How Accurate Is a Filling Defect on PVP CT When Diagnosing DVT?


Horvath JJ, Looney CB, et al:

Abdom Imaging 2014; 39 (June): 554-561

Perivascular stranding and venous expansion increase the likelihood that a filling defect on portal venous phase CT is a deep venous thrombosis.

**Background:** Often clinically occult, prevalence of lower extremity deep venous thrombosis (DVT) and pulmonary embolism (PE) is underestimated. For instance, 2.5% to 7.0% of cancer patients undergoing staging CT have asymptomatic DVT, while 2.6% to 3.4% have unsuspected PE. CT venography, performed with 120 to 180 seconds delay after intravenous contrast, has a sensitivity ranging from 71% to 100% and specificity ranging from 93% to 100% for the detection of DVT. However, in order to best evaluate the abdominal and pelvic viscera, portal venous phase (PVP) protocols are performed with a 40- to 90-second delay. When radiologists detect a filling defect on PVP CT, they often qualify their diagnosis due to venous mixing artifact and lack of data on DVT diagnosis in this contrast phase. Unfortunately, this leads to indeterminate reports that lead to further work-up for possible DVT.

**Objective:** To determine the frequency and positive predictive value (PPV) of venous filling defects detected on PVP CT, and to determine the clinical sequela from this observation.

**Design:** Retrospective study.

**Methods:** Using a computerized database text-searching program, 4682 CT studies were identified that reported venous filling defect or thrombus. This group was further narrowed down to 348 patients (170 males, 178 females, mean age 57.8 years) who specifically had a CT of the abdomen and pelvis in the PVP. The medical record of each of these patients was examined to determine if a reference standard imaging study, ie, lower extremity Doppler ultrasound, MR venography, and conventional venography, was performed within 2 weeks of the CT scan. Perceived level of diagnostic certainty for DVT conveyed by the CT report and clinical impact was determined. Retrospective review of the CT was performed for those patients with reference standard imaging.

**Results:** In only 0.82% of abdominopelvic PVP CTs was a venous filling defect mentioned in the report. A venous filling defect detected on PVP CT had a PPV of 77%. This PPV increased to 95% when there was perivascular stranding and to 100% when there was vessel expansion. Treatment for DVT was more likely if the reports were worded with a higher degree of certainty. Conversely, additional confirmatory imaging was performed in those patients with CT reports worded with lower certainty.

**Conclusions:** Perivascular stranding and venous expansion improve the PPV for filling defect on PVP abdominopelvic CT.

**Reviewer’s Comments:** Although there were several limitations to this study, the most noteworthy was obtaining the study cohort from CT reports rendered by radiologists who were not given specific guidelines for diagnosing DVT or conveying their confidence level. This study highlights the importance of evaluating for perivascular stranding and venous expansion when encountering a filling defect on PVP CT, as these 2 findings can increase the PPV. (See image for this review at practicalreviews.com.) (Reviewer-Humaira Chaudhry, MD).

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Keywords: Deep Venous Thrombosis, Portal Venous Phase CT

Print Tag: Refer to original journal article
Retractor-related hepatic injury following laparoscopic surgery is commonly seen as a hypodense lesion abutting the liver edge with a triangular or linear shape on multidetector CT images.

**Objective:** To describe the multidetector CT (MDCT) findings of retractor-related hepatic injury following laparoscopic surgery.

**Design:** Retrospective analysis.

**Participants/Methods:** This study was comprised of 176 patients who had undergone laparoscopic upper gastrointestinal (GI) surgery. The patients were divided into 2 groups: one group consisted of 77 patients, 21 women and 56 men, with upper GI malignancy undergoing laparoscopic esophagectomy/gastrectomy surgery; the second group consisted of 99 patients, 75 women and 24 men, who had undergone laparoscopic bariatric upper GI surgery. Available preoperative CT studies were reviewed to assess for any pre-existing liver abnormalities, and postoperative CT studies were also reviewed for any new hepatic abnormalities. Postoperative CT examinations were divided into those performed early within 30 days following surgery and those performed late >30 days following surgery. CT examinations were performed using a 64-multidetector CT system. Contrast-enhanced examinations were performed during the portal venous phase. The images were reviewed by an abdominal radiologist.

**Results:** Early MDCT findings of retractor-related hepatic injury following laparoscopic surgery were hypodense lesions abutting the liver edge. The majority were located in the left lobe of the liver, involving segments 2 and 3, aside from one case affecting the right lobe in a patient with a very small left lobe. A hypodense triangular or linear lesion abutting the liver edge was characteristic. These lesions were not present on available preoperative CT examinations. The mean size of these lesions was 3.6 cm. Five of the 8 patients who had both early and late postoperative CT examinations had ≥1 persistent liver abnormalities on the later CT images. Two of the 5 had atrophy of the left lobe of the liver, 3 had a focal subcapsular scar, and the previously seen hypovascular area was either unchanged or was slightly smaller in size in 2 cases. Retraction-related liver abnormalities at postoperative CT were found in 27% of patients with malignancy and in 18% of those in the bariatric group. Over time, these lesions may disappear, remain unchanged, or result in a focal subcapsular scar with associated atrophy.

**Conclusions:** Retractor-related hepatic injury following laparoscopic surgery is commonly seen as a hypodense lesion abutting the liver edge with a triangular or linear shape on MDCT images.

**Reviewer's Comments:** The results of this study are useful in demonstrating that retractor injuries following laparoscopic upper GI surgery have a characteristic location and appearance on MDCT images, which allows for their confident diagnosis. One of the limitations reported in this study was the retrospective design. (See image for this review at practicalreviews.com.) (Reviewer-John C. Sabatino, MD).

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Keywords: Retractor-Related Hepatic Injury, Multidetector CT

Print Tag: Refer to original journal article
Differentiating Infiltrative Cholangiocarcinoma From Benign CBD Stricture


Dynamic contrast-enhanced MRI combined with MRCP may differentiate infiltrative cholangiocarcinoma from benign common bile duct (CBD) stricture based on hyperenhancement during the equilibrium phase and bile wall thickness >3 mm.

Objective: To describe the dynamic contrast-enhanced MRI and magnetic resonance cholangiopancreatography (MRCP) findings that may differentiate infiltrative cholangiocarcinoma from benign common bile duct (CBD) stricture.

Design: Retrospective analysis.

Participants/Methods: This study was comprised of 28 patients with infiltrative cholangiocarcinomas and 23 patients with benign CBD strictures. The main inclusion criteria were a focal common bile duct stricture, preoperative biliary MRI, and obstructive jaundice confirmed by laboratory testing and direct cholangiography. All infiltrative cholangiocarcinomas were confirmed via surgery and histology. Eight benign CBD strictures were confirmed via surgery and histology, and 15 were confirmed using endoscopic biopsy and follow-up biliary MRI >1 year after biopsy. MRI examinations were performed using a 3T system. Sequences included a 3D T2-weighted fast spin-echo MRCP sequence with maximum intensity projection reformats, and dynamic contrast-enhanced imaging with a 3D fat-saturated T1-weighted gradient-echo sequence before and after the intravenous administration of gadolinium contrast. The images were reviewed by 2 radiologists. The following were recorded: maximum length and wall thickness of the CBD stricture, maximum bile duct dilatation adjacent to the involved CBD, and the mean signal intensity of the ductal wall at the stricture and the adjacent liver parenchyma during the arterial, portal venous, and equilibrium phases.

Results: The mean stricture length of the cholangiocarcinomas was approximately 17 mm and 12 mm for the benign CBD strictures. The mean ductal thickness of the stricture was approximately 4 mm in cholangiocarcinomas and 2 mm in benign strictures, and this difference was statistically significant. The mean maximum CBD diameter proximal to the malignant strictures was approximately 21 mm and that proximal to the benign strictures was 17 mm. Of the patients with infiltrative cholangiocarcinomas, approximately 71% on the portal phase and 82% on the equilibrium phase had higher signal intensity than that of the liver. Of the patients with benign CBD strictures, approximately 61% on the portal phase and 74% on the equilibrium phase had similar or lower than signal intensity than that of the liver. Using a cut-off value for the ductal wall thickness of 3.4 mm, the sensitivity and specificity for diagnosing infiltrative cholangiocarcinoma were approximately 86% and 83%, respectively.

Conclusions: Dynamic contrast-enhanced MRI combined with MRCP imaging may differentiate infiltrative cholangiocarcinoma from benign common bile duct stricture based on hyperenhancement during the equilibrium phase and bile wall thickness >3 mm.

Reviewer's Comments: The results of this study are useful in demonstrating features of malignant CBD strictures, which include mural hyperenhancement relative to the liver parenchyma during the portal venous or equilibrium phase, thicker wall, longer stenosis, and more upstream ductal dilatation. One of the limitations reported in this study was the retrospective design. (See image for this review at practicalreviews.com.) (Reviewer-John C. Sabatino, MD).

© 2014, Oakstone Publishing, LLC

Keywords: Infiltrative Cholangiocarcinoma, Common Bile Duct Stricture

Print Tag: Refer to original journal article
Imaging Findings of Hepatic Epithelioid and Non-Epithelioid Angiomyolipomas on MRI

MRI Manifestations of Liver Epithelioid and Nonepithelioid Angiomyolipoma.
Zhao Y, Ouyang H, et al:
J Magn Reson Imaging 2014; 39 (June): 1502-1508

Hepatic epithelioid and non-epithelioid angiomyolipomas cannot be differentiated based on the lesion fat content.

Objective: To evaluate the imaging findings of hepatic epithelioid and non-epithelioid angiomyolipomas on MRI.

Design: Retrospective analysis.

Participants/Methods: This study was comprised of 11 patients with pathologically proven hepatic angiomyolipomas, who underwent abdominal MRI; 5 were of epithelioid AML and 6 were non-epithelioid AML. MR examinations were performed using a 3T system. Sequences included spoiled gradient recalled T1-weighted dual-echo chemical shift imaging, T2-weighted fast spin echo with and without fat suppression, diffusion-weighted imaging with b-values 0 and 800 s/mm2, and a breath-hold 3D volumetric dynamic contrast-enhanced scan sequence. The images were reviewed by 2 radiologists. The following imaging characteristics were recorded: lesion number; lesion diameter; lesion location; presence of tortuous vasculature; presence of hemorrhage; opposed-phase T1-weighted signal loss; T2-weighted signal loss after fat suppression; lesion enhancement; and capsule enhancement.

Results: All lesions were well marginated and low signal on T1-weighted and high signal on T2-weighted images. Fat was perceived in 7 cases on chemical shift imaging, and only in 3 cases on frequency-selective fat saturation imaging. Hemorrhage was detected in 2 cases and blood vessels in 2 cases. There was no significant difference in fat content between hepatic epithelioid and non-epithelioid angiomyolipomas. All but 1 had hyperenhancement in the arterial phase and capsule enhancement in the delayed phase.

Conclusions: Hepatic epithelioid and non-epithelioid angiomyolipomas cannot be differentiated based on the lesion fat content.

Reviewer's Comments: The results of this study are useful in demonstrating that hepatic epithelioid and non-epithelioid angiomyolipomas have similar MR imaging appearances. In addition, potential overlapping findings exist with other fat-containing masses, most importantly hepatocellular carcinoma, and therefore their discrimination may prove difficult. One of the limitations reported in this study was the small sample size. (See image for this review at practicalreviews.com.) (Reviewer-John C. Sabatino, MD).

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Keywords: Angiomyolipoma, Imaging Findings

Print Tag: Refer to original journal article
Does IV Contrast Interfere With Detection of Renal Stones on Contrast-Enhanced CT?

Renal Stones on Portal Venous Phase Contrast-Enhanced CT: Does Intravenous Contrast Interfere With Detection?

Dym RJ, Duncan DR, et al:

Abdom Imaging 2014; 39 (June): 526-532

Portal venous phase CT is highly sensitive for the detection of renal stones ≥3 mm and less sensitive for smaller stones.

Background: More than 20% of all emergent CTs are performed for flank pain and to evaluate for renal stones. Noncontrast CT of the abdomen and pelvis is the imaging study of choice when there is concern for renal stone disease as supported by the American College of Radiology Appropriateness Criteria. Unfortunately, these CTs often demonstrate other pathology, including gastrointestinal or genitourinary inflammatory processes, rather than stone disease. Although it is generally believed that renal stones can be obscured by intravenous contrast, no studies are known to support this belief. Additionally, hydronephrosis, perinephric stranding, and other signs of urinary tract obstruction are equally identifiable on contrast-enhanced CT, and this type of exam would also increase the detectability of non-stone pathology.

Objective: To evaluate the sensitivity for renal stone detection on contrast-enhanced CT in the portal venous phase.

Design: Retrospective study.

Methods: This study was comprised of 85 CTs that met the following inclusion criteria: at least 1 renal calculus with a diameter of ≥1 mm, noncontrast and portal venous phase images, slice thickness of 2.5 mm, and no prior partial nephrectomy. An additional 12 studies without renal stones were included to limit potential reviewer bias. The reference standard for each patient, the noncontrast images, was evaluated by 1 radiologist who assessed each renal stone for location, size, and maximum Hounsfield unit (HU) attenuation value. The portal venous phase images were reviewed by 3 independent radiologists who were blinded to the noncontrast images and patient history. They recorded the location of each renal stone and its maximum axial diameter.

Results: 238 stones with a mean diameter of 3.5 mm were noted in the 97 noncontrast CTs. On portal venous phase images, there was 81% sensitivity for all stone detection, while there was 95% and 99% sensitivity for the detection of stones that were ≥3 mm and ≥4 mm, respectively. The undetected stones on the contrast-enhanced CTs had a mean diameter of 2.1 mm.

Conclusions: Since contrast-enhanced CT is highly sensitive for the detection of renal stones that measure ≥3 mm, it may be beneficial to give intravenous contrast in a patient presenting with symptoms that have >1 diagnostic possibility, including renal stone disease.

Reviewer's Comments: Although there were several limitations to this study, the most notable was not evaluating the performance of portal venous phase CTs in the detection of ureteral stones, which are often of more clinical importance. In my opinion, this study brings up a valid point: contrast-enhanced studies may provide important information that would be otherwise missed on a noncontrast study while still maintaining good sensitivity for the detection of renal stones. (See image for this review at practicalreviews.com.) (Reviewer-Humaira Chaudhry, MD).

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Keywords: Renal Stone, Contrast-Enhanced CT

Print Tag: Refer to original journal article
What Are the Key Imaging Characteristics of Aggressive Angiomyxoma?

Surabhi VR, Garg N, et al:
AJR Am J Roentgenol 2014; 202 (June): 1171-1178

Aggressive angiomyxoma is a rare tumor that should be considered in patients presenting with a large mass with extension on either side of the pelvic diaphragm.

**Background:** A rare mesenchymal tumor, aggressive angiomyxoma, is found primarily in women of reproductive age, and presents as a painless mass or a mass causing local pressure. Although this tumor can be found in many locations, the majority are in the deep soft tissues of the vulva/vagina, pelvis, and perineum. Surgical resection is the current treatment for these large tumors, which are often >10 cm at diagnosis. Local recurrence is common due to its infiltrative nature, and long-term follow-up is necessary as recurrence can be delayed.

**Objective:** To determine the radiologic and clinical features of aggressive angiomyxoma.

**Design/Methods:** A retrospective review of the medical records of 16 patients (11 women, 5 men, mean age 49.4 years) with pathologically proven aggressive angiomyxoma was performed. The following were recorded: patient age, sex, presenting symptoms, treatment, follow-up imaging, and outcome. All patients in the study had preoperative imaging, either CT (n=14), MR (n=12), or both. Two patients had diffusion-weighted MR images and 2 patients had FDG PET/CT. Two radiologists reviewed the imaging studies in consensus and recorded lesion location, presence of tumor extension on either side of the pelvic diaphragm, size, "laminated" appearance on contrast-enhanced CT or T2-weighted MR images, and contrast-enhancement characteristics.

**Results:** The most common location of the tumor was the pelvis and perineum, particularly on either side of the pelvic diaphragm. Initial symptomatic presentation was seen in all patients, most commonly with a mass (69%). The aggressive angiomyxomas in this study were large at presentation, with a mean maximal dimension of 14.4 cm. In 83% of the patients evaluated on MRI, alternating layers of T2 high and low signal intensities was seen creating a laminated appearance, while this appearance was only seen in 43% of patients examined with CT. On MRI, avid contrast enhancement was noted in all patients, while only mild enhancement was noted in 86% of patients on CT. As expected in this tumor with histologic low-mitotic activity, only mild restricted diffusion and mild FDG uptake was seen in the 2 patients who had these imaging studies available for review. In 44% of the tumors, collateral vessels and fingerlike growth pattern was observed on imaging, while internal cystic degeneration was noted in 19%.

**Conclusions:** Aggressive angiomyxoma should be considered in patients presenting with a large multicompartmental mass with extension on either side of the pelvic diaphragm and internal laminated morphology.

**Reviewer's Comments:** Some of the limitations of this study include the small number of patients in the study cohort, however this is an expected limitation given the rarity of this neoplasm. This study does a great job at bringing awareness to the rare entity of aggressive angiomyxoma and its imaging characteristics. (See image for this review at practicalreviews.com.) (Reviewer-Humaira Chaudhry, MD).

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Keywords: Aggressive Angiomyxoma

Print Tag: Refer to original journal article
Incidence of Hyperintense Signal of the Seminal Vesicles on T1-Weighted MRI

Abnormal Signal Intensities of the Seminal Vesicles in a Screening Population.

Maeda E, Katsura M, et al:

J Magn Reson Imaging 2014; 39 (June): 1426-1430

Hyperintense signal of the seminal vesicles on T1-weighted MR images was observed in approximately 2% of the screening population.

Objective: To evaluate the incidence of hyperintense signal of the seminal vesicles on T1-weighted MRI.

Design: Prospective analysis.

Participants/Methods: This study was comprised of 1865 men in a health check-up program mainly targeted at prostatic carcinoma screening, which included a fasting blood test, pelvic MRI, smoking and drinking medical history, subjective symptoms, and a physical examination by a physician. Subjects with a present or past history of prostatic carcinoma or who were taking oral anticoagulant or antiplatelet agents were excluded due to the presumed tendency of hemorrhage in the seminal vesicles. Markers used to compare subjects with and without hyperintense signal of the seminal vesicles on T1-weighted MRI included: age; height; weight; body mass index; drinking and exercise habits; blood pressure; and blood chemistries. MR examinations were performed using a 3T system. T1- and T2-weighted sequences, both with no fat saturation, were performed. The images were reviewed by 2 radiologists. The authors recorded abnormal signal intensities on T1-weighted images with or without hypointense signal on T2-weighted images in each seminal vesicle. Abnormal hyperintensity was present when more than half of the seminal vesicle on one side was higher signal intensity than that of the bone marrow.

Results: Abnormal hyperintense signal of the seminal vesicles on T1-weighted MRI was present in approximately 2%. This involved the right seminal vesicle in 50%, the left seminal vesicle in 44%, and both seminal vesicles in 6%. None of the subjects had seminal vesicle agenesis, seminal vesicle or ejaculatory duct cysts, masses of the seminal vesicles, or abnormalities of the urinary bladder or testes. A significant association was seen between abnormal hyperintense signal of the seminal vesicles on T1-weighted MRI and both increased age and serum creatinine.

Conclusions: Hyperintense signal of the seminal vesicles on T1-weighted MRI was observed in approximately 2% of the screening population.

Reviewer's Comments: The results of this study are useful in demonstrating that abnormal signal intensity of the seminal vesicles was observed in a very small percentage of the screening population, and consequently the finding in isolation is unlikely to be of any clinical significance. One of the limitations reported in this study was that the hyperintense signal of the seminal vesicles on T1-weighted MR images was not verified to correlate with hemorrhagic seminal fluid. (See image for this review at practicalreviews.com.) (Reviewer-John C. Sabatino, MD).

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Keywords: Seminal Vesicles, Hyperintense Signal

Print Tag: Refer to original journal article
Airway Tumor Vs Airway Mucus Is Often Distinguishable

Differentiation Between Mucus Secretion and Endoluminal Tumors in the Airway: Analysis and Comparison of CT Findings.

Hong SR, Lee YJ, et al:

AJR Am J Roentgenol 2014; 202 (May): 982-988

Features that have a high positive predictive value for diagnosing airway tumor over mucus on CT include a round or lobulated shape, not well circumscribed margin, a CT attenuation of ≥21.7 HU, and internal fat or calcification.

**Objective:** To determine CT features that can distinguish between mucus and airway tumor.

**Design:** Retrospective study.

**Participants:** 42 patients who were diagnosed with an airway tumor by pathology were included. Patients with extraluminal extension of tumor or adjacent focal airway wall thickening were excluded. Findings were compared with 48 patients who had endoluminal mucus. These patients were found by search of the hospital radiology database for CT reports that indicated nodular opacities within the airways. These patients either had follow-up CTs that demonstrated disappearance of the lesions or bronchoscopic evaluation that showed no lesions, indicating that the cause of the nodular opacities within the airways was mucus. Any patient with a lesion distal to the second bifurcation of a bronchus, with distal obstructive lung collapse, or with multiple lesions was also excluded.

**Methods:** All patients had contrast-enhanced CTs. Axial images were reconstructed with 1.25-mm slice thickness. The axial images and sagittal and coronal reconstructions were analyzed. Lesions were evaluated for size, shape, margin, attenuation, location being anterior or posterior within the airway lumen, and angle with the adjacent airway wall (acute or obtuse). Lesion shape was characterized as round, ovoid, lobulated, or complex. Lesion margin was characterized as circumscribed if it had a sharply defined circumferential margin. If a lesion mostly or completely filled the lumen, its location being anterior or posterior, and its angle with the adjacent airway wall being acute or obtuse could not be classified, and therefore was labeled unclear. In addition, any change in longest diameter lesion size between mediastinal and lung windows was measured.

**Results:** A high positive predictive value for tumor over mucus was round shape (90.0%), lobulated shape (92.9%), not well circumscribed margin (100.0%), unclear location (87.5%), unclear angle (87.5%), CT attenuation of ≥21.7 HU (91.7%), and internal fat or calcification (100.0%). A high positive predictive value for mucus over tumor was complex shape (100.0%), change in size >15.9% between lung and mediastinal windows (96.8%), attenuation <21.7 HU (83.3%), and internal air density (100.0%).

**Conclusions:** The above findings can help avoid unnecessary additional imaging when diagnosing airway tumor versus airway mucus.

**Reviewer's Comments:** This is a good article that further helps diagnostically characterize endoluminal airway nodules on chest CT sometimes preventing the need for repeat CT. (Reviewer-Vineet R. Jain, MD).

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Keywords: Mucus, Endoluminal Tumors

Print Tag: Refer to original journal article
Objective: To evaluate routine surveillance of patients with Hodgkin lymphoma (HL) who had a complete response with first-line treatment and were at a high risk for relapse with ultrasound (US)/chest radiography compared with standard PET/CT.

Design: Prospective randomized study.

Participants: 300 adults who had newly diagnosed high-risk HL were included. All patients had complete response as seen on FDG PET after first-line treatment.

Methods: In a randomized fashion, half of the patients received follow-up imaging with PET/CT and half of the patients received follow-up imaging with US/chest radiography. In the US/chest radiography group, US imaging was performed to evaluate for enlarged superficial, anterosuperior mediastinal, abdominal, and pelvic lymph nodes, and frontal and lateral chest radiography was performed to evaluate for enlarged mediastinal lymph nodes. Any positive lymph nodes seen in either group, by either FDG PET/CT or US/chest radiography, were pathologically examined via biopsy.

Results: The study was closed after a median follow-up period of 60 months, with 27% of total patients having relapsed. There was no significant difference between the 2 groups regarding time from baseline until recurrence, with a median of 24 months in both groups. There was 1 false-negative case in the US/chest radiography group in which chest radiography missed pathologic enlarged lymph nodes in a deep mediastinal compartment that was later seen by CT. Overall sensitivity for the PET/CT group was 100.0% and for the US/chest radiography group was 97.5%. Specificity for the PET/CT group was 86% and for the US/chest radiography group was 96%. Positive predictive value for the PET/CT group was 73% and for the US/chest radiography group was 91%. Negative predictive value for the PET/CT group was 100% and for the US/chest radiography group was 99%. Estimate of exposure to ionizing radiation was 14.5 mSv for 1 PET/CT versus 0.1 mSv for 1 chest radiograph. Cost per relapse of imaging was estimated to be 10 times higher in the PET/CT group compared with the US/chest radiography group.

Conclusions: Imaging follow-up of high risk for relapse patients with HL who have had complete response with first-line treatment is done safely and effectively with a combination of ultrasound and chest radiography, with less exposure to ionizing radiation and less cost compared with PET/CT.

Reviewer's Comments: In a patient with already diagnosed cancer, I think replacing PET/CT with sonography and chest radiography would be difficult in the U.S., particularly when complete response itself relies upon the findings of PET/CT. (Reviewer-Vineet R. Jain, MD).

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Keywords: Hodgkin Lymphoma

Print Tag: Refer to original journal article
US Followed Selectively by MRI Just as Accurate as CT for Appendicitis in Children

Ultrasonography/MRI Versus CT for Diagnosing Appendicitis.

Aspelund G, Fingeret A, et al:

Pediatrics 2014; 133 (April): 586-593

In children >5 years of age suspected of having appendicitis, an algorithm consisting of ultrasound followed in equivocal cases by MRI is comparable to CT.

Objective: To compare ultrasonography followed selectively by MRI versus CT for diagnosing appendicitis in children who were <18 years of age.

Design: Retrospective study.

Participants: 662 patients who presented to the emergency department with symptoms/signs of appendicitis.

Methods: Group A consisted of 265 patients who were imaged from November 2008 to October 2010 when CT was the primary imaging modality. Group B consisted of 397 patients who were imaged from November 2010 to October 2012 when ultrasound followed in equivocal cases by MRI was the primary imaging modality. MRIs were performed in a non-sedated fashion using a 1.5T MRI. Gadobenate dimeglumine was given with a weight-based dose of 0.2 mL/kg. MRIs were only attempted in patients at least 5 years of age. CTs and MRIs were read as negative if a normal appendix was seen or if there were no signs of inflammatory process involving the region of the cecum/terminal ileum. Ultrasounds were read as negative if a normal appendix was seen. Ultrasounds were read as equivocal if the appendix was not seen or if a phlegmon or abscess was seen indicating potential complicated appendicitis.

Results: In group A, 84.5% of patients had initial imaging evaluation with CT. In group B, 91.9% of patients had initial imaging evaluation with ultrasonography; 19.7% of these patients had findings positive for appendicitis and all of these patients underwent appendectomy. In total, 56.4% of patients who underwent ultrasonography initially in this group had equivocal findings on sonogram. Of the 206 patients in this group who initially underwent evaluation by ultrasonography, 142 (68.9%) underwent a follow-up MRI. CT instead was performed in 34 patients in this group and 1 patient had a CT after the MRI. Of the patients who underwent MRI, 62 (43.7%) were positive for appendicitis. The overall imaging findings were positive for appendicitis in 51.3% of patients in group A and 40.5% of patients in group B. The diagnostic accuracy of the overall imaging pathway was similar in both groups. No cases of missed appendicitis were seen in either group. There was no significant difference in overall time from triage to antibiotic administration or operative intervention between both groups.

Conclusions: In children >5 years of age suspected of having appendicitis, an algorithm consisting of ultrasound followed in equivocal cases by MRI is comparable to CT.

Reviewer's Comments: This is an excellent article that demonstrates that appendicitis can be diagnosed just as well in children aged >5 years using the combination of radiation-free ultrasound and MRI compared with CT. (Reviewer-Vineet R. Jain, MD).

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Keywords: Appendicitis, Diagnosis

Print Tag: Refer to original journal article
Erectile Dysfunction -- Is There a Percutaneous Treatment Option?

*Embolization of the Periprostatic Venous Plexus for Erectile Dysfunction Resulting From Venous Leakage.*

Rebonato A, Auci A, et al:

*J Vasc Interv Radiol* 2014; 25 (June): 866-872

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Antegrade embolization of the periprostatic venous plexus has promising results for treatment of erectile dysfunction caused by veno-occlusive dysfunction.

**Background:** Erectile dysfunction (ED) affects about 20 million people in the United States. Organic causes are most commonly due to vascular etiologies, such as arterial insufficiency or veno-occlusive dysfunction (VOD). VOD is thought to be caused by insufficient venous outlet occlusion.

**Objective:** To evaluate the safety and efficacy of antegrade embolization of periprostatic venous plexus for treatment of ED.

**Design/Methods:** This study was a retrospective review of 18 patients who underwent embolization of periprostatic venous plexus for ED. Patients were evaluated before the procedure using the International Index of Erectile Function questionnaire. The patients were first evaluated by an endocrinologist to rule out psychogenic causes of ED. Ultrasound (US) evaluation was also performed after pharmacologic stimulation. For the procedure, US-guided puncture of the dorsal vein of the penis was performed and a 4.5-F sheath was introduced. Using this access, the periprostatic venous plexus was accessed and embolized using NBCA glue. Follow-up involved US exam and the erectile function questionnaire.

**Results:** The procedure was technically successful in 88% of the patients. At 3-month follow-up, 13 patients had clinical success based on US criteria. At the end of the follow-up period, 7 of these patients reported that they were completely free of symptoms. The remainder of the patients had progressively diminished benefit. There were no major complications; 2 patients experienced minor complications.

**Conclusions:** Antegrade embolization of periprostatic venous plexus is safe with promising short-term results.

**Reviewer’s Comments:** I believe that this is an excellent article reporting a novel interventional technique for the treatment of erectile dysfunction. The authors provide excellent illustrations to describe the technique. While the study sample size is small, the clinical results at short-term follow-up seem promising. The lack of major complications is also noteworthy. The results of this study may serve as an impetus for further larger studies investigating percutaneous embolization of periprostatic venous plexus for treatment of ED. (Reviewer-Abhishek Kumar, MD).

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Keywords: Erectile Dysfunction

Print Tag: Refer to original journal article
Hydroinfusion Not Without Its Own Risks

Safety of Hydroinfusion in Percutaneous Thermal Ablation of Hepatic Malignancies.
McWilliams JP, Plotnik AN, et al:

J Vasc Interv Radiol 2014; 25 (July): 1118-1124

The most frequent complication after hydroinfusion for hepatic tumor ablation is pleural effusion, which may lead to extended hospital stay and readmission, but not long-term morbidity or mortality.

Background: Thermoablation is used often to treat hepatic malignancies, but damage to organs nearby, such as the stomach, bowel, and diaphragm are major concerns during ablation, especially of subcapsular lesions. Hydroinfusion, or the placement of fluid around the liver, is a protective measure that has been devised, but it is not without risk itself.

Objective: To evaluate the safety and complications associated with hydroinfusion.

Design/Methods: This was a retrospective case-control study of 410 consecutive patients who underwent percutaneous hepatic thermal ablation. If a lesion was within 1 cm of the liver margin and adjacent to a vital structure, then hydroinfusion was done on a case-by-case basis. Ablation was performed under ultrasound guidance and monitored using CT. Imaging follow-up was performed by MRI in 24 hours; clinical and MRI follow-up was performed at 1 month and every 2 to 3 months thereafter.

Results: There were 8 major complications in the hydroinfusion group compared to 2 such complications in the control group. Most of these (7 of 10) were symptomatic pleural effusions treated with thoracentesis or diuretics. Two patients from the hydroinfusion group and 1 from the control group were readmitted with hyponatremia. There was no long-term morbidity or mortality. Using logistic regression, the only significant association with hydroinfusion major complications was the subcapsular location of the tumor; 100% of the complications were found in patients with subcapsular lesions. Post-ablation pleural effusion occurred in 45.0% of the patients who underwent hydroinfusion, but in only 16.5% of control patients. Most patients with pleural effusions were asymptomatic.

Conclusions: This study demonstrates that the most frequent complication after hydroinfusion for hepatic tumor ablation is pleural effusion, which may lead to extended hospital stay and readmission, but not long-term morbidity or mortality. Hydroinfusion remains a safe, cheap, and effective procedure for thermal protection of vital structures during radiofrequency ablation or microwave ablation of subcapsular hepatic tumors.

Reviewer's Comments: Complications reported for radiofrequency and microwave ablation are low: <5% for RF and <8% for microwave ablation. Multiple methods have been used to move these organs away from the liver during ablation to prevent injury, and hydroinfusion is the most popular because of its simplicity and low cost, but it is not without risk itself. This study showed that 5.0% of the patients in the hydroinfusion group had major complications related to the hydroinfusion compared to 0.8% in the control group. Three patients in this study developed hyponatremia, but it is unknown if hydroinfusion caused this. Because of this study, these researchers have limited their fluid during hydroinfusion as needed to move the organ in danger, and they have started to aspirate as much fluid as they can after the procedure. (Reviewer-Sharon Gonzales, MD).

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Keywords: Hydroinfusion, Thermal Ablation, Liver Malignancies, Thermoprotection

Print Tag: Refer to original journal article
IR Placement of Prostate Fiducial Markers for IGRT

Single-Center Experience in Prostate Fiducial Marker Placement: Technique and Midterm Follow-Up.

Kably I, Bordegaray M, et al:

J Vaac Interv Radiol 2014; 25 (July): 1125.e1-1132.e1

Ultrasound placement by interventional radiology of prostate fiducial markers is safe and effective.

**Background:** Image-guided radiation therapy (IGRT) for prostate cancer involves doing intensity-modulated radiation therapy (IMRT) with daily positional confirmation by implanted fiducial markers and is highly effective. Using these markers and dose-escalated radiotherapy improves the outcome of prostate cancer while reducing the radiation damage to the bladder, rectum, and the urinary tract.

**Objective:** To evaluate the interventional radiologist's (IR) placement of prostate fiducial markers via transrectal ultrasound.

**Design/Methods:** This is a retrospective review of 75 patients in the authors' institution who underwent transrectal placement of fiducial markers. The patients had an average Gleason score of 7.25. Two patients had radical prostatectomy, and 1 had cryoablation. Absence of the prostate was not a contraindication. Mean follow-up was 19 months.

**Results:** Fiducial marker placement within the prostate was confirmed by CT for 99% of the markers. There were 8 complications in 5 patients. One patient was hospitalized with sepsis after the procedure. Other complications were self-limited perirectal hemorrhage, nausea, hypotension, epididymitis, and urinary tract infection. Most were seen within 2 weeks and were treated on an outpatient basis. Risk factors for complications were metastatic prostate cancer and high tumor grade. IGRT was completed in 70 of the 75 patients after marker placement. Of the patients who did not have IGRT, 2 had medical reasons, 2 developed metastatic disease, and 1 patient stopped treatment because of intractable pain. Of the patients who completed therapy, over half had no side effects. In total, 18% had urinary urgency, 17% had urinary frequency, 11% had urinary pain, and 13% had urinary retention. Most patients only had mild exacerbations of their pre-existing urinary symptoms. The International Prostate Symptom Score increased slightly, from 6.2 to 8.1.

**Conclusions:** This study suggests that placement of fiducial markers in the prostate for IGRT is safe and effective when done transrectally by IR physicians, with complications seen more frequently in patients with high-grade or metastatic disease.

**Reviewer's Comments:** IGRT of prostate cancer is known to have a higher effectiveness, resulting in better biochemical tumor control and lower rates of late urinary tract toxicity, when compared to high-dose radiation without guidance. Fiducial marker by interventional radiologists has a high technical success rate (99.0%) and low complication rates: grade 1, 6.6%; grade 2, 2.6%; and grade 4, 1.3%. These rates are comparable or better than the outcomes of other techniques. The one major complication was *Escherichia coli* sepsis resistant to Cipro®. The antibiotic resistance is unpredictable, and this complication is preventable by implantation through the transperineal route. The other complications were self-limited and minor. The side effects from IGRT, which were exacerbations of patients' pre-existing symptoms, were seen in nearly half of patients, and responded to conservative therapy. (Reviewer-Sharon Gonzales, MD).

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Keywords: Prostate Cancer, Fiducial Placement, Radiation Therapy

Print Tag: Refer to original journal article
Objective: To re-assess the accuracy of classifying benign versus malignant bone lesions using chemical shift imaging.

Design/Methods: A retrospective review was performed of patients who received bone biopsies from 2005 to 2012. In total, 50 patients were included (average age, 67 years; 29 men and 21 women). Pre-biopsy images were reviewed by 2 musculoskeletal radiologists, and all biopsies were performed using 14-gauge co-axial Bonopy needles. A threshold value of 20% was chosen for dropout.

Results: 100% of lesions that demonstrated >20% dropout were benign, while 75% (27 of 36) of lesions that did not demonstrate dropout were malignant. Sensitivity was 100%, specificity 61%, positive predictive value 75%, negative predictive value 100%, and accuracy 80%. Metastasis, multiple myeloma, and lymphoma were the most common malignant lesions detected. The 9 benign lesions that did not dropout included fibrosis, 2 marrow-replacing lesions, and 5 that had no definitive cause.

Conclusions: Chemical shift imaging is a useful addition that takes <1 minute to add on to routine pelvic imaging. With 100% sensitivity using a threshold of 20%, it can avoid biopsies in at least 60% of lesions.

Reviewer’s Comments: I thought this was a useful retrospective review of chemical shift imaging. It highlighted the utility of its addition by revealing the 100% sensitivity in diagnosing benign lesions using the 20% threshold rate. Given that the addition of this sequence does not require much time (<1 minute), its incorporation into routine pelvic imaging seems worthwhile. One limitation of the study is that the authors could have provided further characterization of the lesions that were benign and demonstrated dropout. (Reviewer-Uma Thakur, MD, MSK).

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Keywords: Chemical Shift Imaging, Tumors

Print Tag: Refer to original journal article
Causes and Imaging Features of Radial-Sided Wrist Pain

Imaging of Radial Wrist Pain. Part II: Pathology.
Lok RL, Griffith JF, et al:
Skeletal Radiol 2014; 43 (June): 725-743

Knowledge of the causes of radial-sided wrist pain will aid the radiologist in making a diagnosis.

Objective: To review causes of radial-sided wrist pain. Discussion: The causes of radial-sided wrist pain are reviewed by addressing the most common conditions, etiologies, best imaging modalities, and imaging findings in the bones, joints, tendons, ligaments, nerves, and periarticular soft tissues at the radial aspect of the wrist. The scaphoid is the most commonly fractured carpal bone with 15% to 20% being radiographically occult. MRI is most sensitive for fracture detection, while CT reigns supreme in assessment of nonunion. Dynamic contrast-enhanced MRI is most sensitive for detection of scaphoid avascular necrosis (AVN), as the diagnosis of scaphoid AVN on conventional MRI is not as straightforward as AVN in other places of the body. If the slope and maximal enhancement of the perfusion curve of the proximal pole is less than the distal, AVN is strongly suggested. Avascular necrosis of the lunate is associated with a negative ulnar variance and is most commonly seen in men aged 20 to 40 years. Bone tumors, the most common of the wrist being giant cell tumor, can also be causes for radial-sided wrist pain. Joints of the wrist are best evaluated with MR arthrography, especially for articular cartilage defects. Osteoarthritis is most commonly seen in the radiocarpal, then carpometacarpal, and finally the triscaphe joints. The radiocarpal joint is also the first to be narrowed in rheumatoid arthritis. Tendons are best evaluated on MR and ultrasound. Flexor carpi radialis tendinosis is seen in golfers and tennis players. In de Quervain disease, besides the tendinosis of the first extensor compartment, there is thickening of the extensor retinaculum from the normal 0.5 mm to 2.0 mm. Intersection syndrome is diagnosed by tendinosis of the second extensor compartment 4 to 8 cm above Lister tubercle as they cross over the myotendinous junctions of the first extensor compartment. Ligaments are best evaluated on MR, with the scapholunate being the most commonly injured; a distance of >5 mm is diagnostic of scapholunate dissociation, which can lead to dorsal intercalated instability and scapholunate advanced collapse. Radial and carpal tunnel syndromes can also be causes for pain, with the median nerve >12 mm in diameter being diagnostic for carpal tunnel. Periarticular soft tissue masses, most commonly ganglion cysts, but also masses such as pigmented villonodular synovitis, are also a frequent cause for pain.

Conclusions: Knowledge of the causes of radial-sided wrist pain will aid the radiologist in diagnosis.

Reviewer's Comments: I thought this was a thorough review article of the most common causes, etiologies, and imaging features for radial-sided wrist pain. The authors provide excellent figures and discuss quantitative measures for assessment of conditions such as avascular necrosis via the degree of enhancement or objective criteria for nerve enlargement in carpal tunnels, which I found particularly useful. (Reviewer-Uma Thakur, MD, MSK).

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Keywords: Wrist Pain, Radial

Print Tag: Refer to original journal article
Diffusion Measurements May Play Role in Grading Severity of Hydrocephalus

Axial Diffusivity of the Corona Radiata Correlated With Ventricular Size in Adult Hydrocephalus.

Cauley KA, Cataltepe O:

AJR Am J Roentgenol 2014; 203 (July): 170-179

There is linear correlation between axial diffusivity of the corona radiata and ventricular size in patients with hydrocephalus.

Objective: To evaluate the relationship between severity of hydrocephalus and diffusion-tensor changes in the periventricular corona radiata.

Design: Prospective study of 4 adult patients with acute hydrocephalus, 16 patients with long-standing hydrocephalus, and 48 consecutive healthy adult subjects who underwent MRI imaging of the brain over a 3-year period from August 2009 to August 2012.

Methods: All MRI brain studies included a 15-direction diffusion-tensor imaging (DTI) acquisition. DTI was performed in the axial plane using single-shot echo-planar imaging with the following parameters: TR/TE, 8000/83.2; diffusion gradient encoding in 15 directions; b=0 and 1000 s/mm2; FOV, 260 x 260 mm; matrix size, 128 x 128; section thickness, 5 mm; and number of signals averaged, 1. Ventricular size was assessed using the frontal–occipital horn ratio, which is the ratio of the width of the frontal horns plus the width of the occipital horns divided by twice the interparietal diameter. All MRI analysis was performed by a single experienced observer who was blinded to subject identity. Regression analysis was performed to investigate the relationship between ventricular size and the diffusion-tensor metrics of the corona radiata. Subject age was analyzed as a covariable.

Results: There was a significant positive correlation between fractional anisotropy of the corona radiata and ventricular size in hydrocephalus (r = 0.789, r² = 0.623; P <0.001). There was no significant correlation between mean diffusivity and ventricular size in adult hydrocephalus (r = 0.416; r² = 0.018, which was not significant; P =0.555). A strong positive correlation between axial diffusivity and ventricular size was seen in hydrocephalus (r = 0.663, r² = 0.44; P =0.014), while a strong negative correlation between ventricular volume and radial diffusivity measurements within the corona radiata was seen in acute adult hydrocephalus (r = 0.661, r² = 0.437; P =0.009). In healthy subjects, axial diffusion in the periventricular corona radiata is more strongly correlated with ventricular size than with patient age (r = 0.466; P <0.001 vs r = 0.058; P =0.269).

Conclusions: There is linear correlation between axial diffusivity of the corona radiata and ventricular size in healthy adults and in patients with hydrocephalus.

Reviewer's Comments: The results of this article indicate that diffusion measurements in patients with hydrocephalus may play a role in grading severity of hydrocephalus and in optimizing clinical management. (Reviewer-Sebastian Sadowski, MD).

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Keywords: Hydrocephalus, Diffusion Tensor Imaging

Print Tag: Refer to original journal article
Is There a Relationship Between ADC and Ki-67 Values in Predicting Meningioma Subtypes?

Correlation of Apparent Diffusion Coefficient With Ki-67 Proliferation Index in Grading Meningioma.

Tang Y, Dundamadappa SK, et al:

AJR Am J Roentgenol 2014; 202 (June): 1303-1308

Objective: To evaluate the relationship between apparent diffusion coefficient (ADC) and Ki-67 values in meningiomas as a predictor of tumor aggressiveness.

Design/Participants: Retrospective study of 68 surgically treated patients for meningioma resection (mean age, 63.4 ± 11.6 years) who also underwent MRI of the brain between January 2007 and November 2011.

Methods: All patients underwent presurgical MRI examinations. Two neuroradiology fellows and a fourth-year medical student drew the outline of the tumor and measured ADC values under the supervision of an experienced neuroradiologist. Regions of interest (ROIs) were manually drawn within the tumor on the ADC maps, and mean ADC values were measured. ROIs were drawn to avoid cystic and necrotic areas identified on the T2-weighted and contrast-enhanced T1-weighted images. Histology was available in all patients. Meningiomas were classified according to the WHO (2007) classification. Tumor proliferation indices were reported as the percentage of tumor cell nuclei labeling with the Ki-67 (clone MIB-1) monoclonal antibody in formalin-fixed paraffin-embedded tissue sections. Correlation coefficients were calculated for mean ADC and Ki-67 proliferation index values using linear regression. An independent unpaired Student t test was used to compare the ADC and Ki-67 proliferation index values from low-grade and more aggressive meningiomas.

Results: Among the 68 meningiomas, 20 (27.0%) were atypical, 2 (2.8%) were anaplastic, and 46 (70.0%) were low grade. Among low-grade meningiomas, 9 were meningothelial, 29 transitional, 7 fibroblastic, and 1 microcystic. ADC values and Ki-67 proliferation index, respectively, were 0.89 ± 0.20 x 10-3 mm2/s and 2.7% ± 2.6% for meningothelial; 0.81 ± 0.09 x 10-3 mm2/s and 2.1% ± 1.6% for transitional; 0.83 ± 0.11 x 10-3 mm2/s and 1.9% ± 2.3% for fibroblastic; and 0.75 ± 0.03 x 10-3 mm2/s and 9% ± 5% for aggressive meningiomas. Necrosis, hypercellularity, and small cell morphology were present in 0% of fibroblastic and 86%, 86%, and 86% of aggressive meningiomas, respectively. A statistically significant inverse correlation was found between ADC and Ki-67 proliferation index for low-grade and aggressive meningiomas (r2 = −0.33; P =0.0039). ADC values (± standard deviation) of low-grade meningiomas (0.84 ± 0.14 x 10-3 mm2/s) and aggressive (atypical or anaplastic) meningiomas (0.75 ± 0.03 x 10-3 mm2/s) were significantly different (P =0.0495). Using an ADC cutoff value of 0.70 x 10-3 mm2/s, the sensitivity for diagnosing aggressive meningiomas was 29%, specificity was 94%, positive predictive value was 67%, and negative predictive value was 75%.

Conclusions: There is an inverse relationship between ADC and Ki-67 proliferation index values in all meningiomas.

Reviewer's Comments: I agree with the authors in that ADC values appear to play an important role as a parameter in meningioma characterization and can help in lesion management. (Reviewer- Sebastian Sadowski, MD).

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Keywords: Meningioma, Apparent Diffusion Characteristic, Ki-67

Print Tag: Refer to original journal article
Objective: To evaluate whether the apparent diffusion coefficient (ADC) gradient in peritumoral edema can help differentiate glioblastoma from metastatic lesion.

Design/Participants: This was a retrospective study of 20 patients with glioblastoma and 20 patients with a solitary metastatic lesion who underwent diffusion-weighted brain MRI before surgical resection between December 2010 and August 2012.

Methods: For all 40 patients, 3 regions of interest (ROIs) in the peritumoral region were selected from the proximity of the enhancing tumor to the normal-appearing white matter. The ROI next to the enhancing tumor was called G1, the ROI in the middle of the peritumoral edema was G2, and the ROI farthest from the enhancing tumor was G3. The ADC value from each of the ROIs (ADCG1, ADCG2, and ADCG3) was recorded, and the ADC gradient in the peritumoral edema was calculated as the subtractions ADCG3 − ADCG1, ADCG3 − ADCG2, and ADCG2 − ADCG1. The ADC values in the enhancing tumor, peritumoral edema, ipsilateral normal-appearing white matter, contralateral healthy white matter, and cerebrospinal fluid were also collected. All MRI examinations were randomized, and a single radiologist blinded to the final diagnosis analyzed the images.

Results: Regarding the ADC gradient in the peritumoral region, the ADCG3 − ADCG1 value was significantly higher for glioblastomas than for metastatic lesions (P <0.05). The ADCG1, ADCG2, and ADCG3 values showed no statistically significant difference between the 2 groups (P >0.05). Regarding the minimum ADC in the enhancing peritumoral regions and in the normal-appearing white matter, there were no statistically significant differences between the 2 groups with respect to ADC values or ADC ratios (P ≥0.05).

Conclusions: ADC gradient in peritumoral edema is a promising tool in differentiating glioblastoma from metastatic lesion.

Reviewer's Comments: I agree with the conclusions of this article in that ADC gradient can become an important parameter in differentiating glioblastoma from metastasis with important clinical implications. (Reviewer-Sebastian Sadowski, MD).

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Keywords: Apparent Diffusion Coefficient Gradient, Glioblastoma, Metastasis

Print Tag: Refer to original journal article
A Case for the Judicious Use of Breast Compression During Breast MRI

The Effects of Applying Breast Compression in Dynamic Contrast Material-Enhanced MR Imaging.

Khouli RH, Macura KJ, et al:

Radiology 2014; 272 (July): 79-90

The degree of breast compression during MRI-guided biopsy procedures significantly affects the enhancement and conspicuity of the lesion to be targeted.

Background: Dynamic contrast-enhanced breast MRI has been established as an imaging technique with high sensitivity for the detection of breast cancer. Most breast MRI coils are designed to apply moderate compression during imaging to decrease imaging artifacts introduced from motion.

Objective: To evaluate the effect of compression during breast MRI acquisition on the depiction of masses, glandular enhancement, and image quality.

Methods: 3 separate groups of patients were identified from retrospective review of an imaging database. The first group identified consisted of patients with pathology-proven breast cancer who had undergone breast MRI without compression of at least 1 breast as part of a diagnostic workup and subsequently underwent MRI-guided biopsy with compression of the breast containing the breast cancer. The second group consisted of those patients with a benign breast biopsy diagnosis who had undergone MRI without compression as part of a diagnostic workup, and MRI with compression of 1 breast as part of an MRI-guided biopsy. The third group consisted of those patients who had a lesion identified on MRI performed as part of a diagnostic workup, and when a subsequent MRI-guided biopsy was attempted under unilateral compression, the lesion could not be seen. A single radiologist was tasked with retrospectively reviewing the images for the patients in each group. The radiologist evaluated breast density, percentage breast compression, lesion type, lesion size, and kinetic characteristics when applicable.

Results: During breast compression as part of MRI-guided biopsies, a large variability in breast compression was observed, ranging from 5.8% to 53.2%. Breast compression was found to statistically significantly decrease enhancement of breast cancers as well as glandular tissue during the early enhancement phase. Areas of non-mass enhancement had a greater decrease in enhancement when compression was applied as compared with enhancing masses. Breast cancer lesions appeared to decrease in size by an average of 16% after compression was applied. In 4% of cases, the application of breast compression completely suppressed the enhancement of a lesion. The lesions that were associated with complete suppression of enhancement averaged <1 cm in greatest dimension.

Conclusions: Breast compression during MRI results in decreased enhancement of malignant and benign lesions as well as glandular enhancement.

Reviewer’s Comments: Any radiologist who has some experience with MRI-guided breast biopsy will appreciate the documented findings in this study. In this practice setting, it is not uncommon to find that the lesion to be targeted is less conspicuous or frankly not visible on the day the patient presents for biopsy, and the findings here suggest that the degree of compression is likely a large component of the reason. (Reviewer-Basil Hubbi, MD).

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Keywords: Breast MRI, Breast Compression, MRI-Guided Breast Biopsy

Print Tag: Refer to original journal article
Papillary Lesions of the Breast Diagnosed on Core Needle Biopsy -- Debate Continues

Papillary Lesions of the Breast: Outcomes of 156 Patients Managed Without Excisional Biopsy.
Wyss P, Varga Z, et al:

Breast J 2014; 20 (July): 394-401

Papillary lesions of the breast diagnosed on core needle biopsy should undergo surgical excision; however, those diagnosed with a vacuum-assisted system may undergo close follow-up.

Background: Papillary lesions of the breast are generally considered benign proliferations of the epithelium of the lactiferous duct of the breast. Associated symptoms include a palpable mass or spontaneous bloody or clear nipple discharge. On ultrasound, a papillary lesion is often characterized as an intraductal or intracystic mass with a well-defined border. There continues to be controversy on the follow-up of papillary lesions diagnosed on image-guided core needle biopsy, with some authors recommending excision and others recommending short-term interval follow-up.

Objective: To determine how often papillary lesions of the breast diagnosed on image-guided core needle biopsy are associated with malignancy.

Methods: A pathology database was searched to identify cases of pure papillomas without atypia or associated carcinoma diagnosed on image-guided core needle biopsy. If the lesion was surgically excised, the pathologic features were reviewed to determine the presence or absence of occult atypia or carcinoma. Medical records were reviewed to determine follow-up findings for all cases.

Results: 180 lesions were diagnosed on image-guided biopsy, 77 of which were on vacuum-assisted core needle biopsy and 113 on non–vacuum-assisted core needle biopsy. Mean patient age was 51.4 years. A total of 48.9% of lesions were asymptomatic and detected on imaging, of which 24.4% were palpable on presentation and 20.6% caused pathologic nipple discharge. Only 13.3% were surgically excised after image-guided biopsy, and none were associated with carcinoma on final pathology. Of the lesions that were diagnosed on non–vacuum-assisted core needle biopsy and subsequently underwent vacuum-assisted core needle excision, 8.7% were upgraded to a high-risk lesion or noninvasive carcinoma. Overall, 156 cases were not treated with surgical excision or vacuum-assisted core needle excision immediately and were otherwise followed-up periodically. Only 2 cases of ductal carcinoma in situ were diagnosed over the follow-up period: 1 after 4 years of follow-up and the other after 7 years of follow-up.

Conclusions: Papillary lesions diagnosed on non–vacuum-assisted core needle biopsy were not associated with invasive carcinoma on follow-up.

Reviewer's Comments: The study comes from a European institution and the authors report using 11-gauge and 8-gauge vacuum-assisted core needle biopsy systems to perform the "vacuum-assisted core needle excision." The results suggest that the vacuum-assisted core needle biopsy systems act as effectively as surgical excision in determining the presence of occult noninvasive carcinoma. Adopting this lesson into current practice in North America is not advised, however. Larger-scale studies would help in sanctioning this practice, and to date, most surgical and breast imaging advisory boards do not equate vacuum-assisted biopsy systems with surgical excision in the treatment of papillary lesions of the breast. (Reviewer-Basil Hubbi, MD).

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Keywords: Papilloma, Breast Cancer, Excisional Biopsy, Core Needle Biopsy, Vacuum-Assisted Core Needle Biopsy

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Tomosynthesis Takes on Architectural Distortion, Comes Out Swinging

Detection of Mammographically Occult Architectural Distortion on Digital Breast Tomosynthesis Screening: Initial Clinical Experience.

Partyka L, Lourenco AP, Mainiero MB:

AJR Am J Roentgenol 2014; 203 (July): 216-222

Tomosynthesis in conjunction with mammography detects architectural distortion better than mammography alone, and detects this finding often when it is mammographically occult.

Background: Screening mammography has been shown to be effective in the detection of clinically occult breast cancer; however, the sensitivity has not been shown to improve much more than 90%, indicating that certain cancers are mammographically occult. Architectural distortion in particular is a finding that may often be subtle on traditional 2-view mammography, and its detection has been shown to be less than findings such as masses or calcifications.

Objective: To determine if digital breast tomosynthesis (DBT) in combination with 2-view mammography improves the detection of architectural distortion as opposed to mammography alone.

Design/Methods: A retrospective analysis of screening mammography reports performed at a single institution over a 9-month period was undertaken to identify recalled cases where "architectural distortion" (AD) was described as the main finding. AD was defined as distortion of the breast parenchyma without a visible mass. All the screening mammograms had been performed in conjunction with tomosynthesis. A retrospective review of the studies was conducted by 3 radiologists, of whom 2 were attendings in breast imaging and 1 was a fellow in breast imaging. The participants were blinded to the diagnostic workup and the final pathology. Only cases of pure AD without calcifications or an associated mass were included in the review. Cases were categorized as being seen equally well on DBT and digital mammography (DM), seen better on DBT than on DM, seen only on DBT, seen better on DM, and seen only on DM. After the cases were independently reviewed, a consensus was reached by weighing each radiologist's impression. Review of the medical record was also performed to determine what additional imaging the patient may have undergone and final core needle biopsy pathology or surgical excisional pathology, if available.

Results: A total of 26 cases performed over the retrospective 9-month period met the inclusion criteria for analysis. Of those, 23% were categorized as seen better on DBT than mammography and 73% were categorized as only seen on DBT. Only 1 case was deemed equally evident on DM and DBT. No cases were seen better on mammography or only on mammography. Of the cases of AD seen only on tomosynthesis, 47% were ultimately given a BI-RADS ≥4 category and 22% of those yielded a diagnosis of invasive cancer on core biopsy. All invasive carcinomas were also demonstrated on subsequent ultrasound imaging.

Conclusions: Tomosynthesis in conjunction with mammography detects architectural distortion better than mammography alone, and detects this finding often when it is mammographically occult.

Reviewer's Comments: Tomosynthesis in conjunction with mammography continues to demonstrate improved performance compared to mammography alone. This is just the latest data set that demonstrates just that, and it addresses an all too difficult finding to make: architectural distortion. (Reviewer-Basil Hubbi, MD).

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Keywords: Digital Breast Tomosynthesis, Digital Mammography, Architectural Distortion

Print Tag: Refer to original journal article
Tomosynthesis Shines in the Spotlight

Breast Cancer Screening Using Tomosynthesis in Combination With Digital Mammography.

Friedewald SM, Rafferty EA, et al:

JAMA 2014; 311 (June 25): 2499-2507

The addition of tomosynthesis to traditional mammography increases the cancer detection rate and decreases the recall rate, therefore increasing specificity.

Background: Traditional 2-view mammography has been shown to decrease mortality from breast cancer by identifying cancer before it becomes clinically apparent. Despite the benefits of mammography, some limitations continue, including limited sensitivity, false-positive results, and criticisms of overdiagnosis of lesions of uncertain potential behavior. In 2011, digital breast tomosynthesis was approved by the FDA to be used in combination with traditional 2-view mammography.

Objective: To determine the performance of digital mammography alone versus digital mammography plus tomosynthesis across a variety of breast imaging practices.

Methods: The study was performed at 13 separate institutions over 2 distinct periods. Over the first period, the performance of traditional 2-view digital mammography in the detection of clinically occult breast cancers was assessed over a 1-year period. Following this period, digital breast tomosynthesis was introduced at all 13 institutions and the performance of tomosynthesis in conjunction with 2-view digital mammography was assessed. The variables that were assessed included recall rate, cancer detection rate, positive predictive value of recall, and positive predictive value of biopsy recommendation. All 13 centers used the Selenia Dimensions tomosynthesis machine manufactured by Hologic. Only cancers of breast origin were included in the analysis. Cancers such as lymphoma or metastatic disease were excluded. Screening performance was compared between the 2 periods.

Results: A total of 454,850 cases were interpreted by 139 radiologists. Of those cases, 281,187 comprised the traditional 2-view digital mammogram cases over the first period and 173,663 comprised the 2-view digital mammograms plus tomosynthesis cases over the second period. Across all centers, the average recall rate per 1000 screens for digital mammography alone was found to be 10.7%, and that for digital mammography plus tomosynthesis was 9.1%. Across all centers, the biopsy rate per 1000 screens of digital mammography alone was found to be 1.8%, and that for digital mammography plus tomosynthesis was 1.9%. The cancer detection rate per 1000 screens for mammography alone was found to be 0.42%, and that for digital mammography plus tomosynthesis was 0.54%. For invasive carcinomas specifically, the detection rate for mammography alone was 0.29%, and that for mammography plus tomosynthesis was 0.41%. The positive predictive value (PPV) of recall for digital mammography alone was 4.3%, and 6.4% for mammography plus tomosynthesis. The PPV for biopsy for digital mammography alone was 24.2%, and 29.4% when tomosynthesis was added. Notably, there was an increase in detection of invasive lobular carcinoma from 0.27 to 0.55 when tomosynthesis was added to mammography.

Conclusions: The addition of tomosynthesis to digital mammography increased cancer detection rates and decreased recall rates.

Reviewer’s Comments: This powerful study demonstrates the ongoing maturation of tomosynthesis and its ability to improve on the traditional limitations of 2-view mammography. (Reviewer-Basil Hubbi, MD).

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Keywords: Digital Breast Tomosynthesis, Digital Mammography, Breast Cancer Screening, Cancer Detection Rate, Recall Rate

Print Tag: Refer to original journal article