The e-Imaging Coalition is a broadly representative assemblage of companies, each having a stake in the commercialization and co-modification of decision support. The coalition has succeeded in convincing the federal government, after passage of the Omnibus health care act, that diagnostic evaluations can be programmed through interactive computer prompts that will not just guide but also compel primary care physicians to follow the supposedly most efficacious imaging paradigm. These prescriptions will be based on set decisions as derived from Appropriateness Criteria directives. The benefit, it is presumed, will be quicker and more decisive, and incisive workups will save discomfort, time, and money while reducing cost and risk. However, by this reductive approach, heedless of patient and physician predilection, detailed history, and other intangibles that often inform good and humane practice, e-Imaging has with it the prospect of doing at least as much harm as good. (Reviewer-).

Keywords: Decision Making, Support

Print Tag: Refer to original journal article
3D-GRE MRI using a hepatobiliary contrast agent shows an improved detection rate compared to that achieved with precontrast and dynamic enhanced imaging.

**Objective:** To determine if 3D gradient echo (3D-GRE) MRI using a hepatobiliary contrast agent improves the detection of hypovascular hepatic metastases.

**Design:** Retrospective analysis.

**Methods:** This study was comprised of 41 patients with hepatic metastases who underwent gadolinium-BOPTA–enhanced liver MRI. Before hepatic resection, all patients underwent intraoperative ultrasound, which was correlated with the MRI findings regarding the number of lesions, segment location, and lesion relationship to the vascular structures and liver hilum. MRI examinations were performed on 1.5 T systems. Sequences included T1-weighted in- and out-of-phase 2D-GRE, T2-weighted single-shot turbo spin echo fat saturated, and 3D-GRE. Dynamic contrast-enhanced images using a 3D-GRE sequence were obtained before and after intravenous gadolinium-BOPTA administration during arterial, portal venous, equilibrium, and hepatobiliary phases. Hepatobiliary phase images were obtained with a delay between 107 and 195 minutes. Two radiologists reviewed the precontrast T1- and T2-weighted images, dynamic images, and hepatobiliary phase images to compare the sensitivity of each sequence. The precontrast T1- and T2-weighted images and dynamic images were reviewed first. Subsequently, these images combined with those from the hepatobiliary phase were reviewed 4 weeks later. The readers recorded the presence or absence of metastatic hepatic lesions, as well as the shape, border, enhancement pattern, and internal architecture of the lesions.

**Results:** 76 metastatic lesions were detected at MRI. During dynamic imaging, all of the lesions were hypovascular. The sensitivity for detecting lesions of all sizes on the hepatobiliary phase was approximately 96% compared to 86% to 87% for the precontrast and dynamic images. For lesions measuring >1 cm, the sensitivity was 100% for the hepatobiliary phase, 96% for the precontrast images, and 98% for the dynamic sequence. The difference was even greater when limiting detection to lesions measuring ≤1 cm. For metastases measuring ≤1 cm, the sensitivity for lesion detection on the hepatobiliary phase was approximately 90%, compared to approximately 71% for the precontrast and dynamic MRI.

**Conclusions:** 3D-GRE MRI with hepatobiliary contrast “is an accurate tool in the detection of hepatic hypovascular metastases.”

**Reviewer's Comments:** The results of this study are useful in that they illustrate the potential added benefit of using a hepatobiliary contrast agent to detect hepatic metastatic disease. The hepatobiliary phase improves the rate of detection compared to the precontrast and dynamic-enhanced images. This improved detection can have a profound effect on the selection and consequent management of these patients. A limitation reported in this study was that there may have been selection bias as the patients with a limited number of metastases underwent surgery, thereby limiting the study group to surgical patients. (Reviewer-John C. Sabatino, MD).

Keywords: Liver, 3D Gradient Echo MRI

Print Tag: Refer to original journal article
**Risk Factors for Hepatic Steatosis**

*Hepatic Steatosis (Fatty Liver Disease) in Asymptomatic Adults Identified by Unenhanced Low-Dose CT.*

Boyce CJ, Pickhardt PJ, et al:

AJR Am J Roentgenol 2010; 194 (March): 623-628

Unenhanced CT is a noninvasive means of detecting fatty liver in asymptomatic patients; however, the utility of known clinical risk factors is unreliable.

**Objective:** To examine the frequency of fatty liver in asymptomatic patients undergoing unenhanced CT, and to evaluate the reliability of known clinical risk factors for making the diagnosis.

**Design:** Prospective analysis.

**Methods:** This study was comprised of 3357 asymptomatic patients who underwent screening CT colonography. The following 5 CT criteria for the diagnosis of hepatic steatosis were applied: liver attenuation ≤40 Hounsfield units (HU), liver attenuation less than or equal to spleen attenuation minus 10 HU, liver attenuation less than or equal to spleen attenuation, liver attenuation less than or equal to spleen attenuation plus 5 HU, and liver-to-spleen attenuation ratio ≤1.1. Demographic and clinical characteristics of the screening cohort included the following: age, sex, height, weight, diabetes mellitus, dyslipidemia, hypertension, alcohol overuse, and hepatitis.

**Results:** The liver attenuation ranged between -14 and 90 HU. The mean liver attenuation was 59 HU, while that of the spleen was 55 HU. The prevalence of fatty liver varied depending on which of the CT criteria was used. Six percent had a liver attenuation ≤40 HU, 10% had a liver attenuation less than or equal to spleen attenuation minus 10 HU, 26% had a liver attenuation less than or equal to spleen attenuation, 46% had a liver attenuation less than or equal to spleen attenuation plus 5 HU, and 46% had a liver-to-spleen attenuation ratio ≤1.1. The clinical risk factors that had the highest sensitivity for steatosis were overweight or obesity at approximately 93% and 64%, respectively. However, these factors also had low specificities of approximately 38% and 76%, respectively. Meanwhile the specificities of diabetes or insulin resistance, hepatitis, and alcohol overuse were much higher at approximately 92%, 100%, and 92%, but had sensitivities of only approximately 24%, 2%, and 10%, respectively. Therefore, the majority of the cases of steatosis in this population represented nonalcoholic fatty liver disease.

**Conclusions:** The individual risk factors most closely associated with steatosis were body mass index, hypertension, and diabetes and insulin resistance. Meanwhile, there was a less significant association with alcohol overuse, dyslipidemia, and hepatitis.

**Reviewer's Comments:** The results of this study demonstrate that clinical characteristics such as obesity, diabetes mellitus, dyslipidemia, hypertension, and alcohol overuse have a greater likelihood of predisposing an individual to the development of fatty liver. However, as shown in this study, these characteristics are poor screening criteria either due to poor sensitivities or specificities. One of the limitations reported in this study was that some of the clinical risk factors for hepatic steatosis may not have been accounted for. (Reviewer- John C. Sabatino, MD).

Keywords: Fatty Liver Disease, CT

Print Tag: Refer to original journal article
Role of MRI in Staging of Testicular Neoplasms

*MRI in the Characterization and Local Staging of Testicular Neoplasms.*

Tsili AC, Argyropoulou MI, et al:

AJR Am J Roentgenol 2010; 194 (March): 682-689

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MRI is helpful in the evaluation, as well as preoperative characterization and staging, of testicular neoplasms.

**Objective:** To determine if MRI is advantageous and provides additional information in the preoperative evaluation of patients with testicular neoplasms.

**Design:** Prospective analysis.

**Participants/Methods:** This study was comprised of 33 patients who had a testicular mass based on clinical and sonographic findings. These lesions were confirmed by surgery and/or biopsy. Exclusion criteria included a normal MRI examination, primary extra-testicular abnormality, and lack of histopathologic confirmation. MRI examinations were performed on 1.5-T systems. Imaging sequences included T1-weighted, T2-weighted fast spin echo, and contrast-enhanced T1-weighted images. Additional T1-weighted fat-suppressed images were acquired if the lesion was high signal on T1-weighted images. Images were reviewed by 2 radiologists who recorded the size, margins, signal, and contrast enhancement of the lesions. Characteristics of malignant lesions included a multi-nodular mass that was low signal on T2-weighted images, a heterogeneous mass with variable signal on T2-weighted images, the presence of hemorrhage or necrosis, an enhancing mass, and extra-testicular extension involving the tunica, epididymis, or spermatic cord. The staging of local disease extent was as follows: T1, mass with surrounding normal parenchyma or intact tunica; T2, tunica disruption with or without an accompanying paratesticular mass; T3, enlarged and enhancing spermatic cord due to disease infiltration; and T4, scrotal wall invasion.

**Results:** There were 36 intratesticular lesions; 78% were malignant, and 22% were benign. The malignant lesions were comprised of 13 seminomas, 13 non-seminomatous germ cell tumors, and primary large B-cell lymphomas. These ranged between 1.2 and 12 cm in size; 13 lesions were stage T1, 12 were stage T2, and 3 were stage T3. The accuracy of MRI in the assessment of the local disease extent was approximately 93%. Benign lesions included tubular ectasia of the rete testis, hemorrhagic necrosis, fibrosis, and granulomatous orchitis. The sensitivity and specificity of MRI in differentiating between benign and malignant intratesticular lesions were 100% and 87.5%, respectively. All malignant intratesticular lesions were predominantly isointense to the contralateral testis on T1-weighted images unless they also had fatty or hemorrhagic components, had variable signal on T2-weighted images, and demonstrated heterogeneous enhancement.

**Conclusions:** MRI is helpful in the diagnosis of testicular disease. "It is highly accurate in the preoperative characterization and local staging of testicular neoplasms."

**Reviewer's Comments:** The results of the study are helpful in demonstrating that preoperative MRI can be useful in not only characterizing intratesticular lesions, but also in determining the local disease extent of malignant neoplasms. Therefore, this can supplement the findings found at clinical exam and sonography. A limitation reported in this study was that there was no direct performance comparison between the sonographic and MRI findings to justify the role of MRI in the diagnosis and characterization of testicular diseases. (Reviewer-John C. Sabatino, MD).

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Keywords: Testicle, Neoplasms, MRI

Print Tag: Refer to original journal article
Measuring Change in Mass Better Than Diameter or Volume for GGN Pulmonary Ground-Glass Nodules: Increase in Mass as an Early Indicator of Growth. 
de Hoop B, Gietema H, et al: 
Radiology 2010; 255 (April): 199-206

On CT, a ground-glass nodule’s change in mass as opposed to change in diameter or volume will allow quicker detection if there is any growth. This finding may have implications for earlier detection of cancer in these lesions.

Background: Mass integrates volume and density. If the volume of something or its density increases, its mass increases. Nodule mass can be calculated from CT because x-ray attenuation values are proportional to the density of tissue. The mass of a nodule is its volume and density multiplied by one another.

Objective: To determine whether ground-glass nodule (GGN) diameter, volume, or mass best determines which lesion is malignant.

Design: Retrospective study.

Participants: Patients were recruited from the Dutch-Belgian lung cancer screening trial (NELSON); 52 GGNs were seen in 45 of the participants. Thirteen malignant GGNs and 1 benign GGN were resected. The malignant GGNs were adenocarcinoma and bronchoalveolar carcinoma, and the benign GGN was atypical adenomatous hyperplasia.

Methods: 2 people did all measurements independently. Intra- and interobserver variability was assessed. For every malignant GGN, the change in diameter, volume, and mass during follow-up was evaluated and compared to the variability of each measurement method. The maximum diameter on a single axial image was measured with electronic calipers. The volume was measured by outlining the GGN on all axial images on which the lesion was visible, and a computer calculated the volume. The mass within the nodule volume was calculated by multiplication of the nodule volume by average nodule density, which was mean CT number + 1000. (Adding 1000 to CT attenuation in Hounsfield units equals the physical density in milligrams per milliliter. This works only if no IV contrast was given and no calcification was present in the nodule.)

Results: The average time between the first CT and last CT of the 13 malignant GGNs was 33 months (range, 12 to 49 months). The average diameter increase during this time was 53%; the average volume increased 202%; and the average mass increased 254%. The average growth-to-variability ratio was 11 for diameter, 28 for volume, and 35 for mass. The average time required for growth to be greater than the upper limit of agreement was 715 days for diameter, 673 days for volume, and 425 days for mass.

Conclusions: Mass measurements will allow detection of growth of a GGN earlier than measurements of volume or diameter.

Reviewer’s Comments: This article very nicely demonstrates that change in GGN mass, which takes into account the nodule’s density and volume, is better for trying to determine if the lesion is malignant. Intuitively, one knows that, if a GGN appears more solid on subsequent imaging without a change in diameter, it is very worrisome for malignancy, and this study helps quantify that. (Reviewer-Vineet R. Jain, MD).

Keywords: Ground-Glass Nodules, Pulmonary

Print Tag: Refer to original journal article
Coronary CT Comparable to Catheterization for Hemodynamically Relevant Stenoses

Combined Cardiac CT and MRI for the Comprehensive Workup of Hemodynamically Relevant Coronary Stenoses.

Donati OF, Scheffel H, et al:

AJR Am J Roentgenol 2010; 194 (April): 920-926

Coronary CT angiography plus perfusion-cardiac MRI is comparable to the standard conventional coronary angiography plus perfusion-cardiac MRI for the detection of hemodynamically significant coronary stenoses.

Objective: To compare prospectively ECG-gated coronary CT angiography (CTA) plus perfusion-cardiac MRI with conventional coronary angiography (CA) plus perfusion-cardiac MRI for the detection of coronary stenoses.

Design: Prospective study.

Participants: 47 patients with known or suspected coronary artery disease (CAD) who clinically underwent elective CA.

Methods: All CTs were done on a dual-source CT using prospective ECG gating. All patients received a single 2.5-mg dose of sublingual isosorbide dinitrate before the examination. A prerequisite of the examination was that the patient's heart rate was <70 bpm. Axial images were reconstructed with a slice thickness of 0.6 mm, and the image acquisition window was 70% of the R-R interval. All bi-plane conventional CA exams were performed using standard techniques. All perfusion-cardiac MRIs were performed on a 1.5T system. Data were acquired during breath-hold and end inspiration. Three sections of the left ventricle in short-axis (basal, mid-ventricular, and apical) were obtained. The pharmacologic stress agent used was adenosine. Perfusion-cardiac MRI was obtained immediately after IV gadobutrol (the contrast agent) was given. Ten minutes after stress perfusion imaging, a second bolus of 0.1 mmol/kg gadobutrol was injected, and rest perfusion images were obtained before and after adenosine administration; 10 minutes later, late gadolinium enhancement (LGE) images were obtained. A significant stenosis on CTA was considered ≥50%. On cardiac MRI, segmental perfusion and LGE were rated on a 4-point scale: 0 = definitely normal; 1 = probably normal; 2 = probably pathologic; and 3 = definitely pathologic. Cardiac segments had perfusion defects if there was a decrease in signal intensity or delayed wash-in of a segment at stress but not at rest or if abnormal late gadolium enhancement was present. A hemodynamically significant stenosis was considered with a coronary artery stenosis >50% on coronary CTA or CA and with a perfusion defect in the coronary territory on cardiac MRI. If there was a significant coronary stenosis but no perfusion defect, it was considered not hemodynamically relevant. If there was a perfusion defect in the territory of a coronary artery that did not have at least 50% stenosis, it was considered a false-positive result.

Results: There were perfusion defects in 30 of 47 (63.8%) patients. Image quality was considered diagnostic in 99.5% of coronary segments on CTA. The sensitivity, specificity, negative predictive value, positive predictive value, and accuracy of coronary CTA plus perfusion-cardiac MRI versus CA and perfusion-cardiac MRI was 96.7%, 100%, 94.4%, 100%, and 97.9%, respectively.

Conclusions: Coronary CTA plus perfusion-cardiac MRI was comparable to the standard CA plus perfusion-cardiac MRI.

Reviewer’s Comments: The authors have very nicely demonstrated good preliminary findings suggesting that coronary CTA may one day replace CA for the diagnosis of hemodynamically significant CAD in certain populations. (Reviewer-Vineet R. Jain, MD).

Keywords: Coronary Stenoses, CTA, MRI

Print Tag: Refer to original journal article
Image quality for the purposes of CT fluoroscopy for lung biopsy is gradually improved only after 1.48 mGy/sec, which corresponds to CT parameters of 135 kV and 10 mA. These data can be used for guiding the optimal CT fluoroscopy scan in a given patient.

Objective: To evaluate how different lung CT fluoroscopy scan parameters affect radiation dose, and to determine the optimal parameters for lung interventional radiologic (IR) procedures.

Design: Prospective study.

Participants: 32 patients who had a single tumor in the lung measuring up to 3.5 cm in diameter. Patients were scheduled for lung biopsy or RF ablation.

Methods: A 4-detector row CT was used. Three tube voltages (80, 120, and 135 kV) and 3 tube currents (10, 20, and 30 mA) were studied, yielding a total of 9 different images using different CT scan parameters prior to biopsy or ablation. All other scan parameters such as 6-mm image thickness were the same for each image. A polymethyl methacrylate phantom was used to measure the radiation dose for each different CT scan parameter. The signal-to-noise ratios (SNRs) of the pulmonary parenchyma and tumor were measured using regions of interest (ROIs). Using the SNR, the contrast-to-noise ratio (CNR) was also calculated. Qualitatively, 4 interventional radiologists independently evaluated the 9 different CT axial images obtained with each different CT scan parameter in each patient. Every image was scored on a scale of 0 to 100 for performing an image-guided procedure (0 = not acceptable and 100 = acceptable). When each reader determined that the image generated was acceptable for performing an IR procedure, a score of ≥51 was given.

Results: Acceptable image quality for performing an IR procedure was seen in 30 of 32 (94%) cases when the radiation dose was 1.18 mGy/sec, which corresponded to CT scan parameters of 120 kV and 10 mA, and in 100% of patients when the radiation dose was ≥1.48 mGy/sec, which corresponded to CT scan parameters of 135 kV and 10 mA. Piece-wise linear regression curve demonstrated a rapid improvement in image quality until the radiation dose was 1.48 mGy/sec, after which image quality improvement became more gradual.

Conclusions: Improvement in image quality for the purposes of CT-guided biopsy of lung lesions is gradual after the radiation dose is increased from 1.48 mGy/sec, which corresponds to CT scan parameters of 135 kV and 10 mA. These data can be used to guide the optimal scan parameters for CT-guided lung biopsy using CT fluoroscopy.

Reviewer's Comments: The authors have very nicely demonstrated that a much lower radiation dose is required for CT-guided lung biopsy using CT fluoroscopy than is typically used. (Reviewer-Vineet R. Jain, MD).
Objective: To evaluate the viability of percutaneous radionuclide ablation of axial aneurysmal bone cysts (ABCs) with chromic phosphate extrapolating from its success in managing certain arthropathies. At the authors’ institution, the standard of care of ABCs has been primarily surgical.

Design/Participants: Retrospective study of 5 patients with ABCs of the axial skeleton treated by computed tomography (CT)-guided percutaneous instillation of 2 mCi of Phosphorus-32 (32P) chromic phosphate.

Methods: Given that pathologically ABCs may coexist with other bone lesions (occasionally malignant), all lesions treated herein were demonstrated to have no solid components and were dually confirmed with biopsy. Patients were followed by plain-film, CT, and MRI examinations to discern various lesion characteristics post-therapy. By the authors' standards, local control was defined as lack of lesion growth/progression and ossification in areas of bone involvement.

Results: In 4 patients, the authors demonstrated that 1 application of percutaneously instilled chromic phosphate yielded local control of all lesions. In 1 patient, 2 injections were required for local control. The authors reported 1 significant complication in their data. Conclusion: Phosphorus-32 chromic phosphate is a relatively new and viable approach in attaining local control of axial ABCs. Comparatively, surgery, external beam radiation, and arterial embolization have well-known complications that may be obviated by the use of selective intralesional injection of chromic phosphate.

Reviewer’s Comments: Local injection of 32P chromic phosphate induces necrosis and involution of abnormal tissue by means of beta emission over a very short distance. The authors differentiate their administration of "colloidal" chromic phosphate from the "water-soluble" form. In colloidal form, the radiopharmaceutical does not adversely affect bone marrow cells or osteocytes, restricting radiation dose to the target cells (in this case, ABCs). The manufacturer has reported 1 potential case of leukemia (out of 5000 plus applications for arthropathy), which has garnered some attention. The authors provide the reader with this disclaimer and highlight the "tentative" results they have achieved with local injection of chromic phosphate and its application in select cases. In my opinion, the management of ABCs requires an interdisciplinary approach ultimately weighing the risks and benefits of all treatment options. In some cases, operative treatment may in fact be the most feasible in the hands of a skilled surgeon. External radiation therapy may be necessary under particular circumstances; nevertheless, we are entering an age of heightened awareness of ionizing radiation and its damaging effects, especially in younger patients. More research is necessary concerning the use of intralesional chromic phosphate for the treatment of ABCs, but, so far, so good. (Reviewer-Rahul Pawar, MD).

Keywords: Aneurysmal Bone Cyst, Radionuclide Ablation
Ever Missed a Posterior Shoulder Dislocation on Plain Film?

The “Mouzopoulos” Sign: A Radiographic Sign of Posterior Shoulder Dislocation.

Mouzopoulos G.

Emerg Radiol 2010; February 25 (): epub ahead of print

The “Mouzopoulos” sign is a new addition to the myriad signs described in the literature assigned to posterior shoulder dislocation.

**Objective:** The author describes his very own "Mouzopoulos" sign in hopes of increasing the sensitivity of the anteroposterior (AP) radiograph in diagnosing posterior shoulder dislocation.

**Methods:** 14 cases of CT-confirmed posterior shoulder dislocation were retrospectively analyzed for this study. AP views of each case were presented to orthopedic surgeons for radiographic evaluation. X-ray signs for posterior dislocation were employed as the basis for detection (ie, "light bulb" sign, "rim" sign, "trough line" sign, "absent half-moon" sign, and the "Mouzopoulos" sign). The "Mouzopoulos" sign, as the author details, is essentially the high-density "M"-shaped linear projection of the anterior and posterior borders of the greater and lesser tuberosities of the internally rotated humeral head in the AP dimension. The lesser tuberosity compromises the medial component and the greater tuberosity the lateral component of the "M."

**Results:** From the 14 cases evaluated, the following values are the numbers of instances where the aforementioned signs were visualized: "light bulb" sign, 4 cases; "rim" sign, 6 cases; "trough line" sign, 9 cases, "absent half-moon" sign, 2 cases, and "Mouzopoulos" sign, 12 cases. **Conclusion:** Although the author explains that the "Mouzopoulos" sign may be falsely positive if the humerus is internally rotated and not dislocated, he indirectly highlights the high positive predictive value of this sign in diagnosing posterior dislocation. He regards it as a reliable sign of detecting posterior dislocation, amidst an array of signs that he renders unreliable in many circumstances.

**Reviewer’s Comments:** I agree with the author. Posterior shoulder dislocation is relatively uncommon compared with anterior dislocation. Furthermore, adding to the low suspicion shared by most radiologists and emergency department physicians alike, its radiographic appearance is often ambiguous lending a hand to missed diagnosis. Mouzopoulos has indeed created an ingenious sign of posterior shoulder dislocation bearing his name; however, a larger sample size would have created a larger impact on the radiologic, orthopedic, and emergency medicine communities alike. With a plethora of eponymous signs in the medical literature, such publications can bear the semblance of self-promotion, ultimately detracting from any merit it may in fact possess. In the case of posterior shoulder dislocation, I cannot overstate the importance of close inspection of anatomic landmarks in the context of a clinical history. Radiographic signs, as we all understand, are not meant to replace our understanding of abnormal findings, but rather to serve as an aid in improving our skills of pattern recognition. The "Mouzopoulos" sign can yield a false positive in some cases, but it appears to make sense to the eye. If you remember and/or recognize this sign when confronted with an occult posterior dislocation, just be sure to explain it in your report and to the referring physician to avoid any confusion. (Reviewer-Rahul Pawar, MD).

Keywords: Shoulder Dislocation, Mouzopoulos Sign

Print Tag: Refer to original journal article
Does neoadjuvant Chemotherapy Decrease Overall Glandular Density of Breasts?


Chen J-H, Nie K, et al:

Radiology 2010; 255 (April): 44-52

Neoadjuvant chemotherapy decreases glandular density of the breasts by an average of 10%, with direct correlation to patient age.

Background: In patients with locally advanced breast cancer, neoadjuvant chemotherapy can be initiated in order to downstage the cancer prior to breast conservation surgery. Secondary to data that has proven its ability to improve survival, neoadjuvant chemotherapy has become the standard of care. In itself, chemotherapy has been noted to decrease ovarian function and thereby decrease overall glandular density of the breasts.

Objective: With established reliable methods for quantitative evaluation of breast density on MRI, the objective of this study was to evaluate the breast density of the contralateral disease-free breast in women undergoing neoadjuvant chemotherapy.

Design: Retrospective study.

Methods: Patients, who had previously been invited to participate in a research study involving serial breast MRI, were identified. These women underwent a study that monitored neoadjuvant chemotherapy treatment response via MRI of the breast. Exclusion criteria included those who did not comply with follow-up MRI, those who received chemotherapy variations of the standard protocol, patients with extremely fatty breasts, and those with contralateral breast cancer. All MRI studies were performed on the same machine using the same protocols. All of the patients included underwent 1 MRI study prior to initiating neoadjuvant chemotherapy and 1 to 5 follow-up MRIs during the course of treatment. Quantification of breast density was performed by one of the authors using 3-dimensional MRI computer assisted-based methods developed earlier by the same authors. Although regions of interest were chosen to outline a specific volume of the breast tissue, percentage density was calculated by normalizing this value to the total breast volume. Subjects were placed into 2 separate groups based on the chemotherapy protocols they had undergone.

Results: 54 patients, with an overall mean age of 47 years, were included in this study. The average percentage of decrease in breast density after routine adjuvant chemotherapy effect was 10%. With the use of the chemotherapy drug Taxane, the percentage of decrease was measured to be 12.7%. A multivariate regression model demonstrated that baseline density as well as percent change in density was significantly dependent on age.

Reviewer's Comments: The authors’ findings are intuitive and the data are elegantly presented. What is unclear at this point is whether a decrease in breast glandular density also confers a preventive benefit in breast cancer development. (Reviewer-Basil Hubbi, MD).

Keywords: Neoadjuvant Chemotherapy, Breast Cancer, Breast MRI

Print Tag: Refer to original journal article
Imaging Characteristics of Triple Receptor-Negative Breast Cancers

Multimodality Imaging of Triple Receptor-Negative Tumors With Mammography, Ultrasound, and MRI.
Dogan BE, Gonzalez-Angulo AM, et al:
AJR Am J Roentgenol 2010; 194 (April): 1160-1166

Triple receptor-negative breast cancers have characteristics on mammography and ultrasound that may overlap with those associated with benign masses.

**Background:** Breast cancers that are called "triple receptor-negative" are those that histopathologically do not express estrogen receptors, progesterone receptors, or human epidermal growth factor 2 receptors. These particular breast cancers have a unique gene expression profile that correlates with aggressive behavior. Previous studies on the imaging findings associated with these cancers suggest that their appearance overlaps with benign features belying their malignant nature.

**Objective:** To evaluate the mammographic, sonographic, and MRI features of triple receptor-negative cancers.

**Design:** Retrospective study.

**Methods:** A database was initially searched to identify patients who had been diagnosed with triple receptor-negative cancer at a major academic institution over a retrospective 3-year, 8-month period. Patients who underwent baseline imaging with mammography, ultrasound, and MRI were included in the study. Two breast radiologists retrospectively reviewed the imaging studies to document particular characteristics. For the ultrasound examinations, characteristics that were used included size, mass type (subcategorized into solid or cystic), margin, echogenicity, presence or absence of acoustic enhancement, or calcification. Ipsilateral regional lymph node ultrasound evaluation was also reviewed. For MRI interpretation, the BI-RADS 4th Edition MRI lexicon from 2003 was used. Clinical findings, when available, were also recorded.

**Results:** 44 patients were included in the study. Their median age at initial visit was 42 years. Evaluation of the clinical findings revealed that 95.5% of patients had initially presented with a palpable breast mass. Tumor sizes ranged from 1 to 13 cm (mean size, 3.7 cm). Nearly 91% of the cancers had been visualized on mammography and appeared as a mass 58% of the time. The second most common mammographic presentation was as a focal asymmetry, as seen in 21% of the mammographically evident cancers; 60% were round or oval and 32% had circumscribed margins. Ultrasound detected 93% of the cancers, with 86% of them appearing as masses. Almost 16% of the patients had sonographic characteristics favoring a benign diagnosis, such as a round or oval shape and circumscribed margins. Ultrasound detected 93% of the cancers, with 86% of them appearing as masses. Almost 16% of the patients had sonographic characteristics favoring a benign diagnosis, such as a round or oval shape and circumscribed margins. Ultrasound detected 93% of the cancers, with 86% of them appearing as masses. MRI detected all 44 masses (100% sensitivity), with 77% characterized as mass-like enhancement and nearly 23% characterized as non–mass-like enhancement. Almost 77% of the areas of mass-like enhancement were associated with rim enhancement and the majority of areas of non–mass-like enhancement were associated with heterogeneous internal enhancement.

**Reviewer's Comments:** Similar to invasive lobular carcinoma, triple receptor-negative tumors have a tendency to be a diagnostic challenge. The findings of this study corroborate that conventional wisdom and also emphasize the role MRI can play in these women. (Reviewer-Basil Hubbi, MD).

**Keywords:** Triple-Receptor Negative, MRI, Mammography, Ultrasound, Breast Cancer

**Print Tag:** Refer to original journal article
Are Follow-Up Recommendations for BI-RADS 3 Categories Being Followed?

Recommendation for Short-Interval Follow-Up Examinations After a Probably Benign Assessment: Is Clinical Practice Consistent With BI-RADS Guidance?

Bowles EJA, Sickles EA, et al:

AJR Am J Roentgenol 2010; 194 (April): 1152-1159

Over a 7-year period, 91% of mammograms given a BI-RADS 3 category were also assigned a short interval follow-up recommendation.

**Background:** Prior studies have shown that 14% of screening and diagnostic mammography examinations are assigned BI-RADS category 3 with 40% to 71% of those studies being recommended for short-term interval follow-up. Since the most recent BI-RADS atlas was published in 2003, no study has evaluated concordance with the BI-RADS recommendation and current practice trends.

**Objective:** To evaluate data from the Breast Cancer Surveillance Consortium to determine practice trends when utilizing the BI-RADS 3 category and if radiologist or patient factors bear influence.

**Methods:** The Breast Cancer Surveillance Consortium is a publicly available database derived from 7 geographically different cancer registries. Radiologists who had interpreted mammogram at the 7 sites were invited to participate in a survey. Survey results were then linked to diagnostic mammograms interpreted at the Consortium sites over a 6-year period. Diagnostic mammograms that were rendered a BI-RADS 3 category in otherwise asymptomatic women were selected and linked to the radiologist as well as patient factors such as demographics and breast cancer risk factors. Mammographies done for women who were at particularly high risk or who had previously been followed-up on a short-term basis were excluded.

**Results:** The majority of the radiologists were male (approximately 70%), and nearly 85% spent <25% of their time interpreting mammograms. Among 15,515 women with BI-RADS 3 assessments, nearly 65% were between 40 and 59 years of age. Ninety-one percent of those given a BI-RADS 3 assessment were also recommended for short-term interval follow-up with 4.3% advised to return in 1 year; 1.8% was recommended for biopsy. Asymptomatic women who were less likely to be recommended for short-term interval follow-up tended to be postmenopausal or had extremely dense breasts. Those with extremely dense breasts tended to be recommended for more imaging or biopsy. Radiologists who were >55 years or who had ≥21 years of experience tended to advise for short-term follow-up less than those younger or less experienced. Academic radiologists or radiologists who read >1000 mammograms per year trended toward more short-term interval follow-up recommendations.

**Reviewer's Comments:** Interestingly, the authors report increasing compliance with BI-RADS standards later on in the study period suggesting slow adoption and implementation of the recommended follow-up. A new BI-RADS edition is expected in 2010, and hopefully, with the increased utilization of computer-based dictation programs that link BI-RADS assessment with follow-up intervals, more compliance will be expected. (Reviewer-Basil Hubbi, MD).

**Keywords:** BI-RADS, Mammography, Compliance

**Print Tag:** Refer to original journal article
A diagnosis of radial scar on core biopsy can be upgraded to surgical excision at least 8% of the time and higher when using a 14-gauge core needle.

**Background:** Reports in the literature suggest that radial scars are associated with malignancy up to 40% of the time. Often, radial scars are associated with widely variable pathologic findings, and it has been established that core biopsy underestimates the overall pathologic potential of the area of concern. Prior authors have attempted to select out core biopsy-proven radial scars diagnosed without atypia as possibly not warranting surgical excision.

**Objective:** To evaluate the surgical upgrade rate of radial scars without atypia and whether mammographic and sonographic features can help predict which lesions are associated with malignancy.

**Design:** Retrospective study.

**Methods:** The histologic results of image-guided breast biopsy procedures performed over an 8-year period were reviewed. Patients who had a diagnosis of radial scar as the highest grade lesion were included in the study. Patients who had mammographic and sonographic images available and who ultimately underwent surgical excision of the lesion with documented surgical pathology were included in the study. Mammographic and sonographic images were retrospectively reviewed by 2 different radiologists, with discrepant findings resolved by consensus. The final surgical excisional pathology was judged based on the highest grade cited in the pathology report.

**Results:** 62 lesions were included in the study; 8% proved malignant at surgical excision. The upgrade rate for 14-gauge ultrasound-guided core biopsy specimens was 9% and 5% for 11-gauge vacuum-assist stereotactic core biopsy specimens. Sixty-one percent were seen on mammography, the majority of which as areas of architectural distortion. Microcalcifications were seen in 18% of mammographically evident cases. Seventy-three percent were seen on ultrasound and 62% of those were described as noncircumscribed masses.

**Reviewer's Comments:** These findings serve not to change current practice but rather to corroborate the need for surgical excision of any lesion that is pathologically described as a “radial scar.” Although upgrade rates are relatively low when compared with other lesions described to be high risk, an 8% upgrade rate is still higher than the 2% potential for malignancy allowable under the BI-RADS 3 category. (Reviewer-Basil Hubbi, MD).

**Keywords:** Radial Scars, Cancer, Upgrade Rate, High-Risk Lesion

Print Tag: Refer to original journal article
Autologous stem cell implantation significantly improves the symptoms of patients with PD.

**Background:** The mainstay of treatment for Parkinson disease (PD) is oral levodopa, which leads to increased levels of dopamine in the brain. This treatment has severe adverse long-term effects, such as dyskinesias treated with monoamine oxidase inhibitors and anticholinergic agents. Stem cells isolated from a patient’s own bone marrow have been shown to be able to differentiate into neurons and other tissues. Transvenous infusion does not allow directed therapy.

**Objective:** These researchers present their experience with delivering large numbers of autologous stem cells into the brains of PD patients via directed intraarterial infusion.

**Participants/Methods:** 77 patients were chosen for this prospective experiment that was closely monitored by the institutional review board. Primary end points for the study were safety and clinical response using internationally recognized scales. Secondary end points were functional and metabolic neural response as observed by MRI perfusion, apparent diffusion coefficient (ADC) map, and spectroscopy evaluation. The procedure was performed by first isolating the patient’s own stem cells from their bone marrow, then infusing them slowly into the patient’s brain. Follow-up consisted of evaluation at 12 and 72 hours within the hospital, weekly for the first month, and monthly for 1 year afterwards. Four patients received a second implant at 12 months.

**Results:** Of the 77 patients given autologous transplants, only 53 were followed up in the authors’ facility. None of the treated patients had major complications related to the procedure. The clinical responses to all of the scales were positive, with effect up to a median improvement of 50%. The patients needed to decrease the dose of their medication because of dyskinesias. Only approximately 8 patients were evaluated by functional MRI. On spectroscopy studies, only the left basal ganglia showed significant improvement before and after transplant by 43.5%.

**Reviewer’s Comments:** The aim of traditional PD therapy is to improve symptoms by increasing dopamine in the substantia nigra. In this study, >50% of the patients showed >50% improvement on any scale evaluation after transplant. The increased dyskinesias that can occur after an implant may be caused by the repopulation of the substantia nigra, thus increasing endogenous dopamine. The improvements were seen at 3 to 9 months after the transplant but less dramatically so. Two patients who received a second transplant regained and maintained their improvements. In general, the authors believe that the results from the MRI were supportive but not significant enough to warrant the cost of the imaging. This procedure did show that, overall, the procedure was very safe and very effective. Using autologous stem cells avoided the need for immunosuppression. This approach avoids the inflammation caused by direct injection into the tissue, which often leads to rejection. Continued follow-up to evaluate longevity of the treatment will be performed. (Reviewer-Sharon Gonzales, MD).

Keywords: Parkinson Disease, Autologous Stem Cell, Intraarterial Stem Cell Therapy

Print Tag: Refer to original journal article
Ozone therapy to treat lumbar back pain caused by herniated discs has been shown to be as effective as surgery with very minimal risk.

**Background:** Surgical treatment of lumbar disc herniations to relieve mechanical compression of nerve roots has been the standard treatment for lower back pain when noninvasive methods have failed. Today, there are many minimally invasive techniques used to remove disc material from pressing on the nerve roots. Since the 1990s, oxygen/ozone injection via a medical ozone generator is being used widely in Europe and Asia. This method is not yet used in the United States. Some controversy exists regarding the safety of ozone therapy.

**Objective:** To present a meta-analysis of studies on ozone therapy to determine the efficacy and safety of this treatment.

**Methods:** Literature searches in PubMed and the *International Journal of Ozone Therapy* to find studies where intradiscal injections on multiple levels were done in the lumbar region only according to recommended procedure outlined by the Italian Oxygen-Ozone Therapy Federation (FIO). The studies were weighted by study size so that the larger, better designed studies carried more weight.

**Results:** The literature search yielded 65 papers, of which 11 studies were included in the meta-analysis. The authors also included their own unpublished data in their final meta-analysis. In the meta-analysis group that had similar inclusion/exclusion criteria to the authors’ study, there was a mean improvement of 3.9 points in the visual analog scale (VAS) and 25.7 points in the Oswestry Disability Index (ODI), with a 79.7% likelihood of improvement according to the modified MacNab outcome analysis. For all the included studies, there was a mean improvement of 3.5 points in VAS and 21.0 in ODI, with a 78.2% likelihood of improvement. The meta-analysis yielded an estimated 0.064% chance of having a procedure-related complication. The influence of bias was calculated to be small (<10%).

**Reviewer’s Comments:** Since the 1990s, ozone injections to treat lumbar back pain have been performed throughout Europe and Asia. This meta-analysis combined the results of 11 published and 1 previously unpublished study done on 7859 patients from multiple centers. The overall treatment effect was larger than the minimum detectable change (MDC) and the minimum clinically important difference (MCID), therefore it was determined that the treatment had a significant effect that is beneficial from the patient’s perspective. The pain and function results appear to be similar to surgical discectomy. The safety of ozone therapy appears to be much better than that of other treatments, with a low complication rate of 0.064%. The complications were transient, and all were relieved within 1 day without any interventions. No discitis was noted, most likely because ozone is a strong disinfectant itself. Complications seem to be avoidable entirely if FIO guidelines are followed. Overall, this meta-analysis study demonstrated that oxygen/ozone therapy is a very safe, effective procedure producing significant improvement in a wide range of patients. (Reviewer-Sharon Gonzales, MD).

**Keywords:** Ozone, Oxygen Therapy, Back Pain, Lumbago, Disc Herniation

Print Tag: Refer to original journal article
Preliminary Results on New Treatment for BPH

Prostatic Artery Embolization as a Primary Treatment for Benign Prostatic Hyperplasia: Preliminary Results in Two Patients.

Carnevale FC, Antunes AA, et al:


Preliminary results of PAE to treat symptoms of BPH were successful in 2 patients, but procedure times are long and it is technically difficult.

**Background:** The management of benign prostatic hyperplasia (BPH) depends upon the patient's severity of symptoms and begins with oral medications to decrease symptoms. Open prostatectomy and transurethral prostatectomy (TURP) are traditional surgical approaches to BPH, but transient or permanent effects on the patient's sexual and erectile function may occur. Some minimally invasive techniques have been employed. Prostate arterial embolization (PAE) has been used to control severe hemorrhage and was reported to decrease the size of a patient's prostate by as much as 62%.

**Objective:** These researchers report their experience with PAE used to treat 2 patients presenting with acute urinary retention secondary to BPH.

**Participants/Methods:** 2 patients with urinary retention who failed oral therapy were waiting for prostate surgery; they were offered PAE as an alternative. The patients had US and MRI studies and tests before and 30, 60, and 180 days after PAE. Patient 1: This patient was a 67-year-old male with a prostate that was 63 g by US and 69 g by MRI. Bilateral PAE was performed without complications. The procedure and fluoroscopy times were 160 and 59 minutes, respectively. Patient 2: This patient was a 68-year-old man with an enlarged prostate that was 51 g by US and 54 g by MRI. Right PAE was performed without complications. The left prostatic arteries were not visualized. The procedure and fluoroscopy times were 250 and 95 minutes, respectively.

**Results:** Both patients were seen at 1, 3, and 6 months post-procedure. Patient 1 was voiding normally by 3 months with minimal post-void residual. By 6 months, the prostate had decreased up to 48% by MRI. Patient 2 reported an increase in the post-procedure jet, and the prostate reduced in size by 20% on US and by 24% on MRI after 1 month. After 3 months, the patient was voiding normally, and the prostate decreased in size by 25% on US and by 28% on MRI. No further decrease occurred at the 6-month follow-up.

**Reviewer's Comments:** Much like the procedure done to shrink uterine fibroids, PAE was successful in shrinking the prostate. Erectile function and sexual function were preserved. The procedure was very well tolerated by the patients, who reported minimal or no pain. There was shrinking of the prostate and clinical success in both patients, even though only 1 side was done in 1 patient. Embolizing the prostate is technically more challenging, as the vessels are smaller and harder to isolate than the uterine arteries in the female. This leads to prolonged procedure and fluoroscopy times as evidenced in this study. As this is done more frequently, operators may be able to shorten the procedure times. All in all, PAE shows promise as an alternative treatment for BPH. More studies are needed. (Reviewer-Sharon Gonzales, MD)

Keywords: Prostate, BPH, Prostatic Hypertrophy, Prostate Embolization

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Aneurysm-Related Events in Incompletely Occluded Aneurysms

Late Adverse Events in Coiled Ruptured Aneurysms With Incomplete Occlusion at 6-Month Angiographic Follow-Up.

Ferns SP, Majoie CBLM, et al:

AJNR Am J Neuroradiol 2010; 31 (March): 464-469

Basilar tip aneurysm may represent a unique subgroup of treated aneurysms, and close follow-up should be considered in patients with documented 6-month partial patency.

Objective: To analyze the incidence and outcome of aneurysm-related events in patients with incompletely occluded aneurysms at 6-month follow-up. Aneurysm-related events included re-bleeding, mass effect from aneurysm growth, and complications related to follow-up angiograms.

Methods: Between 1994 and 2007, 901 ruptured aneurysms were coiled with 6-month angiographic follow-up in 713 cases; 124 patients had incomplete aneurysm occlusion, and this group was evaluated. In this subset, 6-month follow-up comparison was made with aneurysms with complete occlusion on the basis of mean size and location. The incidence of episodes of re-bleeding, new mass effect, and complications of follow-up angiography were calculated.

Results: There were no angiographic complications in 307 follow-up angiograms. Eighty-eight of 124 incompletely occluded aneurysms were retreated, 15 more than once. In 4 patients, re-bleeding occurred, with 2 deaths; 4 patients developed progressive mass effect due to aneurysmal enlargement, with 1 death. The annual event rate was 1.9%, the annual mortality rate was 0.7%, and the annual re-bleed rate was 1.0%. The mean aneurysm size was 11.4 mm compared with 6.9 mm in 589 adequately occluded aneurysms. The proportion of large and giant aneurysms was higher in the incompletely occluded aneurysm group than in the adequately occluded aneurysm group. In the incompletely occluded group, the proportion of basilar tip aneurysms was higher despite no difference in the proportion of aneurysms in the posterior circulation. In the 8 aneurysms with late adverse effects, the mean size was greater than that of 116 aneurysms without adverse events. Basilar tip aneurysms were responsible for late adverse events in 4 of 8 patients (50%).

Conclusions: In patients with incomplete occlusion of coiled ruptured aneurysms at the 6-month follow-up, imaging follow-up with re-treatment leads to a low incidence of serious adverse events. The 6-month incompletely occluded aneurysms were larger, with an increased incidence of basilar tip aneurysms compared with adequately occluded aneurysm. Late adverse events occurred more often in large and giant basilar aneurysms. There were no complications in the 307 follow-up angiograms or 124 subsequent treatments.

Reviewer’s Comments: This study focused on a subset of patients with a 6-month angiographic demonstration of incomplete coiling of previously coiled ruptured aneurysms in order to tease apart which aneurysm may re-bleed or demonstrate additional adverse events such as mass effect from growth. The study demonstrated the low procedural risks of angiography, including angiograms in patients who are being re-treated. Imaging follow-up after additional treatment is recommended as re-opening of aneurysms after re-treatment is more frequent, In the subgroup of patients with ruptured posterior circulation aneurysm, an interesting finding is that primary and additional coiling does not always protect against continuous aneurysmal growth, especially in large and giant basilar tip aneurysms, which resulted in progressive brain stem compression and death in 1 of 4 patients. (Reviewer-Maureen T. Barry, MD).

Keywords: Angiogram, Aneurysms, Coiling, Rupture

Print Tag: Refer to original journal article
How Common Are Nonenhancing, intramedullary Astrocytomas?

Nonenhancing Intramedullary Astrocytomas and Other MR Imaging Features: A Retrospective Study and Systematic Review.

Seo HS, Kim J-H, et al:

AJNR Am J Neuroradiol 2010; 31 (March): 498-503

Not all intramedullary spinal cord astrocytomas show enhancement.

**Objective:** To evaluate the incidence of nonenhancing, intramedullary astrocytomas and to review the pertinent medical literature.

**Methods:** 19 patients over a 10-year period were diagnosed with intramedullary astrocytomas, and preoperative MRIs were reviewed. The tumors were as follows: 3 World Health Organization (WHO) grade I; 13 WHO grade II; and 3 WHO grade III. All patients had contrast-enhanced MRI reviewed by 2 neuroradiologists. Enhancement patterns were classified. Tumors were described with respect to location, size, signal intensity, and associated findings such as tumoral cysts and periapical cap. The medical literature was reviewed.

**Results:** Of 19 astrocytomas, 6 (32%) demonstrated no enhancement; 2 of 6 were anaplastic astrocytomas (WHO grade III). The enhancement pattern was focal nodular in 5 cases, patchy in 3, and inhomogeneous diffuse in 5 cases, with no tumor demonstrating homogeneous diffuse enhancement. Relative to the spinal cord on T1 weighted images, 7 cases (37%) were isointense and 11 (58%) were hypointense, with 1 case demonstrating hemorrhage and T1 shortening. On T2-weighted imaging, 18 cases (95%) were hyperintense, with 1 case being isointense. Thirteen tumors were central (68%), and 13 (69%) were located in the cervical spinal cord. Pure thoracic tumors numbered 5. Further classification was as follows: 7 demonstrated edema; 4 demonstrated intratumoral cysts; 3 demonstrated peritumoral cysts; and 2 demonstrated hemorrhage, with 1 periapical cap on T2. No associated syringohydromyelia was seen. The literature review revealed the frequency of nonenhancing intramedullary astrocytomas to be 18%. The review also demonstrated 12 cases with diffuse enhancement, 9 with inhomogeneous enhancement, 2 with homogeneous enhancement, 1 with marked enhancement, and 1 each with moderate, patchy, minimal, well-delineated, and cord surface enhancement.

**Conclusions:** With this paper demonstrating no enhancement in 33% of intramedullary astrocytomas and a review of the literature demonstrating 18%, the absence of enhancement should not dissuade radiologists from adding astrocytoma to the differential diagnosis of an expansile spinal cord lesion. Astrocytomas represent approximately 30% of all spinal cord tumors but only 4% to 10% of all CNS tumors. Therefore, there is not an abundance of literature with respect to enhancement patterns. Nonhomogeneous enhancement, as seen in this paper, is one imaging finding used to differentiate astrocytomas from ependymomas, the next most common spinal cord tumor. Additional criteria include the location in the spinal cord, with astrocytomas more peripherally located. However, in this paper, the authors found 30% eccentrically located.

**Reviewer’s Comments:** This paper further supports that if there is an expansile lesion in the spinal cord, a spinal cord tumor should be considered despite lack of enhancement. An obvious limitation of this study is the small sample size. This paper also supports that enhancement of intramedullary tumors is not as strong a criteria as once thought in the differential diagnosis of spinal cord lesions, and suggests that radiologists cannot differentiate between astrocytomas and ependymomas. (Reviewer-Maureen T. Barry, MD).

Keywords: Spinal Cord Tumors, Astrocytomas, Intramedullary, Spine

Print Tag: Refer to original journal article
Detecting Skeletal Trauma in Child Abuse

Skeletal Trauma in Child Abuse: Detection With 18F-NaF PET.
Drubach LA, Johnston PR, et al:

Radiology 2010; 255 (April): 173-181

18F-NaF PET appears superior to 99mTc MDP in the detection of fractures in child abuse.

Background: Fluorine 18-labeled sodium fluoride (18F-NaF) is a positron emitting bone-seeking radiopharmaceutical agent that was first introduced in 1962 and approved by the Food and Drug Administration in 1972. Initially, there was a limited ability to image positron emitters. Today, however, PET scanners are highly evolved and ubiquitous.

Objective: To re-examine the utility of 18F-NaF as an imaging agent for bone trauma in child abuse.

Design: Retrospective review.

Participants: 22 patients aged <2 years were studied with both skeletal survey and 18F-NaF PET scans over a 17-month period. The skeletal survey was followed with the PET scan within 0 to 13 days (mean, 3 days). In 14 of the 22 patients, a follow-up skeletal survey was performed 10 to 24 days after the baseline skeletal survey examination, and this was the main group studied.

Methods: In the 14 patients who underwent a follow-up skeletal survey, a second experienced reader reviewed both baseline and follow-up images. This final reader's interpretation served as the reference standard against which the earlier PET and baseline skeletal survey image interpretations were compared.

Results: 104 fractures were detected on the delayed radiographic survey, which was considered the gold standard; 148 fractures were suspected on PET, and 112 fractures on the initial baseline bone survey. The sensitivity of PET was, therefore, 85% for all fractures, while that of the baseline bone survey was only 72%. Specificity was similar at 97% for PET and 98% for the bone survey. The greatest advantage of PET was in posterior rib fractures, in which PET exhibited 93% sensitivity; the initial bone survey was only 73% sensitive, with specificities of 93% and 98%, respectively. The greatest advantage of the bone survey was in the detection of classic metaphyseal lesions (CMLs) in which PET was only 67% sensitive and the bone survey was 80% sensitive, with specificities of 99% and 100%, respectively. It is conceivable that the gold standard was less sensitive than the PET scanning, and that some of the apparent false-positive PET studies were actually true positive.

Conclusions: 18F-NaF PET represents an attractive choice for evaluation of suspected child abuse. An initial radiographic survey remains necessary, especially to evaluate CMLs.

Reviewer's Comments: This paper represents an interesting first step in substituting NaF PET studies for methylene diphosphonate bone scans in suspected child abuse. I still wonder about the very high rate of false-positive studies; there were 60 false positives with PET and 37 false positives with the initial bone survey. While some of the false positives in PET may actually be an inferior performance of the gold standard, based on the numbers presented, this translates to a positive predictive value of only 59% for PET and only 67% for the bone survey. This aspect of the data needs to be reckoned with. (Reviewer-Lionel S. Zuckier, MD).

Keywords:18F-NaF, Child Abuse, PET

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