Diffusion-weighted imaging may help to modestly improve the positive-predictive value of breast MRI.

**Background:** Diffusion-weighted imaging (DWI) is an MRI technique that measures the ability of water molecules to move in vivo. In breast MRI, prior studies have shown lower rates of diffusion of water molecules in breast carcinomas suspected to be a function of higher cell density resulting in greater intracellular water signal and less extracellular matrix.

**Objective:** To assess the diagnostic value of DWI as part of routine breast MRI in improving the positive-predictive value (PPV) of suspicious lesions on breast MRI.

**Design:** Retrospective study.

**Participants:** All patients who had undergone breast MRI, which included DWI, over a 1-year period were identified. Those who had subsequently been subjected to core needle or surgical biopsy for MRI-described suspicious lesions were included in the study. Inclusion criteria were limited to those patients given a final MRI BI-RADS assessment of 4 or 5 with final tissue pathology.

**Methods:** All MRI scans were prospectively interpreted by dedicated breast imagers and given a BI-RADS assessment. Of note, DWI sequences were analyzed retrospectively by radiologists blinded to histopathologic outcomes. Imaging findings were correlated with histopathology.

**Results:** 83 lesions in 70 patients comprised the study set. Median patient age was 52 years. Final pathologic results found 63% of lesions to be benign. Median lesion size was 1.2 cm. Considerable overlap in apparent diffusion coefficient (ADC) values was observed between benign and malignant lesions, although malignant lesions tended to exhibit lower mean ADC values, indicating expected decreased mobility of water molecules. For lesions studied, the PPV of routine breast MRI without DWI was 37%. When applying an ADC cutoff value of $1.81 \times 10^{-3} \text{ mm}^2/\text{s}$, the PPV of breast MRI with DWI was found to be 47%. Researchers also found that, had this ADC cutoff value been applied on initial MRI interpretation, 33% fewer false positives would have been reported, with no decrease in the reporting of true positives.

**Reviewer’s Comments:** The overall trend in the more recent radiology literature regarding routine contrast-enhanced breast MRI has been to improve on the known poor specificity. The addition of DWI, as per this article, shows some promise in improving PPV, although only marginally. A recent study that came out of Japan by Tozaki et al did not show such good results with DWI as a whole, although a quantitative ADC value had not been chosen for the population studied. (Reviewer-Basil Hubbi, MD).
Background: Cryoablation is a technique that has been documented to be well visualized on image-guided technique.

Objective: To assess the feasibility and initial outcomes of percutaneous multiprobe cryoablation for in situ breast cancer, while focusing on 1-cm visible ice coverage beyond the visible tumor margins.

Participants/Methods: Over the course of 5.5 years, women who refused surgical options for breast cancer were considered for breast cryoablation, so long as they would be willing to pursue radiation therapy or chemotherapy, if deemed clinically appropriate. Patients who were receiving cryoablation for recurrent or advanced disease and those receiving cryoablation for definitive treatment of a primary cancer were categorized accordingly. All patients had to agree to sentinel lymph node dissection prior to cryoablation. Based on referenced published reports, a 1-cm ice margin correlates with estimates of cytotoxic temperatures throughout the targeted tumor. Cases of tumor skin involvement, tumors >7 cm, and uncorrectable bleeding diatheses were excluded. Pretreatment assessment was always based on breast MRI findings. Breast ultrasound was then used to document breast cancer size, guide cryoprobe placements, and monitor ice formation. FDA-approved cryoprobes that measured 2.4 mm in diameter were used, each probe capable of generating ice approximately 2.5 x 4.5 cm in size. The majority of patients received local anesthesia and minimal conscious sedation. IV antibiotic prophylaxis was used. Initially, the center of the lesion was targeted; this was followed by placing at least 2 cryoprobes parallel to the central needle. Based on tumor size, cryoprobes were arranged according to established guidelines for cytotoxic ice formation. Follow-up imaging included routine CT scanning for recurrent or metastatic disease at 3, 6, and 12 months. Breast MRI was also performed at 1, 3, 6, 12, 18, and 24 months after the cryoablation procedure.

Results: Average patient age was 62.5 years, and average tumor size was 1.7 cm. No skin retraction or scarring was noted. All patients were treated as outpatients. Average procedure discomfort was rated as a 0.3 on a 10-point pain scale, with 10 being the worst pain. Twenty-two cancer foci were treated. Average clinical follow-up approached 2 years. No progressive nodular or asymmetric enhancement was found in patients to suggest local recurrence. Two patients who underwent biopsy after cryoablation yielded no residual cancer on pathology.

Reviewer’s Comments: The apparent 100% procedural success with cryotherapy for breast cancers is encouraging early news for this novel technique. The landscape for breast cancer detection and treatment is indeed changing, providing a broad range of tools for the radiologist and the clinician. Continued open dialogue among our colleagues in surgical and medical oncology is imperative to create solutions for our patients.

(Reviewer-Basil Hubbi, MD).

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Keywords: Cancer, Cryotherapy, Interventional Radiology

Print Tag: Refer to original journal article
Objective: To evaluate the diagnostic role of preoperative axillary ultrasound in known breast cancer patients, and to correlate histology of ultrasound-guided lymph node tissue sampling with eventual sentinel node biopsy.

Design: Prospective study.

Participants/Methods: Over a 6-month prospective period, patients who had invasive breast cancer diagnosed on prior biopsy and normal axillary findings on physical examination were identified. Patients underwent ultrasound of the axillae preoperatively. Those lymph nodes that were described to be closest to the primary tumor or that had the thickest cortex were targeted for core needle biopsy or fine-needle aspiration under ultrasound guidance. These lymph nodes were also localized with hookwire localization for sentinel lymph node dissection. Patients also underwent lymphoscintigraphy and localization for the sentinel lymph node, which was identified as the lymph node with radioactive counts at least 10% higher than the next most radioactive node. Correlation between the wire-localized lymph node and the radio-localized lymph node was noted by the surgeon. If nodes did not correlate, both nodes were dissected and sent to pathology. A frozen section of the sentinel node was sent; if the node was positive, only then did the surgeon proceed to perform an axillary node dissection.

Results: 191 patients were included in the study, with 191 sentinel lymph nodes analyzed. Pathology after surgical excision revealed that 21% had nodal metastasis. Mean cortical thickness of all analyzed nodes was 2.5 mm, with the mean cortical thickness of metastatic nodes determined to be 4.3 mm. Rates of malignancy increased with sonographically evident cortical thickness. A cutoff point of 2.5 mm of cortical thickness yielded a preoperative sensitivity of 85%, a specificity of 78%, and a negative-predictive value of 95%. The positive-predictive value was calculated to be 51% at this cutoff point. The rate of false-negative results in wire-localized nodes was 24%, indicating that those patients had metastasis to at least 1 lymph node not identified sonographically as the sentinel node. Of nodes that were wire localized under ultrasound guidance as the sentinel node, 90% corresponded with radio-localized nodes.

Reviewer's Comments: The findings in this study are quite remarkable. The data suggest that the radiologist can further help guide the patient's surgical course by tissue sampling the sentinel node based on ultrasound criteria reliably and possibly precluding the need for sentinel node excisional biopsy. This can effectively and immediately be applied to any practice using a lymph node cortical thickness of 2.5 mm as a threshold. (Reviewer-Basil Hubbi, MD).

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Keywords: Cancer, Diagnosis, Axillary Lymph Nodes, Sentinel Node Biopsy

Print Tag: Refer to original journal article
Palpable Breast Mass With Benign Features Warrants Short-Term Interval Follow-Up

Short-Term Follow-Up of Palpable Breast Lesions With Benign Imaging Features: Evaluation of 375 Lesions in 320 Women.
Harvey JA, Nicholson BT, et al:
AJR Am J Roentgenol 2009; 193 (December): 1723-1730

Short-term interval follow-up is a safe and appropriate course of action when a palpable breast mass appears benign by imaging criteria.

**Background:** Several prior studies have documented the outcome of short-term follow-up of nonpalpable breast masses with benign sonographic features, although the preponderance of previous data was on nonpalpable masses, with little information on those masses that were also palpable. The dearth of adequate studies on palpable breast lesions has led the BI-RADS authors to recommend against short-term interval follow-up for palpable breast masses.

**Objective:** To evaluate outcomes of women with palpable breast masses who were followed up with short-term imaging.

**Design:** Retrospective study.

**Participants/Methods:** Over a 6.5-year retrospective period, patients who were reported to have presented with a palpable breast abnormality that correlated with a sonographically evident mass were identified. Those patients whose masses were described as round, oval, or lobular with circumscribed margins were included in the study. All images had been interpreted by 1 of 6 radiologists. Lesions that corresponded with simple cysts, lymph nodes, or oil cysts were excluded from the study population. Short-term follow-up was not recommended for lesions found to be new when compared with prior examinations. All women underwent physical examination by the interpreting radiologist as well. Outcome was assessed on the basis of tissue diagnosis, decrease in size of lesion or resolution of lesion, or imaging-documented lesion stability for ≥12 months. Statistical analysis was performed, including cost analysis using current Medicare reimbursement values.

**Results:** 375 palpable masses were included in the study. Mean patient age was 34.4 years. Of lesions, 68.8% were assessed on ultrasound alone, 30.4% were assessed on mammography and ultrasound, and only 0.8% were assessed only on mammography. The majority of lesions that were sampled yielded a pathology of fibroadenoma. The analysis revealed only 1 case of cancer, yielding a 0.3% incidence of malignancy of palpable masses with benign features on imaging. The overall cost analysis revealed that proceeding to image-guided core biopsy nearly doubled the cost of diagnosis versus short-term interval follow-up.

**Reviewer's Comments:** Findings of this study are similar to those of others, answering the question breast imagers have had for years since the Stavros criteria were widely adopted. Should palpability continue to be a factor in assessing breast masses? The data from this study and from a study published earlier this year by a team of South Korean researchers suggest that palpability does not supersede benign imaging characteristics of breast masses. We await a new BI-RADS edition to be released in 2010 that hopefully will integrate these data and help guide clinical practice to minimize unnecessary biopsies. (Reviewer-Basil Hubbi, MD).

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Keywords: Neoplasms, Mammography, Ultrasound

Print Tag: Refer to original journal article
The most common intra-abdominal complication related to ventriculoperitoneal shunts is shunt infection, followed by cerebrospinal fluid pseudocyst, abscess, and infected fluid collection.

Objective: To evaluate CT findings of intra-abdominal complications related to ventriculoperitoneal shunts.

Design: Retrospective analysis.

Participants: 70 patients (33 men and 37 women), all of whom had ventriculoperitoneal shunts and had undergone CT examinations to evaluate for possible shunt-related abdominal symptoms. Inclusion criteria included diffuse or focal abdominal pain with or without fever, advanced hydrocephalus, ventriculitis, diarrhea, abdominal wall mass, hematochezia, and purulent discharge from the operative site.

Methods: CT examinations of the abdomen and pelvis were performed following administration of IV contrast with images acquired at 3 minutes during the delayed equilibrium phase. Images were reviewed by an abdominal radiologist. The size and location of intraperitoneal fluid collections, as well as presence of septations, were recorded. Images were also reviewed to assess for presence of the following: peritoneal thickening, peritoneal enhancement, omentomesenteric infiltration, abscess, bowel perforation, bowel wall thickening and enhancement, abdominal wall infiltration, pneumoperitoneum, and thickening along the catheter track wall.

Results: There were 16 patients with pathologically proven ventriculoperitoneal shunt-related complications. The most common complication of ventriculoperitoneal shunts was shunt infection. This was found in 11 of 16 patients by way of positive microbiological cultures from the shunt catheter tip or peritoneal fluid. Cerebrospinal fluid (CSF) pseudocyst was diagnosed in 6 patients, abdominal abscess in 4, and infected fluid collection in 3. All 4 cases of abdominal abscess, 3 of 6 cases of CSF pseudocyst, and 2 of 3 cases of infected fluid collection coexisted in patients with shunt infection. Five of 6 CSF pseudocysts were found in the peritoneal cavity, and 1 in the abdominal wall. There was only 1 case of bowel perforation.

Reviewer's Comments: The results of this study are useful in that they demonstrate the various intra-abdominal complications that can arise in the setting of ventriculoperitoneal shunts. Shunt infection is the most common and, therefore, should be considered when encountering a fluid collection in the presence of a ventriculoperitoneal shunt. One of the limitations reported in this study was that there was a small number of pathologically confirmed cases, with only 11 of 16 shunt catheter infections cultured. (Reviewer-John C. Sabatino, MD, MSD).

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Keywords: Ventriculoperitoneal Shunts, Complications, CT

Print Tag: Refer to original journal article
Adding diffusion-weighted imaging can be helpful and can provide additional information to T2-weighted images when evaluating anal fistula, especially in patients unable to receive IV contrast.

**Objective:** To determine if diffusion-weighted imaging (DWI) provides additional information to T2-weighted images in the evaluation of anal fistulae.

**Design:** Retrospective analysis.

**Participants:** 13 patients who underwent MRI to evaluate for anal fistula.

**Methods:** MRI was performed using a 1.5 Tesla system. Imaging sequences included T2-weighted fast spin-echo with fat suppression, T1-weighted 3-dimensional (3D) gradient echo with fat suppression, and diffusion-weighted single-shot echo planar imaging with b-values of 0 and 800 s/mm². T1-weighted 3D gradient echo with fat suppression were also obtained 70 seconds after IV gadolinium administration. MRIs were reviewed by 2 radiologists. Initial evaluation was performed of T2-weighted fat-suppressed images only. Subsequently, T2-weighted images combined with either DWIs or gadolinium-enhanced images were evaluated. Location of possible fistulae was recorded and scored on a 4-point scale as follows: 1, probably not; 2, uncertain; 3, possible; and 4, definite. Findings of T2-weighted images alone, DWIs and T2-weighted images combined, and gadolinium-enhanced images and T2-weighted images combined were recorded. Subsequently, images were reviewed along with clinical records of each patient. Two of 13 patients underwent surgery, and surgical results were also reviewed. The additional value of DWIs or gadolinium-enhanced images to T2-weighted images for visualization of fistula extension or communication to an external or internal opening was also recorded.

**Results:** There were 20 anal fistulae in 13 patients; 18 fistulae were detected on T2-weighted images alone, while 19 were detected on DWIs and T2-weighted images combined and on contrast-enhanced images and T2-weighted images combined. One fistula was detected only on contrast-enhanced images and T2-weighted images combined. Confidence scores with DWIs and T2-weighted images combined, and contrast-enhanced images and T2-weighted images combined were found to be significantly greater than those with T2-weighted images alone. In some patients, DWIs improved visualization of the extent of the anal fistula as well as the external or internal opening. No statistically significant difference in confidence scores was found between DWIs and T2-weighted images combined, and contrast-enhanced images and T2-weighted images combined.

**Reviewer's Comments:** The results of this study are useful in demonstrating that DWIs can aid in the evaluation of patients with anal fistulae. This can be especially advantageous in patients who are not able to receive IV gadolinium contrast and, therefore, can be a helpful addition to the standard abdominal MRI protocol. One of the limitations reported in this study was the retrospective nature with a small number of patients. (Reviewer John C. Sabatino, MD, MS).

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**Keywords:** Fistula in Ano, Diffusion-Weighted MRI, Diagnosis

**Print Tag:** Refer to original journal article
CT enteroclysis may be helpful in establishing the diagnosis of uncomplicated celiac disease in patients with nonspecific gastrointestinal symptoms. The most specific finding was reversed jejunoileal fold pattern.

Objective: To describe the CT enteroclysis features of uncomplicated celiac disease in symptomatic patients.

Design: Retrospective analysis.

Participants/Methods: The study was comprised of 44 patients, 21 men and 23 women, with a diagnosis of uncomplicated celiac disease by duodenal biopsy, who had undergone CT enteroclysis. Overall, 32 of 44 patients had a known diagnosis of celiac disease at the time of CT enteroclysis, which was performed because of chronic abdominal pain and evaluation for a possible complication. The remaining 12 patients with nonspecific symptoms such as chronic anemia and chronic abdominal pain were found to have uncomplicated celiac disease after CT enteroclysis. Patients with celiac disease complicated by refractory sprue, jejunoileitis, T-cell lymphoma, and adenocarcinoma were excluded. A control group of 44 patients without celiac disease who had undergone CT enteroclysis for symptoms similar to the study group were included. Following fluoroscopic-guided nasojejunal intubation, CT enteroclysis examinations were performed following infusion of 1.4 to 1.9 L of water and IV administration of an anti-peristaltic agent. Images were obtained 50 seconds following IV administration of nonionic iodinated contrast. Images were reviewed by 2 abdominal radiologists for the presence of: small bowel fold pattern, small bowel wall thickening, small bowel dilatation, intussusception, intramural fat, peritoneal fluid, enlarged or cavitating lymph nodes, mesenteric panniculitis, and mesenteric vessel enlargement. Splenic volume was also calculated and a cut-off of 145 cm$^3$ was used.

Results: The results of the study demonstrated that 28 of 44 study group patients had a greater number of ileal folds/inch when compared to the control group. This reversed jejunoileal fold pattern had a 64% sensitivity and 100% specificity for diagnosis of uncomplicated celiac disease. Fold thickening and wall thickening within the jejunum and ileum were more also frequently found in patients with uncomplicated celiac disease. There was no significant difference between the study group and control group for presence of transient small bowel intussusception, peritoneal fluid, and mesenteric panniculitis. Neither intramural fat deposition nor lymph node cavitation was a feature of either group. Mesenteric vessel enlargement and splenic atrophy were also strongly correlated with presence of uncomplicated celiac disease.

Reviewer's Comments: This study demonstrates that CT enteroclysis can be used in the diagnosis of uncomplicated celiac disease patients. The most specific finding was reversed jejunoileal fold pattern. Additional supporting findings included ileal fold thickening, mesenteric vessel enlargement, and splenic atrophy. One of the limitations reported in the study was that an attempt was not made to establish a correlation between CT enteroclysis features and findings on duodenal biopsy. (Reviewer-John C. Sabatino, MD, MSD).

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Keywords: CT Enteroclysis, Celiac Disease

Print Tag: Refer to original journal article
Multidetector CT and dedicated bronchial reconstruction software demonstrate that bronchial lumen area is lower and bronchial wall area/bronchial lumen area ratio is higher in distal bronchi of patients with asthma compared with controls.

**Objective:** To compare bronchial measurements obtained at CT with pulmonary functions tests (PFTs) and immunohistologic markers in asthma patients and control subjects.

**Design:** Retrospective study.

**Participants:** 27 non-smokers; 15 had stable asthma and 12 did not. Of the 12 control subjects, 10 had been referred for CT for bleb exclusion prior to scuba diving and 2 had a single episode of hemoptysis. None of the control patients had any abnormality on CT or findings of functional airway obstruction.

**Methods:** All patients had PFTs within 72 hours of the CT. CTs were performed on a 16-section MDCT scanner at full inspiration without intravenous contrast. Collimation was 0.75 mm and the images were reconstructed with a high-spatial frequency algorithm with 1-mm reconstruction section thickness and 1-mm reconstruction interval. Images were transferred to an external workstation that had dedicated bronchial analysis software. The software allowed reconstructions to be performed orthogonal to the main axis of any visible bronchus on CT. The software measured the cross-sectional bronchial lumen area (LA) and bronchial wall area (WA). This allowed calculation of airway total area (TA) and mean bronchial wall thickness (WT). The trachea was labeled generation 0 and after each bifurcation, the generation order was increased by 1. All patients with asthma also had fiberoptic endoscopy with biopsy and 2 of the control patients did as well (those with self-limited hemoptysis). Eleven patients (9 with asthma and 2 controls) had bronchial wall specimens from the right middle lobe bronchus obtained in which the thickness of the subepithelial membrane was measured. In 9 of 11 patients, inflammatory cell counts were also obtained using immunohistochemistry. Primary antibodies were used to assess the number of mast cells, T-lymphocytes, etc.

**Results:** Patients with asthma compared with control subjects had a significantly lower LA, WA, and TA and a higher WA/LA and WA/TA ratio from the fourth generation bronchus and downwards. There were correlations between slope and maximal local slope of WA/LA and/or WA/TA ratios and functional data obtained on PFTs reflecting bronchial obstruction ($r=0.46$ to 0.58), thickness of subepithelial membrane ($r=0.67$ to 0.69), subepithelial layer area ($r=0.81$), smooth muscle layer area ($r=0.75$), and inflammatory cell infiltration of the bronchial wall ($r=0.67$ to 0.86).

**Conclusions:** Using multidetector CT and dedicated software that allows orthogonal measurements along the airways, significant changes in bronchial morphology that reflect airflow limitation can be seen in patients with asthma compared with controls.

**Reviewer’s Comments:** The authors have nicely demonstrated morphologic changes in distal bronchi in patients with asthma using CT. It would be interesting to see if there is any reversal in these changes depending upon pharmacologic therapy. (Reviewer-Vineet R. Jain, MD).

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Keywords: Asthma, Bronchial Measurements, Pulmonary Function Tests

Print Tag: Refer to original journal article
Cardiac CT Nicely Demonstrates ASDs for Potential Amplatzer Septal Occluder Closure

Amplatzer Septal Occluder Closure of Atrial Septal Defect: Evaluation of Transthoracic Echocardiography, Cardiac CT, and Transesophageal Echocardiography.

Ko SF, Liang CD, et al:

AJR Am J Roentgenol 2009; 193 (December): 1522-1529

Cardiac CT is comparable to transesophageal echocardiography in assessment of an ASD for closure with an Amplatzer septal occluder.

Objective: To evaluate and compare transthoracic echocardiography (TTE), cardiac CT, and transesophageal echocardiography (TEE) for their ability to depict secundum atrial septal defects (ASDs) for closure with an Amplatzer septal occluder.

Participants: 28 pediatric patients with secundum ASD diagnosed on TTE were considered for closure with a transcatheter Amplatzer septal occluder. All patients were aged at least 2 years, had a weight of at least 10 kg, had a secundum ASD where the long axis was shorter than 40 mm, had a significant left-to-right shunt with a pulmonary-to-systemic blood flow (Qp/Qs) ratio of ≥1.5, and a dilated right atrium and right ventricle.

Methods: TTE and TEE were performed using standard techniques. Cardiac CT was performed with IV contrast and retrospective ECG gating. Measurements of the size of the ASD were made at end-systole, which is the cardiac phase in which it is the largest. Patients were divided into 2 groups: the small ASD group had an ASD <1.5 cm and the large ASD group had an ASD ≥1.5 cm. The 4-chamber view, short-axis view, oblique sagittal view, and coronal views were depicted. The lengths of 4 rims from the circumference of the ASD were measured: anterior superior rim (circumference of ASD to the aortic valve), anterior inferior rim (to the tricuspid valve), posterior superior rim (to the superior vena cava), and posterior inferior rim (to the inferior vena cava). Rim deficiency was when a rim length measured <3 mm.

Results: After the study, 6 patients were excluded for occluder implantation because of incidental congenital heart and lung disorders seen, having an ASD that was not amenable to occluder implantation, and the incidental presence of tumor. The mean age of the studied 22 patients was 4.95 years (range, 2 to 11 years). There were no significant differences between cardiac CT and TEE regarding long-axis and short-axis ASD lengths, lengths of the interatrial septum, and lengths of the 4 rims and ability to detect rim deficiency. On TTE, in patients with a large ASD, the long axis of the ASD was significantly shorter than that seen on cardiac CT and TEE (TTE, 18.50 ± 5.78 mm; cardiac CT, 21.84 ± 5.59 mm; TEE, 21.68 ± 2.94 mm [P =0.012]).

Conclusions: Cardiac CT is comparable to TEE for evaluation of a secundum ASD for closure with an Amplatzer septal occluder.

Reviewer’s Comments: The authors acknowledge that one of the limitations of CT is its radiation dose. They used a low kilovoltage weight-based tube current adjustment and coned down the images over the aortic arch and heart. In this study, the average calculated effective radiation dose was 5.3 mSv (range, 3.5 to 8.0).

(Reviewer-Vineet R. Jain, MD).

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Keywords: Atrial Septal Defect, Cardiac CT, Transesophageal Echocardiography, Transthoracic Echocardiography

Print Tag: Refer to original journal article
Patients with novel swine-origin influenza A (H1N1) virus infection have normal chest x-rays >50% of the time, but those who end up hospitalized and under mechanical ventilation have extensive bilateral airspace opacity.

**Objective:** To review the chest x-ray and CT findings of patients with S-OIV (H1N1) infection.

**Design:** Retrospective study.

**Participants:** Patients admitted to the authors' hospital between May 1, 2009, and July 18, 2009, and had flulike symptoms were evaluated. Patients were positive for influenza A by direct fluorescent antigen-antibody test or viral culture screen. A subset of patients was tested with real-time reverse transcription polymerase chain reaction (RT-PCR) and was confirmed to have S-OIV (H1N1) infection. Those who were not tested with RT-PCR were presumed to also have S-OIV (H1N1) as no other viruses were circulating in the community. All patients evaluated had chest x-rays and/or CTs. A total of 66 patients were studied. A few of the patients' initial chest radiographs were unavailable for review as they were transferred from an outside hospital.

**Methods:** Patients were stratified into 2 groups: group 1 (14 patients, 5 of whom died) required mechanical ventilation as part of their hospital course and group 2 (52 patients) did not. Some group 2 patients were treated as outpatients. Chest x-rays were performed using standard techniques on digital radiography equipment. CTs were performed in 15 patients, 11 of which were performed for evaluation of possible pulmonary embolism (PE). Abnormalities were characterized as consolidation, ground-glass opacity (GGO), nodules, and reticulation. The extent and distribution of abnormalities was characterized. Presence of pleural effusion and adenopathy was also evaluated for. In the subset of patients who had contrast-enhanced CTs, presence of PE was also recorded.

**Results:** Group 1 patients had a higher average age (43.5 vs 22.1 years) than did group 2 patients. The initial imaging test available was abnormal in 28 of 66 (42%) patients. It was abnormal in 100% of group 1 patients and in 14 of 52 (27%) group 2 patients. The most common radiographic finding was patchy consolidation in 14 of 28 (50%) patients. This was most commonly located in the lower and central lung zones. GGO alone or a combination of GGO and consolidation was seen in 7 of 28 (25%) patients. Greater than 3 lung zone involvement was seen in 13 of 14 (93%) of patients in group 1 and in 5 of 52 (9.6%) of patients in group 2. On initial radiographs, 13 of 14 (93%) group 1 patients had abnormal initial radiographs with >20% involvement compared with 0 of 52 (0%) group 2 patients. PE was seen in 5 of 14 (36%) group 1 patients.

**Conclusions:** >50% of patients with S-OIV (H1N1) infection have normal radiographs. Patients who are mechanically ventilated because of infection have extensive bilateral airspace disease. PE is relatively common in this group of mechanically ventilated patients.

**Reviewer's Comments:** One of the weaknesses of this study is that the authors did not always have the initial radiographs of patients who ended up under mechanical ventilation. (Reviewer-Vineet R. Jain, MD).

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Keywords: Swine Flu, CT Findings, Chest X-Ray

Print Tag: Refer to original journal article
Musculoskeletal CT imaging confers relatively higher effective doses when scanning joints closest to the torso, as well as to the spine.

**Background:** Myriad studies have documented the effective radiation dose (ED) conferred by CT of the head, neck, chest, abdomen, and pelvis.

**Objective:** To determine the ED to the spine and appendicular skeleton by CT imaging.

**Design:** Retrospective review of 20 imaging studies of the spine and upper and lower extremities. ED was estimated based on absorbed radiation dose ($H_T$) values and tissue-weighting factors ($W_T$). To ensure the reliability of their data, the authors used their methodology to calculate the ED to the chest, abdomen, and pelvis as well, subsequently weighing them against ED values in the current literature.

**Results:** The following values were ED calculations for musculoskeletal imaging: shoulder (2.06 mSv), elbow (0.14 mSv), wrist/hand (0.03 mSv), hip (3.09 mSv), knee (0.16 mSv), ankle/foot (0.07 mSv), cervical spine (4.36 mSv), thoracic spine (17.99 mSv), and lumbar spine (19.15 mSv). Interestingly, the authors also estimated the number of chest x-ray equivalents based on the anatomic location imaged by CT.

**Conclusions:** CT imaging of the thoracic and lumbar spine conferred the highest ED, equivalent to an estimated 225 and 240 chest x-rays, respectively. ED to the extremities increased as the anatomic location approached the torso (ie, highest ED from shoulder and hip imaging). Using commonly ascribed values of radiation exposure to the public from various sources, a single CT scan of the hip or shoulder is tantamount to the annual exposure from background radiation (approximately 3 mSv). Conversely, CT imaging of joints, such as the wrist or ankle, conferred less radiation than a posteroanterior chest x-ray (0.08 mSv).

**Reviewer's Comments:** Aside from the medical community, the general public is gaining awareness of both the overutilization of medical imaging and its associated risks, namely ionizing radiation. Several studies in the literature put forth the stochastic risk of radiation exposure based on data from atomic bomb survivors and nuclear accidents. Despite the lack of data directly attributing malignant disease to radiation from medical imaging, we as physicians would be foolish to assume otherwise. The authors cite studies claiming "acute exposures between 10 and 50 mSv, or cumulative doses between 50 and 100 mSv, may predispose patients to the development of certain cancers." Regardless of the study's limitations, their estimations of ED to the thoracolumbar spine and proximal joints are astounding. In my opinion, research of this nature serves to add a necessary "transparency" to our profession. In light of current health care reform, I strongly believe it is up to physicians to self-regulate, and perpetually bear in mind the first tenet of the Hippocratic oath – "First, do no harm." (Reviewer-Rahul Pawar, MD).

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Keywords: CT, Effective Dose, Radiation Exposure, Musculoskeletal Imaging

Print Tag: Refer to original journal article
Radiofrequency ablation appears to be a reasonable management approach for soft tissue desmoid tumors.

**Objective:** To determine the relative success of radiofrequency ablation (RFA) for soft tissue desmoid tumors. Typically, desmoid tumors are treated by surgical resection, radiation, anti-inflammatory medications, and/or chemotherapy.

**Design:** Prospective study.

**Participants/Methods:** Over a 6-year period, 7 patients were referred for RFA of soft tissue desmoid tumors. In 3 patients, the lesions of interest were within 1 cm of a nerve, which is a contraindication to treatment since irreversible nerve damage can result. Interventional musculoskeletal radiologists with several years of experience using RFA performed the desmoid tumor ablation. An average of 30-month follow-up was obtained for all 4 patients, the longest term being 6 years. Clinical examination and/or contrast-enhanced MRI was used to document recurrence.

**Results:** 2 patients had 1 ablation each, whereas other individuals required a series of ablations (maximum, 4) for larger lesions. All procedures were performed early in the day to maximize immediate follow-up. One patient had suffered local cellulitis at the ablation site that was easily treated by antibiotics. Another patient developed soft tissue necrosis at the ablation site ultimately requiring surgery with skin grafting. Clinical examination and MRI demonstrated no tumor recurrence over the mean 30-month follow-up.

**Conclusions:** RFA for treatment of desmoid tumors is a viable and practical alternative to surgery, radiation, and/or medical therapy. In experienced hands, functional and esthetic side effects of wide surgical resection can be avoided. Furthermore, recurrence rates appear to be comparatively lower with RFA.

**Reviewer's Comments:** Desmoid tumors, although benign, are aggressive and unpredictable. To date, there is no definitive treatment. RFA is gaining popularity amongst many radiologists with subspecialty training. In the arena of musculoskeletal radiology, its application has been relatively successful in the palliative treatment of painful bone metastasis and osteoid osteomas. Ilaslan and colleagues have contributed to the literature on this subject, since only a single case report from 2007 documents the treatment of a desmoid tumor with RFA. An important limitation of this study was the small sample size. It is difficult to conclude with certainty how safe or effective RFA is for treatment of desmoid tumors. Nevertheless, this study has far reaching implications. Radiology is one of the few specialties with the potential for continual expansion. Minimally invasive techniques, such as RFA, have their own attendant risks and benefits, yet are on the cutting edge. In the case of the unpredictable desmoid tumor, we can enhance patient management by shifting the paradigm of treatment in a more predictable manner. (Reviewer-Rahul Pawar, MD).

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Keywords: Desmoid Tumors, Radiofrequency Ablation

Print Tag: Refer to original journal article
The oblique projection of the wrist enhances diagnostic sensitivity for fracture, in particular, of the carpal bones.

**Background:** While the American literature, including that from the American College of Radiology, support anteroposterior (AP), oblique, and lateral projections of the wrist in trauma evaluation, the English literature does not substantially address the issue.

**Objective:** To determine if the sensitivity of diagnosing wrist fracture is increased by the addition of the oblique projection.

**Design:** Retrospective study.

**Methods:** 4 readers (1 radiologist, 3 advanced practitioners/non-radiologists) individually interpreted 250 wrist examinations comprised of only the AP and lateral views. At some point after 1 month, the readers reinterpreted the same 250 examinations, albeit the second time with inclusion of an oblique view. Five categories of injury were used for classification, including definite fracture, probable fracture, or no fracture. Of note, the readers were not able to reference their previous interpretations, and the order of films was randomly altered. Statistical analysis was generated based on the readers’ performance data.

**Results:** Compared with the initial reading utilizing AP and lateral projections, the total number of fractures identified by the addition of the oblique projection increased by 4.4%. "Negative" interpretations decreased by 1.2%. Fifty-three reports that were initially read as negative were changed to "definite fracture" when the oblique view was added to the series. Of all fractures, 2.8% were demonstrated by only oblique imaging; furthermore, 85.7% of these were scaphoid fractures. Overall, the authors’ results demonstrated strong statistical significance. Interobserver variability decreased when the oblique projection was included.

**Conclusions:** The oblique projection is inherently valuable and boosts diagnostic sensitivity in evaluating wrist trauma.

**Reviewer’s Comments:** Although the authors mention that 1 projection of the wrist is roughly equivalent to 1 day of background radiation, we, as radiologists, are required to evaluate each and every film we obtain—not only in terms of diagnostic adequacy but also with respect to clinical necessity. Compounded over time, radiation exposure can accrue much like interest on a loan, albeit with far more damaging consequences. Jackson and Henderson have addressed an important issue for radiologists worldwide. Interestingly, in the United Kingdom, non-radiologists are sometimes assigned the role of interpretation, a feature of their health system that I believe is of debatable virtue. Nevertheless, the authors demonstrated that the additional oblique projection in the evaluation of the wrist decreased inter-observer variability, as well as increased sensitivity for fracture for all readers. Identifying carpal fractures is even more imperative, since missed or delayed diagnoses can result in untoward sequelae. I advocate the use of AP, lateral, and oblique projections to thoroughly evaluate suspected wrist trauma. (Reviewer-Rahul Pawar, MD).

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Keywords: Wrist, Trauma, Fracture

Print Tag: Refer to original journal article
The addition of subtraction techniques to contrast-enhanced MRI enhances diagnostic sensitivity for sacroiliitis, especially for early disease.

**Background:** Using MRI with contrast is a well-documented means of identifying sacroiliitis. Objective: To determine the efficacy of adding subtraction techniques to MRI evaluation of the sacroiliac (SI) joints. Design: Prospective study. Participants/Methods: A total of 58 patients underwent contrast-enhanced MRI of the SI joints (50 symptomatic patients, 8 asymptomatic [control] patients). Sequences obtained included T1WI with and without fat-saturation, short-tau inversion recovery (STIR), 3D-FLASH with fat-saturation, and post-contrast T1WI with fat-saturation. The "subtraction" method entailed subtracting the fat-saturated post-contrast T1WI from the fat-saturated pre-contrast T1WI. Symptomatic patients included in the study complained of low back pain with radiographic and clinical evidence of spondyloarthropathy. Radiologists interpreting the MRIs were blinded to the histories and radiographic findings. Positive findings were identified on the basis of enhancement of the cartilage and/or subchondral bone marrow at the SI joints. Results: Using the subtraction technique, 20 of 27 patients were diagnosed with active sacroiliitis with either no or minimal enhancement of the SI joints; 20 of 23 patients were diagnosed with having moderate or prominent enhancement of the SI joints. All control patients were interpreted as having negative results by MRI. The contrast-enhanced subtraction technique identified more patients with sacroiliitis than did standard post-contrast T1WI with fat-saturated and STIR sequences. Conclusion: Algin and colleagues have demonstrated a statistically significant increase in sensitivity for diagnosing sacroiliitis using subtraction techniques with contrast-enhanced MRI of the SI joints. Reviewer’s Comments: There are myriad etiologies for sacroiliitis including, but not limited to, inflammatory bowel disease, ankylosing spondylitis, septic arthritis, psoriasis, and reactive arthritis. As with many musculoskeletal abnormalities, plain film findings may be diagnostic, yet are often manifest only after the disease has progressed substantially. MRI is more sensitive than plain film and CT evaluation of suspected sacroiliitis. Nevertheless, the authors have demonstrated that going above and beyond the standard protocol for evaluation of sacroiliitis with subtraction techniques is indeed worthwhile. Perhaps it may require additional post-processing on our behalf; however, going the extra mile in this case may benefit the patient--another instance in which radiologists can discernibly improve patient care. (Reviewer-Rahul Pawar, MD).
Image-guided drainage of pericardial effusions is safe, with the most common complication being non–life-threatening arrhythmia secondary to indwelling drains.

**Background:** Pericardial effusions in patients with malignant disease are common and may occur in up to 21% of cancer patients. Cancer patients with pericardial effusions have a decrease in survival and poor prognosis. The etiology of these effusions, whether malignant or not, will affect the patient’s treatment.

**Objective:** To report the authors’ experience with image-guided drainage of pericardial effusions in their cancer center.

**Participants/Methods:** 40 oncology patients had 43 pericardial procedures. Of these patients, 33 had drains placed, and the remainder had pericardiocentesis. In half of these patients, the effusion was not accessible from the subxyphoid approach. Three patients had pericardiocentesis on an outpatient basis.

**Results:** Technical success was achieved in all patients; 75% of patients who had symptom palliation, mainly shortness of breath, experienced complete resolution, 11% had improvement, and the remaining 14% had no change. Three patients required a second intervention. Sixty percent of patients had cardiac tamponade. CT was used 77% of patients. Real-time imaging (ultrasound or CT fluoroscopy) was used in 35% of cases. Pericardiocentesis drained 237 mL of fluid. Catheter dwelling time was an average of 3.6 days, and 953 mL was drained. Samples were analyzed in 74%, and a diagnosis was made in 84%. In 33%, the etiology was malignant effusion. There were no technical or procedure-related complications. Delayed events occurred in 26% of patients, primarily new or worsening arrhythmia. Four of 5 patients had pericardial drain placement.

**Conclusions:** There was no statistical difference in survival between pericardiocentesis and pericardial drain placement or malignant versus non-malignant effusion.

**Reviewer’s Comments:** There is a controversy as to whether pericardial effusions should be drained in the absence of cardiac tamponade. In patients with cancer, doctors are more aggressive. Pericardiocentesis in cancer patients provides important diagnostic information that influences clinical decision making and relieves symptoms. Shortness of breath was the chief complaint in 90% of patients, and 86.1% of patients experienced complete or partial resolution of their symptoms. The pathology was consistent with the literature, showing that two thirds of these effusions were not malignant. In 79% of these cases, the pericardial effusion was not easy to access by a cardiologist. Interventional radiology has a technical advantage and expertise in real-time image-guided procedures. The complication rate was 25.6%, with most cases consisting of non–life-threatening arrhythmias that produced no symptoms. The drainage catheter was present in 36% of patients who had delayed arrhythmias. This study demonstrates that the post-procedure pneumomediastinum or pneumothorax seen in 43% of patients is clinically insignificant. Image-guided pericardiocentesis is safe and feasible when performed by interventional radiologists. The authors recommend post-procedure monitoring on telemetry and prompt removal of any pericardial drains to avoid post-procedure arrhythmias. (Reviewer-Sharon Gonzales, MD).

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**Keywords:** Pericardial Effusions, Drain Placement, Image-Guided Pericardiocentesis, Cardiac Cancer Complications

**Print Tag:** Refer to original journal article
Percutaneous removal of biliary calculi can have a success rate of 93% and is the first choice in patients with a biliary enteric anastomosis.

**Background:** Biliary stones can be due to a variety of conditions that cause stasis of the bile and formation of stones above the strictures. Strictures can be caused by primary or secondary cholangitis, idiopathic reasons, or impaired drainage secondary to benign or malignant causes.

**Objective:** The authors present a review of the literature of the current practice of percutaneous removal of biliary calculi. **Discussion:** If endoscopic retrograde cholangiopancreatography (ERCP) is unsuccessful or not feasible, the transhepatic approach is indicated. Percutaneous treatment should be the first choice in cases of impacted intrahepatic stones, after a biliary-enteric anastomosis, and in stones above malignant strictures. The first approach is percutaneous transhepatic cholangiography (PTC), which has a technical success rate of up to 98% in dilated systems and 70% in non-dilated systems. Contraindications include extensive ascites, coagulopathy that is uncorrected, polycystic liver disease, extensive malignant involvement of the liver, and the presence of bowel in the way of accessing the liver. Once the PTC has been performed via the right or left lobes as necessary to access the stone, up to 12 weeks must pass in order to develop a biliary cutaneous fistula. If a T-tube is present, this tract can be used. Also, a surgically tacked-up loop of small bowel against the anterior abdominal wall can be used to access to the biliary tree. Stones can also be extracted via a tract formed by percutaneous cholecystostomy. Prior to removal of the stones, balloon angioplasty of any biliary strictures should be performed; high-pressure balloons or cutting balloons can be used if needed. This must be followed by long-term, large-bore 12 to 16 French size catheter internal drainage. The stones can be pushed by simple occlusion or extraction balloons or by retrieval baskets.

**Conclusions:** Device-assisted lithotripsy can be performed through a small endoscope using a YAG laser or a wire for electrohydraulic lithotripsy. If the stones are very hard, extracorporeal lithotripsy can be attempted.

**Reviewer’s Comments:** The authors found that percutaneous removal of biliary stones is effective and safe, particularly when performed in conjunction with an experienced endoscopic department. The technical success rate for percutaneous lithotripsy can reach 90% initially and 93% after the second try. For stones above an anastomotic stricture, the initial success rate nears 100%. At 3 years, the success rate after balloon dilation of strictures is lower, from 42% after sclerotic cholangitis to 76% after iatrogenic injuries. The complication rate is about 10%, with a mortality rate of <2%. Mild to moderate complications include persistent pain, obstructed catheters, migration or displacement of catheters, and cholangitis. More serious complications are hematoma, hemorrhage, arterial injury, biliary leak, peritonitis, bacteremia, abscess, injury of the lung or diaphragm, and/or pneumothorax. Most of these conditions can be managed percutaneously. (Reviewer-Sharon Gonzales, MD).
Sequelae of Embolization of Renal Angiomyolipomas

Embolization of Renal Angiomyolipomas: Short-Term and Long-Term Outcomes, Complications, and Tumor Shrinkage.


Cardiovasc Intervent Radiol 2009; 32 (November): 1171-1178

TAE is a safe treatment for angiomyolipomas that saves renal function and controls bleeding and symptoms, even if incomplete.

**Background:** Renal angiomyolipoma is a common benign tumor that is associated with tuberous sclerosis complex. Transcatheter arterial embolization (TAE) is used selectively for the treatment of acute hemorrhage, for preoperative embolization, or for prophylactic embolization.

**Objective:** These researchers report a retrospective study on the clinical outcomes of angiomyolipomas after TAE.

**Design/Methods:** Retrospective review of records of 11 patients undergoing TAE for angiomyolipomas. Embolization was performed to spare as much normal kidney parenchyma as possible. Gelfoam was used with or without coils. Alcohol was also used in one patient. Complete embolization involved total obliteration of all vessels feeding the tumor. Incomplete embolization was defined as anything less.

**Results:** 11 patients received 13 TAE treatments for 11 tumors. Nine patients were symptomatic with flank pain, but only 5 had hemorrhage. Seventy-two percent of patients had complete embolization. In 64%, Gelfoam alone was used; in 27%, Gelfoam plus micro coils were used; and in 1 patient, absolute alcohol was used. Sixty-three percent of patients had post-embolization syndrome. One patient (9.1%) had a major complication (abscess formation). The mean size of the angiomyolipomas before embolization was 8.57 cm. All tumors except one were reduced in size. One patient eventually had a nephrectomy. The mean size reduction was 3.1 cm on short-term follow-up and 3.8 cm on long-term follow-up. Two patients with incomplete embolization of their tumors had a relapse of pain. One patient had 3 embolizations to treat flank pain. No patient had tumor bleeding or a rupture during follow-up. Statistically, there was a significant difference decrease in the size of the angiomyolipomas on short- and long-term follow-up. Tumors did not shrink significantly between short- and long-term follow-up. There was no significant difference in shrinkage between patients who were and were not completely embolized.

**Reviewer's Comments:** Historically, radical nephrectomy was the treatment of choice for kidney angiomyolipomas. By 1986, TAE was used to treat these patients. Now, recommendations are that tumors >4 cm with severe symptoms and >8 cm that are asymptomatic should be treated. Angiomyolipomas have a very low bleeding rate (3%) and a required intervention rate of 6.6% in patients with tuberous sclerosis complex. TAE is safe and effective and preserves renal function, with a success rate of 73% for the treatment of bleeding and symptoms. Surgery is reserved for TAE failure or suspected malignancy. Most investigators use absolute alcohol for the embolization, but in this study, Gelfoam powder was used because of cost reasons. The one complication in this study was infection secondary to no antibiotic prophylaxis, so prophylaxis is now routine prior to embolization. The 18% tumor relapse rate is less than has been previously reported. These findings suggest that short-term results are suggestive of long-term outcome. Tumors with substantial size reduction at short-term follow-up are not likely to relapse at long-term follow-up. (Reviewer-Sharon Gonzales, MD).

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Keywords: Angiomyolipoma, Tuberous Sclerosis Complex, Transcatheter Arterial Embolization, Gelfoam, Alcohol Embolization

Print Tag: Refer to original journal article
Radionuclide brain death studies improved greatly after the introduction of brain scanning radiopharmaceuticals that were designed to cross the blood-brain barrier.

In 1968, an ad hoc committee at the Harvard Medical School produced the first set of criteria for determination of brain death, which they called "irreversible coma." Forty years later, the general concept of brain death has achieved widespread acceptance. There are 3 major elements to the determination of brain death: deep coma, absence of all brainstem reflexes, and apnea. In the United States, irreversible dysfunction of the brain and brainstem are required for a diagnosis of brain death. Diagnosis of brain death can be solely clinical. Confirmatory examinations play an important role in augmenting the physical examination in special situations when some of its specific components cannot be performed or reliably evaluated. Factors to be considered in evaluating confirmatory tests include sensitivity and specificity of the examination, availability at the bedside and during evening and weekend hours, operator variability, and any effect of the examinations on the patient's organs if they are subsequently needed for transplantation. Confirmatory examinations include tests of electrical function, such as EEG, somatic evoked potentials, and brainstem auditory evoked potentials. Tests of blood flow include 4-vessel angiography, which is one of the standards of determining brain death. Limitations include the need to bring the patient, with all attendant equipment and personnel, to the radiology department and the effect of contrast load on the kidneys. CT and MR angiography can also be performed. The former entails a contrast load, and both tests require bringing the patient to the radiology department. Doppler ultrasound (both transcranial and extracranial) can be performed at the bedside. These require a fair amount of operator expertise and have a <100% success rate in identifying the blood vessels of interest. The 2 main radionuclidic techniques used in the evaluation of brain death are radionuclide angiography with non-lipophilic radiopharmaceuticals and parenchymal imaging with lipophilic agents. The initial method of performing blood flow examinations used radiopharmaceuticals that did not cross the blood-brain barrier. The examinations, therefore, consisted primarily of the bolus phase. Radionuclide brain death studies improved greatly after the introduction of brain scanning radiopharmaceuticals that were designed to cross the blood-brain barrier. These offered greater certitude in making the diagnosis of brain death. Here, the emphasis is not on the 2-second flow images but rather on the static images that are performed thereafter. If any activity is seen within the skull, there is, by definition, blood flow. Specific technical guidelines for the determination of brain death have been promulgated by professional medical societies.

Reviewer's Comments: This topic is of great importance to the practice of medicine and has also garnered considerable attention in the lay press. (Reviewer-).

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Keywords: Brain Death, Tc-Hexamethylpropyleneamine

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Fallacies Can Lead to Recurrent Self-Deception

Fallacies. Part 2.
Stephen R. Baker, MD

Fallacies in the field of radiology are as common as in any other discipline.

Fallacies are not only errors in logical analysis at one point in time, but they also instruct a paradigm of thought that leads to recurrent self-deception. In radiology, they are as rife as in any other discipline. In this report, I will present 3 prominent fallacies that inform discussion about diagnostic imaging and its organization as a consultative specialty. They are the "exalted human" notion, the spurious equivalence of unfair and unfortunate, and the false dichotomy argument. In each, the opportunities for mistakes and mischief abound, and, like a tenacious infection, they are hard to dislodge once having entry to one's corpus of opinions.
(Reviewer-).

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Keywords: Reasoning Fallacies, Medicine

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