Chemical shift imaging is comparable to T2*-weighted imaging for detecting significant hepatic iron deposition, although concomitant steatosis decreases the performance of both sequences.

**Objective:** To determine if chemical shift imaging is comparable to single-echo T2*-weighted imaging in the quantification of hepatic iron, and if coexisting steatosis affects its performance.

**Design:** Retrospective analysis.

**Participants/Methods:** This study was comprised of 63 patients (50 men and 13 women) who had undergone MRI of the liver and concomitant histopathologic analysis within 90 days of the MRI. Histopathologic results were provided by explant analysis, core biopsy, or segmentectomy. Clinical histories included chronic hepatitis B or C, alcohol abuse, cryptogenic cirrhosis, autoimmune hepatitis, primary sclerosing cholangitis, primary hemochromatosis, abnormal liver function tests, obstructive jaundice, end-stage renal failure, and sarcoidosis. MRI examinations were performed on 1.5T systems. Routine liver protocol sequences included T2 HASTE, T2-weighted fat-suppressed 2D chemical shift, and fat-suppressed 3D T1-weighted imaging before and during dynamic contrast administration. Of the 63 patients, 49 also had a 2D single-echo T2*-weighted sequence. Images were reviewed by 2 observers. Regions of interest were drawn to measure hepatic signal intensity, avoiding any focal lesions and vessels. Paraspinal muscle signal intensity was used as an internal reference while avoiding any areas of macroscopic fat and signal loss on out-of-phase images. The spleen was not used due to possible iron deposition. An iron index was calculated for the chemical shift sequence and for the T2*-weighted sequence. Two histopathologists quantified the degree of iron deposition and hepatic steatosis. Iron deposition was graded as follows: grade 0, iron granules absent or barely visible at 400x magnification; grade 1, granules barely visible at 250x magnification; grade 2, granules resolved at 100x magnification; grade 3, granules visible at 25x magnification; and grade 4, granules visible at 10x magnification or to the naked eye.

**Results:** 47 of 63 patients had hepatic iron deposition. Cirrhosis was more prevalent among patients with a histopathologic iron deposition grade of 2 or greater. No significant correlation was found between iron grade and degree of inflammation or stage of fibrosis in patients with chronic viral hepatitis. With increasing iron deposition, there was an increase in the chemical shift iron index and a decrease in the T2* iron index. The accuracy of both chemical shift and T2* sequences in detecting hepatic iron deposition was decreased in the presence of steatosis.

**Reviewer's Comments:** The results of this study demonstrate that both chemical shift imaging and single-echo T2*-weighted imaging are comparable in the detection of significant hepatic iron deposition. However, one must keep in mind that the concomitant presence of steatosis decreases the accuracy of both sequences. One of the limitations reported in this study was that the use of core biopsy in some patients can lead to potential sampling error and, consequently, an imperfect reference standard. (Reviewer-John C. Sabatino, MD).

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Keywords: Liver, Iron Deposition

Print Tag: Refer to original journal article
The ADC values of diffusion-weighted imaging of deep infiltrating endometriosis are consistently low regardless of pelvic location.

**Objective:** To determine if diffusion-weighted imaging (DWI) is useful in the detection of deep infiltrating endometriosis.

**Design:** Prospective analysis.

**Participants/Methods:** This study was comprised of 56 patients with known or suspected endometriosis. MRI of the pelvis was performed using a 1.5T system. Imaging sequences included turbo spin echo T2-weighted, fat-suppressed T1-weighted, and DWI with b-values of 50, 400, 800, and 1200 s/mm². The images were reviewed by 2 readers. Endometriotic cysts were diagnosed as follows: homogeneous T1 hyperintensity and T2 hypointensity or cysts with fluid-fluid levels or "hematocrit effect." Deep infiltrating endometriosis consisted of signal changes and involvement of the retroperitoneum or adjacent organs. Regions of interest were drawn for quantification of signal intensity of the lesions as well as of the internal controls of muscle, functional ovarian cysts, and urine. Apparent diffusion coefficient (ADC) values of the endometriotic cysts and internal controls were calculated from the DWI results.

**Results:** There were 62 endometriotic cysts and 48 cases of deep infiltrating endometriosis. Locations of deep infiltrating endometriosis included retrocervical, bladder detrusor wall, colon wall, and rectovaginal septum. Functional ovarian cysts were found in 46 patients. Mean ADC values of retrocervical, bladder detrusor wall, and colon wall endometriosis ranged between 0.70 x 10⁻³ mm/s² and 0.79 x 10⁻³ mm/s². The mean ADC value of endometriotic cysts was 1.11 x 10⁻³ mm/s², and that of functional ovarian cysts was 2.14 x 10⁻³ mm/s². ADC values of deep infiltrating endometriosis were lower than those of endometriotic cysts.

**Reviewer's Comments:** The results of this study are useful in that they illustrate the potential added benefit of including DWI in the evaluation of deep infiltrating endometriosis. ADC values of deep infiltrating endometriosis were lower than those of endometriotic cysts, which were, in turn, lower than those of functional ovarian cysts. A limitation reported in this study was that pathologic correlation was not obtained in all cases. (Reviewer-John C. Sabatino, MD).

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Keywords: Endometriosis, MRI

Print Tag: Refer to original journal article
Objective: To determine if an angular interface with the renal parenchyma can distinguish benign from malignant exophytic renal lesions.

Design: Retrospective analysis.

Methods: This study was comprised of 152 patients (103 men, 49 women), with a total of 162 exophytic renal masses measuring ≥2 cm. Images degraded by motion or susceptibility artifacts were not included. MRI examinations were performed with 1.5T systems. Imaging sequences included single-shot fast-spin echo T2-weighted and dual-echo T1-weighted in- and opposed-phase and 3D spoiled gradient echo fat-suppressed images before and during dynamic contrast enhancement. The single-shot fast-spin echo T2-weighted images were reviewed by 2 radiologists. This sequence allowed a clear demarcation between the mass and the native renal parenchyma. It was also able to distinguish between simple cyst fluid and solid or hemorrhagic tissue. However, the sequence was not able to distinguish between hemorrhage and neoplasm. The authors recorded the number of exophytic masses ≥2 cm, lesion diameter, and the presence or absence of an angular interface with the renal parenchyma. Histopathology results after partial or total nephrectomy served as a reference standard for renal cell carcinomas and benign non-fatty solid masses. MRI follow-up was used to confirm the remaining masses as benign, which were stable for at least 18 months and without suspicious findings on contrast-enhanced images.

Results: There were 65 benign masses and 97 renal cell carcinomas, with mean diameters of 3.5 cm and 3.3 cm, respectively; 79% of benign complex exophytic masses and 76% of angiomyolipomas had an angular interface. No exophytic renal cell carcinoma had an angular interface with the remainder of the kidney. The sensitivity and specificity of an angular interface in diagnosing a benign renal mass were 78% and 100%, respectively.

Conclusions: “The presence of an angular interface with the renal parenchyma at single-shot fast SE T2-weighted MRI is a strong predictor of benignity in an exophytic renal mass ≥2 cm.”

Reviewer’s Comments: The results of this study are useful in demonstrating the higher likelihood of a renal mass being benign when it is ≥2 cm in size and has an angular, as opposed to round, interface with the renal parenchyma. One of the limitations reported was that approximately one-fifth of the studies were excluded on the basis of inferior image quality. (Reviewer-John C. Sabatino, MD).

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Keywords: Kidney, Masses, MRI

Print Tag: Refer to original journal article
Irregular pericardial thickening, especially with mediastinal lymphadenopathy on CT, has the potential to be a reliably specific finding for malignant pericardial effusion, but pericardial fluid or tissue analysis is still necessary.

**Objective:** To evaluate whether the presence and type of pericardial thickening as well as any other findings on CT can differentiate benign from malignant pericardial disease.

**Design:** Retrospective review.

**Participants:** 74 patients who had a pericardial effusion.

**Methods:** Every patient had pericardial effusion diagnosed by echocardiography, underwent cytologic examination of the pericardial fluid or pericardial biopsy, and underwent CT <30 days after these procedures. No patients had a large pericardial mass. All CTs were performed with IV contrast, and the presence of pericardial thickness was ascertained, which was defined as pericardial thickening >3 mm anywhere using electronic calipers on a PACS monitor. Irregular pericardial thickening was defined as nodular pericardial thickening. Smooth pericardial thickening, either localized or generalized, was defined as pericardial thickening without any discrete nodularity.

**Results:** 42 of the 74 patients had malignant disease. This included 23 patients with lung cancer and the rest with other malignancies. Twenty-eight cases of malignant pericardial effusion and 46 cases of benign pericardial effusion were present. The benign pericardial effusions were due to tuberculosis in 9 cases and other or unknown causes in the remainder. In those with malignant disease but benign pericardial effusion, the pericardial effusion did not recur with >1 year of follow-up. Mean pericardial thickening was larger in association with malignant pericardial disease (7.25 ± 2.91 mm) than with benign pericardial disease (4.11 ± 1.39 mm; *P* <0.05). There was no pericardial thickening in 15 cases of malignant pericardial effusion and in 35 cases of benign pericardial effusion. The 13 cases of malignant pericardial thickening included 10 cases that were irregularly thickened and 3 cases that were smoothly thickened. Using a criterion of >3 mm for pericardial thickening, the sensitivity and specificity of pericardial thickening for malignant pericardial effusion was 46.4% and 76.1%, respectively. Using a criterion of >4 mm for pericardial thickening, the sensitivity and specificity of pericardial thickening for malignant pericardial effusion was 42.9% and 91.3%, respectively. The sensitivity and specificity of abnormal mediastinal lymphadenopathy for malignant pericardial effusion was 60.7% and 93.5%, respectively.

**Conclusions:** CT findings of irregular pericardial thickening and mediastinal lymphadenopathy have the potential to be a reliably specific finding suggesting a malignant pericardial effusion, but pericardial fluid or tissue analysis is still useful.

**Reviewer's Comments:** One interesting finding was that, of the 11 cases of benign pericardial thickening in this study, 7 occurred in patients with tuberculous pericardial effusion. In areas where tuberculosis is not as common, pericardial thickening may have greater sensitivity and specificity for malignant pericardial effusion. (Reviewer-Vineet R. Jain, MD).

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Keywords: Pericardial Effusion, CT

Print Tag: Refer to original journal article
Whole-body linear slit digital radiography works as well as conventional CXR in evaluation for rib fracture, pneumothorax, and lung contusion as an initial imaging modality in trauma patients.

**Background:** New digital radiography (DR) units can image the whole body, and the total radiation dose is significantly less than that required for radiographs to cover the same area.

**Objective:** To compare low-dose linear slit DR with conventional chest radiography (CXR) in the evaluation of chest trauma using CT as a gold standard.

**Design:** Retrospective.

**Participants:** Trauma patients who were either in a motor vehicle crash or other high-energy crash or who had fallen from a height were included.

**Methods:** The study group included 80 patients with rib fractures seen on CT, and the control group included 80 patients who did not have rib fractures on CT. All patients had undergone linear slit DR and CT scanning the same day. Eighty-seven of these total patients also underwent conventional CXR within 24 hours. The whole-body DR images were obtained in the anteroposterior direction. CTs were performed with IV contrast, and conventional CXR was performed in supine positioning. The CTs were analyzed for the number of rib fractures, their degree of displacement, the presence of pneumothorax, and/or the presence of lung contusion. These same findings in a blinded fashion were evaluated for on the linear slit DR and CXRs, with the confidence level of the finding also noted by the reader; the readers were 4 radiology residents who worked independently.

**Results:** In the study group, 612 rib fractures were present. Comparing linear slit DR with CXR, the rate of correctly identified fractures of the ribs was higher (true-positive findings per image, 2.55 vs 2.21; \( P = 0.02 \)), the rate of missing rib fractures was lower (false-negative findings per image, 4.98 vs 6.19; \( P = 0.02 \)), and the diagnostic confidence was higher (2.03 vs 1.73 using a 3-point scale; \( P = 0.01 \)). On a per-patient level, the differences between the techniques did not reach statistical significance. In linear slit DR, the rate of patients with at least 1 missed rib fracture was 16.3%, while in conventional CXR, it was 22.2%. The average sensitivity and specificity for detecting pneumothorax with linear slit DR was 19.8% and 93.1%, respectively, and with CXR, the sensitivity and specificity was 20.0% and 85.3%, respectively. This difference was not statistically significant. The average sensitivity and specificity for detecting lung contusion with linear slit DR was 14.5% and 89.6%, respectively, while with CXR, it was 29.3% and 76.0%, respectively. This difference was also not statistically significant.

**Conclusions:** Whole-body linear slit DR can substitute for conventional CXR in the initial radiologic evaluation of patients with chest trauma.

**Reviewer's Comments:** The authors have very nicely demonstrated that linear slit DR did not miss any significant findings compared with conventional CXR in the acute trauma setting. They also nicely demonstrated that pneumothoraces and lung contusions are often missed with both techniques. (Reviewer-Vineet R. Jain, MD.)
CT May Identify Active TB Cases Missed by CXR

The Role of Chest CT Scanning in TB Outbreak Investigation.

Lee SW, Jang YS, et al:

Chest 2010; 137 (May): 1057-1064

CT scanning can be helpful during an outbreak of TB as it can detect findings suggesting active disease that are missed on CXR.

Objective: To investigate the role of CT in differentiating active tuberculosis (TB) from latent TB infection (LTBI) during an outbreak of tuberculosis.

Participants: Members of the South Korean army who were potentially exposed to TB were investigated and followed-up. Four members of the battery were diagnosed with TB, and subsequently the other 88 members of the battery were tested.

Methods: In addition to history, a chest radiograph (CXR), tuberculin skin test (TST), QuantiFERON TB Gold In-Tube assay (QFT), as well as acid-fast smear and mycobacterial culture of sputum were performed. If either the chest radiograph, TST, or QFT was abnormal, a CT scan was performed. Active TB was considered present if sputum specimens were positive for acid-fast staining or TB was cultured or if the patient clinically met clinical criteria for active TB. For these clinical cases, radiographic signs of active TB (cavitation, branching linear opacities, and/or multiple noncalcified pulmonary nodules) had to be present on the CT. Patients with active TB were treated with 4-drug therapy (isoniazid, rifampicin, pyrazinamide, and ethambutol) for 6 months, with pyrazinamide for 2 months. LTBI was considered present if the TST and QFT were positive, but no active lesions were seen on CT. LTBI was treated with isoniazid and rifampicin for 3 months.

Results: 87 participants completed the study, and none had HIV. Among the 18 participants diagnosed with active TB, 9 had a normal CXR, but did have pulmonary parenchymal lesions suggestive of active TB on CT. Seven of these 9 patients had respiratory symptoms such as cough and sputum production, and 3 had positive sputum culture of TB. Of the 18 patients diagnosed with active TB, all received the 4-drug therapy. In those who were culture positive, negative culture conversion was achieved. In those who had positive CT findings, radiographic improvement was achieved. Twenty-five patients were diagnosed with LTBI, and 22 of these received 3 months of treatment with isoniazid and rifampicin (3 refused treatment). In these 22 patients, the development of active TB was not seen for a median follow-up of 319 days.

Conclusions: CT scanning can be helpful during an outbreak of TB. In this study, because of the inclusion of CT scanning, 9 additional patients were treated as having active TB even though their CXR did not demonstrate abnormalities.

Reviewer's Comments: The authors prudently point out that if one were to consider implementing a strategy of diagnosing TB during an outbreak that incorporated CT scanning, the risk/benefit ratio would have to be carefully analyzed as the additional radiation burden from CT (particularly in a young population) needs to be accounted for. (Reviewer-Vineet R. Jain, MD).

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Keywords: Active Tuberculosis, Latent Tuberculosis Infection, Imaging

Print Tag: Refer to original journal article
CT Angiography Aids Evaluation of Active GI Hemorrhage

Detection of Active Gastrointestinal Hemorrhage With CT Angiography: A 4½-Year Retrospective Review.

Kennedy DW, Laing CJ, et al:

J Vasc Interv Radiol 2010; 21 (June): 848-855

Mesenteric CT angiography can detect GI hemorrhage at lower rates than mesenteric angiography while giving more information than RBC scanning. A negative CT angiogram will most likely be associated with negative bleeding scans and angiograms.

Background: Acute gastrointestinal (GI) bleeding remains a common cause of hospitalization, morbidity, and mortality. Animal studies have shown that CT angiography can detect rates of bleeding below the threshold of first-order mesenteric angiography.

Objective: To determine the success of CT angiography in detecting and localizing bleeding in patients with active GI hemorrhage referred for interventional radiology.

Design: Retrospective review.

Participants/Methods: In 74 patients, 86 CT angiography studies were performed to evaluate acute GI hemorrhage. The records were evaluated for documentation of subsequent procedures to further evaluate or treat the GI hemorrhage. A positive diagnosis of GI bleeding was made when contrast was seen within the bowel lumen when the contrast scan was compared to the pre-scan. Patients with positive CT angiography underwent selective angiography and coil embolization if appropriate. Patients who were negative on CT angiography underwent complete mesenteric angiography or other studies when appropriate.

Results: 15 patients had upper GI bleeding, and 59 patients had lower GI bleeding. Of the 86 CT angiograms performed on these 74 patients, 25 were followed by mesenteric angiography within 24 hours. CT angiography showed active hemorrhage in 19 of 86 studies. In 86% of positive scans, the hemorrhage was confirmed on angiography or at surgery or autopsy. Three patients who were positive on CT angiography went directly to surgery; therefore, in 92% of the cases with negative CT angiography, no further intervention was needed, and patients were discharged without incidence. Three patients required endoscopy for angiodysplasia and arteriovenous malformations not seen on angiography. In no case of a negative CT angiography was the angiogram positive. The sensitivity of CT angiography was 79%, specificity was 95%, accuracy was 91%, positive predictive value was 86%, and negative predictive value was 92%.

Conclusions: According to the authors, “CT angiography provides valuable information that can be used to determine the appropriateness of catheter angiography and guide mesenteric catheterization if a bleeding source is localized.”

Reviewer’s Comments: CT angiography to evaluate acute GI hemorrhage has advantages over RBC scanning and angiography. CT angiography is available rapidly at all times and provides good mapping of the vasculature; if positive, it allows for directed therapy at angiography. Mesenteric CT angiography gives more information about the pathology, thus providing definitive therapy earlier. In this series, when CT angiography was negative, there were no adverse events associated with deferring angiography and avoiding unnecessary invasive tests. In several cases, first-order mesenteric angiography failed to show the hemorrhage seen on CT angiography, which was only revealed by sub-selective angiography. This calls into question the status of angiography being the gold standard for GI hemorrhage. The fact that 92% the patients with a negative CT angiogram needed no further intervention even if other tests were done (angiography, endoscopy) shows that the results are pertinent for patient management. Angiodysplasia and hemangiomas seem to be lesions that are difficult to detect by CT angiography. (Reviewer-Sharon Gonzales, MD).

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Keywords: Mesenteric Angiography, CT Angiography, GI Hemorrhage

Print Tag: Refer to original journal article
Embolization Before Cryoablation May Reduce Postprocedural Hemorrhage

Role of Intraarterial Embolization Before Cryoablation of Large Renal Tumors: A Pilot Study.

Woodrum DA, Atwell TD, et al:

J Vasc Interv Radiol 2010; 21 (June): 930-936

Embolization of renal tumors followed by cryoablation may decrease the risk of hemorrhage in the treatment of large renal tumors.

Background: Renal tumors have been treated with nephron-sparing percutaneous procedures such as radiofrequency (RF) ablation and cryoablation for patients who are not surgical candidates. Tumors >4 to 5 cm tend to have lower rates of success with additional RF ablation sessions and higher complication rates. One particular complication that occurs with greater frequency in these larger tumors is hemorrhage because of the vascularity and the increased number of probes used.

Objective/Design: To examine, retrospectively, whether pre-RF ablation arterial embolization would decrease postprocedural hemorrhage.

Methods: 129 tumors treated with cryoablation in the authors' institution were retrospectively reviewed. Of these, 10 patients had indeterminate renal tumors >5 cm. Four of the 10 patients had been treated with selective intraarterial tumor embolization prior to the cryoablation procedure. In the majority of these patients, the diagnosis was renal cell carcinoma (RCC), oncocytic tumors, or oncocytoma. Embolizations were performed using spherical particles subselectively. Cryoablation followed the next day and was performed under CT and US guidance. Biopsies were performed before the ablation. All tumors were treated with a freeze-thaw-freeze cycle. The patients were followed-up with CT or MRI at 3, 6, 12, 18, 24, and 36 months postprocedure as possible.

Results: 6 of the 10 patients underwent cryoablation alone and had a postprocedural hematoma 67 to 1276 cc in size. One patient (with the largest hematoma) became symptomatic and required transfusion and had an increase in creatinine and troponin levels. Of the 4 patients who underwent embolization then cryoablation, the postcryoablation hematoma ranged from 3 to 57 cc in size. All patients from both groups had no recurrence of tumor on follow-up imaging.

Conclusions: According to the authors, this study “supports the finding that percutaneous cryoablation of very large renal masses measuring at least 5 cm is technically feasible, relatively safe, and appears to be effective local tumor control at short-term follow-up.”

Reviewer's Comments: In the literature, RF ablation for renal tumors has been shown to be 100% successful in tumors <3 cm, 92% successful in tumors 3 to 5 cm, but only 25% successful in tumors ≥5 cm. With cryoablation, there is even less evidence-based literature on success rates in controlling renal tumors. Cryoablation has several advantages over RF ablation. There is good intraprocedural monitoring with cryoablation because the ice ball can be followed closely with CT and MRI. Margins of treatment are difficult to see during RF ablation procedures. There are a few series about RF ablation of RCC after arterial embolization that showed feasibility and safety. The advantage of pretreatment arterial embolization is the decrease in the risk of significant hemorrhage. Even though there was more hemorrhage seen in the group that was not embolized, only 1 patient developed severe enough bleeding to need transfusion. This study suggests that embolization prior to cryoablation of large renal tumors may reduce postprocedural hemorrhage, and that cryoablation of large (≥5 cm) renal tumors is safe and effective. (Reviewer-Sharon Gonzales, MD).

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Keywords: Cryoablation, Radiofrequency Ablation, Postablation Complications

Print Tag: Refer to original journal article
The fiducials placed for CyberKnife radiosurgery can migrate, particularly in the lung.

**Background:** Stereotactic radiosurgery is the delivery of a high dose of radiation to a small target area while keeping the radiation dose low in the surrounding tissue. The CyberKnife system uses bony landmarks in the skull and upper spine and implanted markers called fiducials in other locations to focus the high-dose radiation to certain spots. In parts of the body where the target is moving (abdominal or chest region), there is a stereotactic system that tracks the target in real time adjusting the beams in real time.

**Objective:** These authors describe their experience with CT-guided placement of these gold fiducials.

**Methods:** 105 patients presented for CyberKnife treatment of primary and metastatic lesions with a size range of 0.5 to 11 cm. A total of 114 lesions, located mainly in the lungs and liver, were treated by placement of 319 gold markers. Placement of the fiducials themselves was performed through an 18-g trocar that was used to place the markers in different locations throughout the target lesion. The patients were then observed for 3 to 4 hours postprocedure.

**Results:** 98% of the fiducials were successfully placed in the area intended. In 75% of the cases, there was only 1 puncture performed to implant multiple fiducials. In all other cases, there was either only 1 fiducial implanted or 2 punctures used. Migration of the fiducials occurred in 3 cases, 2 being in lung and 1 in an abdominal nodal mass. In only 1 of the lung cases all 3 fiducials migrated and reimplantation of the fiducials was necessary. There were 2 episodes of pneumothorax, with only 1 of them needing a chest tube for management. There were also 3 episodes of mild pulmonary parenchymal hemorrhage that were treated conservatively.

**Conclusions:** This study indicates that the placement of fiducial markers is safe and effective with low complication rates.

**Reviewer’s Comments:** The CyberKnife was created to treat tumors in any part of the body, mobile or not. The stereotactic tracking system can account for small amounts of patient movement. Stainless steel can be used for bony applications. These fiducial markers should be placed in an array of 4 to 6 markers and can be inserted in or adjacent to the tumors but within 6 cm of the target lesion. In cases where the expectation of stereotactic radiotherapy is imminent, the fiducials can be placed at the time of biopsy. In this series, there were 2 cases of pneumothorax and several of mild pulmonary hemorrhage. Migration seemed to occur frequently in lung tissue. Fiducial movement of >1.5 mm may render the patient untreatable since it may degrade the accuracy of the stereotactic radiation treatment. (Reviewer-Sharon Gonzales, MD).

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Keywords: Radiosurgery, Complications, Radiation Tx, CyberKnife, Fiducials

Print Tag: Refer to original journal article
The difference between malignant and benign diffusion-weighted characteristics is generally greater for mass-like enhancement than for non-mass-like enhancement.

**Background:** Dynamic contrast-enhanced MRI (DCE-MRI) has been the most widely studied technique in assessing breast lesions detected on MRI and imaging findings that suggest a potential for malignancy. BI-RADS lexicon descriptors have created categories of mass-like and non-mass-like lesions and their respective characteristics such as size, shape, margin, enhancement pattern, and kinetic curve evaluation. The differentiation between benign and malignant pathology has been relatively ineffective on DCE-MRI when evaluating non-mass-like enhancement.

**Objective:** To evaluate the utility of diffusion-weighted imaging (DWI) in the differentiation between malignant and benign breast lesions and its application to different lesion type and lesion size.

**Design/Methods:** Over a 13-month retrospective period, breast lesions that had been evaluated on MRI and had been given a BI-RADS 3, 4, or 5 were identified. Only those cases that had documented tissue pathology, documented data in a tumor registry, or had been proven to have been stable over a 2-year imaging follow-up period were included in the study. The original interpretations of the MRI examinations were noted and lesion characteristics as originally described were recorded including: size, type (subcategorized into mass or non-mass-like enhancement), BI-RADS category, and recommended follow-up. The lesions were retrospectively analyzed with specialty software to determine apparent diffusion coefficient (ADC) values after regions of interest were drawn to include the maximum extent of the hyperintense contrast-enhancing abnormality. ADC values for both benign and malignant lesions were then compared with documented lesion type and size.

**Results:** 116 lesions from 92 MRI examinations were included in the study. In total, 61% were described as masses and 39% described as non-mass-like abnormalities; 22% of the masses were malignant while 29% of the non-mass-like areas were malignant. Median size of all masses was 0.8 cm and all areas of non-mass-like enhancement were 2.5 cm. Although both masses and areas of non-mass-like enhancement had lower ADC values associated with malignancy, the difference between malignant masses and benign masses was greater than the differences between malignant areas of non-mass-like enhancement and benign areas of non-mass-like enhancement. This suggests greater overlap in ADC values for benign and malignant areas of non-mass-like enhancement. Lesion size had no influence on the ability of DWI to discern between benign and malignant lesions.

**Conclusions:** Diffusion-weighted MRI shows promise in differentiation of benign and malignant masses and lesions with non-mass-like enhancement found at breast MRI, and is not affected by lesion size. However, ADC measurements may be more useful for discriminating masses than for discriminating lesions with non-mass-like enhancement.

**Reviewer’s Comments:** The study is notable as it is the first to compare the different diffusion-weighted characteristics with variability in lesion type and lesion size. The data are promising as they suggest that diffusion characteristics can serve as an adjunct to morphologic descriptors and routine contrast kinetics. (Reviewer-Basil Hubbi, MD).

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Keywords: Breast Cancer, MRI, Diffusion-Weighted Imaging

Print Tag: Refer to original journal article
What Are Certain Pathologies Associated With False-Negative Findings on MRI?

Breast Cancers Not Detected at MRI: Review of False-Negative Lesions.
Shimauchi A, Jansen SA, et al:
AJR Am J Roentgenol 2010; 194 (June): 1674-1679

In general, a small percentage of non-invasive carcinomas are associated with false-negative presentation on breast MRI although most of these cases are mammographically evident.

**Objective:** To evaluate the sensitivity of dynamic contrast-enhanced MRI and to evaluate characteristics of false-negative lesions.

**Design:** Retrospective study.

**Methods:** Over a 16-month retrospective period, MRI examinations of the breasts performed at a single institution were identified. The indications for the MRI examinations were noted as well as any clinical characteristics and whether or not breast MRI lesions were also visualized on mammography or ultrasound. The standard institutional MRI protocol was utilized. The images were subjected to retrospective review by 2 radiologists with extensive experience in breast MRI interpretation. These radiologists interpreted the studies with the knowledge of patient history, pathology, or prior mammogram and ultrasound results. The interpreters determined the studies to be positive based on morphologic characteristics. If a lesion was morphologically suspicious, but failed to enhance on contrast-enhanced MRI, it was considered a false-negative finding. The background breast parenchymal enhancement was rated as minimal, mild, moderate, or marked. Histology results of all lesions were reviewed by an experienced breast pathologist and radiologic-pathologic correlation was performed.

**Results:** 222 cancers in 217 patients comprised the study set. Enhancement was observed in 95.9% of lesions. The sensitivity of dynamic contrast-enhanced MRI was determined to be 96.8% for all cancers. For invasive cancers, this sensitivity increased to 98.3% and for ductal carcinoma in situ (DCIS), the sensitivity dropped to 90.2%. Interestingly, all the false-negative lesions except one were detected on mammography as suspicious calcifications. Three of the false-negative cases were pathologically proven to be foci of invasive carcinomas in a background of DCIS.

**Conclusions:** Small tumor size and diffuse parenchymal enhancement were the principal reasons for these false-negative results. Although the overall sensitivity of cancer detection was high (96.8%), it should be emphasized that a negative MRI should not influence the management of a lesion that appears to be of concern on physical examination or on other imaging techniques.

**Reviewer’s Comments:** The study shows that 3.2% of cancers studied were occult on contrast-enhanced MRI, although most of these were detectable on mammography. Moreover, the main take-home message of the article is the emphasis on the multi-modality approach to breast imaging. Used in concert and under the proper indications, mammography, ultrasound, and MRI act to provide a reliable arsenal for the detection of breast cancer in various histopathologic forms. (Reviewer-Basil Hubbi, MD).

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Keywords: Breast Cancer, MRI, False-Negative Cancers

Print Tag: Refer to original journal article
Non-mass-like lesions of the breast tend to be associated with a higher false-positive rate when compared with mass lesions.

**Background:** Breast MRI has become widely used and the sensitivity of MRI for detecting breast lesions has been well established through research. The goal to reduce the number of false-positive findings on MRI remains relatively elusive. Use of various techniques from dynamic contrast-enhancement to diffusion-weighted imaging has been studied with mixed results.  

**Objective:** To analyze biopsy-proven breast lesions to determine which BI-RADS criteria and subgroups are associated with greater false-positive readings.  

**Design:** Retrospective study.  

**Methods:** Over a 16-month retrospective period, breast MRI examinations at a single institution were identified. Women who had biopsy proven breast lesions identified on MRI were included in the study. The breast MRI images were reinterpreted by 2 radiologists who were not involved in the initial study interpretations. The interpreters were blinded to histopathologic results and ultimate conclusions were rendered upon consensus. Characteristics of lesions recorded included the morphologic dichotomy between mass lesions and non-mass lesions. BI-RADs descriptors that were also utilized included those referring to shape, margin, and internal enhancement pattern. Imaging findings were compared with histopathologic examinations.  

**Results:** 151 lesions in 131 women were included in this retrospective analysis. Mean age of patients was 54.4 years. The positive predictive value for mass lesions was 86.1%, which was significantly higher than the 51.7% positive predictive value of non-mass lesions. Tumor diameter had no bearing on improved diagnostic accuracy for non-mass lesions although it did have a bearing on accuracy for mass lesions. In the case of mass lesions, the smaller the mass, the greater the false-positive rate. In terms of enhancement, non-mass lesions with stippled enhancement were associated with a decreased likelihood of malignancy. This was the only statistically significant feature that differentiated benign versus malignant lesions.  

**Conclusions:** Non-mass lesions were the major cause of false-positive breast MRI findings. BI-RADS descriptors are not sufficient for differentiating benign and malignant non-mass lesions.  

**Reviewer’s Comments:** As with any data such as this, it’s important for each practicing breast imager to incorporate this published data along with engagement in active radiologic and pathologic correlation. Radiologists who are involved in interpretation of breast MRI and image-guided tissue sampling should continuously perform quality control improvements by comparing imaging findings with subsequent histopathologic diagnosis. (Reviewer-Basil Hubbi, MD).
The vast majority of radiology residents pursuing a career in breast imaging tend to be women with a significant percentage of those aware of the more flexible schedule breast imagers tend to be privy to.

**Background:** Certain medical societies have suggested that a current and potential future shortage of radiologists qualified to interpret mammograms threatens access to this lifesaving tool. Rising to this demand is a possible resurgence of interest in breast imaging by radiology residents.

**Objective:** To gather and evaluate the experiences and preferences of radiology residents with respect to breast imaging.

**Design:** Survey study.

**Participants/Methods:** Over a 1.5-year period, radiology residents in NY and NJ were invited to participate in this study. The researchers visited the radiology residency programs willing to participate and provided a self-administered survey that was then returned by regular mail or email. The survey addressed topics under 3 major categories: experiences during residency, future career plans, and opinions regarding mammography. More specific items included questions about the likelihood of pursuing a fellowship, academic inclination, desire to work part time, and interest in mammography. Items were rated on a 6-point scale that ranged from strongly agree to strongly disagree.

**Results:** 26 radiology residency programs participated in the study with a total of 344 residents completing the survey. Total response rate was determined to be 62% with a fairly even distribution across levels of training. Although all programs offered training in breast imaging, at the time of the survey, 95% of postgraduate year (PGY) 2 residents had no exposure to breast imaging. Of the PGY 5 radiology residents surveyed, only 41% felt prepared to interpret mammograms independently. Overall, 93% of residents were likely to pursue a fellowship, with 7% specifically interested in a fellowship with breast imaging as a major component; 96% of those residents were women. Almost 95% of residents agreed that mammography is an important component of women's health and almost 70% agreed that a radiologist specialized in breast imaging should be the interpreting physician. Approximately 97% of residents agreed that mammography has a high risk of malpractice. There was a greater sense by the residents that a career in breast imaging tended to include a more flexible work schedule. Only 17% of those who did not plan to pursue breast imaging as a subspecialty felt that it is an interesting field.

**Conclusions:** Radiology residents' negative and positive views about mammography seem to be independent of time spent training in mammography and of future plans to pursue fellowship training in breast imaging. Systematic assessment of the plans and preferences of radiology residents can facilitate the development of strategies to attract trainees to careers in breast imaging.

**Reviewer's Comments:** As many practices struggle with filling vacant positions in breast imaging, it's interesting to notice the demographic of the residents choosing this subspecialty. The study finds the tendency for those going into breast imaging to be women with an awareness of the malpractice element but also with a desire to have a more flexible work schedule. (Reviewer-Basil Hubbi, MD).
Muscle Aches and Lipid-Lowering Agents -- The Role of MRI

MRI in Lipid-Lowering Agent-Associated Myopathy: A Retrospective Review of 21 Cases.
Peters SA, Kley R, et al:
AJR Am J Roentgenol 2010; 194 (April): W323-W328

MRI demonstrates nonspecific findings with respect to LLA-associated myopathy, but confirms muscle abnormalities that may be sequelae of cholesterol-lowering therapy.

Background: Cardiovascular and cerebrovascular diseases are among the leading causes of morbidity and mortality in Americans. The efficacy of cholesterol-lowering agents in combating dyslipidemia has led to millions of prescriptions nationwide. Research involving several thousand patients has demonstrated a small, yet definite risk of statin-induced myopathy.

Objective: To determine a disease-specific pattern, if any, of lipid-lowering agent (LLA)-associated myopathy.

Design/Participants: Retrospective review of 21 patients with myopathy associated with LLA.

Methods: Given the array of specific myopathies, the authors attempted to discern if there exists a specific pattern of myopathy secondary to LLA. Variables examined included age, sex, duration of hyperlipidemia, duration and type of medication use, latency of symptoms, presence of myalgia, weakness, and peak creatine kinase (CK) levels. Drawing from clinical, neurophysiologic and laboratory data, the investigators sought to eliminate nonrelated myopathies. MRI was used to assess the thigh and leg musculature.

Results: 76% of patients complained of myalgia and 24% complained of muscle weakness on an average of 9.9 months after initiation of LLA therapy. Average maximum CK values were >6000 U/L. Dorsal muscle groups of the thighs and legs were primarily affected by LLA-associated myopathy based on MRI. T1- and T2-weighted imaging demonstrated fatty degeneration and muscle edema, respectively. Statistical analysis drew a weak, yet significant association between LLA therapies, MRI findings of the dorsal lower extremity musculature, and peak CK values. A stronger correlation was linked between ventral thigh muscle weakness and LLA therapy.

Conclusions: Although MRI failed to demonstrate a pathognomonic pattern of LLA-associated myopathy, signal abnormalities do involve the dorsal musculature of the thigh and leg, preferentially. Weakness of the ventral musculature was also notable in a percentage of patients.

Reviewer's Comments: Peters and colleagues were able to draw fairly substantial conclusions based on their retrospective review of 21 patients. They do, however, reiterate that LLA-associated myopathy is a diagnosis of exclusion that "lacks specific clinical signs or histopathologic characteristics..." In my opinion, the importance of this research lies not in the details of their work, but rather in stimulating awareness amongst radiologists that there exists an association between cholesterol-lowering agents and myopathy. One of our many roles of image interpretation entails providing clinicians with succinct and relevant differential diagnoses. Nonspecific complaints of muscle pain may prompt an MRI for further evaluation; however, more often than not, besides a brief history of the complaints, radiologists are not informed of a patient's medications. It may be, for instance, that a radiologist observes MRI findings suggestive of LLA-associated myopathy prompting the clinician to take a second look at their patient's drug history. Owing to the fact that statin myopathy has resulted in mortality (albeit rarely), the substantiation of this specific myopathy in the clinical and radiologic literature is invaluable. (Reviewer-Rahul Pawar, MD).

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Keywords: Dyslipidemia, Myopathy, Statin Myopathy

Print Tag: Refer to original journal article
Fatty degeneration of thigh muscles in the elderly and corresponding balance and gait disturbances are linked with low vitamin D levels.

**Background:** The importance of vitamin D cannot be underestimated. It is essential for maintaining bone health, immunity, neurologic function, and has been touted to lower the risk of specific cancers. Ninety percent of the elderly population is measurably vitamin D deficient. Autopsy research has even demonstrated atrophy of muscle fibers in vitamin D-deficient individuals.

**Objective:** To determine if MRI of thigh muscles in elderly patients would reveal fatty atrophy, and if there exists a correlation with low 25-hydroxyvitamin D (25-OHD) levels.

**Participants/Methods:** 20 patients fulfilled the authors' criteria for inclusion in this prospective study. Serum blood values of 25-OHD, MRI of the thigh musculature, and clinical assessment of balance and gait were all gathered for subsequent correlative analysis.

**Results:** 90% of patients evaluated were vitamin D deficient, with serum values <20 ng/mL. Using a grading scale of fatty degeneration (0 to 3), 85% of patients demonstrated either grade 1 or 2 atrophy of the extensor muscles; 95% of patients demonstrated either grade 1 or 2 atrophy of the flexor muscles. In 55% of all patients, MRI demonstrated total atrophy of at least 1 thigh muscle. A strong statistical correlation was evident between MRI findings, low 25-OHD levels, and performance on balance and gait tests.

**Conclusions:** There is indeed a significant association between low vitamin D levels in the elderly and fatty atrophy of thigh musculature. A corresponding reduction in balance and gait can be appreciated by clinical examination.

**Reviewer's Comments:** The elderly are more prone to falls and subsequent injury for many reasons. Morbidity and mortality of hip fractures in this population are higher than average and is a target of research by many fields in medicine, as well as the pharmaceutical industry. Vitamin D is imperative for preservation of bone mineral density, and there are ample data in the literature to prove it. However, until now, there has been no research examining radiologic findings in muscles of lower extremities in vitamin D-deficient patients. The authors have investigated this relationship in their work confirming what histologic autopsy specimens have already revealed. Although there may be confounding variables that may be difficult to control (ie, atrophy secondary to hypoactivity), their data are still remarkably important. Recognizing selective muscle atrophy at a subclinical stage may prompt a discourse between the radiologist and clinician regarding a patient's vitamin D status. Research in endocrinology has revealed that millions of Americans, belonging to all age groups, are deficient in vitamin D. With growing awareness, physicians may begin to treat patients, one subgroup at a time. Arguably, aggressively monitoring 25-OHD levels in the elderly has tremendous merit and ultimately may reduce the incidence of falls and subsequent fracture-related morbidity. (Reviewer-Rahul Pawar, MD).

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Keywords: Vitamin D Deficiency, Muscle Degeneration, MRI

Print Tag: Refer to original journal article
AN Risks Seemingly Not Affected by Contract-Enhanced CT

Functional Contrast-Enhanced CT for Evaluation of Acute Ischemic Stroke Does Not Increase the Risk of Contrast-Induced Nephropathy.
Lima FO, Lev MH, et al:

Contrast administration for CT angiography/CT perfusion may not affect the risk of acute nephropathy in acute stroke patients.

Objective: To examine the incidence of contrast-induced nephropathy in ischemic stroke patients who undergo a functional contrast-enhanced CT as compared with a similar group of patients who do not receive contrast.

Design: Prospective cohort study.

Participants/Methods: 575 patients were administered contrast; 313 underwent a CT angiography (CTA), 224 underwent CTA/CT perfusion (CTP), and 38 had CTA/CTP as well as conventional angiography. There were 343 patients in the non-exposed group. The incidence of acute nephropathy (AN) was assessed at 24, 48, and 72 hours comparing the contrast-exposed group to the unexposed group. Patients were categorized based on glomerular filtration rate (GFR). CT and CTA studies were performed with 8- or 16-section CT scanners. All patients in the contrast-exposed group received 100 to 140 mL of the nonionic iodinated contrast agent iopamidol (Isovue). Some patients also underwent angiography for intra-arterial thrombolysis after CTA/CTP, receiving approximately 230 mL (38 patients). Patient age, sex, race, and medical history were reviewed. The incidence of AN between exposed and unexposed groups was assessed, as well the incidence of AN in patients who underwent conventional angiography following CTA/CTP compared with patients who had only CTA/CTP.

Results: The incidence of AN was 5% in contrast-exposed patients and 10% in unexposed patients, with an overall incidence of 7%. Significantly higher incidences of AN were noted in the unexposed group at 24 and 48 hours. After adjusting for age, sex, admission estimated GFR, hypertension, diabetes, coronary artery disease, and congestive heart failure, patients in the contrast-exposed group had a lower risk for AN than did those in the unexposed group. There was a 5% incidence of AN in 38 patients who underwent contrast-enhanced CT followed by angiography. This was unchanged at 24, 48, and 72 hours.

Reviewer’s Comments: This was the largest retrospective study in the evaluation of contrast-induced nephropathy in acute stroke patients. Interestingly, the incidence of AN in contrast-exposed patients was lower than that in unexposed patients. There was no increased risk of AN in patients exposed to conventional angiography after CTA/CTP. This study demonstrated that, in acute stroke patients, contrast administration does not increase the risk of nephrotoxicity. Because time is essential in the management of stroke patients and the time to onset of thrombolitics should be as short as possible, any delay should be minimized. Therefore, administration of contrast should not be delayed while waiting for assessment of GFR as there may be no increased risk of AN if appropriate prophylactic measures are taken. Due to the low number of patients with severe renal insufficiency, data in this study do not apply to that group. (Reviewer-Maureen T. Barry, MD).

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Keywords: Contrast-Induced Nephropathy, CT Perfusion, CT Angiography, Stroke

Print Tag: Refer to original journal article
Lumbar Scoliosis Is Underreported on MRI of Lumbar Spine

Adult Lumbar Scoliosis: Underreported on Lumbar MR Scans.

Anwar Z, Zan E, et al:
AJNR Am J Neuroradiol 2010; 31 (May): 832-837

Objective: To determine the prevalence of scoliosis in patients with low back pain referred for an MRI and to report the rate of reporting by the radiologist of scoliosis and spondylolisthesis on MRI as well as to determine the association between scoliosis and spondylolisthesis.

Design/Methods: The authors prospectively reviewed MRI results of the lumbar spine in patients referred for low back pain. The degree of scoliosis was determined on the coronal scout images of the lumbar spine and considered positive if the curvature angles were >10°. Sagittal images were used in the determination of spondylolisthesis. The findings of the authors were compared with the official reports.

Results: In 1299 patients, the prevalence of adult scoliosis was 19.9% with 22.6% in females and 15.6% in males, a statistically significant difference. Prevalence increased with age groups. Females were 1.5 times more likely to have scoliosis compared with men. Older patients were 6.2 times more likely and middle-aged patients were 1.5 times more likely to have scoliosis than young adults. Prevalence of spondylolisthesis was 15.7% and the prevalence increased with age and differed between the scoliotic and non-scoliotic group. L4/L5 was the most frequent site of spondylolisthesis. In total, 88.9% demonstrated grade 1 scoliosis with 10.6% demonstrating grade 2 and only 0.5% grade 4. The prevalence of scoliosis was higher in patients with spondylolisthesis (42.2%) than without (15.9%). Overall, 84.2% had mild scoliosis (11° to 20°), and 15.8% had moderate or severe scoliosis (>21°). The severity of scoliosis increased with age. Levo-scoliosis was seen in 64.1% and dextroscoliosis was seen in 34.7%. A total of 66.7% of scoliotic cases went unreported on the official report. In 153 instances of mild scoliosis, only 26.1% were reported; 99.5% of spondylolisthesis was reported.

Conclusions: Adult lumbar scoliosis is a prevalent condition with particularly higher rates among older individuals and females but is underreported on spine MR images. The coronal "scout images" should be reviewed as part of the complete lumbar spine evaluation if dedicated coronal sequences are not already part of the spine protocol.

Reviewer's Comments: There was a significant difference between scoliosis and non-scoliosis patients regarding age as well as gender. The prevalence of scoliosis was 19.9%, which is greater than in prior studies, possibly due to the aging population. There was also an increased prevalence of scoliosis in patients with spondylolisthesis, confirming a relationship. In patients imaged on MR for low back pain, 84.2% had mild scoliotic deformity and 15.8% had moderate or severe scoliotic deformity. This study demonstrated that scoliosis goes underreported by radiologists. Spondylolisthesis does not seem to be underreported. Adult spinal deformity may contribute to back pain and neurologic dysfunction. If spinal deformity goes unreported, there is a risk that the patient's true cause of symptoms will remain untreated. Radiologists should report on the presence and degree of scoliosis as patients may be referred to a spine surgeon and be treated appropriately. Obtaining a coronal diagnostic sequence may aid in the reporting of scoliotic deformity to help the underreporting of scoliosis by radiologists. Spinal deformity should be routinely described on MRI, even if mild. (Reviewer-Maureen T. Barry, MD).

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Keywords: Scoliosis, Lumbar Spine, Spondylolisthesis

Print Tag: Refer to original journal article
FDG Differentiates Acute vs Chronic Aortic Dissection

Imaging of Acute and Chronic Aortic Dissection By 18F-FDG PET/CT.

Reeps C, Pelisek J, et al:


Combined anatomic/functional information of PET-CT is critical in differentiating acute from chronic dissection, thereby allowing proper triage. The authors of this study feel that uptake correlates with areas of acute laceration.

**Background:** When detected by CT, it is difficult to determine if an aortic dissection (AD) is acute and potentially requiring intervention, or chronic, and not needing intervention. These authors hypothesize that acute dissection will evidence metabolic processes in the recently lacerated vessel.

**Objective:** To analyze FDG uptake in the aortic wall of acute and chronic dissection.

**Design:** Prospective descriptive study.

**Participants:** 18 consecutive patients with clearly acute (11) or chronic stable (7) type B dissections were included. Two of the acute patients had acute symptomatic distal progression of known preexisting type B dissection.

**Methods:** Acute patients were admitted to the ICU. After 3 to 13 days, they underwent multislice FDG-PET including contrast-enhanced CT angiography of the aorta. In patients with asymptomatic chronic stable AD, PET-CT was performed on an outpatient basis. Imaging was performed 90 minutes post-injection. Imaging results were evaluated independently by a nuclear medicine specialist and a vascular surgeon and included both CT morphology and FDG uptake. $S_{UV_{max}}$ was determined in the dissected aortic wall, dissection membrane, and in the adjacent lumen. A ratio of uptake in the dissected aortic wall or membrane to the adjacent aortic lumen was calculated.

**Results:** Maximum diameter of the aorta in patients with acute AD did not significantly differ from that in patients with chronic stable AD. In patients with acute AD, increased FDG was noted in the membrane and in the adjacent aortic wall, as visually assessed. In asymptomatic patients with chronic and proven stable dissection, no noticeable uptake was apparent. When assessed by $S_{UV_{max}}$, a statistically significant difference was noted between the 2 groups. A superior differentiation between groups was noted when the mural uptake was normalized by the adjacent blood pool SUV (ie, a ratio of wall to lumen was used).

**Conclusions:** Combined anatomic/functional information of PET-CT is critical in differentiating acute from chronic dissection, thereby allowing proper triage. The authors feel that uptake correlates with areas of acute laceration.

**Reviewer's Comments:** The authors note a selection bias in that patients who could not tolerate a 30- to 45-minute imaging session could not be studied. We therefore do not know the imaging characteristics of this group. It is interesting to compare this paper to that of Kato, published in the same edition. Kato's group suggested that elevated uptake was due to the pathogenesis of the dissection, and correlated with severity of injury and prognosis. These authors believe the uptake is secondary to injury, and indicate an acute response, thereby helping to differentiate chronic from acute dissection. Further studies will be needed to differentiate which of these theories is correct. (Reviewer-Lionel S. Zuckier, MD).

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Keywords: Aneurysm, Dissection, Prognosis, FDG

Print Tag: Refer to original journal article
FDG Uptake Signals Unfavorable Outcome in Dissection

Uptake of 18F-FDG in Acute Aortic Dissection: A Determinant of Unfavorable Outcome.


J Nucl Med 2010; 51 (May): 674-681

SUV at the site of maximum dissection at 50 minutes after injection was higher in unfavorable than in favorable outcome patients with acute aortic dissection.

**Background:** Acute aortic dissection (AAD), particularly the Stanford type B variety, can be followed conservatively, typically relying on careful long-term monitoring of morphologic parameters on CT. In patients with less-favorable features, timely surgical or endovascular intervention is needed. Metabolic processes including chronic inflammation and proteolysis play a crucial role in degeneration of the aortic wall. It is, therefore, not surprising that FDG uptake has been reported in diseased aortas of patients with acute aortic dissection.

**Objective:** (1) To compare thoracic aortic uptake of FDG in patients with AAD and normal controls, and (2) to see if FDG uptake predicts short- and mid-term outcomes in medically controlled patients with AAD.

**Design:** Prospective descriptive study.

**Participants:** 28 patients with acute aortic dissection (26 Stanford type A and 2 Stanford type B) emergently admitted to the hospital, and 14 matched controls (studied for cancer screening).

**Methods:** Patients had thorough laboratory tests and multiple standard enhanced CT exams performed over the following year. PET-CT was performed 12.2 ± 5.3 days after admission, with imaging at 50 and 100 minutes following FDG. Mean and maximal SUVs were calculated at proximal, distal, and maximal dissection sites. Differences between patients with dissections and controls were assessed. The predictive value of clinical and imaging findings on short-term (1 month) and mid-term (6 month) outcome was assessed by statistical means.

**Results:** Of the 28 AAD patients, 8 had unfavorable outcome (2 deaths, 4 surgical repairs, 2 progressions). Unfavorable patients had statistically greater chest pain, radiating pain, pulse deficit, maximum dissection diameter, and mean value of HDL cholesterol. SUV max and mean at 50 minutes was significantly greater in patients with AAD than in controls, and SUV at the site of maximum dissection was higher in unfavorable than in favorable outcome patients. Interestingly, this latter feature was absent at 100 minutes. Mean SUV at the site of maximum dissection independently predicted unfavorable outcome. An SUV cutoff of 3.3 demonstrated reliable predictive powers.

**Conclusions:** This study demonstrated the value of FDG uptake in prognosticating AAD. A proposed mechanism is the presence of macrophages that mark atherosclerotic inflammation.

**Reviewer's Comments:** This is a useful study in giving the clinicians an additional functional parameter to assess the risk of progression of aortic aneurysms. The authors point out that this paper does not differentiate causative factors versus epiphenomena. Furthermore, there is no clear statement that the degree of uptake did not influence the disposition of the patients (ie, the presence of uptake may have induced the surgeons to operate, thereby leading to an apparent correlation between uptake and complications). (Reviewer-Lionel S. Zuckier, MD).

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Keywords: Aortic Dissection, FDG, PET-CT, Prognosis

Print Tag: Refer to original journal article