph node biopsies, which tend to be less accurate. Cancer mortality is decreasing in the younger population but increasing in the older age groups. Cancer therapy has less predictable effects in the elderly. Elderly patients with excellent performance status and a high quality of life have similar results to their younger counterparts to many types of cancer therapies. The significantly lower percentage of patients who started therapy because of malignant diagnoses was usually secondary to poor medical condition because of other comorbid diseases. Another reason was the patient's desire to choose a better quality of life that may be limited rather than aggressive, potentially damaging therapy. (Reviewer-Sharon Gonzales, MD).

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**Keywords:** Percutaneous Biopsy, CT-Guided Biopsy, Complications, US-Guided Biopsy, Elderly

**Print Tag:** Refer to original journal article
Compromised performance score, increased bilirubin, and high tumor burden are worse prognostic factors for survival after treatment with Y-90 for liver malignancies.

**Background/Objective:** Metastatic disease to the liver usually predicts a worse outcome. Oncologists treating patients who are unresponsive to traditional therapy have been trying to identify the factors associated with good outcomes when treating patients with yttrium-90 (Y-90). These researchers examine their experience to determine the prognostic factors that showed the greatest effect on outcome after being treated by Y-90 microspheres.

**Participants/Methods:** 130 patients treated with Y-90 after failing standard therapy for metastatic liver disease were available for follow-up. Performance status (PS) was determined for each patient. Tumor response was determined by imaging 1 month after treatment and every 3 months after that as well as measuring up to 4 lesions as they changed. Bilirubin and lymphocyte values were also recorded. Age, tumor type, higher dose, and extrahepatic disease were also evaluated.

**Results:** 130 patients were available for regression analysis. Only 52% of the patients were alive at study completion. Patients with a PS >0 were much more likely to have died, with a hazard ratio (HR) of 10 on univariate and 7.98 on multivariate analysis. Patients with 51% to 75% tumor burden all had died by the time of study completion, causing a 4.5 HR on univariate and 2.46 HR on multivariate analysis when compared with those who had tumor burden <25%. Patients with a bilirubin >1.3 had an HR of 2.9. The HR for those who showed a response to treatment based on World Health Organization criteria was 0.3 in univariate analyses and 0.48 in multivariate analyses compared to those who showed no response. In studies of primary tumor sources, patients with breast metastases to the liver had an HR of 2.52 when compared with those from other sources. The HR for those with lymphocyte depression was 0.62 versus those who did not have lymphocyte depression. In colorectal patients, the median survival time for the patients who responded to treatment was 21.9 months versus 8.5 months for nonresponders.

**Reviewer's Comments:** This study was aimed at finding out which factors showed better survival after Y-90 treatment. Of the factors analyzed here, a performance score >0, hepatic tumor burden >50%, bilirubin >1.3, and metastatic disease from breast cancer were worse prognostic factors in multivariate analysis. Patients who had positive tumor response and patients who had lymphocyte depression had a favorable prognosis. There was longer survival of patients with colon metastases who responded versus those who did not. Neuroendocrine tumors had a favorable prognosis when compared to the others in univariate analysis. Compromised performance (PS >0) was the most powerful negative prognostic factor in this analysis, and tumor response was the most favorable prognostic factor. (Reviewer-Sharon Gonzales, MD).

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Keywords: Metastatic Disease, Y-90 Radioembolization, Liver Metastases, Prognosis

Print Tag: Refer to original journal article
EVAR Has Been Most Significant Technical Innovation in AAA Repair

Endovascular Aortic Aneurysm Repair With the Endurant Stent-Graft: Early and 1-Year Results From a European Multicenter Experience.
Torsello G, Troisi N, et al:

J Vasc Interv Radiol 2010; 21 (January): 73-80

The Endurant stent graft allows the treatment of AAA with complicated anatomy.

**Background/Objective:** Endovascular aneurysm repair (EVAR) has been shown to be beneficial in patients at high risk for open repair. However, many high-risk patients are not ideal candidates for EVAR because they have unsuitable anatomy. Complicated aortic anatomy increases the complications post-EVAR, including stent migration and endoleaks. The Endurant stent graft was developed to treat these difficult cases and the researchers now report the interval findings.

**Methods:** 45 patients (age range, 51 to 86 years) from 3 European centers were included in this study. All had undergone abdominal aortic aneurysm repair and had any or all of the following criteria: (a) short neck less ≤10 mm; (b) a "neck bulge;" (c) a tapered neck; (d) angulated neck of at least 60°; and (e) neck thrombus covering >50% of the neck circumference. The system ranges from 16 to 20 French.

**Results:** Technical success was achieved in all cases. In 16% of the cases, a type 2 endoleak was noted. No major complications or deaths were noted in the intraoperative period. Upon discharge, CT showed a type 1 endoleak and 2 persistent type 2 endoleaks; there was 1 left limb graft thrombosis. The overall 30-day technical and clinical success rates were 98% and 96%, respectively. Early midterm results (6 months) showed no death or complications. The type 1 endoleak was treated by placement of an aortic cuff. At 6 months the 2 type 2 endoleaks were still present, but there was no increase in aortic diameter in these patients. Late midterm results (1 year) again confirmed 2 persistent type 2 endoleaks without expansion of the aneurysm. There were no repeat interventions or development of new endoleaks. The overall freedom from type 1 and 3 endoleaks was 98%, and freedom from repeat intervention was 93%.

**Reviewer’s Comments:** EVAR has been the most significant technical innovation in AAA repair, surpassing improvements in surgery and anesthesia, for decreasing morbidity and mortality. Until now, many of the higher risk patients had anatomy that was unsuitable for endovascular repair, called “hostile neck.” These patients had higher complication rates during the procedure and late in their course. The newest advances in endografts for AAA include those that address the difficult anatomy. The Endurant endograft, with its suprarenal bare-metal controlled-release anchors to ensure proximal fixation and its flexible M-shaped body has been used with good early and mid-term results. The 2.2% rate of type 1 endoleaks and 2.2% graft thrombosis rate is comparable with other stent grafts. In addition, the 20-French delivery device can ensure total percutaneous delivery with no iliac injury in most cases. The Endurant stent graft is efficacious and safe in mid-term results and can be used to treat patients with even a hostile neck anatomy. (Reviewer-Sharon Gonzales, MD).

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Keywords: EVAR, Stent Grafts, Hostile Neck Anatomy, Endurant, Abdominal Aneurysm Repair

Print Tag: Refer to original journal article
MRI findings in rheumatoid and tuberculous arthritis differ with respect to degree of synovial thickening, size and number of bone erosions, enhancement characteristics, and extra-articular cystic masses.

Background/Objective: Prototypically, rheumatoid arthritis (RA) and tuberculous arthritis (TA) have distinct features allowing reasonable differentiation between the 2 entities. However, in many instances, RA and TA can manifest similarly in anatomic distribution, radiographically, and clinically. In fact, the authors have cited literature in which TA was erroneously diagnosed as RA. Therefore, they sought to determine if RA and TA are more easily differentiated by their magnetic resonance imaging (MRI) features.

Design: 36 cases of RA and 27 cases of TA were retrospectively reviewed with respect to MRI findings. For all patients, MRI was performed to evaluate initial-onset monoarticular arthropathy in which referring physicians had no awareness of the underlying etiology. Ultimately, the diagnosis of RA or TA was confirmed by a variety of tests, including but not limited to, synovial biopsy and serologic studies. Sequences included T1-weighted images, T2-weighted images (with and without fat-suppression) and post-contrast T1-weighted images with a minimum of 2 orthogonal planes.

Results: Non-uniform synovial thickening was statistically more significant in RA compared with TA. Furthermore, the particular locations of synovial involvement by RA were significantly thicker compared with TA. Erosive changes and their surrounding rim enhancement were larger and more pronounced in TA relative to RA. In addition, cystic masses in the extra-articular space were more numerous in TA. Bone marrow edema was often present in both arthritides to a relatively similar extent.

Conclusions: Despite the potential for very similar clinical and radiographic manifestations of RA and TA, there are key differentiating MRI features. Asymmetric or "bulky" synovial thickening is more common with RA, while more uniform and thinner synovial proliferation is more common with TA. Rim-enhancing central erosions were common with TA versus a more peripheral location for RA-associated erosive changes. Extra-articular cystic masses in TA often represent "cold abscesses" and are more frequent in TA as a postinfectious complication.

Reviewer's Comments: As the authors explain in their discussion, monoarticular arthropathy is typically of an infectious origin. However, less typical presentations of certain arthritides, as may be the case with RA, can make timely diagnosis of monoarticular arthritis problematic. Aside from more invasive and/or time-consuming methods of determining joint pathology, the authors have demonstrated that MRI may be the critical step necessary in distinguishing RA from TA. Perhaps a larger sample size or a prospective review of the MRI findings in both arthritides may be more conclusive. In the meantime, I advocate the use of MRI in problem cases where the diagnosis remains elusive. As documented in the literature, misdiagnosis not only delays appropriate treatment for patients, but also compromises our role in the management of such patients.

(Reviewer-Rahul Pawar, MD).

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Keywords: Rheumatoid Arthritis, Tuberculous Arthritis, MRI

Print Tag: Refer to original journal article
As Radiologists, Are We Prepared to Handle a National Disaster?

*Department of Homeland Security National Planning Scenarios: A Spectrum of Imaging Findings to Educate the Radiologists.*

Burch H, Kitley CA, Naeem M:

Emerg Radiol 2009; November 20 (): epub ahead of print

All radiologists should have a thorough understanding of their role in the management of national disasters including, but not limited to, recognizing key radiologic findings of disaster injury.

**Objective:** The authors of this paper have illustrated several imaging findings that all diagnostic radiologists should be aware of in the event of a national disaster.

**Design:** The authors highlighted 12 scenarios devised by the Department of Homeland Security that have radiologic implications. The scenarios are as follows: nuclear detonation; biological aerosol attack with anthrax; biological disease outbreak from pandemic influenza; biological attack from pneumonic plague; chemical attack from industrial chemicals; chemical attack from chlorine tank explosion; radiation dispersion attack; and explosive attack using improvised explosive devices (IED).

**Results:** In the case of a nuclear detonation, patients may present with severe burns and various forms of projectile and/or crush injury. Acute lung injury can be fatal, presenting as bilateral pulmonary infiltrates and ultimately progressing to complete “white-out” on chest x-ray. The radiologist may be called upon to effectively manage acute radiation exposure as well. A single anthrax exposure can result in several thousand acute infections. Patients can present with profound respiratory distress, vomiting, and constitutional symptoms. Chest x-ray or CT may demonstrate hemorrhagic mediastinitis, effusions, and lymphadenopathy. A single influenza outbreak may lead to millions of outpatient visits worldwide and several thousand deaths. Imaging findings are broad, but can include bronchopneumonia, consolidations, and effusions. Aerosolized pneumonic plague, extremely potent and highly communicable, can be rapidly fatal. Pulmonary consolidations and lymphadenopathy in the chest and cervical regions may accompany severe gastrointestinal symptoms. A chemical attack can be incited by bombing an industrial plant or chemical repository. While blast injuries may be the presenting features, patients may suffer from a combination of acute respiratory distress syndrome (ARDS) and metabolic insult to the globus pallidi and cerebellar white matter. A chlorine attack can reach as far as 25 miles from the primary site and instantly kill up to 2.5% of affected individuals. Primarily, patients will develop ARDS. Dispersion of radioactive substances is a serious threat given the ease with which terrorists can launch an attack. Short-term effects may be largely "psychosomatic" as the authors describe, however, long-term effects of ionizing radiation are dose-dependent and potentially carcinogenic. Improvised Explosive Devices (IED) can be detonated in crowded spaces (e.g., concert hall or sports complex). Patients would be subject to blast, thermal, and overcrowding injuries.

**Conclusions:** In the event of a national disaster, radiologists are expected to play a large role in emergent management.

**Reviewer's Comments:** Burch and colleagues have compiled an informative collection of clinical and radiologic findings that every radiologist should know in the event of a national disaster. I highly suggest all radiologists, including subspecialists, familiarize themselves with all potential scenarios. Reviewing protocols for acute radiation exposure is also worth special attention. (Reviewer-Rahul Pawar, MD).

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Keywords: Disaster Medicine, Biological Warfare, Blast Injury, Homeland Security

Print Tag: Refer to original journal article
Adhering to the Ottawa Ankle and Foot Rules, patients with isolated ankle injury need not be evaluated with concomitant foot films.

**Objective:** Since plain films of the foot are often obtained gratuitously for ankle trauma, the authors of this study sought to determine if the Ottawa Ankle and Foot Rules were sufficient in excluding them from the work-up of patients who have sustained isolated ankle injury.

**Design:** Retrospective review.

**Participants/Methods:** Over a time period of 18 months, a total of 243 patients met the inclusion criteria for the study. All patients had plain films obtained of the ankle and foot upon initial work-up. Essentially, all patients had sustained sprain, strain, or twisting of the ankle, and/or a fall injury whereby ankle films were acquired irrespective of ankle pain. Based on the algorithmic Ottawa Ankle and Foot Rules, histories and physical examinations of all patients were reviewed to determine if foot films ordered were indeed necessary in the radiographic work-up.

**Results:** Out of 243 patients, 37 had fractures of the distal fibula, medial, or lateral malleolus; 9 patients had either bimalleolar or trimalleolar fractures. An additional 9 patients suffered fracture at the base of the fifth metatarsal. After careful review, it was determined that all fractures of the fifth metatarsal base could have been diagnosed radiographically by properly acquired ankle films. Furthermore, no other fractures or dislocations were identified in the foot.

**Conclusions:** Based upon history and clinical examination and employing the Ottawa Ankle and Foot Rules, patients who have sustained isolated ankle injury can be evaluated solely by plain films of the ankle. The addition of foot films, prompted by fears of litigation or the need to reassure patients, is ultimately unwarranted. Furthermore, an ankle series obtained with strict attention to technique will ensure visualization of proximal metatarsal fractures should they be present.

**Reviewer's Comments:** In today's climate of health reform, overutilization, and rising concerns about the untoward effects of ionizing radiation, it is imperative that physicians not only ensure the standard of care for their patients, but also self-regulate their practices based upon evidence-based research. The Ottawa Ankle and Foot Rules have been in effect since 1992, yet emergency department physicians across the United States continue to order foot films when they may be entirely unnecessary. As the authors illustrate, several factors are likely contributors to this problem, hence rectifying the issue may require many steps towards an ultimate reduction in excessive diagnostic imaging procedures. Perhaps allaying legal concerns clinicians have may prove to be the most powerful determinant of changing healthcare for the better. In my opinion, one of the cornerstones of applying advanced medical care lies in understanding their indications and purpose. With respect to patients sustaining minor ankle trauma, we can begin by eliminating the foot film from the "ankle" evaluation. (Reviewer-Rahul Pawar, MD).

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Keywords: Foot, Ankle, Trauma, Ottawa Rules

Print Tag: Refer to original journal article
Does Prevalence of Lumbar Spondylolysis Increase With Age?

Lumbar Spine Spondylolysis in the Adult Population: Using Computed Tomography to Evaluate the Possibility of Adult Onset Lumbar Spondylosis as a Cause of Back Pain.

Brooks BK, Southam SL, et al:

Skeletal Radiol 2009; Epub ahead of print (November):

There is no statistically significant difference in prevalence for lumbar spondylolysis across age groups >20 years of age.

**Objective:** The authors sought to determine if lumbar spondylolysis does in fact increase with age based upon their own experiences. Furthermore, if a direct relationship does exist between age and prevalence, perhaps there could be a new window of opportunity for treatment.

**Design:** Retrospective study examining patients who had undergone CT scanning over a 5-month period. Any patient with history of "back pain" was eliminated from the study so as to prevent selection and "result bias." A total of 2,555 patients were reviewed, all individuals >20 years of age. Age groups were classified according to decade; however, patients >70 years old were grouped collectively. The level of the defect and unilaterality or bilaterality was recorded.

**Results:** 203 cases of lumbar spondylolysis (pars defects) were documented. The prevalence per decade was roughly equivalent, ranging between 7.0% and 9.2%. Statistical analysis demonstrated no significant difference in prevalence of lumbar spondylolysis across age groups. There was, however, a significant gender difference in prevalence. The male-to-female ratio was 1.5:1. **Conclusion:** The prevalence of lumbar spondylolysis did not increase with age. The authors’ subjective experience suggesting that possibility was refuted by their own retrospective analysis. Their findings differed from that of a plain-film based study; nevertheless, it is fair to assume that CT evaluation is more sensitive and specific comparatively. Ultimately, the data did not support the authors’ secondary hypothesis that spondylolysis may represent a "rare, but treatable form of back pain" in adults. Males are statistically more likely to develop lumbar spondylolysis compared to women.

**Reviewer’s Comments:** As supported by the current literature, the presence of lumbar spondylolysis does not correlate with the presence of pain, yet the development of pars interarticularis defects may well be. Brooks and colleagues have shown that despite the somewhat logical assumption that aging predisposes to increased prevalence of spondylolysis, the data indicate otherwise. The implications are important in that treatment for lumbar spondylolysis may be unwarranted in many cases. It is foreseeable that radiologists and clinicians may suppose that treatment for spondylolysis in older patients may be beneficial. Any treatment offered to patients should be indicated by evidence, and not based on presumptions or subjective experiences alone. (Reviewer-Rahul Pawar, MD).

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Keywords: Spondylolysis, Lumbar Spine, Low Back Pain

Print Tag: Refer to original journal article
A new bone lesion in a patient with documented primary malignancy is in all likelihood a metastasis from the primary cancer.

**Objective:** To determine the probability that a new bone lesion in an individual with a known malignancy represents another etiology besides metastasis. **Design/Materials:** Retrospective review of 54 bone biopsies that were performed over a 5-year period in patients with history of primary malignancy.

**Methods:** All biopsies were performed employing CT localization, and specimens were analyzed by cytopathology or core-biopsy.

**Results:** The most common primaries were breast cancer, lung cancer, and non-Hodgkin's lymphoma. The lumbar spine and ilium were the most frequently biopsied. Ninety-eight percent of biopsies represented metastasis from the known primary malignancy. Only 1 biopsy (2%) represented a second primary (myelofibrosis in a patient with chronic myelocytic leukemia). No adverse biopsy-related complications were reported.

**Conclusions:** As the authors illustrate, in a significant number of cases where patients have documented bone lesions, they are not referred for image-guided biopsy. In this study, they demonstrated that a statistically significant percentage of new bone lesions indeed represent metastasis from the primary tumor. They also reason that in most instances, biopsy of nearly all lesions is cumbersome. However, in some cases (i.e., lymphoma), a new lesion may represent different pathology, ultimately changing the short- and/or long-term management.

**Reviewer's Comments:** In standard radiology practice, we come across many cases where imaging demonstrates a new bone lesion in a patient with documented malignancy. Besides plain-film detection, other modalities such as CT, MRI, and nuclear imaging studies are utilized for surveillance in patients with cancer. What are we to do – biopsy every lesion? Whether we biopsy ourselves via image-guidance or refer to orthopedics, excessive (and unnecessary) biopsy procedures incur a measurable burden on the services involved. Cronin and colleagues have shown that in all likelihood, in a patient with a documented primary malignancy, a new suspicious bone lesion overwhelmingly represents metastasis. Despite these data and the propensity to avoid unnecessary biopsy, I still caution all radiologists to approach each case individually and analyze any elements that may provide sufficient reason to biopsy a new bone lesion. Statistics and probability should not transform into unwavering bias toward a particular diagnosis. (Reviewer-Rahul Pawar, MD).

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Keywords: Bone Metastases, Etiology, Primary Carcinoma, Alternative Diagnosis

Print Tag: Refer to original journal article
**Objective:** To evaluate the diagnostic utility of reference images when distinguishing between malignant and benign clustered microcalcifications on mammograms.

**Methods:** A publicly available database of screening mammography maintained by the University of South Florida was searched for cases of microcalcifications discovered on screening mammography. Only cases that ultimately went to biopsy were included in the study. Images where there were <5 or >35 microcalcifications and where the cluster size was >25 mm were excluded from the study. Images were rated by 3 radiologists who performed image interpretation separately. The radiologists gave a score from 0 to 1, with increasing number indicating increasing suspicion of malignancy. These images were then filtered based on the average scores given to include moderately difficult and indeterminate cases as unknowns to be used in the observer study set. This was done to minimize the number of benign-appearing malignant lesions and malignant-appearing benign lesions. Ultimately, 460 images of 287 benign and 173 malignant lesions comprised the observer study set. In this study set, an unknown image was displayed and the observer was asked to indicate the degree of suspicion of malignancy on the same rating scale. After this, 8 reference images, 4 benign and 4 malignant, were displayed adjacent to the unknown. The radiologist was then again asked to give a rating of the degree of suspicion of malignancy, now having performed direct comparison with the reference images. The observers consisted of 5 attending radiologists and 3 breast imaging fellows. Statistical analysis included developing receiver operating curves and analysis of interobserver variability.

**Results:** Evaluation of receiver operating curves before and after the display of the 8 reference images demonstrated a statistically significant improvement in diagnostic accuracy. Findings were similar for the attending physicians and the fellows who participated. There was no statistically significant interobserver variability.

**Reviewer's Comments:** These data are a corroboration of a long-held suspicion that comparison of an unknown with a known, for example from a reference atlas, will improve diagnostic accuracy and may help improve training. As more centers transition to reading soft copy films on a monitor, it is possible that we will be seeing manufacturers of display systems incorporating reference images based on data such as this. In the meantime, we still have the BI-RADS atlas that can aid in diagnosis. (Reviewer-Basil Hubbi, MD).

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**Keywords:** Mammogram, Calcification, Diagnostic Accuracy, Computer Aided Diagnosis

**Print Tag:** Refer to original journal article
When Radiologists Perform Best: The Learning Curve in Screening Mammogram Interpretation.

Miglioretti DL, Gard CC, et al:

Radiology 2009; 253 (December): 632-640

Objective: To evaluate the evolution of screening mammogram interpretation in radiologists who have had fellowship training in breast imaging and those who have not.

Methods: This study included referencing data from the National Cancer Institute-funded Breast Cancer Surveillance Consortium. The Consortium includes data from 7 different geographic locations across the United States that link data from pathology databases, cancer registries, and women who undergo mammography. The Consortium also includes data regarding the interpreting radiologists. In this study, 231 radiologists were identified who interpreted screening mammograms over a retrospective 9-year period. Only screen-film mammography interpretation was included; digital mammogram interpretation was excluded in order to simplify the study. Only screening mammograms were included in the study, and only in women without a history of breast augmentation. Radiologists were surveyed for the following criteria: age and sex; experience of mammography interpretation in years; fellowship training in breast imaging; volume of mammograms interpreted independently; and percentage of time working in breast imaging. Also included was whether the radiologist practiced in an academic medical center or not. Women were considered to have breast cancer if ductal carcinoma in situ (DCIS) or invasive ductal carcinoma was diagnosed within 1 year of a mammogram. Sensitivity, false-positive rates, positive predictive value, and recall rates were calculated. Statistical analysis also included the affect of increasing years of experience on these performance variables. The analysis was performed for radiologists with and without reported fellowship training in breast imaging.

Results: Almost 40% of the radiologist had an average of <10 years experience, and 20% had an average of >20 years experience. Approximately 73% were men, and most were nonacademic radiologists. More than 90% had no fellowship training in breast imaging. Those with less experience tended to be women with fellowship training, but with less years of experience. Radiologists without fellowship training and with longer experience had lower false-positive rates and tended to have higher positive predictive values. Overall performance for radiologists without fellowship training tended to improve over time although no significant trends in sensitivity were found. The greatest improvement occurred over the first 3 years of practice. For those with fellowship training, performance was good from the first year onwards, with no change in false-positive rates, recall rates, or positive predictive value with increasing experience.

Reviewer's Comments: These results indicate the importance of auditing data in all practices performing screening mammography in order to monitor the variables discussed, with an emphasis on matching trends in accuracy with experience, especially for those without fellowship training in breast imaging. (Reviewer-Basil Hubbi, MD).

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Keywords: Mammography, Screening, Fellowship Training

Print Tag: Refer to original journal article
Why Do Some Women Decline MRI Screening for Breast Ca?


Berg WA, Blume JD, et al:
Radiology 2010; 254 (January): 79-87

The most common reason for declining screening breast MRI is claustrophobia, with time constraints and financial concerns also cited.

**Objective:** The American Cancer Society issued specific guidelines in 2007 recommending screening breast MRI as an adjunct to mammography for specific patient populations meeting a certain risk level. The purpose of this study is to examine why some women decline supplemental screening with MRI after already undergoing screening with mammography and ultrasound.

**Methods:** Women who participated in the American College of Radiology Imaging Network 6666 Protocol were originally enrolled for the evaluation of supplemental ultrasound in screening women with elevated risk of breast cancer. The American College of Radiology (ACR) Imaging Network involves multiple American and International participants. Women who had already completed 3 rounds of screening with mammography and ultrasound were offered MRI as well. This offer occurred over a 20-month period. The women who were enrolled were required to agree to certain potential circumstances, including short-term interval MR imaging and/or MR imaging-guided biopsy, if deemed appropriate based on original MRI interpretation. Contraindications to MRI were recorded when applicable. If the patient had been judged eligible for MRI, but did not participate in this portion of the protocol, then the primary reason for nonparticipation was recorded by the researchers.

**Results:** 1215 women were offered inclusion in the MR imaging portion of the protocol, of which only 57.9% agreed to participate. The median age for participants and nonparticipants was identical. Logistic regression analysis predicted that Hispanic or Latino women tended to be less likely to participate, and those with a calculated lifetime risk of breast cancer ≥25% as per Gail or Claus models tended to be more likely to participate. Over 25% of those eligible for MRI declined participation on the basis of claustrophobia, which was the most common reason cited. The second most common reason was time constraints and less common were financial concerns or inability to provide a referral from their physician.

**Reviewer's Comments:** The results of this study are valuable for all practices with varying degrees of patient compliance regarding breast MRI. With knowledge of the factors that may deter certain patients (claustrophobia, etc), catering to the patient's particular concerns should be expected to increase participation accordingly. (Reviewer-Basil Hubbi, MD).

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Keywords: Breast Cancer Screening, MRI, ACRIN

Print Tag: Refer to original journal article
Accuracy of lesion size measurements in mammography may result in significant discrepancy with different mammography display and acquisition systems.

**Background/Objective:** The U.S. Food and Drug Administration (FDA) has approved 8 digital mammography systems to date. The current available documents on image quality among the systems and review stations do not comment on measurement accuracy. Due to initial observational discrepancies between mammographically determined cancer size and pathologically determined cancer size, the authors seek to investigate the accuracy of lesion size measurement on digital mammography across different systems.

**Methods:** The authors designed the study using an American College of Radiology (ACR) Mammography Accreditation Program phantom where they placed a 1-cm acrylic disk on its upper surface that sat 4.5 cm above the breast support surface. Initially, nonmagnification views were obtained and followed by magnification views at 3 separate Mammography Quality Standards Act-approved mammography sites. Radiologists were then asked to use electronic calipers to measure the size of the disk in each magnification view.

**Results:** For the first system used, the 1-cm disk measured 1.05 cm in the nonmagnification view and 1.64 cm in the 1.6x magnification mode. For the second system used, the 1-cm disk was measured as 0.99 cm in the nonmagnification view and 0.66 cm in the 1.5x magnification mode. The third system tested measured accurate measurements for both imaging modes and used Selenia from Hologic for acquisition and a PACS viewing station designed by Horizon Medical Imaging from McKesson.

**Conclusions:** The authors conclude that it cannot be assumed that PACS systems or review stations will display and measure lesions and sizes correctly on magnified images even though they bear FDA approval.

**Reviewer’s Comments:** This brief yet informative paper tells us that simply assuming that DICOM-compatible FDA-approved equipment will work together seamlessly is unacceptable. Testing and quality control should be evaluated by a medical physicist whenever possible in order to ensure lesion measurement accuracy regardless of acquisition or display equipment. Any practice that is transitioning to digital soft copy reading or employs equipment from various manufacturers should be aware of this potential problem. (Reviewer-Basil Hubbi, MD).

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Keywords: Digital Mammography, Display, Acquisition, Selenia, Hologic, Medical Physicist

Print Tag: Refer to original journal article
Furosemide administered either 15 or 45 minutes following 18F-FDG resulted in SUV$_{\text{max}}$ that were 3-fold less than in control patients not administered a diuretic.

**Background:** Intense pelvic bladder activity from excreted 18F-fluorodeoxyglucose (18F-FDG) can obscure adjacent pelvic pathology. Diuretic administration has been used to try and dilute the bladder activity and promote voiding.

**Objective:** To study the effects of 2 variations of a furosemide protocol as compared to a control group not administered a diuretic.

**Design:** Retrospective analysis.

**Participants:** 109 patients with known or suspected malignancy were included in the study. Of these patients, 39 received 20 mg of furosemide 45 minutes following $^{18}$F-FDG administration (15 minutes prior to imaging), and 45 patients were administered furosemide 15 minutes following 18F-FDG (45 minutes prior to imaging). The third group, consisting of 25 patients, did not receive furosemide.

**Methods:** Elliptical regions of interest were placed to approximate the interior bladder volume. Mean and peak standard uptake values (SUVs) were obtained. The bladder size was visually compared to the bladder size on CT. The mean SUV of a region within the right lobe of the liver was also used to normalize the bladder average SUV.

**Results:** Imaging was interrupted because of urinary urgency in 2 patients when furosemide was given later, at 45 minutes following 18F-FDG, but not when given early, at 15 minutes following 18F-FDG, nor in the control groups. There was no significant difference in bladder intensity between the 2 diuretic groups; however, maximum SUV (SUV$_{\text{max}}$) were lower by a factor of 3 and mean SUV (SUV$_{\text{mean}}$) were lower by a factor of 2 as compared to controls. When the mean bladder SUV was normalized by the mean liver SUV, the early furosemide group had a slightly lower ratio than the late furosemide group. Bladder volumes were greater in the furosemide groups than in the control group, and the early furosemide group had relatively larger mean bladder volumes than the late furosemide group. The furosemide groups had greater misregistration between emission and CT bladder images than the control group, and this was greatest when furosemide was given earlier. In several cases, the authors state that the lower bladder activity following furosemide facilitated discrimination between urine, bladder wall abnormalities, and surrounding structures.

**Conclusions:** Diuretic did increase bladder volume and lower concentration of bladder activity to the point where it became easier to discriminate bladder wall and surrounding activity from the bladder itself. Early furosemide was better tolerated (ie, with less interrupted acquisitions) than late furosemide, and bladder volumes and degree of misregistration were larger.

**Reviewer's Comments:** One oddity in this paper was that the patients were given saline following 18F-FDG administration, which is not a standard technique. That may make it difficult to generalize the findings described herein to patients not hydrated in the same manner. (Reviewer-Lionel S. Zuckier, MD).

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Keywords: Furosemide, PET/CT, Artifacts, Bladder

Print Tag: Refer to original journal article
Until 10 years ago, scintigraphy was the imaging test of choice to diagnose pulmonary embolism (PE). During the current decade, CT angiography (CTA) has become the new gold standard for imaging PE. CT is more rapid, produces sharper images, and, at most hospitals, and is available 24/7, while nuclear medicine technicians may not be on call. But Dr. Len Freeman has preached and published on the need to increase utilization of the ventilation/perfusion (V/Q) scan for PE diagnosis. CT involves excessive radiation to the female breast — the breast receives between 65 to 200 times greater radiation than from V/Q scintigraphy. The potential long-term risks from CT radiation merit considering the use of V/Q for diagnosing PE whenever possible. A pretest algorithm can select patients for CT versus nuclear medicine when PE is suspected. A plain chest x-ray can triage patients in the emergency room. A patient with negative chest x-ray in whom PE is still suspected should have a V/Q study. Patients with a positive x-ray showing pneumonia, pleural fluid, or significant chronic disease go for CTA. Current practice uses V/Q for PE patients with contrast allergies and/or renal impairment. Some now would add patients with normal chest x-rays because radiation exposure is a concern. The younger the patient exposed to ionizing radiation, the more radiosensitive her breast tissue and the more time to develop cancer. Drs. Freeman and Haramati reported that using chest x-ray for triage in the ER results in 60% of PE studies being V/Q. SPECT-V/Q produces even clearer results and has become standard practice in Europe where Technegas, a superior ventilatory SPECT agent, is available. Dr. Freeman expects the Food and Drug Administration to approve Technegas in the next year or two.

**Reviewer's Comments:** The case certainly seems compelling for use of lung scintigraphy to diagnose PE in patients with clear chest x-rays, especially in women of childbearing age. We recently ran a 1-year follow-up of our low-probability scans for emergency room patients. We found no PE-associated mortality for patients returning with repeat PEs. If these patients were all submitted to angiography or even spiral CT, small and apparently clinically insignificant PEs would have been discovered in up to 15% of the patients. Many of these would have been put on anticoagulation with its attendant risks of no apparent clinical benefit. (Reviewer-C. Richard Goldfarb, MD).

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Keywords: Pulmonary Embolism, V/Q Imaging

Print Tag: Refer to original journal article