Gastric Cancer -- ADC Values Help Evaluate Histologic Type

Apparent Diffusion Coefficient Value of Gastric Cancer by Diffusion-Weighted Imaging: Correlations With the Histological Differentiation and Lauren Classification.

Liu S, Guan W, et al:

Eur J Radiol 2014; 83 (December): 2122-2128

Apparent diffusion coefficient values of diffusion-weighted imaging may be helpful in evaluating the histological type, degree of differentiation, and Lauren classification of gastric carcinomas.

**Objective:** To evaluate the correlation between histological differentiation of gastric carcinoma and the apparent diffusion coefficient (ADC) values of diffusion-weighted imaging (DWI).

**Design:** Prospective analysis.

**Participants:** 45 men and 24 women with histopathologic diagnosis of gastric carcinoma >5 mm.

**Methods:** MRI was performed within 7 days after endoscopy and before undergoing surgery. MR examinations were performed using 3.0T system. MR sequences included T2-weighted imaging, DWI with \( b \) values of 0 and 1000 s/mm\(^2\), spectral presaturation attenuated inversion recovery, and multiphase enhanced T1-weighted imaging. Images were reviewed by 2 radiologists. An ADC map containing the largest portion of the neoplasm was used, and an ROI was placed within the solid portion of the lesion. The mean and minimum ADC values of the gastric carcinomas were compared with those of the corresponding normal gastric walls. In addition, the ADC values of the gastric cancers with different histologic types, degrees of differentiation, and Lauren classifications were compared.

**Results:** Mean and minimum ADC values of the gastric carcinomas were significantly less than those of the normal gastric walls. The mean and minimum ADC values gradually increased as the degree of histological differentiation of the adenocarcinomas increased from poorly differentiated to well differentiated. The shortest diameters of the lesions ranged from approximately 5 mm to 30 mm. The ADC values seen in poorly differentiated adenocarcinomas were similar to those seen in signet-ring cell carcinomas of the stomach.

**Conclusions:** ADC values may be helpful in evaluating the histological type, degree of differentiation, and Lauren classification of gastric carcinoma.

**Reviewer's Comments:** The results of this study are useful in demonstrating that ADC values may be helpful as a noninvasive method for evaluating gastric carcinomas. One of the limitations reported in the study was the relatively high proportion of poorly differentiated adenocarcinomas, which consequently might reduce the ADC value of the entire sample of gastric carcinomas. *(See image for this review at practicalreviews.com.)* (Reviewer-John C. Sabatino, MD).

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Keywords: Gastric Carcinoma, Diffusion-Weighted Imaging, Apparent Diffusion Coefficient Values

Print Tag: Refer to original journal article
Post-ERCP pancreatitis is most commonly a mild disease clinically, and its clinical severity is accurately depicted on imaging and via the modified CT severity index.

Background: The assessment and treatment of pancreaticobiliary diseases is often performed by endoscopic retrograde cholangiopancreatography (ERCP). Unfortunately, acute pancreatitis is a common complication of ERCP, with increased risk associated with female gender, history of acute pancreatitis, suspected sphincter of Oddi dysfunction, difficult cannulation during ERCP, and pancreatic sphincterotomy. The severity of acute pancreatitis can be assessed with the modified CT severity index (MCTSI), which accounts for the degree of pancreatic necrosis, peripancreatic inflammation, and extrapancreatic complications. However, the MCTSI has not been specifically evaluated in patients with post-ERCP pancreatitis (PEP), an entity shown to rarely be clinically severe in several studies.

Objective: To determine if MCTSI is useful for assessing the severity of PEP and to correlate MCTSI results with established risk factors and clinical severity parameters.

Design: Retrospective study.

Methods: All patients who had PEP during a 10-year study interval at 1 institution were evaluated. A patient was considered to have PEP if he/she had a serum amylase and/or lipase level ≥3 times the upper limit of normal, epigastric abdominal pain, and imaging findings consistent with acute pancreatitis. Contrast-enhanced CT studies performed at hospital admission were evaluated independently by 2 experienced radiologists who gave an MCTSI score for each patient. Readers evaluated the CT for inflammation of the pancreas (including peripancreatic fluid collections), necrosis of the pancreas, and complications outside the pancreas, such as pleural effusions, ascites, and vascular complications. Additionally, parameters related to clinical severity were noted, including necessity for radiologic or surgical intervention, persistent organ failure, days in the ICU, and mortality.

Results: The final patient cohort was comprised of 84 patients (59 women, 25 men; mean age, 46.5 years). Mild MCTSI was seen in 53.6% of patients with PEP, while moderate and severe MCTSI were noted in 42.8% and 3.6% of patients, respectively. Interobserver agreement was excellent (kappa, 0.91). As the length of hospital stay increased, so did the MCTSI. The only risk factor for PEP that significantly correlated with the MCTSI score was the duration of ERCP.

Conclusions: PEP is most commonly a mild disease clinically. The severity of PEP is accurately depicted on imaging and via the MCTSI.

Reviewer’s Comments: In this study, the most notable limitations were the small study cohort and limited ability to perform multivariate analysis since few patients had severe disease. In my opinion, this study does a great job at raising awareness of PEP in the radiology community, and it also emphasizes the need for an even larger study to help elucidate which patients actually need imaging in this clinical group. (See image for this review at practicalreviews.com.) (Reviewer-Humaira Chaudhry, MD).
Know the CT Findings of Perigastric Appendagitis

Perigastric Appendagitis: CT and Clinical Features in Eight Patients.
Justaniah Al, Scholz FJ, et al:
Clin Radiol 2014; 69 (December): e531-e537

CT findings of perigastric appendagitis consist of ovoid fat inflammation in the distribution of the perigastric ligaments.

Objective: To evaluate the imaging findings of perigastric appendagitis.
Design: Retrospective analysis.
Participants: 8 patients (4 women and 4 men) with perigastric appendagitis.
Methods: CT examinations were performed using 8- or 64-detector multidetector-row CT (MDCT) scanners, and multisequence MRI examinations were performed using 1.5T systems. Images were reviewed by 2 radiologists.
Results: Patients presented with epigastric abdominal pain (n=7) in the right upper quadrant (n=3) or left upper quadrant (n=2). The pain was either sudden or gradual and was aggravated by movement and deep inspiration. The patients denied nausea, vomiting, or fever and had normal serum white blood cell count (WBC), alkaline phosphatase, amylase, and lipase levels. CT findings included an oval heterogeneous fat density focus with mild surrounding fat stranding anterior to the stomach along the course of the gastrohepatic ligament, posterior to the stomach along the course of the gastrosplenic ligament, and anterior to the liver along the course of the falciform ligament. The fat density rim of perigastric appendagitis was either well-defined (similar to epiploic appendagitis) or ill-defined (similar to omental infarction). The average size was 4 cm. Other accompanying findings included perihepatic and pelvic ascites, a prominent umbilical vein, and mild adjacent gastric antral thickening. On MRI, the ovoid inflamed fat was hypointense on T1- and T2-weighted images compared to the adjacent fat, demonstrated rim enhancement on T1-weighted post gadolinium images, and had surrounding fat stranding and adjacent mild gastric wall thickening. All patients were treated conservatively and discharged within 2 days with complete resolution of pain and no complications.
Conclusions: CT findings of perigastric appendagitis consist of ovoid fat inflammation in the distribution of the perigastric ligaments.
Reviewer's Comments: The results of this study are useful in demonstrating that accurate diagnosis of perigastric appendagitis will avoid unnecessary interventions and further workup due to its self-limiting course similar to epiploic appendicitis. 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: Perigastric Appendagitis, CT Findings

Print Tag: Refer to original journal article
CT Findings Provide Hints to Differentiate Peritoneal Tumors

Differences in CT Features of Peritoneal Carcinomatosis, Sarcomatosis, and Lymphomatosis: Retrospective Analysis of 122 Cases at a Tertiary Cancer Institution.

O'Neill AC, Shinagare AB, et al:

Clin Radiol 2014; 69 (December): 1219-1227

There are distinguishing CT findings that can help differentiate between peritoneal carcinomatosis, sarcomatosis, and lymphomatosis.

Objective: To evaluate the imaging findings of peritoneal carcinomatosis, sarcomatosis, and lymphomatosis.

Design: Retrospective analysis.

Participants: 122 patients with histopathologically confirmed peritoneal disease comprised of 50 with peritoneal carcinomatosis, 50 with sarcomatosis, and 22 with lymphomatosis.

Methods: CT examinations were performed with oral and IV contrast, unless contraindicated by a history of severe contrast allergy or renal dysfunction with estimated glomerular filtration rate (eGFR) ≤30. The images were reviewed by 2 radiologists. The presence or absence of discrete peritoneal or omental nodules were recorded as well as the size of the largest nodule, number of nodules, solid or cystic nature of the nodules, nodule outline, nodule margin, and presence of calcification. The presence or absence of omental caking and peritoneal sarcomatosis more frequently had discrete well-defined, smooth nodules. Peritoneal lymphomatosis was more frequently associated with pleural effusion, omental involvement, lymphadenopathy, and splenomegaly.

Results: Peritoneal carcinomatosis was more often seen in older women and is associated with ascites, peritoneal thickening, and, when present, discrete ill-defined nodules with irregular outlines on CT. Peritoneal sarcomatosis more frequently had discrete well-defined, smooth nodules. Peritoneal lymphomatosis was more associated with pleural effusion, omental involvement, lymphadenopathy, and splenomegaly.

Conclusions: There are distinguishing CT findings that can help differentiate between peritoneal carcinomatosis, sarcomatosis, and lymphomatosis.

Reviewer's Comments: The results of this study are useful in demonstrating that peritoneal carcinomatosis, sarcomatosis, and lymphomatosis have characteristic patterns on imaging, although these imaging findings are not a substitute for pathological diagnosis. (See image for this review at practicalreviews.com.) (Reviewer-John C. Sabatino, MD).

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Keywords: Secondary Peritoneal Malignancies, CT Features

Print Tag: Refer to original journal article
Nonpolypoid adenomas are an uncommon entity and are unlikely to be aggressive. Most nonpolypoid adenomas can be detected by CT colonography.

Background: The prevalence and aggressiveness of nonpolypoid adenomas of the colon are not completely transparent. Although thought to be rare in Western countries, they are more prevalent in the Japanese population with prevalence rates ranging from 13% to 48%. Compared with polypoid adenomas, nonpolypoid adenomas have been described in some studies as being more likely to have advanced morphologic features and to be more aggressiveness, but other studies suggest a more benign histology. A lesion can be considered as nonpolypoid by the restricted criteria if it protrudes ≤3 mm above the mucosal surface. The sensitivity of CT colonography (CTC) for the detection of nonpolypoid adenomas has not been adequately studied.

Objective: To evaluate the prevalence of nonpolypoid adenomas, their association with advanced pathologic features, and the sensitivity of CTC in their detection.

Design: Retrospective study.

Methods: The National CT Colonography Trial ACRIN 6664 was used to identify the cohort of 62 patients with nonpolypoid adenomas ≥5 mm in diameter found on either CTC or traditional colonoscopy. Both 2D and 3D techniques were utilized to retrospectively review the CTCs and determine which of these lesions met the restricted criteria of nonpolypoid adenomas (height ≤3 mm and height-to-width ratio <50%). Prevalence, size, and histologic features were reported with descriptive statistics.

Results: 21 lesions (mean diameter, 9.1 mm) in 21 patients (13 men, 8 women; mean age, 60.4 years) met the restricted criteria for nonpolypoid adenoma. There was a prevalence of 0.83% of nonpolypoid adenomas, and 38.1% of these were advanced adenomas. With using combined 2D and 3D interpretation, the sensitivity of CTC for nonpolypoid adenomas ≥5 mm in diameter was 0.76. Polypoid adenomas had a statistically similar detection sensitivity (P <0.37).

Conclusions: Although most nonpolypoid adenomas can be detected by CTC, they have a low prevalence (<1%) and uncommonly display advanced pathologic features when they are <10 mm in diameter.

Reviewer's Comments: There were several limitations to this study, including the lack of use of dye spraying (an advanced endoscopic technique that can improve the detection of flat lesions) and the fact that many of the nonpolypoid lesions seen on CTC were not detected on traditional colonoscopy, and therefore, an accurate specificity of CTC is difficult to determine. In my opinion, this study makes the useful take-home point that nonpolypoid adenomas are an uncommon entity that are unlikely to be aggressive, and it also shows that CTC can usually detect them. (See image for this review at practicalreviews.com.) (Reviewer-Humaira Chaudhry, MD).

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Keywords: Nonpolypoid Adenomas, Detection, CT Colonography

Print Tag: Refer to original journal article
The 2 best positions to optimize colonic distention on CT colonography for improved lesion detection are the right lateral decubitus and supine positions.

**Background:** Inadequate luminal distention on CT colonography (CTC) can result in suboptimal polyp detection. Improved lesion detection has been shown with dual scanning in the supine and prone positions at CTC and has become the standard protocol for CTC. A third series, typically in the right lateral decubitus position, is often used in patients when inadequate distention affects the same colonic segment. There is anecdotal evidence that the decubitus series has the best overall distention compared to the supine and prone series.

**Objective:** To calculate the total volume of gas in the colon and luminal distention by colonic segment on CTC and to determine which 2 best views should be in the routine protocol.

**Design:** Retrospective study.

**Participants:** 146 patients (65 women, 81 men; mean age, 59.2 years; mean BMI, 30.9).

**Methods:** All patients underwent CTC in supine, prone, and right lateral decubitus series. Cathartic bowel preparation, fecal tagging with oral contrast, and colonic distention with CO₂ were performed on all patients. Although standard CTC protocol was in the supine and prone positions, CT technologists were trained to recognize inadequate distention at the completion of these 2 series and could add a right lateral decubitus series if there was focal collapse. An automated tool was used to calculate the total colonic gas volume for each patient position. Luminal distention for each colonic segment on each series was scored separately on a 4-point scale by 2 independent radiologists.

**Results:** Total colonic gas volume was highest in the right lateral decubitus position (mean volume, 1901 mL) and was lowest in the prone position (mean, 1441 mL). For the prone series, 12.1% of segments were found to be inadequate or collapsed, while only 4.2% of segments were found to be inadequate or collapsed in the decubitus series (P < 0.001 for each reader). The supine series performed intermediate between the prone and decubitus series, with a mean total gas volume of 1617 mL and with 10.4% of segments deemed as inadequate or collapsed subjectively.

**Conclusions:** On routine CTC, the 2 best positions to optimize colonic distention for improved lesion detection are the right lateral decubitus and supine positions.

**Reviewer's Comments:** Although there were several limitations to this study, the most notable was possible selection bias since the authors only included those CTC studies in which all 3 series were available, and 3 series were only performed in those patients who had suboptimal supine and prone views. This study is novel in that it questions whether the standard CTC protocol (supine and prone positions) is suboptimal and provides data to suggest that the prone view should be replaced with the right lateral decubitus view. *(See image for this review at practicalreviews.com.)* (Reviewer-Humaira Chaudhry, MD).

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Keywords: Colon Polyps, CT Colonography, Luminal Distention vs Patient Position

Print Tag: Refer to original journal article
CT's Diagnostic Value Limited in Minimal-Fat Angiomyolipomas

Unenhanced CT for the Diagnosis of Minimal-Fat Renal Angiomyolipoma.
Schieda N, Hodgdon T, et al:

AJR Am J Roentgenol 2014; 203 (December): 1236-1241

Objective: To assess the accuracy of unenhanced CT in diagnosing minimal-fat renal angiomyolipomas.

Design: Retrospective analysis.

Participants: This study included 16 patients with minimal-fat renal angiomyolipomas and a control group of 48 patients with renal cell carcinomas (RCCs) who underwent unenhanced CT before resection of the solid renal mass. The control group was comprised of 18 patients with clear cell RCC, 17 patients with papillary RCC, and 13 patients with chromophobe RCC.

Methods: CT examinations were performed with 4-, 16-, and 64-MDCT scanners. Only the unenhanced CT scan was reviewed. Images were shown in the axial plane with a slice thickness of 2.5 to 5 mm and in the coronal plane on 16- and 64-MDCT scanners with a slice thickness of 3 to 4 mm. Images were reviewed by 2 radiologists. The size of the renal mass was measured in anterior-posterior, transverse, and craniocaudal dimensions, and the mean size was recorded. Three ROI measurements were made both within the most homogeneous portion of the lesion and in the adjacent normal renal parenchyma, taking care to avoid areas of calcification. They evaluated each unenhanced CT examination to determine presence or absence of imaging features of minimal-fat angiomyolipoma, including additional gross fat-containing angiomyolipoma, calcification, and hypodense rim sign.

Results: RCCs were significantly larger (median size, 28 mm) than minimal-fat angiomyolipomas (14 mm). The mean attenuation was a significantly higher for minimal-fat angiomyolipomas (43 HU) than for clear cell, papillary, and chromophobe RCCs (range, 33 to 34 HU). There was no difference in the identification of the hypodense rim sign in minimal-fat angiomyolipomas compared with RCCs.

Conclusions: Minimal-fat angiomyolipomas have higher attenuation on unenhanced CT compared with RCC, although overlap in density values limits the use of attenuation for confident diagnosis.

Reviewer's Comments: The results of this study are useful in demonstrating that minimal-fat angiomyolipomas and RCC can display an increased absolute density on unenhanced CT. One of the limitations reported in the study was the small sample size. (See image for this review at practicalreviews.com.) (Reviewer-John C. Sabatino, MD).

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Keywords: Minimal-Fat Renal Angiomyolipoma, Diagnosis, Unenhanced CT

Print Tag: Refer to original journal article
Coronary Calcium Scores Vary Substantially Between CT Systems

Coronary Artery Calcification Scoring With State-of-the-Art CT Scanners From Different Vendors Has Substantial Effect on Risk Classification.

Willemink MJ, Vliegenthart R, et al:

Radiology 2014; 273 (December): 695-702

Background: The measurement of coronary calcification via unenhanced CT is expressed as an Agatston score, which is useful for risk stratification and guiding primary prevention strategies in patients with cardiovascular disease.

Objective: To evaluate the variability of Agatston scores determined using CT systems from 4 different vendors and to simulate the effects of this variability on cardiovascular risk reclassification.

Methods: Four scanners were used: Brilliance iCT from Philips Healthcare, Aquilion One Vision from Toshiba Medical Systems, Discovery CT 750 HD from GE Healthcare, and Somatom Definition Flash from Siemens Healthcare. These CTs were used to scan 15 human cadaveric hearts. Five hearts were scanned twice with each different CT. A region within a coronary artery with a HU >130 was marked as an area of calcification. The various Agatston scores of the ex vivo hearts were then used to simulate the effects of the different CTs on reclassification of cardiovascular risk in a human cohort already deemed to be at intermediate clinical risk based on a Dutch longitudinal population-based study. In that study, 432 asymptomatic participants who had intermediate clinical Framingham risk scores and known Agatston coronary calcium scores were reclassified based on their Agatston score. A participant with a score <50 was reclassified as being at low risk, and a participant with a score >615 was reclassified as being at high risk.

Results: The Agatston scores differed substantially between the different CT scanners. The median Agatston scores of the 15 cadaveric hearts were 353.4 for the Philips scanner, 409.5 for the Toshiba scanner, 469.0 for the GE scanner, and 332.1 for the Siemens scanner. After simulation, cardiovascular risk stratification changed for 0.5% to 6.5% (depending on the CT scanner used in the simulation) of the 432 participants from the Dutch longitudinal population-based study. In the original study, Agatston scoring reclassified 196 participants into the low-risk category. Compared with the reclassification for the alternating reference vendor, up to 205 participants were put into the low-risk category. In the original study, Agatston scoring reclassified 70 participants into the high-risk category. Compared with the reclassification for the alternating reference vendor, up to 84 participants were put into the high-risk category.

Conclusions: Coronary calcium Agatston scores derived using different CT systems can vary substantially from 1 manufacturer to another and can result in up to 6.5% of individuals with a clinically intermediate cardiovascular risk factor profile being stratified into a different risk category, depending on the CT scanner used.

Reviewer’s Comments: I found it very interesting that the calcium score is not an exact score but a number that falls in a range of possible values. (Reviewer-Vineet R. Jain, MD).

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Keywords: Coronary Artery Disease, Risk Stratification, Calcification, Agatston Scoring

Print Tag: Refer to original journal article
PE, RVT Very Common in Nephrotic Syndrome

In nephrotic syndrome, pulmonary embolism and renal vein thrombosis are both common, with pulmonary embolism being more common and often asymptomatic.

Objective: To evaluate the prevalence of pulmonary embolism (PE) and renal vein thrombosis (RVT) in patients with nephrotic syndrome and to identify any factors in these patients that are predictive of PE and RVT.

Design: Prospective analysis.

Participants: Patients with nephrotic syndrome who were scheduled to undergo CT pulmonary angiography and renal CT venography.

Methods: CT pulmonary angiography was performed using standard methods on a dual-source CT. CT venography was performed immediately after the CT pulmonary angiography from the diaphragm to the pubic symphysis. If a pulmonary embolism was seen on CT pulmonary angiography, the number of clots, proximal extent of clot, and clot burden were evaluated. The ratio of right ventricle diameter to left ventricle diameter (RV/LV ratio) was calculated as a measure of RV dysfunction if PE was present. In each patient, the underlying renal disease causing the nephrotic syndrome was recorded. The patients’ demographic data and clinical symptoms were recorded as well as routine blood and urine lab work. D-dimer testing results were recorded. The clinical probability of PE was evaluated using the Wells score.

Results: 180 of 512 patients with nephrotic syndrome (35%) had PE (n=153; 80%) and/or DVT (n=112; 22%). PE was accompanied by RVT in 85 of 153 patients (56%). Of 153 patients with PE, 128 (84%) were asymptomatic. PE and RVT were seen together in 15 of 80 children with nephrotic syndrome (19%). The most common cause of nephropathy associated with PE or RVT was membranous nephropathy, with PE and RVT occurring together in 48% of these patients. Other independent predictors of PE or RVT were age >60 years, high hemoglobin level, prolonged prothrombin time, and elevated creatinine.

Conclusions: In nephrotic syndrome, PE and RVT are both common, with PE being more common and often asymptomatic.

Reviewer's Comments: It is interesting to note the relative large percentage of patients who have asymptomatic PE in this disease. I wonder what percentage of patient's with PE in this disease suffers significant morbidity/mortality because of asymptomatic PE. (Reviewer-Vineet R. Jain, MD).

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Keywords: Nephrotic Syndrome, Complications, Thromboembolism, Diagnosis, Risk, CT

Print Tag: Refer to original journal article
S.M.A.R.T. Stents Safe, Effective for SFA Lesions


Gray WA, Feiring A, et al:


S.M.A.R.T. self-expanding nitinol stents have a high patency rate for superficial femoral artery atherosclerotic lesions.

Background: The best treatment strategy for superficial femoral artery (SFA) lesions in peripheral vascular disease is uncertain. Angioplasty, which was considered a mainstay, is now being replaced with primary stent placement. Concerns have been raised about short- and long-term outcomes of SFA stent placement, which include stent fracture and stenosis.

Objective: To report outcomes of the STROLL study investigating the outcomes of placement of the S.M.A.R.T.® self-expanding nitinol stent in SFA lesions.

Design/Participants: This study was a single-arm, prospective trial across 39 U.S. centers with enrollment of 250 patients.

Methods: The primary safety end point was freedom from major adverse events, and 12-month target lesion revascularization. The primary efficacy end point was patency at 12 months, defined by U.S. criteria. Patients with Rutherford/Beckford classification (category 2 to 4) symptomatic limb ischemia, an ABI ≤0.8, and 1 SFA lesion with >50% stenosis or total occlusion were included in the study. Stents were sized 1 to 2 mm larger than the vessel diameter. Ultrasound exams and x-rays were obtained at 1 month, 6 months, and every year thereafter to assess for stent fracture and stenosis.

Results: No major adverse events were noted in the first 30 days, and the primary safety end point was achieved in 100% of patients. Primary patency at 12 months was 81.7%. Patency rates were not significantly different between patients who had diabetes versus those who did not, nor was there a significant difference between patients with SFA stenosis versus those with SFA occlusions. At 12 months, stent fracture was observed in only 4 patients, none of which progressed over time.

Reviewer’s Comments: I believe that this is an excellent study investigating the safety and efficacy of the S.M.A.R.T. stent for use in SFA lesions. The well-designed study features an extensive follow-up. The lack of major complications is noteworthy. In addition, a primary patency rate of 80% is high for such lesions, comparing well with other stents, including those of the drug-eluting variety. Overall, this is a well-designed study with significant implications to clinical practice. (Reviewer-Abhishek Kumar, MD).

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Keywords: Peripheral Vascular Disease, Superficial Femoral Artery Lesions, Arterial Stent

Print Tag: Refer to original journal article
Use Shorter Follow-Up Intervals in Year 1 After HCC Therapy

Optimal Imaging Surveillance Schedules After Liver-Directed Therapy for Hepatocellular Carcinoma.

Boas FE, Do B, et al:


After locoregional therapy for hepatocellular carcinoma, recurrence is 6.5 times more likely during the first year than during the second. Shorter follow-up intervals are needed when the recurrence risk is highest.

**Background:** After locoregional therapy for hepatocellular carcinoma (HCC), the main goal of imaging is to determine residual or recurrent disease. Currently, there is no definitive surveillance schedule for posttreatment HCC imaging.

**Objective:** To develop an optimal surveillance schedule to monitor for recurrent disease after locoregional therapy for HCC.

**Methods:** 910 patients undergoing 1766 consecutive chemoembolizations, radioembolizations, and radiofrequency ablation procedures were evaluated. CT or MRI performed before repeat therapy was used to determine the "time to recurrence." Progression that did not lead to repeat treatment was excluded. Diagnostic delay was defined as the time between recurrence and detection. An optimal surveillance schedule was then determined to minimize diagnostic delay.

**Results:** In the first year after treatment, recurrence is 6.5 times more likely to occur than in the second year. Therefore, the authors recommend that, during the first 2 years after treatment, follow-up should be performed at 2, 4, 6, 8, 11, 14, 18, and 24 months. This schedule was also found to be cost-effective.

**Conclusions:** This schedule allows for shorter follow-up intervals during the first year when there is a higher chance of recurrence and for longer follow-up intervals during the second year when there is lower chance of recurrence.

**Reviewer's Comments:** I believe this article answers an important question in interventional oncology. Protocols for follow-up MRI or CT imaging after locoregional therapy for HCC vary among institutions. In this study, the authors aim to derive an optimum protocol for imaging after locoregional liver therapy. This is a fairly large cohort of patients, and I believe the study's results are noteworthy. There are, however, a few study limitations. The authors assume that the length of delay in detection is proportional to harm. This may not necessarily be true as harm varies based on the extent and amount of disease. In addition, the author's only looked at recurrences that prompted therapy, and thus the results may not be applicable to all posttreatment recurrences. Overall, I believe this article adds to the interventional oncology literature. (Reviewer-Abhishek Kumar, MD).

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Keywords: Hepatocellular Carcinoma, Posttreatment Imaging, Recurrence, Surveillance Schedule

Print Tag: Refer to original journal article
Posterior medial meniscal root lesions are associated with increased age, tears of the meniscus, cruciate ligament degenerative changes, and insufficiency fractures.

**Objective:** To determine the MRI appearance of posterior medial meniscus root ligament (PMMRL) lesions, to develop a classification system, and to describe associated findings.

**Design/Methods:** 500 consecutive knee MRIs performed within a 6-month study interval were retrospectively reviewed. Cases were excluded if there was a history of surgery, fracture, infection, inflammation, or neoplasm. After exclusions, 419 studies were included for 225 women and 194 men with a mean age of 45.7 years. Two board-certified MSK-trained radiologists with 11 and 18 years of experience independently reviewed the images. The PMMRL was defined as extending from the tibial attachment site to just lateral to the articular cartilage inflection point of the medial tibial plateau. Tear locations were subdivided into 3 zones: posterior horn root junction (tear occurred at junction between root and posterior horn), middle portion (tear occurred within the root ligament itself), and entheseal (tear occurred at the tibial attachment site). Each PMMRL lesion was classified as degeneration, partial tear, or complete tear; and tears patterns were classified as either radial tears or longitudinal cleavage tears. The authors also assessed images for the following associated findings: medial meniscus extrusion, insertional PMMRL osseous changes, regional synovitis, insufficiency fracture, and cruciate ligament degeneration or tear.

**Results:** PMMRL lesions were found in 29% of knees (n=120), with degeneration in 14%, partial tears in 12%, and complete tears in 3%. Sixty knees demonstrated tears (radial tears, 69%; longitudinal tears, 22%; miscellaneous tears, 10%). Most lesions (93%) involved the most medial aspect at the PMMRL’s junction with the posterior horn of the medial meniscus. Most PMMRL lesions (87%) were associated with a tear in the meniscus proper. When comparing patients with PMMRL lesions versus those without, significant differences were noted in age, medial meniscal tears, medial meniscal extrusion, insertional osseous change, regional synovitis, osteoarthritis, insufficiency fracture, and cruciate ligament degeneration.

**Conclusions:** PMMRL lesions are associated with meniscal tears and extrusion, increased age, osteoarthritis, regional synovitis, insufficiency fracture, insertional osseous change, and cruciate ligament degeneration.

**Reviewer’s Comments:** I thought this was an interesting article with good charts. However, there was no arthroscopic correlation in this study, which the authors mentioned in the section discussing limitations. Also, while the authors did discuss some potential changes in surgical management depending on proximity of tear to the attachment, the clinical importance of such description, based on the 3 zones described in this study, remains to be seen. (Reviewer-Uma Thakur, MD, MSK).

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Keywords: Knee, Posterior Medial Meniscus Root Ligament Lesions, MRI, Classification

Print Tag: Refer to original journal article
Lesions of Hand and Fingers Reviewed

Diagnostic Imaging of Benign and Malignant Osseous Tumors of the Fingers.
Melamud K, Drapé JL, et al:


Awareness of imaging appearances, patient age, and lesion location is critical in assessing osseous lesions of the hand.

**Objective:** To review imaging appearances of the most common benign and malignant osseous tumors in the fingers and to describe the most appropriate imaging modalities. **Modalities:** X-ray is always a good initial modality to start with characterizing bone lesions. CT rarely provides further characterization, but it can be useful for more sensitive detection of cortical abnormalities. MRI, with a small FOV and surface coil, can frequently provide the most information. **Approach:** Osseous lesions of the fingers should be approached with age and location as the initial questions, followed by margin and matrix characterization. **Benign Tumors:** The most common benign tumors of the hand are enchondromas. Malignant degeneration is rare and should be considered when there is an increase in pain or lesion size, cortical disruption, ill-defined margins, or periostitis. Surgical curettage is the treatment for benign lesions. Periosteal chondromas are benign cartilaginous tumors that occur in the metaphyses of long bones, but they can be confused with periosteal osteosarcoma because of erosion of cortex. Osteochondromas are the most common benign bone tumor and should stop growing with skeletal maturity. Although malignant degeneration is rare (<1% of cases), it should be considered when there is growth or when the cartilage cap increases to >1.5 cm. Subungual exostoses are painful lesions that are distinct from osteochondromas, are usually due to prior trauma or infection, and have a T2 hypointense cap, and have no contiguity with marrow. Florid reactive periostitis presents with progressive pain and swelling in individuals aged 20 to 30 years and is seen in the diaphyses of long bones in 92% of cases. BPOP (bizarre parosteal osteochondromatous proliferation) also presents with painful progressive swelling and is seen mostly in the proximal and middle phalanges of the hands (92% in phalanges versus 8% in metacarpals). There should be no contiguity with underlying bone. MRI of BPOP demonstrates uniform enhancement, and treatment is excision. Aneurysmal bone cysts and giant cell tumors typically occur in the metacarpals, and osteoid osteomas have classic appearance as elsewhere in the body. **Inflammation:** Inflammatory conditions that should be considered in the hand include sarcoid, gout, hyperparathyroidism, rheumatoid arthritis, and infection. **Malignant Tumors:** Malignant lesions include chondrosarcomas, squamous cell of the nail bed, and metastases.

**Conclusions:** Awareness of imaging appearances, patient age, and lesion location is critical in assessing osseous lesions of the hand.

**Reviewer's Comments:** I think this is an excellent article that thoroughly reviews the imaging appearances, clinical presentations, and treatments of the most common conditions of the hand. A chart summarizing all the conditions, including the age, distribution, and presentation, would have been useful. (Reviewer-Uma Thakur, MD, MSK).

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Keywords: Fingers, Imaging Features of Various Osseous Lesions

Print Tag: Refer to original journal article
Conventional radiography misses many wrist fractures, and CT should be considered when radiography is negative in cases with a high index of suspicion for wrist fractures.

**Objective:** To evaluate the ability of conventional radiographs to detect wrist fractures using multidetector CT (MDCT) as the reference standard.

**Design:** Retrospective analysis.

**Participants:** 455 patients at the authors' institution who presented to the emergency department with suspected wrist injury and underwent both conventional radiographic imaging and MDCT images. During the study interval, 3212 patients underwent only conventional radiography for suspicion of wrist injury.

**Methods:** Initial radiographs consisted of an anterior, posterior, and lateral view of the wrist. If there was further suspicion, an oblique view and/or scaphoid view was also obtained. All CTs were performed shortly after the radiographs. CTs were performed on a 16-section MDCT scanner. The slice thickness was 1.0 mm, and the reconstruction increment was 0.75 mm. Sagittal and coronal reformatted images were obtained in all cases, in addition to the axial images. For this study, the radiographs were interpreted without knowledge of the MDCT findings.

**Results:** 223 patients (49.0%) had single or multiple fractures of the wrist, and a total of 302 fractures were present. For all fractures, the sensitivity, specificity, positive predictive value (PPV), and negative predictive value (NPV) of radiography were 57.8%, 99.5%, 87.4%, and 97.4%, respectively. For carpal fractures only, the sensitivity, specificity, PPV, and NPV of radiography were 38.7%, 99.5%, 75.7%, and 98.2%, respectively. There were a total of 128 occult fractures not seen on radiography: 17 scaphoid, 12 lunate, 17 triquetrum, 4 pisiform, 9 trapezium, 4 trapezoid, 11 capitate, 10 hamate, 31 radius, 6 ulna, and 7 proximal metacarpals. In 25 of 457 wrists (5.5%), the radiographs were false positive for fracture. These included 10 scaphoid, 4 trapezium, 1 capitate, 2 hamate, 4 radius, 1 ulna, and 3 proximal metacarpal fractures.

**Conclusions:** Conventional radiography misses many wrist fractures. CT scanning should be considered when radiography was negative in those patients with a high index of suspicion for wrist fracture.

**Reviewer’s Comments:** As the authors acknowledge, a limitation of this study is that the group studied is not representative of all patients arriving to the ED with suspected wrist trauma because only patients who underwent CT scanning were evaluated. (Reviewer-Vineet R. Jain, MD).
Objective: To present a practical approach to identifying facial muscles on routine cross-sectional imaging. Design: Retrospective review of literature, with an emphasis on articles detailing facial anatomy with the use of CT. Introduction: The mimic muscles receive innervation via the facial nerve. When trying to locate facial muscles, remember that they share common insertion sites. Therefore, correctly identifying the mimic muscles is most easily accomplished by tracing them from the insertion site of the group back to their individual origin. This can be accomplished by organizing facial muscles into 6 categories. Lower Lip Insertion: The most caudal insertion site of the mimic muscles in the face is the lower lip. Three muscles use this insertion: the mentalis, depressor labii inferioris, and platysma. Modiolus Insertion: Moving cranially, the next group of muscles insert at the modiolus, which is a conglomerate of closely intertwined muscle and fibrous tissue located just lateral and superior to the angle of the mouth. This is the largest muscle group with 6 members: the orbicularis oris, buccinator, risorius, levator anguli oris, depressor anguli oris, and zygomaticus major. Upper Lip Insertion: The next group of muscles inserts on the upper lip and includes the levator labii superioris, levator labii superioris alaeque nasi, and zygomaticus minor. Nose Insertion: More cranially, 3 muscles insert around the nose and include the nasalis, depressor septi nasi, and dilator naris. The dilator is too small to identify on CT imaging. Orbit Insertion: 4 muscles insert on the orbit. The first is the orbicularis oculi, which is the sphincter muscle surrounding the eye. The other 3 include the procerus muscle and the depressor and corrugator supercilii muscles. Scalp Insertion: The frontal belly of the occipitofrontalis is easily identified on imaging in the forehead region because it is the only muscle located in this area. SMAS: The superficial musculoaponeurotic system (SMAS) is a continuous organized fibrous network that connects the facial muscles to the overlying dermis. It consists of 3 distinct layers. On CT, the SMAS appears as a hyperattenuating tortuous line separating the superficial and deep fibroadipose tissue. Conclusions: The proposed practical approach to identifying facial muscles based on their common insertion site and then tracing each one back to its origin is a quick and accurate approach when evaluating these structures on cross-sectional imaging. Reviewer's Comments: I agree with the authors that a practical approach to identifying facial muscles based on their common insertion provides a comprehensive systematic approach that can improve accuracy. (Reviewer-Sebastian Sadowski, MD).
Be Selective When Ordering Head CT for Syncope, Dizziness

JOURNAL CLUB: Head CT Scans in the Emergency Department for Syncope and Dizziness.

Mitsunaga MM, Yoon HC:

AJR Am J Roentgenol 2015; 204 (January): 24-28

In patients presenting to the ED with syncope or dizziness, acutely abnormal head CT findings are most likely to be found in those with focal neurologic deficit, age >60 years, and acute head trauma.

Objective: To evaluate the yield of acutely abnormal findings on brain CT studies in patients presenting to the emergency department (ED) with syncope or dizziness.

Design: Retrospective review of medical records and head CT examinations of patients presenting to the ED between July 1, 2012, and December 31, 2012, with primary complaint of dizziness, syncope, or near-syncope.

Methods: The following clinical information was collected on all patients: age, gender, loss of consciousness, acute head trauma, seizure, headache, slurred speech, altered mental status, history of neurologic deficit, physical examination focal neurologic deficit found on the ED physician's examination, laboratory evidence of drug intoxication or hypoglycemia, use of anticoagulation medications, hospital admission, and results of head CT study. Only head CT findings that could be responsible for the patient's presentation were considered acutely abnormal.

Results: 253 patients presented with dizziness and 236 patients presented with syncope or near-syncope. Of the 253 patients presenting with dizziness, 7.1% (n=18) had an acutely abnormal head CT finding. The hospitalization rates were significantly higher for patients with dizziness and simultaneous acute abnormality on head CT (55.6%; n=10) than for patients presenting with dizziness in general (18.6%). For the 236 patients presenting with syncope or near-syncope, 6.4% (n=15) had an acutely abnormal head CT finding, and of these, 73.3% (n=11) were hospitalized. However, of all 236 patients who underwent head CT for syncope or near-syncope, 39.8% were hospitalized overall. The hospital admission rate was significantly higher for patients with syncope or near-syncope who also had an acute abnormality on head CT than for those with unremarkable head CT findings. Compared to patients with dizziness, patients with syncope or near-syncope had a significantly higher hospital admission rate (chi-square, P < 0.001). Three clinical factors significantly correlated with acutely abnormal head CT findings: a focal neurologic deficit, age >60 years, and acute head trauma.

Conclusions: Head CT examinations obtained in the ED for patients presenting with syncope or dizziness may not be useful unless the patient is older, has a focal neurological deficit, or underwent head trauma.

Reviewer's Comments: I agree with the authors in that head CT examinations in the ED should not be ordered indiscriminately on all the patients presenting with syncope or dizziness. (Reviewer- Sebastian Sadowski, MD).

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Keywords: Syncope & Dizziness, Head CT

Print Tag: Refer to original journal article
Radiologists Now Dominant Provider of Lumbar Punctures

Trends in Lumbar Puncture Over 2 Decades: A Dramatic Shift to Radiology.

Kroll H, Duszak R Jr, et al:

AJR Am J Roentgenol 2015; 204 (January): 15-19

During the last 2 decades, radiologists have become the foremost provider of diagnostic lumbar punctures.

**Objective:** To evaluate the national trends in lumbar puncture (LP) procedures with emphasis on roles of specialty groups.

**Design:** Retrospective review of Medicare Physician Supplier Procedure Summary master files from 1991 through 2011.

**Methods:** The examined files contained the following information: Current Procedural Terminology (CPT) codes for procedure; codes for region, place of service, and provider specialty; and numbers of procedures.

**Results:** There was a small increase in the total number of LPs performed between 1991 and 2011. A minimal increase was found for diagnostic LPs (1991, 90,460 diagnostic LPs; 2011, 90,785 diagnostic LPs). Therapeutic LPs underwent the greatest increase (1991, 2868 therapeutic LPs; 2011, 6461 therapeutic LPs). Overall, radiologists performed 10,533 LP procedures in 1991 and 45,338 in 2011, which accounts for 11.3% of LP procedures in 1991 and 46.6% of LP procedures in 2011. For diagnostic LPs, radiologists have become the foremost provider group, performing 10,272 diagnostic LP procedures in 1991 and 43,601 in 2011 (a 325% increase). Although there has also been an increase in the number of diagnostic LPs performed by emergency medicine providers, the overall percentage of procedures is skewed toward radiology (23.7% diagnostic LPs performed by emergency medicine vs 48.0% by radiology in 2011). For therapeutic LP procedures, radiology now performs the second greatest number of LP procedures (9.0% in 1991 and 26.9% in 2011). The greatest number of therapeutic LP procedures was performed by neurologists and neurosurgeons. The inpatient hospital setting is the primary site of service, followed by procedures performed in the emergency department.

**Conclusions:** The number of LP procedures has increased during the last 2 decades. The radiology department is now the dominant provider.

**Reviewer’s Comments:** I agree with the authors’ conclusions in that the trend during the last 2 decades has moved radiology into the forefront of providing LP procedures in the hospital setting. (Reviewer-Sebastian Sadowski, MD).

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Keywords: Lumbar Puncture, Specialty Group

Print Tag: Refer to original journal article
On mammography, mucocele-like lesions of the breast most often present as calcifications. Surgical excision is warranted when atypia is found on core needle biopsy.

**Background:** Mucocele-like lesions (MLLs) of the breast are rarely encountered pathologic entities consisting of dilated epithelium-lined ducts containing abundant mucin. Although most MLLs are considered benign, the epithelium may have characteristics of atypical proliferations, including atypical ductal hyperplasia and ductal carcinoma in situ (DCIS). Surgical excision is generally recommended when this pathology is found on image-guided core needle biopsy (CNB).

**Objective:** To evaluate the rate of malignancy in MLLs diagnosed on CNB and to determine if imaging features suggest the presence of malignancy.

**Methods:** An 8-year retrospective period was chosen to identify image-guided core needle breast biopsies performed at a major academic teaching hospital. Those cases with CNB pathology results of MLLs were included in the study. The following factors were recorded: patient age, family or personal history of breast cancer, lesion characteristics, and biopsy imaging guidance and technique. Clinical and imaging follow-up were determined from the electronic medical records. Pathologic diagnosis on CNB was compared with that on surgical excision, when available, to determine upgrade rates or rates of underestimation of atypia and/or carcinoma on CNB.

**Results:** 35 total MLLs were diagnosed in 35 patients during the designated study interval. Approximately 54% of lesions presented as calcifications on mammography. At CNB, 34% of MLLs were associated with atypical ductal hyperplasia or flat epithelial atypia, and 66% were benign. Of MLLs with atypia on CNB, only 1 case was upgraded to DCIS on surgical excision. No invasive carcinoma was diagnosed. Overall, 24 of 35 MLLs went to surgical excision, and 4 of 24 excised lesions (17%) were upgraded to either a lesion with atypia or DCIS. Of the 11 patients who did not undergo surgical excision, 5 were lost to follow-up and 6 had stable imaging findings throughout follow-up.

**Conclusions:** A significant minority of MLLs of the breast is associated with atypia, and those found with atypia on CNB warrant surgical excision. Imaging follow-up for those patients diagnosed with MLLs without atypia on CNB is reasonable for patients who desire to avoid surgery.

**Reviewer’s Comments:** These data suggest that surgical excision of MLLs found with atypia at CNB is warranted, but surgical excision may not be necessary for those lesions without atypia. If the presence of atypia changes patient management, such as offering the patient chemoprophylaxis, then excision is advised. Otherwise, imaging follow-up may help best guide care for those patients seeking to avoid surgery. (Reviewer-Basil Hubbi, MD).

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Keywords: Mucocele-Like Lesions, Malignancy Rate, Core Needle Biopsy

Print Tag: Refer to original journal article
**Background:** Cystic apocrine metaplasia is a common benign pathologic entity that is considered a subset of fibrocystic change and histologically manifests as clustered cysts lined by apocrine epithelium of varying thickness and morphology. The diagnosis may be made on image-guided core needle biopsy (CNB) of the breast and often manifests sonographically as a cluster of microcysts.

**Objective:** To evaluate the MRI features of apocrine metaplasia and correlate those features with histopathologic characteristics to establish radiologic-pathologic understanding.

**Methods:** A retrospective period of 8 years and 4 months was chosen to identify those patients referred for MRI-guided biopsy. All the histopathologic slides for those biopsies were reviewed by a pathologist. The pathologist classified cases as cystic apocrine metaplasia when >75% of the lesion consisted of discrete clustered cysts lined by apocrine epithelium. Cases were excluded if the lesion coexisted with other pathologic entities, such as fibroadenomas or papillomas. The architecture of the epithelial lining of the cysts was assessed to understand the relationship between architectural complexity and vascularity. Breast MRI examinations were reviewed by 2 radiologists who recorded the morphologic, kinetic, and T2 characteristics of the lesions. If there was a discrepancy in the description of the features of a lesion, the difference was resolved on consensus. The imaging characteristics were then correlated with the pathologic features.

**Results:** Of 261 biopsies performed in 241 patients during the retrospective period, 7% (n=19) were found to be cystic apocrine metaplasia, which met the inclusion criteria for the study. Most lesions were described as masses, and most of those were <1 cm in size. Washout kinetics were present on contrast-enhanced MRI in >50% of the lesions, and >70% were found to be hyperintense on T2-weighted imaging. On histopathologic analysis, cystic apocrine metaplasia was found to be slightly more vascular when compared with background fibroglandular tissue.

**Conclusions:** Cystic apocrine metaplasia is associated with MRI enhancement and most often presents as a hyperintense T2-weighted lesion <1 cm in size.

**Reviewer's Comments:** The MRI features of cystic apocrine metaplasia described here are useful in stratifying the suspicion of these types of findings on MRI. The finding that these lesions are more often hyperintense on T2-weighted imaging supports the understanding that microcysts make up a decent proportion of these lesions, and the finding on histopathologic analysis of increased vascular density gives an understanding as to why these lesions enhance. (Reviewer-Basil Hubbi, MD).

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**Keywords:** Cystic Apocrine Metaplasia, Breast MRI Features vs Pathologic Correlation

**Print Tag:** Refer to original journal article
Abbreviated screening breast MRI has promise for providing high diagnostic accuracy that far exceeds the diagnostic accuracy of mammographic screening.

**Background:** During the past decade, breast MRI is being used with greater frequency, especially for screening women who are at increased lifetime risk of the development of breast cancer. The typical screening protocols at most institutions remain relatively time-consuming and often require an acquisition time of >30 minutes.

**Objective:** To assess the performance of abbreviated breast MRI for breast cancer detection.

**Methods:** Women who presented for screening breast MRI were recruited for participation in this prospective study during an 18-month period. Women who presented for screening with an elevated familial-based risk of breast cancer were recruited and stratified for risk based on the BRCAPRO model. Women with a personal history of breast cancer were also included in the study for evaluation of the breast contralateral to the affected breast. All patients had to have a negative clinical exam on the day of MRI acquisition, a previously performed negative or benign mammogram, and for patients with mammographically dense breasts, a negative breast US. On the day of breast MRI acquisition, all patients underwent a full diagnostic protocol (FDP) consisting of 8 sequences, including a precontrast T1-weighted gradient echo sequence and all 4 dynamic phases of the postcontrast T1-weighted gradient echo sequence. Two readers were tasked with interpreting the images and were blinded to the indication for the exam, relevant clinical information, and findings on previous mammography and US. The abbreviated protocol (AP) consisted of viewing only the MIP images obtained from the first post-contrast phase of the T1-weighted gradient echo sequence followed by the subtracted images (pre-minus postcontrast sequences) and the sequence corresponding to the first phase of the dynamic postcontrast T1-weighted gradient echo sequence. The AP was read first, followed by the FDP. Interpretation time was recorded, and diagnostic accuracy was compared between the 2 reading scenarios.

**Results:** 606 screening MRI exams were conducted. Acquisition time was 3 minutes for the AP versus 17 minutes for the FDP. Average time to read the completed AP was 28 seconds. Using the AP, diagnostic yield was 18.2 cancers/1000 screens, and the negative predictive value (NPV) was 100%. Specificity and positive predictive values (PPV) of the AP were 94.3% and 24.4%, respectively. Overall diagnostic accuracy of the AP was identical to the FDP.

**Conclusions:** Abbreviated breast MRI is equivalent in diagnostic accuracy to the full protocol.

**Reviewer's Comments:** These results are simply amazing. An abbreviated breast MRI exam takes 3 minutes to perform, 28 seconds to read, and yields high diagnostic accuracy. Hopefully this portends a new era in the evolution of screening breast MRI. (Reviewer-Basil Hubbi, MD).
Is PET-MRI Preferred for Assessing Gynecologic Malignancies?

[18F]FDG PET/MRI vs. PET/CT for Whole-Body Staging in Patients With Recurrent Malignancies of the Female Pelvis: Initial Results.
Beiderwellen K, Grueneisen J, et al:


PET/MRI and PET/CT have equivalent accuracies for detecting recurrent gynecologic malignancy.

**Background:** Identifying tumor recurrence in women with ovarian or cervical cancer is important for determining both prognosis and optimal therapy. Furthermore, appropriate therapy is dependent on the location of the recurrence. PET/CT has been found to be superior to both CT and MRI for the purpose of identifying tumor recurrence in these malignancies. However, MRI has nearly ideal soft tissue contrast and is superior for determining the extent of tumor margins.

**Objective:** To compare FDG PET/CT with FDG PET/MR in this clinical setting.

**Participants/Methods:** All patients in the study carried a diagnosis of ovarian or cervical cancer and had suspected recurrent disease based on either clinical or biochemical findings. Patients initially underwent FDG PET/CT imaging followed shortly thereafter by PET MRI. The gold standard for final assessment of the accuracy of these 2 methodologies was tissue histology and/or imaging follow-up. Two experienced interpreters separately evaluated PET/MRI and PET/CT images for presence or absence of malignant and benign lesions. They also assessed lesion conspicuity based on a 4-point scale and diagnostic confidence based on a 3-point scale.

**Results:** There were 19 subjects in this study, of whom 16 were found to have recurrent disease. Of the 19 subjects in this study, 8 had cervical cancer and 11 had ovarian cancer. There were total of 58 malignant foci and 20 benign lesions. In total, 57 of the 58 malignant lesions showed significantly abnormal FDG uptake. Both PET/CT and PET/MRI correctly detected all malignant lesions. Moreover, conspicuity was determined to be equivalent for the 2 imaging methodologies except for benign pulmonary lesions where conspicuity was considered to be higher for PET/CT.

**Conclusions:** Although accuracy for categorizing benign and malignant lesions was identical for the 2 imaging modalities, the reviewers rated diagnostic confidence as significantly higher with PET/MRI compared to PET/CT.

**Reviewer’s Comments:** The findings in this study are similar to other studies in that the accuracy for detecting malignancies, albeit not necessarily gynecologic malignancies, appears to be essentially equivalent for these 2 imaging methodologies. Gynecologic malignancies would appear to be excellent candidates for assessment with PET/MRI. Although in this study the accuracy was the same, the authors did report an improved level of interpreter confidence for PET/MRI, which suggests the potential for improved accuracy. Certainly larger studies would be needed to determine whether in fact this is the case. I think detection of metastatic lung disease remains a problem for PET/MRI compared to PET/CT for any malignancy with a propensity for pulmonary metastases. (Reviewer-David Bushnell, MD).

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Keywords: Ovarian Cancer, Cervical Cancer, PET/CT

Print Tag: Refer to original journal article
RAI Primary Choice to Treat Spinal Mets From Thyroid Cancer

Current Treatment Modalities for Spinal Metastases Secondary to Thyroid Carcinoma.

Kushchayeva YS, Kushchayev SV, et al:

Thyroid 2014; 24 (October): 1443-1455

The average survival of thyroid cancer patients with non–I-131 avid bone metastasis was 19.3 months versus 49.0 months in those with I-131 avid metastases.

Discussion: In differentiated thyroid cancer, the spine is the most common site of bone metastases. Spinal metastases (SMS) are more likely to occur in follicular thyroid cancer (TC) compared with papillary, and are associated with severely reduced quality of life, causing pain, vertebral fractures, and spinal cord compression. American Thyroid Association guidelines note that complete surgical resection of isolated symptomatic bone metastases can improve survival and should be considered, especially in patients aged <45 years. Half of patients with single-site SMs at the time of presentation do not have any other distant metastases and should be considered for aggressive treatment. In fact, patients presenting with initial distant bone metastases seem to have better outcomes compared to those who develop distant bone metastases after initial presentation. Radioiodine is the primary treatment choice, but bone metastases are frequently unresponsive to I-131 therapy. Positive uptake by bone metastases is reported in only half of the patients with bone metastases, and complete responses to I-131 treatment have been observed only in 30% to 50% of those patients who have I-131 avid metastases. The efficacy of I-131 therapy depends on the volume of the tumor, with small bone metastases that take up I-131 on diagnostic scan having better survival. The average survival of patients with non–I-131 avid bone metastasis was 19.3 months versus 49.0 months with I-131 avid metastases. Early diagnosis and repeated I-131 therapy can be effective by targeting not only visible metastases but also those still too small to be imaged. Although protracted thyrotropin (TSH) elevation induced before I-131 therapy may cause enlargement of the tumor size, with compressive or obstructive symptoms, the reported rate of neurological complications after recombinant human TSH and thyroid hormone withdrawal-aided I-131 therapy for brain and spine metastases has been similar. Metastases from TC vessels are notoriously vascular. Selective embolization therapy can be used as a palliative treatment or a preoperative procedure to decrease the risk of hemorrhage during open surgery. In 4 studies, embolization of bone metastasis was proven more effective in combination with radioiodine and external radiation than embolization alone, providing temporary symptomatic relief for 15.0 and 6.5 months, respectively.

Reviewer's Comments: The American Thyroid Association regards the seemingly narrow topic of spinal metastases from thyroid cancer as important enough to commission this 13-page state-of-the-art essay with 88 references. I limited my discussion to the role of radioiodine, but would urge anyone with interest in the topic – and certainly if you are involved in an actual case – to study the original. The essay describes in detail selective embolization therapy, pharmacologic therapy, external beam radiotherapy, spine stereotactic radiosurgery, vertebroplasty/kyphoplasty, percutaneous spinal tumor ablation, and open surgery followed by an extensive algorithm for clinical management. (Reviewer-C. Richard Goldfarb, MD).

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Keywords: Cancer, Bone Metastases

Print Tag: Refer to original journal article
PET MPI Helpful in Evaluating for Cardiac Allograft Vasculopathy

The Prognostic Value of Rb-82 Positron Emission Tomography in Patients Following Heart Transplant.
Mc Ardle BA, Davies RA, et al:
Circ Cardiovasc Imaging 2014; 7 (November): 930-937

82Rb PET with quantitative myocardial blood flow evaluation has good prognostic value in heart transplant patients.

Background: One of the most common causes of death following heart transplantation is cardiac allograft vasculopathy (CAV), a long-term complication where immune-mediated rejection results in diffuse, concentric intimal thickening of proximal as well as distal coronary arteries and the microcirculation. This results in ischemia and contractile dysfunction. Because transplanted hearts are denervated, patients often don’t experience angina. This motivates routine screening with periodic invasive angiography for the first 3 to 5 years following transplantation. If detected early, CAV can be mitigated by intensifying immunosuppressive therapy. Of course, invasive angiography is inconvenient and not risk free, so noninvasive imaging for early detection of CAV would be a nice alternative.

Objective: To determine the prognostic value of 82Rb PET in patients with a history of heart transplantation.

Methods: The study included 140 consecutive patients who underwent heart transplantation a median of 8.2 years prior to PET imaging.

Results: 9 patients had a diagnosis of CAV at baseline. During the observation period, 14 patients experienced the primary outcome of death (9 patients), acute coronary syndrome (1 patient), or heart failure (4 patients). Near normal or normal PET images (summed stress score [SSS] <4) were observed in 93% of patients. By univariate analysis, time since transplantation was not a significant predictor of adverse events. The event rate among patients with SSS <4 and rest left ventricular ejection fraction (LVEF) >45.0% (n=131) was 8.7%. The event rate for patients with an abnormal perfusion images or LVEF <45% (n=9) was 33% (P =0.066). When myocardial flow reserve (MFR) was included, the event rate for patients with SSS <4, LVEF >45.0%, and MFR >1.75 (n=107) was 4.6%. The event rate for patients with abnormal images, LVEF, or MFR <1.75 (n=33) was 27% (P =0.0006).

Conclusions: 82Rb PET has prognostic value in heart transplant patients.

Reviewer's Comments: I've been waiting a long time for a study like this because I believe that routine angiography can be avoided in heart transplant patients with appropriate noninvasive perfusion evaluation. Some heart failure specialists believe that SPECT myocardial perfusion imaging is likely to miss CAV because the diffuse nature of the disease will result in relatively homogeneous decrease in myocardial tracer uptake that can be missed on perfusion imaging. Whether this would happen to a significant degree or not, the addition of quantitative blood flow evaluation should boost sensitivity in cases where cardiac perfusion is homogeneously reduced. (Reviewer-Shayne Squires, MD).

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Keywords: Heart Transplantation, Perfusion, Cardiac Allograft Vasculopathy, PET, SPECT

Print Tag: Refer to original journal article
FDG-PET Fails to Detect Viability in Stress Cardiomyopathy

Cardiac 99mTc Sestamibi SPECT and 18F FDG PET as Viability Markers in Takotsubo Cardiomyopathy.
Christensen TE, Bang LE, et al:

Int J Cardiovasc Imaging 2014; 30 (October): 1407-1416

Cardiac viability studies with SPECT perfusion imaging and FDG-PET are not predictive of functional recovery in patients with Takotsubo cardiomyopathy.

Background: Takotsubo cardiomyopathy, also known as apical ballooning syndrome or stress cardiomyopathy, typically occurs in response to physical or emotional stress and is more common in women. It's generally reversible, typically resolving within approximately 1 month. Because of its reversibility, it's reasonable to predict that a cardiac viability study would demonstrate viable myocardium.

Objective: To determine whether single SPECT myocardial perfusion imaging and 18F-FDG PET demonstrate viable myocardium in stress cardiomyopathy.

Methods: The study included 24 patients who were recruited from a cohort that presented with acute coronary syndrome. Patients were included if they had no significant coronary artery disease by angiography and "apical ballooning," defined as akinesis or dyskinesis of the apex to mid-ventricle. At 4-month follow-up, 5 patients were classified as not having stress cardiomyopathy and 3 achieved normal contractility prior to nuclear imaging. The final analysis included 16 patients. Each patient underwent rest myocardial SPECT perfusion imaging and FDG-PET myocardial imaging within 5 days of presentation and at 4 months.

Results: Perfusion was reduced in the apex and mid-ventricle, but not base, in each patient by an average of 43% and 27%, respectively. Surprisingly, FDG uptake was also reduced by an average of 47% in the apex and 30% in the mid-ventricle. No patient was found to have a significant amount of "viable hibernating" myocardium by conventional standards. At 4-month follow-up, each patient had normal perfusion and metabolism, no regional wall motion abnormalities, and ejection fraction >60%.

Conclusions: Myocardial perfusion and metabolism imaging failed to detect viability in the acute phase of stress cardiomyopathy, possibly because of "partial volume" effect.

Reviewer's Comments: This was a surprising study because FDG-PET failed to show viability in demonstrably viable myocardial tissue. I completely reject the authors' suggestion that their results could be explained from partial volume averaging. Rather, there seems to be a difference in the underlying tissue metabolism between stress cardiomyopathy and ischemic cardiomyopathy. (Reviewer-Shayne Squires, MD).

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Keywords: Takotsubo Cardiomyopathy, Stress Cardiomyopathy, SPECT MPI

Print Tag: Refer to original journal article
Radiology
Volume 42 Number 8: January 30, 2015
Quiz Code: 33110P

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Quiz Questions

1. The apparent diffusion coefficient values of diffusion-weighted imaging seen in poorly differentiated gastric adenocarcinomas are similar to those seen in signet-ring cell carcinomas of the stomach.
   Circle one: True False

2. In patients with post-ERCP pancreatitis, the duration of the ERCP significantly correlates with the modified CT severity index score.
   Circle one: True False

3. In cases of perigastric appendagitis, the fat density rim seen on CT is either well defined (similar to epiploic appendagitis) or ill-defined (similar to omental infarction).
   Circle one: True False

4. On CT, peritoneal carcinomatosis is associated with peritoneal thickening and, when present, discrete ill-defined nodules with irregular outlines.
   Circle one: True False

5. With using combined 2D and 3D interpretation, the sensitivity of CT colonography for detecting nonpolyoid adenomas ≥5 mm in diameter is approximately 0.76.
   Circle one: True False

6. The 2 best positions to optimize colonic distention on CT colonography are the right lateral decubitus and supine positions.
   Circle one: True False

7. On unenhanced CT, identification of the hypodense rim sign does not differ significantly for minimal-fat angiomyolipomas versus renal cell carcinomas.
   Circle one: True False

8. Agatston coronary calcium scores derived using different CT systems do not differ substantially from one CT vendor to another.
   Circle one: True False

9. In patients with nephrotic syndrome, pulmonary embolism is often asymptomatic.
   Circle one: True False

10. In general, some of the long-term problems associated with superficial femoral artery stents may include stent fracture and stenosis.
    Circle one: True False

11. The main goal of imaging after locoregional therapy for hepatocellular carcinoma is to detect residual or recurrent disease.
    Circle one: True False

12. Most posterior medial meniscal root lesions involve the root ligament's attachment site to the tibia.
    Circle one: True False

13. After skeletal maturity, continued growth of an osteochondroma is normal.
    Circle one: True False

    Circle one: True False

15. The muscles of facial mimicry receive innervation via the facial nerve.
    Circle one: True False

16. More than 50% of patients presenting to the emergency department with a complaint of dizziness will have acutely abnormal head CT findings.
    Circle one: True False

17. During the last 2 decades, the radiology department has become the dominant provider of lumbar punctures in the hospital setting.
    Circle one: True False

18. Among mucocele-like lesions of the breast found to have atypia on core needle biopsy, >50% of cases are found to have invasive carcinoma on surgical excision.
    Circle one: True False

19. Cystic apocrine metaplasia of the breast most commonly presents on MRI as a large mass >2 cm in size.
    Circle one: True False

20. In women undergoing MRI screening for breast cancer, the diagnostic accuracy of the abbreviated screening protocol is significantly lower than the diagnostic accuracy of the full screening protocol.
    Circle one: True False
Radiology
Answers for Volume 42 Number 7: December 30, 2014
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1. T In an MRI-based study of uterine sarcomas, the only subtype that displayed a heterogeneous signal on T2WI and extrauterine extension was leiomyosarcoma.

2. T In a study by Spektor et al, the presence of small bowel pneumatosis and/or large bowel pneumatosis was only observed in patients with gastric pneumatosis who died.

3. T Inner-to-inner measurements of endometrial thickness measured via MDCT demonstrate an excellent correlation with the same measurements made with US.

4. T On diffusion-weighted MRI of the kidney, both cortical and medullary apparent diffusion coefficient (ADC) values are significantly lower in patients with chronic kidney disease compared to healthy controls.

5. T When evaluating the appendix via US, a scan of the patient in the left posterior oblique position is helpful for locating the retrocecal appendix.

6. T After pancreatic transplant, contrast-enhanced multi-detector CT is excellent at detecting vascular complications in the early postoperative course.

7. T On multi-detector CT of intraductal papillary mucinous neoplasms of the pancreas, the detection of a mural nodule has only fair to moderate interobserver agreement among radiologists.

8. F Elimination of the noncontrast phase of a dual-phase CT angiography protocol does not significantly impact the diagnostic accuracy of the study for aortic intramural hematoma.

9. F Organ laceration CT grading using the criteria of the American Association for the Surgery of Trauma is not predictive of patient outcomes.

10. T Using the National Lung Screening Trial database, increasing the threshold diameter of lung nodules that defines a "positive CT screening test" reduces the number of CTs obtained between annual screenings.

11. T In patients with hepatic tumors who undergo a mapping angiogram procedure before selective internal radiation therapy, the use of antireflux microcatheters can reduce procedure time.

12. T Critical limb ischemia manifests with ischemic pain of the limb at rest or tissue loss.

13. T Retrograde pedal access is a useful technique for revascularization of infrainguinal arterial occlusive lesions.

14. F The lateral collateral ligament complex of the radioulnar joint is most commonly injured iatrogenically during surgery.

15. F Meniscal ossicles typically present with mechanical locking like that seen with loose joint bodies.

16. F In a study by Malhi et al, the malignancy rate was >80% for thyroid nodules with echogenic foci seen on US.

17. T The incidence of contrast-induced nephropathy is relatively low in patients who undergo neuroendovascular procedures and receive contrast material at a dose ≥250 mL.

18. T MRI has high diagnostic accuracy for giant cell arteritis in patients receiving systemic corticosteroid therapy for ≤5 days.

19. F After 1 or 2 courses of topical corticosteroids to treat idiopathic granulomatous mastitis, breast imaging generally shows complete resolution of pretreatment findings in all patients.

20. F A review by O'Connell et al shows that the radiation dose for dedicated breast CT is significantly lower than the radiation dose for conventional 2-view mammography.