Fallacies Rife in Medical Investigation

Fallacies Part 1.

Stephen R. Baker, MD:

-Special Presentation

The obligation of a reviewer is to recognize fallacies, because as they intrude on truth and inhibit the recognition of uncertainty, they can lead to false beliefs, wrong policies, harm to patients, and the imposition of increased costs of care.

Scientific inquiries must conform to the dictates of logical estimation. Yet, fallacies are rife in medical investigation as they are in life in general. The obligation of a reviewer is to recognize fallacies, because as they intrude on truth and inhibit the recognition of uncertainty, they can lead to false beliefs, wrong policies, harm to patients, and the imposition of increased costs of care. For these urgent reasons, fallacies must be exposed. The repertoire of fallacies is vast including incorrect propositions, unsuitable quantifications, logical mistakes both formal and informal, inappropriate generalizations, and irrelevancies. Most of these occur in the radiologic literature. The first part of this 2-part lecture will be an introduction to the range of fallacies--both general and specific--that the wary reader of the medical literature must watch out for. (Reviewer-).

Keywords: Fallacies vs Radiology

Print Tag: Refer to original journal article

Site of Ductal Dilatation Not Significant Predictor of Malignancy

Main Pancreatic Duct Intraductal Papillary Mucinous Neoplasms: Accuracy of MR Imaging in Differentiation Between Benign and Malignant Tumors Compared With Histopathologic Analysis.

Manfredi R, Graziani R, et al:

Radiology 2009; 253 (October): 106-115

Malignant and mixed type intraductal papillary mucinous neoplasms are differentiated from benign variants by the presence of enhancement and nodularity of the main pancreatic duct wall.

Objective: To assess the accuracy of MRI combined with MR cholangiopancreatography in differentiating between benign and malignant intraductal papillary mucinous neoplasms of the main pancreatic duct (MPD).
Design: Retrospective analysis.
Participants/Methods: This study was comprised of 51 patients with histopathologically proven intraductal papillary mucinous neoplasms that had preoperative MRI combined with MRCP. Exclusion criteria included presence of side branch intraductal papillary mucinous neoplasm (IPMN), prior pancreatic surgery, poor quality MR study, as well as imaging performed at an outside institution. The mean interval between MR imaging and surgery was 2.6 months. MR examinations were performed with a 1.5-T scanner. Sequences included chemical shift T1-weighted gradient-echo; fat-saturated T2-weighted; 2D and 3D MRCP; and dynamic enhanced 3D volumetric gradient-echo during the pancreatic, portal venous, and delayed phases at 35 to 45, 75 to 80, and 180 seconds, respectively. Images were reviewed by 2 radiologists who were aware of the diagnosis of IPMN of the MPD, but not of the histopathologic diagnosis. Qualitative analysis consisted of recording the following parameters: location of MPD dilatation, presence or absence of mural nodules along the nondependent surface, and enhancement of the wall of the MPD. Quantitative image analysis consisted of the measurement of the MPD and mural nodules. Histopathologically, the epithelial lesions of MPD IPMNs were classified as adenoma, borderline tumor, or adenocarcinoma.
Results: There were 11 adenomas, 13 borderline tumors, and 27 adenocarcinomas at histopathologic analysis. The more common site of dilatation of the MPD was the body or tail in 55% of patients with adenomas, diffuse dilatation in 46% with borderline tumors, and diffuse dilatation in 74% of adenocarcinomas. Nondependent mural nodules were seen in 8% of patients with borderline tumors, in 59% of adenocarcinomas, and in none of the adenomas. Mural enhancement of the MPD was seen in 9% of patients with adenomas, in 31% with borderline tumors, and in 74% with adenocarcinomas.
Conclusions: Mural nodules and wall enhancement were significant predictors of malignancy in IPMNs. The site of ductal dilatation was not a significant predictor of malignancy. However, diffuse dilatation of the MPD had a higher probability of being a malignant IPMN than did segmental dilatation confined to the head, body, or tail.
Reviewer's Comments: The results of this study are useful in that they point out 2 additional features in IPMN that have a higher association with the lesion being malignant. Diffuse involvement with dilatation of the MPD has long been known to have a greater likelihood of malignancy in IPMN lesions. However, this combined with mural nodules and duct wall enhancement increases this probability and therefore allows for a more specific diagnosis. A limitation noted in this study was the retrospective design which would make it difficult to have standard constant reproducible imaging protocols and parameters. (Reviewer-John C. Sabatino, MD, MSD).

Keywords: Pancreas, MRI, Cholangiopancreatography, Papillary Mucinous Neoplasms

Print Tag: Refer to original journal article

How Specific Is DW MR in Differentiating Between Benign and Malignant Disease?

Pitfalls in Abdominal Diffusion-Weighted Imaging: How Predictive Is Restricted Water Diffusion for Malignancy.

Feuerlein S, Pauls S, et al:

AJR Am J Roentgenol 2009; 193 (October): 1070-1076

There are a number of benign entities that can result in restricted diffusion and therefore be misinterpreted as malignant disease.

Objective: To determine the specificity of abdominal diffusion-weighted MR in differentiating between benign and malignant disease.
Design: Retrospective analysis.
Participants/Methods: This study was comprised of 230 patients who underwent abdominal MR that included diffusion-weighted imaging (DWI). MR examinations were performed with a 1.5-T system. DWI was performed using a respiratory-gated single-shot spin-echo echo-planar sequence with b-values of 0, 150, 500, and 1000 seconds/mm2. Images were reviewed by 2 radiologists. Lesions were only detected on DWI with a b-value of 1000 seconds/mm2. Regions of interest were used to measure the apparent diffusion coefficient (ADC) to assess for presence of restricted diffusion of the lesions. The characteristic imaging appearance on imaging follow-up, features on T1-weighted and T2-weighted images or CT, or tissue sampling were used to establish lesion diagnosis.
Results: There were 52 patients who had 55 lesions that had restricted diffusion with a mean ADC value of 809 mm2 per second. Forty-three of 55 lesions were malignant and had ADC values that were lower than those of the 12 benign lesions. However, this was not found to be statistically significant. In the liver, the mean ADC value was 851 mm2 per second. Malignant lesions included metastases, hepatocellular carcinoma, and cholangiocellular carcinoma with a mean ADC value between 791 and 866 mm2 per second. The benign lesions had a mean ADC value of 1049 mm2 per second. Benign lesions included hemangioma and adenoma. In the pancreas, an adenocarcinoma had restricted diffusion with an ADC value of 1025 mm2 per second. Benign lesions included teratoma and autoimmune pancreatitis with an ADC value between 789 and 799 mm2 per second. In the colon and rectum, malignant lesions were primary colorectal carcinoma and rectal metastasis of cervical carcinoma with an ADC value of 923 mm2 per second and 750 mm2 per second, respectively. In the uterus and ovaries, malignant lesions were cervical, vaginal, and ovarian carcinomas with a mean ADC value of 768 mm2 per second. Other malignant lesions with restricted diffusion included lymphoma, bladder carcinoma, osseous metastases, soft tissue sarcomas, and breast carcinoma. Benign lesions with restricted diffusion included Crohn's disease, hemorrhagic ovarian cyst, Bartholin cyst, and renal abscess.
Conclusions: Restricted diffusion is generally considered to be associated with malignant tumors because of their high cellularity. However, in interpretation of DWIs, it should be kept in mind that a number of benign lesions can exhibit restricted diffusion on images with high b values, thus mimicking malignant lesions.
Reviewer's Comments: The results of this study are useful in that they demonstrate that the majority of malignant lesions with restricted diffusion have low ADC values. However, it was also shown that restricted diffusion can also be seen with benign lesions. Consequently, these have the potential of being incorrectly classified as malignant. Therefore, caution should be used in classifying lesions as malignant solely on the basis of restricted diffusion. One of the limitations reported in this study was the lack of histopathologic confirmation for all the lesions. (Reviewer-John C. Sabatino, MD, MSD).

Keywords: MRI, Diffusion-Weighted Imaging, Malignancy

Print Tag: Refer to original journal article

Contiguous Parenchymal Mass, Colorectal Cancer Can Help Predict Metastasis

Differential CT Features of Intraductal Biliary Metastasis and Double Primary Intraductal Polypoid Cholangiocarcinoma in Patients With a History of Extrabiliary Malignancy.

Lee YJ, Kim SH, et al:

AJR Am J Roentgenol 2009; 193 (October): 1061-1069

CT findings of an expansile intraductal mass with a contiguous parenchymal mass in a patient with a history of colorectal carcinoma favor that the intraductal lesion is a metastasis rather than double primary intraductal cholangiocarcinoma.

Objective: To determine if CT can accurately differentiate between intraductal metastases and double primary intraductal cholangiocarcinoma.
Design: Retrospective analysis.
Participants/Methods: This study was comprised of 14 patients, of which 8 had intraductal metastases and 6 had double primary intraductal cholangiocarcinoma. All patients had a history of extrabiliary neoplasm. Patients with intraductal metastases had a colorectal primary neoplasm. Patients with double primary intraductal cholangiocarcinoma had extrabiliary neoplasms of the liver, stomach, prostate, or lung. Contrast-enhanced CT examinations were performed in all patients. All studies had images obtained during the portal venous phase at 70 seconds following contrast administration, while some also had additional early and/or late arterial phase images at 28 and 45 seconds, respectively. Four patients with intraductal metastases and 2 with double primary intraductal cholangiocarcinoma had MR studies. MR examinations were performed with 1.5- or 3-T systems. Imaging sequences included T2-weighted single-shot fast spin-echo, T2-weighted fast spin-echo, and T1-weighted gradient-recalled echo in-phase and out-of-phase. MR cholangiopancreatographic examinations consisting of thick-slab T2-weighted fast spin-echo and thin-section HASTE sequences were performed in 3 patients Multiphasic dynamic enhanced images were subsequently acquired during the arterial, portal, and equilibrium phases at 20 to 35, 45 to 60, and 180 seconds, respectively, after intravenous contrast administration. Images were reviewed by 2 radiologists. Features of the intraductal tumor that were recorded included: size, multiplicity, appearance (papillary, expansile), attenuation or signal, and presence of calcification or hepatic mass. All cases had histopathologic confirmation either by surgery or ultrasound-guided biopsy.
Results: All of the intraductal metastases were from colorectal carcinoma. Those that had immunohistochemical staining were confirmed by being negative for cytokeratin 7 and positive for cytokeratin 20. The only 2 features that proved to be statistically significant in differentiating intraductal metastases from intraductal cholangiocarcinomas were lesion appearance and presence of a hepatic parenchymal mass. All intraductal cholangiocarcinomas were purely intraductal masses; 62% of intraductal metastases had a contiguous hepatic mass; 88% of intraductal metastases were expansile; and 83% of the intraductal cholangiocarcinomas were papillary.
Conclusions: When an intraductal lesion is found in a patient with extrabiliary malignancy, presence of a contiguous parenchymal mass, an expansile nature of the intraductal lesion, and history of colorectal cancer may suggest presence of intraductal metastasis rather than double primary intraductal cholangiocarcinoma.
Reviewer's Comments: The results of this study are useful in demonstrating that there is a greater likelihood of an intraductal biliary neoplasm being a metastasis rather than a double primary intraductal cholangiocarcinoma when the patient has a history of colorectal cancer. One of the limitations noted in this study was the small patient populations for both disease entities. (Reviewer-John C. Sabatino, MD, MSD).

Keywords: Intraductal Biliary Metastasis, Double Primary Cholangiocarcinoma, Malignancy

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Foci of Myocardial Fat Present in Tuberous Sclerosis Complex

Fatty Foci in the Myocardium in Patients With Tuberous Sclerosis Complex: Common Finding at CT.

Adriaensen ME, Schaefer-Prokop CM, et al:

Radiology 2009; 253 (November): 359-363

Patients with TSC often have well-circumscribed foci of fat density within their myocardium that is centered within the mid-myocardium and extends into either the subendocardial or subepicardial space or both.

Background: Tuberous sclerosis complex (TSC) is an autosomal dominant multi-organ disease that has variable expression.
Objective: To evaluate focal fatty foci seen in the myocardium in patients with TSC.
Design: Retrospective study.
Participants: 55 patients with known TSC who had abdominal CTs in order to have the base of the heart evaluated. There were also 55 control patients who had a similar age and sex as the study group and who had an abdominal CT, but did not have TSC.
Methods: Study patients with TSC had an abdominal CT with either a single-detector or 16-detector row CT. Non-contrast images were obtained followed by contrast-enhanced images utilizing 120 mL of iopromide (Ultravist 300). Control patients had an abdominal CT performed with the 16-detector row CT with the same parameters as the study patients. On each CT, presence of foci of fat within the myocardium was evaluated for. If these foci of fat were seen, its perpendicular diameter was obtained on the axial plane, its density was measured using a region of interest in the center of the lesion, and its location was recorded. Images were analyzed independently by 2 researchers and discrepancies were resolved with a third researcher.
Results: In 35 of 55 (64%) patients with TSC, focal areas of fat attenuation were seen in the myocardium. The largest focus of fat was in the interventricular septum in 51% of cases, the left ventricular wall in 26% of cases, the right ventricular wall in 17% of cases, and in the papillary muscle in 6% of cases. The size of the focal fat ranged from 3 x 1 mm and 62 x 31 mm with an average length of 20 mm and an average width of 6 mm. The average density of the fatty lesions was -73 HU. Nineteen patients had >1 lesion and in these patients, the average number of lesions was 2.5. All lesions were centered in the mid-myocardium and extended into the subendocardial or subepicardial space or both. No lesion was just located in the subendocardial space. Most of the lesions had an ovoid shape. In the control group, 1 of 55 patients (2%) had a focal area of fat attenuation seen within the myocardium. This focus of fat was linear in configuration and was located exclusively within the subendocardial region of the left ventricular wall.
Conclusions: The majority of patients with TSC demonstrate well-circumscribed foci of fat density within their myocardium.
Reviewer's Comments: The authors have very nicely demonstrated another characteristic of TSC. They postulate that these fatty foci may represent lipomas perhaps derived from perivascular epithelioid cells that may have the ability to differentiate into fat, vasculature, and smooth muscle. (Reviewer-Vineet R. Jain, MD).

Keywords: Tuberous Sclerosis Complex, Focal Fatty Foci

Print Tag: Refer to original journal article

Lung Scintigraphy More Reliable Than Pulmonary CTA in Pregnant Patients

Pulmonary Embolism in Pregnancy: Comparison of Pulmonary CT Angiography and Lung Scintigraphy.

Ridge CA, McDermott S, et al:

AJR Am J Roentgenol 2009; 193 (November): 1223-1227

Due largely to transient interruption of contrast by unopacified blood in the IVC, pulmonary CT angiograms performed in pregnant patients are often non-diagnostic; therefore, lung scintigraphy is preferable in these patients.

Objective: To evaluate lung scintigraphy and pulmonary CT angiography (CTA) in pregnant patients suspected of having a pulmonary embolism (PE).
Design: Retrospective study.
Participants: Patients suspected of having PE between July 1, 2006, and April 1, 2008, at the author's institution and had a CTA or lung scintigraphy.
Methods: CTA was performed using a 64-MDCT scanner and images were taken in a caudocranial direction during an inspiratory breath-hold. In total, 75 mL of iopamidol was injected at 4 mL/s followed by a 50-mL saline flush. Bolus tracking software was employed with a trigger of 100 HU in the main pulmonary artery (MPA). The patient was instructed to breathe quietly during bolus tracking and to take a deep inspiration once the attenuation threshold in the MPA was reached. Images were reconstructed with 1-mm slice thickness. All lung scintigraphy and CTAs were characterized as adequate or inadequate for the diagnosis of PE based upon the radiology report. The attenuation of the MPA was measured in the pregnant patients. The CTAs were also evaluated for transient interruption of contrast by unopacified blood from the inferior vena cava (IVC). The contribution of the IVC to the right side of the heart compared with the superior vena cava (SVC) was calculated by a formula where the IVC contribution to the right atrium and right ventricle was calculated by equating the attenuation in HU in these chambers to a weighted average of the attenuation of the SVC and IVC.
Results: 28 CTAs and 25 lung scintigraphic exams were performed in pregnant patients. Ten of the CTAs were non-diagnostic and 1 of the lung scintigraphic examinations was non-diagnostic. The rate of non-diagnostic study was significantly less for lung scintigraphy than CTA (4.0% vs 35.7%; P <0.0058). The rate of non-diagnostic CTA was also significantly less for nonpregnant patients versus pregnant patients (2.1% vs 35.7%; P <0.001). The average attenuation of the MPA in the non-diagnostic pregnant group was 111.4 ± 44.8 HU versus 228.7 ± 50.4 HU in the diagnostic pregnant group. In the control nonpregnant group, the average attenuation of the MPA was 311.6 ± 43.0 HU. In the 10 CTAs that were non-diagnostic in the pregnant patients, transient interruption of contrast by unopacified blood in the IVC was found in 8 of them.
Conclusions: Lung scintigraphy is more reliable than pulmonary CTA in pregnant patients.
Reviewer's Comments: This is a very interesting study. The authors state in their conclusion that lung scintigraphy should be considered the test of choice for suspected PE in pregnant patients unless the image quality of pulmonary CTA can be optimized in this group with different breathing maneuvers and contrast administration. I wonder what other institution's experiences are with this patient population. (Reviewer-Vineet R. Jain, MD).

Keywords: Pulmonary Embolism, Lung Scintigraphy, Pulmonary CTA, Pregnant Patients

Print Tag: Refer to original journal article

Mechanical Heart Valves Well Assessed With ECG-Gated 64-MDCT

Evaluation of Mechanical Heart Valve Size and Function With ECG-Gated 64-MDCT.

LaBounty TM, Agarwal PP, et al:

AJR Am J Roentgenol 2009; 193 (November): W389-W396

CT has high interobserver agreement in measurement of size and function of mechanical heart valves and the results are similar to the specifications expressed by the manufacturer.

Objective: To ascertain the ability of CT to evaluate mechanical heart valve size and function.
Design: Retrospective study.
Participants: 62 patients who had 64 mechanical valves were evaluated. Thirty-seven were single-disc valves and 27 were bileaflet valves. Fifty-nine were aortic valves and 5 were mitral valves. All patients underwent transthoracic echocardiography (TTE) and retrospective ECG-gated 64-MDCT using IV contrast.
Methods: On CT, the reconstruction slice thickness was 1.25 mm. Multiplanar reformatted images at 10% intervals of the R-R interval were reviewed. The opening angle and disc closure of each valve was evaluated using various reformatting planes. An electronic protractor measured the opening angle of each disc. Complete closure was closure to 0° for single-disc valves and complete disc apposition for dual-disc valves. The annulus diameter was measured from external edge to external edge of the annulus. The geometric orifice area was measured on the short-axis plane of the valve. TTE was performed using standard techniques. A subset of patients also had cinefluoroscopy performed.
Results: The opening angle, evaluation of closure, and annulus diameter could be assessed in all cases. The geometric orifice area could be assessed in 58 of 64 with motion artifact preventing evaluation in the rest. There was excellent correlation and minimal interobserver difference between CT readers for CT and TTE measurement of opening angle (r=0.96; 76.7 ± 9.0° vs 76.8 ± 9.6°); annulus diameter (r=0.96; 25.9 ± 3.3 vs 25.9 ± 3.2 mm); and geometric orifice area (r=0.98; 3.8 ± 0.9 vs 3.6 ± 0.8 cm2). In patients who had cinefluoroscopy, there was a strong correlation in evaluation of opening angle between CT and cinefluoroscopy (r=0.77; 79.2 ± 9.8° vs 77.2 ± 15.5°). When comparison was made with manufacturer specifications, CT opening angles were smaller for single-disc valves (67.4° ± 5.7° vs 75°) and were similar for bileaflet valves (83.8° ± 3.9° vs 85°). When comparison was made with the manufacturer specifications, CT mildly underestimated annulus diameter (26.4 ± 3.0 vs 27.5 ± 3.3 mm) and mildly underestimated geometric orifice area (3.7 ± 0.7 vs 3.8 ± 0.8 cm2). On CT, each disc demonstrated complete closure. On echocardiography, all of the discs had either absent or mild regurgitation. The mean radiation dose was 44.0 ± 8.3 mSv, which included the thoracic and abdominal aorta as well as imaging of the pelvis in several patients.
Conclusions: CT has high interobserver agreement in measurement of size and function of mechanical heart valves and the results are similar to the specifications expressed by the manufacturer.
Reviewer's Comments: The authors note that radiation exposure is a limitation, but dose could be reduced by covering a smaller z-axis and reducing current. (Reviewer-Vineet R. Jain, MD).

Keywords: Mechanical Heart Valves, Size and Function, MDCT

Print Tag: Refer to original journal article

Is it Advantageous to Have a Dedicated Musculoskeletal Radiologist on Staff?

Magnetic Resonance Imaging and Magnetic Resonance Arthrography of the Shoulder: Dependence on the Level of Training of the Performing Radiologist for Diagnostic Accuracy.

Theodoropoulos JS, Andreisek G, et al:

Skeletal Radiol 2009; October 14 (): Epub ahead of print

Musculoskeletal radiologists achieve higher diagnostic accuracy when interpreting MRI/MRA of the shoulder compared with general radiologists.

Objective: To determine the diagnostic accuracy of general radiologists versus fellowship-trained musculoskeletal radiologists in identifying shoulder pathology by magnetic resonance imaging (MRI) and/or magnetic resonance arthrography (MRA).
Design/Participants: Retrospective cross-sectional study of 238 patients who had undergone 250 MR examinations.
Methods: As a reference standard for diagnosis, all patients had undergone arthroscopic surgery. Overall, 22% of patients had MRI of the shoulder and 78% had MRAs. Forty-eight MRI studies were read by community-based general radiologists and 58% were reinterpreted by a musculoskeletal radiologist. Fifty-seven MRAs were performed by community-based general radiologists and 74% were reevaluated by a musculoskeletal radiologist. Pathology of the glenoid labrum, rotator cuff muscles, biceps tendon, and humeral head were given specific attention. Statistical comparison between general radiologists and musculoskeletal radiologists was generated with respect to sensitivity, specificity, positive and negative predictive values, and overall accuracy.
Results: Comparing the evaluation of unenhanced MRI, general radiologist accuracy rates were 46%, 75%, 96%, and 96% for disorders of the labrum, rotator cuff, biceps, and humeral head, respectively. For musculoskeletal radiologists, accuracy rates were 79%, 93%, 96%, and 96%, respectively. Comparing the evaluation of MRAs, general radiologist accuracy rates for the same pathology were 55%, 67%, 90%, and 95%, respectively. Musculoskeletal radiologists attained accuracy rates of 88%, 90%, 98%, and 98%, respectively.
Conclusions: Musculoskeletal radiologists average higher diagnostic accuracy when evaluating MRI/MRA of the shoulder, compared with general radiologists. Although the authors cite some limitations to their study (retrospective design, selection bias, etc), they qualify it by referencing Zanetti, who has demonstrated the implications of MR imaging in therapeutic decision-making. Furthermore, the utility of MR imaging is only constructive when its diagnostic accuracy exceeds the high clinical accuracy of clinical examination.
Reviewer's Comments: As a field, radiology is evolving continually. At the postgraduate level, the American Board of Radiology is in the process of altering the board certification process, with increasing emphasis on producing more subspecialty trained radiologists. Although we should be cautious in extrapolating the results of this study to other subspecialties within radiology, it is important to note the superior diagnostic accuracy that some subspecialty trained radiologists can achieve. As a staff member of an academic practice, I routinely observe the imaging referrals that bombard our musculoskeletal radiologists, many of which are submitted by orthopedic surgeons requiring reinterpretation. In my opinion, this study has 2 implications: to bolster the initiative of radiology residents to pursue fellowship training and to increase the awareness of generalists regarding their limitations, hopefully enough to foster additional learning opportunities (ie, courses, conferences, workshops). (Reviewer-Rahul Pawar, MD).

Keywords: Shoulder, MRI, MRA, Diagnostic Accuracy, General vs Musculoskeletal Radiologists

Print Tag: Refer to original journal article

Plain Films Unwarranted for Low-Risk Patients

Are Cervical Spine Radiograph Examinations Useful in Patients With Low Clinical Suspicion of Cervical Spine Fracture? An Experience With 254 Cases.

Lange BB, Penkar P, et al:

Emerg Radiol 2009; September 4 (): Epub ahead of print

Patients who are low-risk for cervical spine trauma may not need evaluation by plain x-ray.

Objective: Since intermediate- to high-risk patients are evaluated with cervical spine computed tomography (CT), the authors of this study sought to determine the utility of plain x-rays for the evaluation of low-risk patients.
Design: Retrospective review.
Methods: Patients that were seen in the Emergency Department over a 1-year period were included in the study. In total, 254 plain films of the cervical spine and 3080 CT scans were evaluated for acute fracture. Subsequently, positivity rates were then tabulated for both imaging modalities. For the purpose of stratifying risk, patients were identified as low-risk if they met either Canadian C-spine Rule (CCR) or National Emergency X-Radiography Utilization Study Group (NEXUS) criteria for imaging.
Results: 237 plain films were negative for acute fracture; 11 films were suboptimal, and 6 cases that were questionable for acute fracture were eventually ruled out by further imaging or clinical examination. Out of 3080 CT scans, 196 were positive for acute fracture.
Conclusions: The positivity rate for detecting acute fractures by plain film was 0.0%. The authors concluded that plain films are essentially unwarranted in evaluating low-risk patients. They put forth 2 explanations for these findings. First, patients who were worked up with plain films may not have fulfilled the criteria designated by the CCR or NEXUS group. Secondly, many of the patients evaluated with plain films may not have needed imaging in the first place.
Reviewer's Comments: If patients meet any of the CCR or NEXUS criteria and/or there is strong clinical suspicion for cervical spine injury, CT scanning is the modality of choice. Imaging the cervical spine in a multi-formatted, thin-slice technique is optimal for diagnosing acute fracture. However, the subgroup of patients that fall into the low-risk category is often worked up with plain films regardless of whether a radiographic work-up is warranted. In my experience, this tends to be the standard practice since referring physicians would rather err on the side of caution when dealing with trauma patients. Frankly, I empathize with their thought process with respect to ruling out spinal injury; nevertheless, Lange and colleagues have given us food for thought. It may take several more studies such as this to convince community-based radiologists to suggest that cervical spine x-rays are unnecessary for low-risk patients. I must stress that this study did not compare the efficacy of plain x-ray versus CT, but only examined the "positivity rate" for plain x-ray in low-risk patients. (Reviewer-Rahul Pawar, MD).

Keywords: Cervical Spine, Trauma, Plain X-Ray, Low-Risk Patients

Print Tag: Refer to original journal article

MR, CT Characteristics Useful in Distinguishing Meningiomas and Schwannomas

Radiological Findings of Spinal Schwannomas and Meningiomas: Focus on Discrimination of Two Disease Entities.

Liu WC, Choi G, et al:

Eur Radiol 2009; 19 (November): 2707-2715

According to this study, thoracic lesion in a female with calcification and dural tail is characteristic of meningioma, whereas lumbar location, foraminal widening, T2 fluid signal, rim enhancement, and scalloping are characteristic of schwannoma.

Objective: To determine the effectiveness of CT and MR imaging in differentiating extramedullary intradural spinal meningiomas and schwannomas.
Design: Retrospective study.
Participants: 128 consecutive patients ranging from ages 17 to 83 years with spinal intradural extramedullary masses were evaluated. Only patients with meningioma and schwannoma were included.
Methods: Noncontrast multidetector CT was used with evaluation of 3-mm axial and sagittal images. MRI evaluation included sagittal and axial 4-mm T1- and T2-weighted fast spin-echo. In total, 128 patients received contrast. Various characteristics of each tumor were assessed. Dural tail was diagnosed when the tail was identified on 2 successive images, tapered smoothly away from the tumor, and enhanced greater than the tumor itself. Tumor enhancement was graded and considered strong when T1 signal was as high as subcutaneous fat, weak when equal to vertebral body signal, and none when lower than vertebral body.
Results: Findings exclusive to schwannomas included foraminal widening (19.6%), erosion (8.7%), scalloping (8.7%), and lumbar location (53.3%). Calcification was exclusively seen in meningiomas (58.3%). Findings favoring schwannomas included fluid signal on T2 (55.4% compared with 2.8% of meningiomas) and rim enhancement (58.7% of schwannomas vs 8.3%). Features favoring meningioma included diffuse enhancement (91.7% vs 38.0%) and dural tail (58.3% vs 5.4%). Schwannomas were nearly evenly distributed between the sexes; 80.6% of meningiomas were in females. Overall, 53.0% of schwannomas were lumbar, 30.4% thoracic, and 14.1 cervical, whereas 86.1% of meningiomas were thoracic and the rest were cervical (13.9%). On T2 images, 61.1% of meningiomas were hyperintense to cord, and 36.0% isointense compared with 31.5% and 13.0%, respectively, for schwannomas. All meningiomas and 96.7% of schwannomas demonstrated strong enhancement, 2.2% of schwannomas demonstrated weak enhancement, and 1.1% none.
Conclusions: MR and CT characteristics were useful in discriminating spinal meningiomas and schwannomas. Thoracic lesion in a female with calcification and dural tail was statistically significant for predicting meningioma, whereas lumbar location, foraminal widening, T2 fluid signal, rim enhancement, and scalloping on CT were statistically significant in predicting schwannoma.
Reviewer's Comments: This was a well done, useful study with a large number of patients assessing a wide range of characteristics to use in discriminating spinal meningioma from schwannoma. Unfortunately other intradural extramedullary tumors were excluded. (Reviewer-Yaron Lebovitz, MD).

Keywords: Schwannoma, Meningioma, CT, MRI

Print Tag: Refer to original journal article

Atlantoaxial Interval More Reliable in Detecting Atlantoaxial Dissociation

Evaluation of the C1-C2 Articulation on MDCT in Healthy Children and Young Adults.

Rojas CA, Hayes A, et al:

AJR Am J Roentgenol 2009; 193 (November): 1388-1392

In this study, lateral atlantodental interval measurements were unreliable for atlantoaxial dissociation due to the large SD and common occurrence of asymmetric values.

Objective: To determine normal values of the C1-C2 articulation, specifically the atlantoaxial interval and the lateral atlantodental space.
Design: Retrospective study.
Participants: 290 patients who presented to a hospital for trauma and underwent cervical spine multidetector CT. No osseous or soft-tissue abnormality was found in any patient. Only patients evaluated in a cervical collar were included in order to standardize neck position, and none of the patients had follow-up visits with diagnosis of neck injury for 1 year following initial presentation.
Methods: Atlantoaxial interval was measured as the space between the lateral masses of C1 and C2 in the mid-coronal plane of the atlantoaxial joint. Measurements were obtained in the lateral, midpoint, and medial portions of each joint bilaterally. Lateral atlantodental interval (ADI) was evaluated in the mid-coronal plane of the dens with a line drawn from the medial-most aspect of the lateral mass of C1 to the nearest point on the dens.
Results: Of 290 patients, 178 were adults aged 20 to 40 years, and 112 were children aged 2 months to 10 years. In adults, mean right atlantoaxial interval was 2.2 mm with a standard deviation (SD) of 0.6 mm. Upper limit of normal (including 97.5% of the population) was 3.3 mm on the right and 3.4 mm on the left. For right lateral ADI, upper limit of normal was 4.7 mm and 5.6 mm on the left, with means of 3.0 ± 0.8 mm on the right and 3.4 mm ± 1.1 mm on the left. In pediatric patients, intervals tended to decrease with age and were larger in males. Overall, >95% of the pediatric patients had atlantoaxial interval <3.9 mm, right lateral ADI <7.4 mm, and left lateral ADI <8.0 mm. Greater than 1 mm asymmetry between the 2 sides was seen in 46% of subjects. Intraobserver variability was less than interobserver reliability. Measurements in the middle of the atlantoaxial joint space were most reproducible.
Conclusions: Use of normal values for the atlantoaxial interval could aid in the detection of ligamentous injury of the craniocervical junction, particularly atlantoaxial dissociation. Lateral ADI measurements were unreliable for atlantoaxial dissociation due to the large SD and common occurrence of asymmetric values.
Reviewer's Comments: This group has now published a number of excellent articles documenting normal values in pediatrics and adults in the craniocervical region on MDCT that are invaluable to radiologists when a joint space seems abnormal but one is not sure. One of the most challenging situations is where there is lateral atlantodental asymmetry. Unfortunately, the authors did not publish the range of values that were seen; this too would have been invaluable for radiologists in assessing when such asymmetry is abnormal or further evaluation is warranted. (Reviewer-Yaron Lebovitz, MD).

Keywords: Normal Value, Atlantodental Interval, Atlantoaxial Interval, Atlantoaxial Dissociation

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MRS Is Useful Tool for Assigning Nonspecific Enhancing Lesions

Developing a Clinical Decision Model: MR Spectroscopy to Differentiate Between Recurrent Tumor and Radiation Change in Patients With New Contrast-Enhancing Lesions.

Smith EA, Carlos RC, et al:

AJR Am J Roentgenol 2009; 192 (February): W45-W52

Routine contrast-enhanced MRI cannot reliably determine recurrent neoplasm, and, therefore, advanced noninvasive imaging such as MR spectroscopy is being used more for tumor evaluation.

Objective: To evaluate alterations in ratios of brain metabolites, namely, choline (Cho), creatine (Cr), and N-acetylaspartate (NAA), in the prediction of tumor recurrence in patients previously treated for brain tumors then present with new contrast-enhancing lesions.
Participants: 33 patients who had been treated for primary brain tumors then presented with contrast-enhancing lesions on MRI. Final diagnosis was determined using pathology or imaging follow-up.
Methods: Ratios of Cho, Cr, and NAA were calculated and correlated with outcome. The authors then used a logistic regression model to create a prediction model based on the most statistically significant ratio. Of note, 28 patients had gliomas (World Health Organization [WHO] grades II through IV). Other diagnoses were primitive neuroectodermal tumors, medulloblastoma, ependymoma, and malignant scalp melanoma.
Results: Elevations of ratios Cho/Cr and Cho/NAA and a decrease in the ratio NAA/Cr were found in patients with recurrent tumor (n=20) compared with postradiation change (n=13). The prediction model using the Cho/NAA ratio resulted in a sensitivity of 85%, a specificity of approximately 70%, and an area under the receiver operating characteristic curve of 0.92. Statistics showed that for every unit increase in the Cho/NAA ratio, the odds of tumor recurrence increased approximately 13-fold. They used the example that a patient with a lesion Cho/NAA ratio of 1.0 would have an 11% probability of tumor recurrence, whereas a patient with a lesion that has a Cho/NAA ratio of 2.7 would have a 90% probability of tumor recurrence.
Conclusions: An elevated Cho/NAA ratio correlated with evidence of tumor recurrence and allowed creation of a prediction rule to aid in lesion classification. The results suggest that MR spectroscopy (MRS) is a useful tool in assigning patients with nonspecific enhancing lesions to either invasive biopsy or conservative management. MRS findings have been shown to correlate well with pathologic specimens obtained at biopsy or resection.
Reviewer's Comments: This study gives readers an additional tool using noninvasive imaging to help differentiate between post-therapeutic change versus tumor recurrence when patients present with enhancing lesions on MRI using MRS. This is a routine diagnostic dilemma for the radiologist and, therefore, is a useful, clinically relevant paper for those reading brain MRI studies. (Reviewer-Maureen T. Barry, MD).

Keywords: Recurrent Tumor, Radiation Change, New Contrast-Enhancing Lesions, MR Spectroscopy

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Consider Combined US, CT for Preop Evaluation of Papillary Thyroid Tumors

Preoperative Staging of Papillary Thyroid Carcinoma: Comparison of Ultrasound Imaging and CT.

Choi JS, Kim J, et al:

AJR Am J Roentgenol 2009; 193 (September): 871-878

Ultrasound and CT are useful in the evaluation of papillary tumors of the thyroid, and both should be considered in the preoperative evaluation of thyroid malignancy.

Objective: (1) To compare the diagnostic accuracy of CT with that of ultrasound (US) for preoperative evaluation of papillary carcinoma of the thyroid gland and cervical lymph nodes, and (2) to determine if CT has greater diagnostic value than US. US is routinely used for preoperative evaluation of papillary thyroid carcinoma (PTC) and is able to evaluate lymph node metastatic lesions as small as 5 mm. If a suspicious lymph node is visualized with US, needle aspiration biopsy can be performed immediately.
Participants: 299 consecutive patients with pathologically proven PTC.
Methods: Accuracies of ultrasound, CT, and a combination for evaluation of PTC tumors and lymph node metastasis were compared. Findings of papillary thyroid microcarcinoma (≤10 mm) were compared with those of PTCs >10 mm. US evaluations were performed prospectively by radiologists with 8 to 12 years of experience and specialization in thyroid US. All patients underwent contrast-enhanced CTs with a multi-detector CT scanner, which were retrospectively read by 1 head and neck radiologist who knew the cytologic results regarding thyroid malignancy but was blinded to surgical diagnosis and US findings. Patients were then stratified into 2 groups: those with papillary thyroid microcarcinomas (PTMCs, n=186) ≤10 mm, and those with PTCs (n=113) with tumors >10 cm in maximum diameter. The authors evaluated tumor size, extrathyroidal extension, and invasion of adjacent structures for assignment of T category; 212 patients underwent total or near-total thyroidectomy.
Results: US was actually more accurate than CT in predicting presence of extrathyroidal tumor extension and presence of malignant disease overall and in both subgroups. CT had a greater sensitivity than US alone in predicting central node (neck level VI) metastasis for all lesions. The combination of US and CT had a higher sensitivity than US alone in prediction of presence of central node metastasis in the 2 subgroups, but this was not statistically significant for PTMC. US alone and US with CT had a greater sensitivity than CT alone in predicting lateral node (levels II through V) metastasis.
Conclusions: This study reinforces that US is accurate in preoperative evaluation for extrathyroid tumor extension as well as lateral lymph node metastasis. CT, however, is more sensitive that US alone in the detection of central lymph node metastasis. For PTMC, however, the diagnostic accuracy of US, CT, or the combination of the 2 are similar.
Reviewer's Comments: Preoperative determination of lymph node metastasis is important for successful surgical management. It is also important to predict tumor size and extrathyroidal extension as these are considered risk factors for tumor recurrence. While US is useful to evaluate thyroid malignancies, it largely depends on operator skill. This study showed that preoperative evaluation of extrathyroidal tumor extension as well as central compartment metastasis was significantly more accurate with US than with CT alone. However, the findings of the central compartment are of dubious clinical significance because surgeons routinely dissect these central neck nodes. Also, the lateral compartment is dissected only in patients with suspicious lymph node metastasis or high-risk patients, and therefore preoperative detection of lateral compartment metastasis strongly influences the surgery. A strength of this study is in determining that US, alone or in combination with CT, is more sensitive than CT alone in the detection of lateral compartment metastasis. (Reviewer-Maureen T. Barry, MD).

Keywords: Papillary Thyroid Carcinoma, Preoperative Staging, Ultrasound, CT

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Is Breast MRI Useful as a Problem-Solving Tool?

Is Breast MRI Helpful in the Evaluation of Inconclusive Mammographic Findings?

Moy L, Elias K, et al:

AJR Am J Roentgenol 2009; 193 (October): 986-993

Very rarely does MRI actually detect malignancy when mammography and ultrasound are inconclusive.

Background: Contrast-enhanced breast MRI has been shown to be useful in evaluating certain conditions when used as an adjunct to mammography. The limited specificity of breast MRI findings has been a limiting factor in homogeneous endorsement of MRI as a broadly useful tool for varied indications.
Objective: To evaluate the utility of breast MRI as a problem-solving tool when mammography and ultrasound have already yielded equivocal results.
Methods: Over a retrospective 6-year period, a database was searched to identify breast MRI studies that were performed as a problem-solving tool in the evaluation of inconclusive mammography and breast ultrasound findings. Cases of mammographically detected suspicious microcalcifications and cases with a documented palpable abnormality were excluded. Also excluded were cases that were performed to evaluate recurrence after breast conservation surgery. During this study, mammographic and sonographic studies were retrospectively reviewed along with MRI images. Findings and BI-RADS lexicon descriptors were recorded. All MRI studies were ultimately categorized under a single BI-RADS category with exclusion of the BI-RADS 0 category. Sensitivity, specificity, and positive-predictive value of MRI was calculated after correlation with pathology reports or as per long-term clinical follow-up assessed over 2 years after MRI was performed.
Results: 115 studies in 115 patients comprised the study set. Mean patient age was 54 years. Overall, only 3.9% of all breast MRI examinations at this particular institution were performed for problem-solving indications. Of patients, 63% had heterogeneously dense breasts as assessed on mammography. Mammographic indications that led to breast MRI included the finding of an "asymmetry" 85.2% of the time, with the remaining patients documented to have architectural distortion or mammographic changes of a previously biopsy-proven benign mass. Of women with an abnormal mammographic finding, 86.9% had no abnormal enhancement in the area on MRI or had non-mass enhancement that was similar to the rest of the breast tissue. The sensitivity and specificity of MRI was calculated to be 100.0% and 91.7%, respectively. The positive-predictive value was 40%, and the negative-predictive value was 100%. Of abnormalities that were inconclusive on mammography, 80% were found to be benign on MRI. Only 0.7% of inconclusive findings further assessed on MRI proved to be malignant.
Reviewer's Comments: A consensus regarding use of MRI as a problem-solving tool is still unclear. The findings in this study suggest that a very small percentage of malignancies are actually found on MRI when mammography and sonography are inconclusive. Given these findings, it stands to reason that MRI as a problem-solving tool may be best reserved for those patients who are at increased risk for breast malignancy. (Reviewer-Basil Hubbi, MD).

Keywords: Breast Cancer, Mammography, MRI

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Do BI-RADS Descriptors Predict Malignancy?

BI-RADS Lesion Characteristics Predict Likelihood of Malignancy in Breast MRI for Masses but Not for Nonmasslike Enhancement.

Gutierrez RL, DeMartini WB, et al:

AJR Am J Roentgenol 2009; 193 (October): 994-1000

One of the most important factors in predicting malignancy in MRI-detected breast lesions is lesion size of ≥1 cm.

Background: The most recent addition of the BI-RADS lexicon released by the American College of Radiology in 2006 provided terms to describe findings on breast MRI. As yet, no published reports have assessed these terms to indicate likelihood of malignancy based on specific terms for lesions initially detected on MRI.
Objective: To determine which BI-RADS lesion terms predict malignancy.
Methods: All breast MRI studies performed over a 2.5-year retrospective period were identified in a database. All lesions that were initially detected on MRI and given a BI-RADS assessment of 4 or 5 were included. Only lesions where tissue sampling was performed yielding reliable pathology were included. Lesion characteristics were prospectively recorded by 1 of 5 breast-imaging radiologists without knowledge of pathologic results. When available, examinations were interpreted along with clinical history, as well as images from prior mammograms and breast ultrasound examinations. Lesion characteristics that were recorded included lesion size, margin, and enhancement. Also documented was the type of lesion categorized as mass, focus, or non–mass-like enhancement.
Results: 258 lesions were included in the study; 28% were proven to be malignant on subsequent pathology, and 72% were benign. Of lesions, 57% were >1 cm, and 48% were masses, 37% were non–mass-like enhancements, and 16% were defined as foci. Those lesion characteristics that yielded a positive-predictive value of malignancy >40% were the following: lesion size >1 cm, lobular or irregular shape, irregular or spiculated margins, and heterogeneous or rim enhancement. Lesions defined as foci were significantly less likely to be malignant. Odds of malignancy tripled for masses with irregular margins when compared with those with smooth margins.
Conclusions: BI-RADS descriptors were not predictive of malignancy for MRI-detected non–mass-like enhancements.
Reviewer's Comments: What is noteworthy about this study is that the study set included only those lesions initially detected on MRI. Although the radiologists involved in this retrospective study were permitted to review associated mammograms and breast ultrasound studies, the diagnostic accuracy of characteristics were assessed only with respect to MRI findings. (Reviewer-Basil Hubbi, MD).

Keywords: BI-RADS, Masses, Morphology, MRI

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Does Increasing Size of Breast Lesion Indicate a Sonographic Correlate?

Targeted Ultrasound of the Breast in Women With Abnormal MRI Findings for Whom Biopsy Has Been Recommended.

Meissnitzer M, Dershaw DD, et al:

AJR Am J Roentgenol 2009; 193 (October): 1025-1029

Although increasing size of MRI-detected breast lesions increases the probability of a sonographic correlate, only 56% of these lesions will have a sonographic correlate.

Background: Prior studies have shown that up to 77% of breast lesions detected on breast MRI may not have a sonographically evident correlate.
Objective: To determine how often sonographic correlates are evident when a lesion on MRI is judged to be suspicious to warrant biopsy.
Methods: Over a 28-month retrospective period, those lesions detected on MRI that were categorized as BI-RADS 4 or 5 were identified. Lesions were included in the study if subsequent breast ultrasound was performed within 3 weeks of the MRI in an effort to locate the lesion in order to facilitate potential ultrasound-guided biopsy. Correlation of MRI findings was made with other breast imaging examinations when available. When available, MRI characteristics of lesions, ultrasound characteristics of lesions, and pathologic diagnoses were recorded and included in the data analysis.
Results: 519 MRI-evident lesions comprised the study set. An ultrasound correlate was found for 56% of lesions. Of MRI-evident lesions, 82% were categorized as masses and 18% as non-mass lesions. Of MRI-defined masses, 62% had an ultrasound correlate versus only 31% of MRI-defined non-mass lesions. Another MRI characteristic of lesions that tended to have ultrasound correlates was size >0.5 cm. Increasing lesion size revealed a statistically significant increasing probability of having an ultrasound correlate. Furthermore, malignant lesions were more likely to be found by ultrasound than were benign lesions, although a lack of an ultrasound correlate did not beget a statistically significant increased probability of benignity. There was a decreased probability of discovery of an ultrasound correlate for lesions with pathology-proven ductal carcinoma in situ when compared with invasive cancers. There was no statistically significant difference in ultrasound conspicuity based on enhancement kinetics.
Reviewer's Comments: Given the increasing utilization of breast MRI, questions regarding what to do with incidentally discovered lesions remain. It is neither feasible nor cost-effective to recommend an MRI-guided biopsy across the board. Findings from this study suggest that recommending a second-look ultrasound may be helpful for assessing the potential for ultrasound-guided biopsy in cases of mass lesions that are >0.5 cm. (Reviewer-Basil Hubbi, MD).

Keywords: Biopsy, Cancer, Imaging, MRI, Ultrasound

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ROLL Technique Effective, Widespread Use Questionable

Radioguided Localization of Nonpalpable Breast Cancer Lesions: Randomized Comparison With Wire Localization in Patients Undergoing Conservative Surgery and Sentinel Node Biopsy.

Martínez AM, Solà M, et al:

AJR Am J Roentgenol 2009; 193 (October): 1001-1009

In this study, an alternative to preoperative wire localization of breast cancer for breast conservation surgery is at least as effective as the traditional technique.

Background: There are several different methods for presurgical localization of clinically occult yet radiologically evident breast cancer. Although the most common method is wire localization, other techniques are also used, including a technique termed radioguided occult lesion localization (ROLL). ROLL consists of injection of radiotracer into the tumor followed by preoperative scintigraphy to display the injection site. Surgical excision is then performed with the aid of an intraoperative gamma detector probe.
Objective: To evaluate the effectiveness of ROLL compared with the routine wire localization technique.
Design: Prospective clinical trial.
Participants/Methods: After informed written consent, patients with nonpalpable ductal carcinoma in situ were randomized into 2 separate groups for preoperative lesion localization: one using traditional routine wire localization, and one using ROLL. Image guidance for both methods was used, consisting of either stereotactic mammography or ultrasound guidance. For the ROLL procedure, a single 74-MBq dose of Tc99m colloid was injected into the tumor under image guidance. This was performed between 3 and 16 hours before surgery. This single injection was also used to locate the sentinel lymph node. In cases of image-guided wire localization, sentinel lymph node detection using Tc99m lymphoscintigraphy was performed prior to wire localization. Preoperative scintigraphy was performed at least 2 hours after injection. During surgery, a handheld gamma ray probe with an 11-mm detector was used to localize the tumor for those in the ROLL group and to localize the sentinel node in both groups. To confirm lesion excision, specimen radiography was performed in 2 orthogonal planes or specimen sonography was performed in real-time. Pathologic results were recorded and included in the analysis. Adequate margins were defined as ≥1 cm from the margin of the specimen.
Results: 134 patients participated in the study, with the ROLL technique used in 66. Both techniques detected 100% lesion excision; 89.4% of patients undergoing ROLL had free margins as opposed to 82.4% undergoing wire localization. Overall, there was no statistically significant pathologic or radiologic difference in the results of the 2 groups.
Reviewer's Comments: Here is a novel technique from a group of researchers in Europe who demonstrate equal efficacy for lesion localization with an established wire localization technique. Whether widespread practice of this technique is anticipated is questionable, given the additional equipment, costs, and infrastructure needed for the ROLL technique versus routine wire localization. (Reviewer-Basil Hubbi, MD).

Keywords: Nonpalpable Cancer, Conservative Excision, Radioguided Localization, Sentinel Lymph Node Detection, Wire Localization

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Single Bed Position Minimizes Bladder Wall Misregistration

PET/CT Image Fusion Error Due to Urinary Bladder Filling Changes: Consequence and Correction.

Heiba SI, Raphael B, et al:

Ann Nucl Med 2009; 23 (October): 739-744

Reimaging the pelvis with a single PET-CT bed position is effective in eliminating disparity in bladder position between the 2 studies.

Background: Several potential areas of misregistration can bedevil PET-CT imaging, including variation in the shape of the bladder between PET and CT images, which can potentially affect the location of pelvic structures.
Objective: To study changes in urinary bladder size and position between PET and CT images, and to consider factors affecting disparity between these measurements.
Design: Retrospective review
. Participants: 88 patients (50 men and 38 women) imaged with FDG for known or suspected malignancy. Oral contrast, specifically Gastrographin® diluted with 1.5% water, was administered in 68 of these 88 patients.
Methods: Patients were studied in their normal manner. A subset of 31 patients in whom Gastrographin was administered additionally had a repeat single bed PET-CT reimaging of the pelvis 5 to 10 minutes following completion of their whole-body scans. Images were analyzed by consensus of 2 observers. Dimensions of bladder cavity and location of bladder walls were determined independently on both CT and PET images. Comparisons of differences were performed using tests of statistical significance, with a *P* value of <0.05 considered significant.
Results: The mid-urinary bladder height dimensions were significantly greater on PET as compared to CT, while the width and depth of the bladder was not significantly increased; this correlated with a displacement of the superior urinary bladder wall on PET as compared to CT. Mid-urinary bladder height was also significantly increased in PET versus CT in the subset of patients who did not receive oral contrast, although this difference was less severe than in patients who did receive oral contrast. In patients with a repeat single bed-position pelvic study, bladder shape on PET and CT were almost identical, and this difference was statistically different from the variation in shape of the bladder on PET and CT that was noted during the main study. Average mid-urinary bladder heights were 40 ± 13 mm for PET versus 30 ± 13 mm for CT when including all patients. In patients without oral contrast, bladder height on PET measured 34 ± 13 mm versus 29 ± 13 mm on CT. In the subgroup of single bed-position pelvic studies, heights measured 34 ± 16 mm for PET versus 33 ± 16 mm for CT, which was borderline significant.
Conclusions: This study clearly documents a magnitude of displacement of the superior wall of the bladder that occurs in PET-CT imaging, which is especially pronounced in patients administered oral contrast. Repeat imaging of the pelvis with a single bed position minimizes these problems.
Reviewer's Comments: This paper is instructive in quantifying the magnitude of change in bladder size between CT and PET images. I would have also liked a discussion and formal analysis of the effect of misregistration on apparent standard uptake value measurement, which was not performed. (Reviewer-Lionel S. Zuckier, MD).

Keywords: PET-CT, Bladder Size, Artifact

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Avoid Endoleak Recurrence With TA or TL Approach

Type 2 Endoleak Embolization Comparison: Translumbar Embolization Versus Modified Transarterial Embolization.

Stavropoulos SW, Park J, et al:

J Vasc Interv Radiol 2009; 20 (October): 1299-1302

Embolization of the endoleak cavity via the modified transarterial or translumbar approach is essential to avoid recurrence. Both methods have a similar success rate of about 75%.

Background: Endovascular repair of aortic aneurysm is a commonly used alternative to open abdominal aneurysmal repair. Type 2, collateral endoleak, is the most common type of complication. With this, blood travels retrograde into the aneurysm sac via the inferior mesenteric artery or a lumbar artery. If this does not resolve or causes continued expansion of the aneurysm sac, the endoleak must be repaired.
Objective: To compare 2 types of type 2 endoleak repairs: the modified transarterial (TA) and translumbar (TL) direct puncture routes.
Participants: 84 patients underwent endoleak repair at their institution, which was identified on surveillance CT. All patients had diagnostic angiography prior to embolization, and the decision was made to go for a TL or modified TA repair.
Methods: Researchers used a modified TA approach where the endoleak cavity is accessed and embolized with coils via the feeding vessel, and then the feeding vessel is embolized itself. Briefly, the method for TL embolization involves accessing the endoleak cavity percutaneously as the patient is in a prone position. A 5-Fr catheter is then inserted. The endoleak cavity is then embolized to stasis with coils and glue. Outcomes were recorded and compared.
Results: 85 endoleaks were embolized in 84 patients, and they were followed up for a mean of 19 months. There were 62 endoleaks treated with the TL method, and 23 treated with the TA method. There was a technical failure in the TA group (4.3%) and no failures in the TL group. Clinical success rate in the TA group was 78%, with endoleaks recurring in 5 patients. Clinical success was achieved in the TL group 72% of the time. The difference in clinical success rates was not statistically significant. The major complication rate was 3.2%, all in the TL group.
Reviewer's Comments: This study demonstrates that both the TL and modified TA methods appear to have a similar clinical success rate of about 75%. In the literature, using the TA method and only embolizing the feeding vessel leads to an 80% recurrence rate. The importance of embolizing the endoleak sac is emphasized here. Currently, if CT shows that patients' vessels are amenable to it and/or there is not a good window for the TL approach, then a modified TA endoleak embolization is attempted. In the 1 technical failure of the TA group, the vessel tortuosity was too great. Major complications seen in this study are of nontarget embolization and bleeding. If one method did not work, researchers tried the other method if possible. These results suggest that type 2 endoleaks can be treated effectively by either method, as long as the endoleak cavity itself is embolized. (Reviewer-Sharon Gonzales, MD).

Keywords: Aortic Aneurysm, Endovascular Repair, Type 2 Endoleak, Translumbar vs Transarterial Embolization

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UAE vs Laparoscopic Occlusion -- Long-Term Results Are in

Uterine Artery Embolization Versus Laparoscopic Occlusion of Uterine Arteries for Leiomyomas: Long-Term Results of a Randomized Comparative Trial.

Hald K, Noreng HJ, et al:

J Vasc Interv Radiol 2009; 20 (October): 1303-1310

Uterine artery embolization is more efficacious than laparoscopic uterine artery occlusion for long-term control of symptoms secondary to uterine fibroids.

Background: Uterine artery embolization (UAE) is a well-known, safe, and effective treatment for symptomatic uterine fibroids in patients who do not want a hysterectomy. Another therapeutic option, laparoscopic occlusion of the uterine arteries, is being evaluated.
Objective: To determine long-term efficacy of UAE compared to laparoscopic occlusion, and to present long-term outcomes.
Design: Randomized prospective study.
Participants/Methods: 66 women with menorrhagia and/or pressure and pain secondary to uterine fibroids were enrolled. Half the patients had UAE, and the other half had ligation of the uterine arteries laparoscopically just lateral to the ureter using endoclips. Bleeding symptoms, pressure, and pain were evaluated at 1, 3, and 6 months post-procedure by clinical assessment and ultrasound. Follow-up beyond that included outpatient visits and questionnaires at 12 months and every year thereafter until hysterectomy or menopause. MRI with contrast was performed at 1, 3, and 6 months.
Results: Eventually, 58 patients were treated; 29 for each treatment. Mean follow-up was 48 months. The cumulative clinical failure rate, hysterectomy rate, and recurrence rate was lower in the UAE group than in the laparoscopy group. Clinical failure rates were similar in the 2 groups after 6 months. Median symptom-free interval was longer in the UAE group at 36 months, versus 22 months in the laparoscopic group. MRI data show the decrease in uterine volume at 6 months was greater in patients having UAE versus those having laparoscopy. There was complete infarction of fibroids in all patients after UAE, whereas there was complete infarction in only 23% and partial infarction seen in 36% of fibroids in the laparoscopy group.
Reviewer's Comments: Long-term results of this study reveal that UAE is better than laparoscopic ligation of uterine arteries in treating symptoms of uterine fibroids. Even though the results of control of bleeding were similar after 6 months between the 2 groups, symptoms tended to recur more so in the laparoscopic group, particularly in patients who did not have complete infarction of their fibroids on MRI. The symptom recurrence rate was 15% in the laparoscopy group compared to 5% in the UAE group. Total uterine volume reduction was more important than individual fibroid reduction. The authors believe that there was a better outcome with UAE because of several factors. Collateral vessels can form to circumvent the laparoscopically occluded UAE. It is believed that ischemia in fibroids themselves is the best correlation with control of symptoms. The fact that spherical embolics can travel deeper and occlude the fibroid vasculature may be the reason UAE is more successful in controlling symptoms. (Reviewer-Sharon Gonzales, MD).

Keywords: Uterine Artery Embolization, Fibroids, Gynecological Laparoscopy, Leiomyomas

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n-BCA Is Efficacious New Tool for LGIB

Initial Experience Using N-Butyl Cyanoacrylate for Embolization of Lower Gastrointestinal Hemorrhage.

Frodsham A, Berkmen T, et al:

J Vasc Interv Radiol 2009; 20 (October): 1312-1319

The efficacy of glue for lower gastrointestinal bleeding approaches 100%, and it is good in patients with coagulopathy or tortuosity. Problems with post-embolization ischemia still exist.

Background: Lower gastrointestinal bleeding (LGIB) refractory to conservative therapy has been treated with transcatheter arterial embolization (TACE) since the 1970s. Microcoils, the agent of choice, can be ineffective, particularly in cases of coagulopathy, vessel spasm, tortuosity, and in lesions with multiple collaterals. The FDA approved *N*-butyl cyanoacrylate (n-BCA, aka glue) as an embolic agent in 2000.
Objective: To present a case series of patients with LGIB treated with glue to document the feasibility and efficacy.
Participants/Methods: 14 patients with LGIB went for embolization with glue. These patients had at least 1 of the following risk factors: >1 arterial feeder, coagulopathy, need for anticoagulation after embolization, insufficient embolization with other methods, or hemodynamic instability. During the procedure, extravasation was noted in all cases to document a hemorrhage. Via microcatheters, n-BCA was diluted 1:2 with ethiodol and given under fluoroscopy to occlude bleeding, with a total <1 mL in each case. Hemostasis was confirmed afterward with completion angiography. Patients were followed up until discharge or death.
Results: Technical success rate, meaning cessation of bleeding after treatment, was achieved in 100% of patients. Clinical success, meaning no rebleeding, was achieved in 79%. There was a 14% clinical failure rate. The superior mesenteric artery (SMA) territory was treated in 6 patients, and the inferior mesenteric artery (IMA) was treated in 8. One patient in the IMA group died from multisystem organ failure despite cessation of bleeding (class F major complication). Two patients in the SMA group had rebleeds within 3 days necessitating right hemicolectomies (class E major complications). Another patient had a minor rebleed that was self-limited (class A minor complication).
Reviewer's Comments: Use of microcoils for embolization in LGIB is limited in patients with atherosclerotic or tortuous vessels. Also, in patients with coagulopathy, higher rates of rebleeding after microcoil embolization are seen. n-BCA has been used extensively to treat arteriovenous malformations, and now, LGIB. The high technical success rate, 100%, demonstrated the effectiveness of this method. It can be delivered more proximally to occlude a distal hemorrhage, and it can be delivered through smaller microcatheters rather than microcoils. Another advantage of glue is that it is not reliant on coagulation status, as is microcoil embolization. Bowel ischemia is seen after standard embolization techniques 0% to 22% of the time. In 2 cases here, ischemia can occur with this method as well, 14% in this series. Some disadvantages of this methodology include costs of materials and need for experience using glue. Other possible complications include abscess formation, non-target embolization, and catheter entrapment. This study shows that glue embolization is a safe and effective option to use in patients with LGIB, particularly in those with coagulopathy, severely tortuous vessels, or significant hemodynamic instability. (Reviewer-Sharon Gonzales, MD).

Keywords: Lower Gastrointestinal Hemorrhage, Glue Embolization,*N*-Butyl Cyanoacrylate, Coagulopathy

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