Does Adding DWI to Abdominal MRI Increase HCC Detection?

**Added Value of Breathhold Diffusion-Weighted MRI in Detection of Small Hepatocellular Carcinoma Lesions Compared With Dynamic Contrast-Enhanced MRI Alone Using Receiver Operating Characteristic Curve Analysis.**

Xu PJ, Yan FH, et al:

*J Magn Res Imaging*; 29 (February): 341-349

The abdominal MRI protocol achieves a higher sensitivity in the detection of small hepatocellular carcinomas when it includes diffusion-weighted imaging.

**Objective:** To determine if diffusion-weighted imaging (DWI) combined with conventional dynamic contrast-enhanced MRI examination is more sensitive than dynamic contrast-enhanced MRI alone in the detection of small hepatocellular carcinomas (HCCs).

**Design:** Prospective analysis.

**Participants/Methods:** This study was comprised of 37 patients with chronic liver disease suspected of having small HCCs measuring 2 cm detected on basis of clinical findings, CT, or MRI. Thirty patients had surgical confirmation, 6 via percutaneous biopsy and 1 via characteristic angiographic findings and iodized oil CT. Four of the 30 surgically confirmed cases were via liver transplantation. Follow-up dynamic contrast-enhanced MRI examinations were performed for a minimum of 6 months. MRI examinations were performed on 1.5T systems. Sequences included T2-weighted turbo spin-echo and T1-weighted fast low-angle shot. DWI consisted of a single shot spin-echo planar sequence with a b-value of 500 seconds/mm². Dynamic images were obtained prior to and following IV gadolinium administration during late arterial, portal, and equilibrium phases at 20 to 25, 70 to 90, and 180 seconds, respectively. Criteria for HCC on dynamic contrast-enhanced MRI included arterial phase enhancing nodule with washout on portal venous and equilibrium phases or nonenhancing nodule with mosaic pattern, peritumoral capsule, or fatty metamorphosis. Lesions that were only seen on the arterial phase and not on any other unenhanced or enhanced images were referred to as hepatic artery phase enhancement-only lesions. Criteria for HCC on combined diffusion-weighted and dynamic contrast-enhanced MRI included a hyperintense nodule on DWI, which did not have characteristics of a cyst, hemangioma, metastasis, or other specific appearance on the dynamic contrast-enhanced portion of the examination. The images were reviewed by 2 gastrointestinal radiologists. Two separate image sets were reviewed: the unenhanced and dynamic contrast-enhanced images and the unenhanced and dynamic contrast-enhanced images combined with DWIs. A receiver operating characteristic (ROC) curve analysis was performed for each imaging set.

**Results:** 47 small lesions were detected. There was an increased sensitivity in detection of small HCC for the combined DWI and dynamic contrast-enhanced images compared to dynamic contrast-enhanced images alone. The area under the ROC curve was also higher for all small lesions. Seven of the 47 lesions were only detected on the DWI. The positive predictive values were slightly higher for both observers when DWI was added to the dynamic contrast-enhanced protocol.

**Reviewer's Comments:** The results of this study are useful in that they illustrate the potential added benefit of including DWI in the standard abdominal MRI protocol. This can increase the sensitivity for the detection of small HCC lesions in those with chronic liver disease as shown in this study. A limitation reported in this study was that not all of the lesions were confirmed with liver transplantation specimens.

**Additional Keywords:** Diffusion-Weighted Imaging

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How to Differentiate Adenomas From Nonadenomas

Distinguishing Adrenal Adenomas From Nonadenomas: Combined Use of Diagnostic Parameters of Unenhanced and Short 5-Minute Dynamic Enhanced CT Protocol.
Kamiyama T, Fukukura Y, et al:
Radiology; 250 (February): 474-481

Characterizing adrenal lesions with unenhanced and 5-minute dynamic contrast enhanced CT is comparable to results obtained with current longer protocols.

**Objective:** To compare the accuracy of characterizing adrenal lesions using unenhanced and 5-minute dynamic enhanced CT to the currently reported longer imaging protocol.

**Design:** Retrospective analysis.

**Participants/Methods:** 61 patients (53 adenomas and 15 nonadenomas) were included. Enhanced CT images were performed at 35 seconds and 5 minutes following IV contrast administration. Wash-in attenuation was calculated by subtracting unenhanced from 35-second region of interest value. Wash-out attenuation was calculated by subtracting 5-minute from 35-second region of interest value. Percentage enhancement wash-out (PEW) ratio was calculated by dividing wash-out attenuation by wash-in attenuation values and multiplying by 100. Relative percentage enhancement wash-out (RPEW) ratio was calculated by dividing wash-out attenuation by 35-second region of interest value and multiplying by 100.

**Results:** There was 100% accuracy in differentiating lipid-rich adenomas from nonadenomas when attenuation values on unenhanced measured 10 hounsfield units (HU) and at 5 minutes measuring 50 HU. RPEW 31% had 90% sensitivity, 100% specificity, and 93% accuracy. When using threshold levels with 100% specificity, nonadenomas were excluded when the following parameters were obtained: size 15 mm; unenhanced attenuation 19 HU; 5-minute enhanced attenuation 50 HU; wash-in attenuation 99 HU; wash-out attenuation 31 HU; PEW 45%; and RPEW 31%. When using 5-minute delayed enhanced threshold value of 50 HU, there was a sensitivity of 100%, 30%, and 70% for lipid rich, lipid poor, and total adenoma groups, respectively. Meanwhile, specificity was 100% for all 3 groups. Therefore, it is possible to characterize an adrenal mass as an adenoma if it has an unenhanced attenuation value of 19 HU and a PEW 45%. This yielded a 94% sensitivity and 100% specificity. When unenhanced scan is not performed, 5-minute delayed enhanced CT attenuation value 50 HU and RPEW 31% yield 92% sensitivity and 100% specificity.

**Reviewer's Comments:** The results of this study are useful in providing possible criteria for differentiating adenomas from nonadenomas using a shorter delayed enhanced CT protocol. One of the limitations reported in the study was that most of the patients underwent a dedicated CT protocol following the knowledge of there being a suspected adrenal mass from a prior study, while patients with primary extra adrenal neoplasms did not undergo the adrenal CT protocol.

**Additional Keywords:** Diagnostic Parameters

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Can DWI Distinguish Between Mass-Form FP, PC, and Normal Pancreas?

Pancreatic Diffusion-Weighted Imaging (DWI): Comparison Between Mass-Forming Focal Pancreatitis (FP), Pancreatic Cancer (PC), and Normal Pancreas.


Diffusion-weighted imaging and apparent diffusion coefficient have potential in differentiating between mass-forming focal pancreatitis, pancreatic carcinoma, and normal pancreas.

**Objective:** To determine if diffusion-weighted imaging (DWI) can distinguish between mass-forming focal pancreatitis (FP), pancreatic carcinoma (PC), and normal pancreas.

**Design:** Retrospective analysis.

**Methods:** There were 14 patients with mass-forming FP, with the diagnosis confirmed by histopathology in 7 patients (surgical resection, intraoperative biopsy, or endoscopic ultrasound-guided fine-needle aspiration [FNA]). The other 7 patients had the diagnosis clinically established based on the repeat imaging and follow-up between 20 to 41 months. Ten patients had PC confirmed by histopathology by way of surgical resection or FNA. There were 14 patients in the control group who presented with abdominal pain. They all had a normal endoscopic pancreatic function test (ePFT) with secretin stimulation and normal MRI/MR cholangiopancreatography (MRCP) findings. Examinations were performed on a 1.5T system. The following sequences were obtained: T1-weighted spoiled gradient-echo (SGE) in dual phase; T1-weighted fat-saturated 2D SGE; and T2-weighted fast spin-echo with and without fat saturation. Dynamic contrast-enhanced T1-weighted fat-saturated 2D SGE images were obtained at 25, 60, 120, and 180 seconds during the arterial dominant, portal venous, venous, and late venous phases, respectively. Echo-planar DWI was acquired with $b$-values of 0 and 600 s/mm². Apparent diffusion coefficient (ADC) values were also calculated. Images were reviewed by 2 abdominal radiologists. DWI images were not used in the localization of the mass-forming FP and PC. Mass-forming FP was recognized as an enlarged area of the pancreas with similar enhancement as the remainder of the gland, while PC was an area of diminished arterial enhancement demarcated from the rest of the gland. Cystic areas and side branch ectasia were excluded from ADC measurements.

**Results:** Mass-forming FP was found in the head in 13 out of 14 patients. This was heterogeneous and indistinguishable from remaining pancreas on DWI with $b$-value 600 s/mm². It had a mixed color associated with its mean ADC value. PC was demarcated from the rest of the gland and hyperintense on DWI, with $b$-value 600 s/mm². It had homogeneous color associated with its mean ADC value. The mean ADC value of PC was significantly lower than that of remaining gland, mass-forming FP, and normal control group. The mean ADC value of mass-forming FP was similar to the remaining gland, but higher than the normal control group. The ADC value of the remaining gland in patients with mass-forming FP was significantly higher than the normal control group.

**Reviewer's Comments:** The results of this study are useful in that they demonstrate the potential utility of including DWI in the discrimination of mass-forming FP from PC, which is not an uncommon diagnostic dilemma. One limitation of this study was the small sample size.

**Additional Keywords:** DWI

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CT Cannot Distinguish Between Transudates and Exudates

Pleural Effusion: Characterization With CT Attenuation Values and CT Appearance.

Abramowitz Y, Simanovsky N, et al:
AJR Am J Roentgenol; 192 (March): 618-623

The CT attenuation of pleural fluid cannot accurately differentiate between transudative and exudative pleural effusion. While the presence of loculation, pleural thickening, and pleural nodules is more common in exudative effusions, these features may also be present in transudative effusions.

Objective: To evaluate whether pleural effusions can be characterized as exudative or transudative based on their CT appearance.

Design: Retrospective review.

Participants: 100 patients who had a pleural effusion and underwent CT and thoracentesis within 48 hours of each other.

Methods: Pleural effusions were classified as transudative or exudative based on Light's criteria. An effusion is exudative if it has one of the following features: pleural fluid total protein/serum total protein >0.5, pleural fluid LDH/serum LDH >0.6, or pleural fluid LDH more than two-thirds the upper limits of normal LDH. The etiology of the pleural fluid (ie, congestive heart failure, pneumonia, or malignancy) was also determined by chart review. CTs were performed with either a 16-MDCT or 64-MDCT scanner. Fifty-three patients had IV contrast during their CT, 30 with a standard protocol and 23 with an angiographic protocol. The pleural effusions had their largest AP diameter recorded and their density in Hounsfield units recorded. The presence of loculation (septations, compartmentalized, in a fissure, or nondependent), pleural nodules, pleural thickening, and increased density of extrapleural fat were also recorded.

Results: By Light's criteria, 22 of the pleural effusions were transudates and 78 were exudates. The mean density of the exudative effusions was not significantly different than the transudative effusions (7.2 HU; [SD] 9.4 HU; range, 21 to 28 HU vs 10.1 HU; [SD] 6.9 HU; range, 0.3 to 32 HU) (P =0.24). Loculation, pleural nodules, and pleural thickening also did not accurately distinguish between transudative and exudative pleural effusions. Loculation, pleural thickening, and pleural nodules were present in 58%, 59%, and 13% of exudates and 36%, 36%, and 5% of transudates, respectively. These differences did not meet statistical significance.

Conclusions: CT attenuation of pleural fluid cannot differentiate between transudative and exudative pleural effusions. Loculation, pleural thickening, and pleural nodules are more common in exudative effusions, but these features cannot accurately characterize an effusion as exudative or transudative.

Reviewer's Comments: The authors have elegantly demonstrated the limitations of CT in its ability to characterize pleural fluid.

Additional Keywords: CT

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CT-Guided FNA of GGO Lesions Can Be Helpful

*Diagnostic Accuracy of CT Fluoroscopy-Guided Needle Aspiration Biopsy of Ground-Glass Opacity Pulmonary Lesions.*

Hur J, Lee H-J, et al:
AJR Am J Roentgenol; 192 (March): 629-634

The overall sensitivity, specificity, and accuracy of CT-guided FNA biopsy of ground-glass opacity pulmonary nodules is 71%, 100%, and 82%, respectively, and the accuracy is significantly greater for lesions that have some solid component to them.

**Objective:** To determine how accurate CT-guided fluoroscopic needle aspiration biopsy is for ground-glass opacity (GGO) nodules.

**Participants:** 28 patients who had a GGO nodule identified on CT and had a CT-guided biopsy were enrolled in the study.

**Methods:** All of the nodules had to have a ground-glass component >50%. Nodules were divided into 3 groups based on size: <10 mm, 11 to 20 mm, and >20 mm. The biopsies were performed using fluoroscopy on a 16-MDCT. All biopsy samples were obtained using either a 20- or 22-gauge Chiba needle. After biopsy, if a pneumothorax >25% of 1 lung volume was observed or if the patient was experiencing symptoms/signs of respiratory compromise, a thoracostomy tube was inserted. On cytologic examination of the aspirated material, a diagnosis of malignancy or suspicion of malignancy was considered a positive result. A finding that was negative for malignancy or nondiagnostic was considered a negative result.

**Results:** 17 of 28 nodules (61%) were malignant and 11 (39%) were benign. Twelve lesions were positive for malignancy on biopsy, all of which were true positive by confirmation with surgery. Thirteen lesions were negative for malignancy on biopsy, 5 of which were false-negative based on surgical pathology (2 were bronchoalveolar carcinoma, 2 were atypical adenomatous hyperplasia, and 1 was MALT lymphoma). Three lesions were nondiagnostic on biopsy, all of which were benign on surgical histology (1 was interstitial fibrosis and 2 were chronic inflammation). Of the 11 benign lesions, 5 were diagnosed as benign based on a decrease in size on follow-up CT. The sensitivity, specificity, and accuracy for CT-guided biopsy were 71%, 100%, and 82%, respectively. There was no significant difference in the sensitivity, specificity, and accuracy of biopsy based on lesion size or depth from the pleural surface. The sensitivity, specificity, and accuracy of CT-guided biopsy for nodules that had a 50% to 90% ground-glass component was 82%, 100%, and 90%, respectively; for nodules that had a >90% ground-glass component, the rates were 50%, 100%, and 57%, respectively. This difference was statistically significant ($P =0.046$). There was an 18% pneumothorax rate (5 patients), and 7% of patients required thoracostomy tubes (2 patients). Mild self-limited hemoptysis occurred in 11% (3 patients).

**Conclusions:** CT-guided fluoroscopic needle aspiration biopsy is helpful in patient management and has a complication rate that is within acceptable limits. It is significantly more accurate for GGO lesions that have some solid component.

**Reviewer's Comments:** In patients who are surgical candidates, a positive result will usually be resected, and a negative result will either require surgical confirmation or follow-up CT to ensure lesion regression. This may hamper the utility of this procedure for GGO nodules in this patient population.

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Gated CTA Can Differentiate Myxomas From Thrombi

Atrial Myxomas and Thrombi: Comparison of Imaging Features on CT.
Scheffel H, Baumueller S, et al:
AJR Am J Roentgenol; 192 (March): 639-645

Atrial myxomas and atrial thrombi can be accurately distinguished on contrast-enhanced gated CT angiography based on analysis of size, origin, shape, presence of mobility, and presence of valvular prolapse.

**Objective:** To evaluate atrial myxomas and thrombi on CT, and to determine if any features can distinguish them from one another.

**Design:** Retrospective study.

**Participants:** 23 patients were clinically referred for CT coronary angiography (CTA) and had a cardiac myxoma or cardiac thrombus. The myxomas were initially diagnosed by echocardiography and were symptomatic. They were all confirmed pathologically. The thrombi were seen incidentally on CT. On follow-up, they were no longer present due to anticoagulation therapy, which was considered proof of the diagnosis.

**Methods:** CTs were performed using a dual-source CT scanner. Calcium scoring was part of the protocol and involved an unenhanced CT prior to the CTA. For the CTA, a 2-phase IV contrast method was used (first phase, 60 to 80 mL of contrast; second phase, 60 to 80 mL of contrast with a dilution of 1:5 parts saline). ECG gating was also employed. The slice thickness was 0.75 mm with an increment of 0.5 mm. The axial images, multi-planar reformatted images, and cine images were evaluated. Lesions were evaluated for attenuation, size, location, origin (fossa ovalis, interatrial septum separate from fossa ovalis, posterior wall, lateral wall, or atrial appendage), shape, mobility (presence defined as movement of at least 5 mm during cine images), presence of prolapse through a valve, and presence of calcification.

**Results:** CT attenuation between myxomas and thrombi demonstrated no significant difference (43 14 HU vs 57 30 HU). Myxomas were significantly greater in size than thrombi (33 16 mm vs 21 7 mm). Both lesions were more often present within the left atrium than the right atrium. Myxomas most often originated from the fossa ovalis, whereas thrombi most often originated from the left atrial appendage ($P <0.001$). Myxomas were polypoid or villous in shape, whereas thrombi were only polypoid ($P <0.05$). Myxomas were more often mobile than were thrombi ($P <0.01$). Many myxomas demonstrated prolapse compared with none of the thrombi ($P <0.01$). The presence of calcifications within myxomas or thrombi was not significantly different. CT correctly determined the origin of 11 of 13 myxomas. One myxoma thought to originate from the interatrial septum upon surgery was noted to originate from the fossa ovalis. One myxoma thought to originate from the posterior wall of the left atrium upon surgery was noted to originate from the fossa ovalis.

**Conclusions:** Cardiac myxomas and thrombi can be accurately distinguished based on analysis of size, origin, shape, the presence of mobility, and the presence of prolapse.

**Reviewer's Comments:** It would be interesting to see whether myxomas and thrombi can be accurately distinguished from one another on a non-gated contrast-enhanced CT of the chest.

**Additional Keywords:** CT

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How Common Is PICC-Associated DVT in CF Patients?

Incidence of Deep Vein Thrombosis Associated With Peripherally Inserted Central Catheters in Adults With Cystic Fibrosis.


DVT in CF patients who have PICC lines is associated with increased systemic inflammation, as is caused by Burkholderia cepacia complex infection.

Background: Patients with cystic fibrosis (CF) frequently require long-term central access to receive antibiotics for frequent pulmonary infections. Peripherally inserted central catheters (PICC lines) carry the risk of deep vein thrombosis (DVT), among other complications. In the literature, CF patients are more susceptible to thrombosis in general. CF patients infected with pulmonary Burkholderia cepacia complex (BCC) infection have been reported to have an increased incidence of DVT. The incidence of PICC-related DVT is higher in patients with systemic inflammation. The authors' institution treats a large number of CF adults.

Objective: To evaluate the incidence of DVT in CF adults with PICC lines, and to assess its relationship to BCC infection.

Design/Methods: A retrospective cohort study was performed. Over 6 years, 147 CF adult patients had at least 1 PICC line placed to treat chronic infection; 71% of these patients were BCC negative. Blood tests such as erythrocyte sedimentation rates (ESR) were also evaluated.

Results: 33% of these PICC lines were placed in BCC-positive patients, who tended to have a higher number of PICCs (3 vs 2) and a longer indwelling duration (21 vs 14 days) than BCC-negative cohorts. Of all patients, DVT was diagnosed in 12.9%. Symptomatic DVT was seen in 8.2% of patients, and roughly half of them were BCC positive. Also, 20.9% of the BCC-positive patients had PICC-related DVT. BCC-negative patients had a DVT incidence of 7.7%. The overall incidence of DVT-related PICC is 0.18 per 1000 PICC days. Patients who had PICC-related DVT had a significantly higher ESR than those who did not have PICC-related DVT.

Conclusions/Reviewer’s Comments: The incidence of PICC-related DVT in the adult CF population was 3.7% per PICC as seen in this study, which is comparable to the incidence of 1% to 4% seen in symptomatic DVT in non-malignant cases in the literature. The incidence of 0.18 PICC-related DVT cases per 1000 PICC days is similar to the reported incidence of 0.185 cases per 1000 in the literature. The incidence of PICC-related DVT was significantly higher in patients with BCC compared with BCC-negative patients, regardless of catheter dwelling time or number of catheters inserted. This is thought to be due to the tendency of BCC infection to produce a severe systemic inflammation. This is also mirrored in the fact that the patients in this study who had PICC-related DVT had a significantly elevated ESR before its placement. The authors believe that the finding of increased DVT in patients with increased ESR and BCC infection is important in assessing risk versus benefits. This also shows that ESR is an important risk marker for DVT in any patient receiving PICC lines, but this needs to be better evaluated with prospective studies.

Additional Keywords: Cystic Fibrosis

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Multiple Therapies for Acute Stroke Equals Better Outcome

Intraarterial Therapy for Acute Ischemic Strokes.

In patients with acute ischemic stroke, intraarterial stroke management includes angioplasty, stent placement, thrombolytic administration, and mechanical thrombectomy.

**Background:** A number of methods are available to ensure that the highest amount of brain tissue is saved in patients with acute ischemic strokes. The first method is venous tissue-type plasminogen activator (tPA) administration, which can be done only within 3 hours of onset. The next method is intraarterial thrombolysis, which must be started within 6 hours of symptom onset. The last method is mechanical clot removal, which can be used within 8 hours of symptom onset. Angioplasty and stent placement can be used to open up stenotic vessels.

**Objective:** To evaluate the safety and effectiveness of intraarterial stroke therapy for patients with acute ischemic stroke.

**Design:** This was a retrospective review of the records of patients treated intraarterially for stroke over the course of 3 years. The patients had a non-contrast CT, then were evaluated with the National Institutes of Health Stroke Score (ranging from 0 to 42). The score was retabulated 7 to 10 days after treatment or at discharge.

**Methods:** The patients went first for a diagnostic cerebral angiogram. If thrombolysis was contraindicated, clot retrieval was attempted. If it was feasible, heparin was given and thrombolysis was started. If initial thrombolysis failed, then clot retrieval was attempted before 8 hours from onset of symptoms. Post-angiography, the results were scored from 0 to 4 (Thrombolysis in Cerebral Infarction score). A non-contrast CT of the head was performed after 24 hours or if the patient became symptomatic to evaluate for bleeding. The patients were followed up by phone interview with a modified Rankin Scale.

**Results:** Complete follow-up was obtained in 83 patients. Sixty-three percent of patients were given thrombolysis without thrombectomy, 17% had a combination of thrombolysis and thrombectomy, 3.6% had thrombectomy alone, and 17% had a combination of thrombolysis, thrombectomy, angioplasty, and/or stent placement. The overall recanalization rate was 76%. The median stroke severity score in the beginning was 17. The median 7- to 10-day discharge score was 5. The 90-day mortality rate was 22%. Symptomatic intracranial hemorrhage was seen in only 6% of all patients.

**Conclusions/Reviewer's Comments:** This review showed favorable outcomes when combination therapies were used compared to previously published trials. The outcome of a stroke severity score of 2 was 11% to 12% higher than those trials. Recanalization rates were 10% higher than the thrombolysis-only studies and 33% higher than the thrombectomy device alone. The 90-day mortality rate was slightly higher or similar to that of studies with thrombolysis alone and lower than the study with thrombectomy alone. The symptomatic intracranial hemorrhage rate was similar to rates of other trials in which thrombolysis was used. Despite all the limitations of this retrospective study, the use of a combination of intravascular therapies is feasible and beneficial, leading to improved cerebral perfusion and improvement in patient function with a decrease in morbidity and mortality, all without a significant increase in morbidity or mortality compared to trials assessing single therapies.

**Additional Keywords:** Ischemic Stroke

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Techniques for Repairing Subclavian Artery Puncture in CVC Placement

Management of Subclavian Arterial Injuries Following Inadvertent Arterial Puncture During Central Venous Catheter Placement.

Abi-Jaoudeh N, Turba UC, et al:
J Vasc Interv Radiol; 20 (March): 396-402

Techniques such as stent graft placement, thrombin injection, downsizing, and Gelfoam embolization have been used to repair the subclavian artery after inadvertent puncture.

**Background/Objective:** Placement of a central venous catheter (CVC) in critical care or emergency settings is common, as is puncture of the subclavian artery while trying to obtain venous access. Surgical repair of these inadvertent punctures was the treatment of choice, but now minimally invasive techniques are available. These authors have compiled a case series of 5 patients showcasing the methods used in their institution to treat these inadvertent arterial punctures.

**Case 1:** A 53-year old woman developed a subclavian pseudoaneurysm after removal of a right subclavian arterial catheter. The patient was successfully treated with a homemade 5-mm stent-graft.

**Case 2:** A 41-year-old man with inadvertent puncture of the left subclavian artery was successfully treated by deployment of a 10-mm self-expanding stent graft (Fluency). Attempts were made at using a closure device (Perclose) twice without success.

**Case 3:** A 54-year-old woman with inadvertent puncture of the right subclavian artery and a small dissection with a non-occluding flap was successfully treated with a self-expanding covered stent (Viabahn). An attempt was made to use a closure device without success.

**Case 4:** A 66-year-old man with inadvertent puncture of the right subclavian artery was successfully treated by embolization of the tract with Gelfoam pledgets.

**Case 5:** A 55-year-old man with left subclavian artery puncture was treated successfully with serial downsizing of the 7-F sheath to a 3-F catheter over 36 hours.

**Reviewer's Comments:** Inadvertent arterial placement of a CVC is reported to occur in 2% to 9% of cases, despite the use of ultrasound as a guide. Bleeding does not usually become significant unless the arterial nature of the needle stick goes unrecognized. Risk factors also include operator inexperience, radiation or surgery in the area, and obesity. There can also be problems such as distal embolization, pseudoaneurysm, vessel rupture, or immediate hemorrhage that follow. The first step in evaluating the punctured artery is imaging via CT angiography or catheter-based angiography. The options available include covered stents, balloon tamponade, closure devices, tract embolization, and serial downsizing. Closure devices may be used when the tissue tract is <8 cm and when there is no underlying dissection or pseudoaneurysm, but not near branch vessels. Covered stents are useful when there is a pseudoaneurysm or dissection, or when there is persistent bleeding. They should not be used at the thoracic inlet, in the setting of sepsis, or in small children. Thrombin injection may be attempted if there is a small neck to a pseudoaneurysm. Gelfoam embolization of the tract and sequential downsizing of the catheter can be used in the setting of sepsis or branch vessels, or in the thoracic inlet. The treatment should be tailored to suit each patient.

**Additional Keywords:** Complications

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Can ADC Values Distinguish Benign From Malignant Cold Thyroid Nodules?

Can Quantitative Diffusion-Weighted MR Imaging Differentiate Benign and Malignant Cold Thyroid Nodules? Initial Results in 25 Patients.

Schueller-Weidekamm C, Kaserer K, et al:
AJNR Am J Neuroradiol; 30 (February): 417-422

| Cold malignant thyroid nodules demonstrate higher apparent diffusion coefficient values than do benign nodules. |

**Background:** Radionuclide scintigraphy is one of the methods used to evaluate thyroid nodules. "Cold" lesions, which do not take up Tc-99m sodium pertechnetate, are more likely to be malignant, but as much as 80%, or more, are still benign.

**Objective:** To determine the ability of diffusion-weighted imaging (DWI) to distinguish between malignant and benign cold nodules.

**Design:** Prospective study.

**Participants:** Patients scheduled for thyroid removal based on cold nodules diagnosed with Tc-99m sodium pertechnetate who underwent sonography and ultrasound-guided fine-needle aspiration (USg-FNAC) biopsy. Only patients with suggestive or inconclusive findings on sonography and/or USg-FNAC were included.

**Methods:** MRI consisted of sagittal T1, T2, and STIR. Echo planar imaging DWI was obtained with fat saturation. \( b \)-values of 800 s/mm² were used. A minimum 3-week interval was used following USg-FNAC before MRI.

**Results:** 5 patients had benign adenoma, and 20 had malignancy consisting of 10 papillary thyroid carcinomas, 6 medullary thyroid carcinomas, and 4 follicular carcinomas. Apparent diffusion coefficient (ADC) values of thyroid cancer differed significantly from ADC values of adenomas (\( P =0.004 \)). No statistical difference was present among the various types of cancer. Normal thyroid tissue demonstrated significantly lower ADC values than either benign or malignant lesions (\( P <0.009 \)). ADC values of thyroid carcinoma ranged (95% CI) from 2.43 to 3.037, whereas adenomas ranged from 1.626 to 2.233. An ADC value of 2.25 was predictive of carcinoma with an accuracy of 88%, sensitivity of 85%, and specificity of 100%.

**Conclusions:** Quantitative DWI is a reliable non-invasive diagnostic technique for differentiating benign from malignant cold thyroid nodules, but further studies are required.

**Reviewer’s Comments:** The results of this study are diametrically opposed to the conclusions of the study by Bozgeyik et al in the March 2009 issue of *Neuroradiology* (see review #11). They found ADC of malignancy to be lower than that of benign lesions, as is typically the case. Briefly, some reasons for the discrepancy between the 2 current studies may be related to the inherent selection bias of the current study, on which analysis was done only on lesions that were either positive or indeterminate on biopsy. In the study by Bozgeyik, indeterminate lesions on FNAC were excluded from study. Another possible source of discrepancy was the fact that these patients were analyzed following biopsy. The authors waited 3 weeks, but it is feasible that the FNAC may have resulted in tissue damage with increased ADC values. This would not necessarily explain the reversal of benign and malignant lesions, however.

**Additional Keywords:** Neoplasm

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Again - Can ADC Values Distinguish Benign From Malignant Thyroid Nodules?

Diffusion-Weighted MR Imaging of Thyroid Nodules.


Malignant nodules demonstrate lower apparent diffusion coefficient values than do benign lesions. Using a cutoff value of 0.65 (with $b=300$), sensitivity for malignant lesions is 100% and specificity is 95%.

**Background:** Incidental thyroid nodules on imaging studies are very commonly encountered. The majority of these are benign, but a significant minority are histologically malignant. Ideally, we would like to limit the number of biopsies performed, and a method to distinguish benign from malignant lesions is sought. Lately, there has been promising research in using diffusion-weighted imaging (DWI) in distinguishing benign from malignant lesions in the head and neck.

**Objective:** To determine whether DWI and apparent diffusion coefficients (ADCs) can be used to differentiate benign from malignant thyroid nodules.

**Design:** Prospective study.

**Participants:** 20 healthy control subjects and 86 consecutive patients with thyroid nodules diagnosed by ultrasound.

**Methods:** Prior to fine-needle aspiration, patients were imaged with T1, T2, and DWI. For each patient, DWI was performed with $b$-values of 100, 200, and 300. Forty- to 45-mm$^2$ regions of interest (ROI) were placed over the lesions, and ADC values were determined. Areas of normal thyroid tissue were also evaluated.

**Results:** A number of patients/nodules were excluded due to imaging problems, nodules that were too small, or indeterminate diagnosis on cytology. There were 88 benign and 5 malignant nodules. ADC values (in 10-3 mm$^2$/s) were statistically significantly lower in malignant lesions compared with benign lesions. For $b$ -100, ADC values ranged from 0.38 to 2.05 for malignant and 1.37 to 4.10 for benign. For $b$ -200, malignant lesions ranged from 0.14 to 1.29, whereas benign ranged from 0.70 to 3.17. For $b$ -300, malignancy ranged from 0.11 to 0.62 and benign nodules were 0.34 to 2.16. ROC curves were created and used to determine optimal values for differentiating lesions. $b$ -300 values were found to be most useful. Using a cutoff of 0.65, sensitivity for malignant lesions was 100% and specificity was 95%.

**Conclusions:** Malignant thyroid nodules demonstrate low ADC values relative to benign nodules, and DWI may be useful in differentiating malignant and benign thyroid nodules. Cutoff values determined in this study may be used as threshold values in larger prospective trials assessing when to use fine-needle aspiration biopsy.

**Reviewer's Comments:** The design of this study was straightforward and the conclusions useful. The greatest problem with the study was the fact that there were only 5 malignant lesions, and presumably had there been more, the range of ADC values may have been wider, with more overlap with benign lesions. This study corroborated a prior similar study by Razek et al from the *AJNR* in 2008 (29:563-568), in which malignant nodules demonstrated low ADC values and benign lesions higher values. However, the conclusions are opposite those reached by a similar study that appears in the February issue of *AJNR* (see review #10).

**Additional Keywords:** Neoplasm

**print tag:** () Refer to original journal article.
Graves' Ophthalmopathy

Graves' Ophthalmopathy.
Bartalena L, Tanda ML:
N Engl J Med; 360 (March 5): 994-1001

Patients with Graves' ophthalmopathy should be evaluated and treated by both an endocrinologist and an ophthalmologist with expertise in the condition.

Ophthalmopathy occurs in about half of patients with Graves' disease, is clinically relevant in 20% to 30% of patients, and is sight-threatening in 3% to 5% of patients. Symptoms include diplopia and effects of corneal exposure such as photophobia, tearing, grittiness, and pain. Optic nerve dysfunction is detected in only 6% of patients. Dysthyroid optic neuropathy, corneal breakdown, or both, indicate that Graves' ophthalmopathy is sight-threatening and requires immediate treatment. Patients should be evaluated and treated by both an endocrinologist and an ophthalmologist with expertise in this disorder. Referral is urgent for suspect optic neuropathy, globe subluxation, corneal opacity, or incomplete closure of the lids. Factors associated with increased risk of progression should be eliminated. Risk factors include cigarette smoking, severe hyperthyroidism, high levels of antithyroid-stimulating hormone receptor antibodies, and uncontrolled hypothyroidism after radioiodine therapy. In 2 randomized trials, concomitant therapy of high-risk patients with oral prednisone prevented progression and ameliorated pre-existing Graves' ophthalmopathy. Prophylactic therapy with glucocorticoid agents may therefore be appropriate for many patients treated with radioiodine, especially those with active ophthalmopathy or other risk factors. Hypothyroidism should be avoided. Patients treated with levothyroxine as early as 2 weeks after therapy had a markedly reduced risk of progression of Graves' ophthalmopathy as compared to patients in whom levothyroxine treatment was not initiated until hypothyroidism developed.

Conclusions: The authors state that appropriate use of radioiodine therapy for managing hyperthyroidism in patients with Graves' ophthalmopathy remains uncertain. If used, oral glucocorticoids are usually recommended, but the timing, optimal dose, and duration are uncertain. The authors typically prescribe oral glucocorticoid prophylaxis. If they treat with IV glucocorticoid agents, radioiodine therapy is given in the period between doses of glucocorticoids. Alternatively, antithyroid drug therapy may be continued for an 18- to 24-month course.

Reviewer's Comments: This article does a nice job of discussing Graves' ophthalmopathy, including issues related to use of radioiodine. This is a good state-of-the-art review for those radiologists who prescribe radioiodine for Graves' disease.

Additional Keywords: Radioiodine

print tag: () Refer to original journal article.
BSGI Has Higher Sensitivity Than Mammography, Sonography, MRI for Breast Cancer Dx

Invasive Lobular Carcinoma: Detection With Mammography, Sonography, MRI, and Breast-Specific Gamma Imaging.
Brem RF, Ioffe M, et al:
AJR Am J Roentgenol; 192 (February): 379-383

Breast-specific gamma imaging has better sensitivity than all other breast imaging modalities for invasive lobular carcinoma.

Objective: To evaluate the sensitivity of breast-specific gamma imaging (BSGI) in the detection of invasive lobular carcinoma and to compare it with that of mammography, ultrasonography, and MRI.

Design: Multicenter retrospective study.

Methods: Women with biopsy-proven pure invasive lobular carcinoma who also underwent BSGI were identified. Pathology which indicated ductal components was an exclusion criterion. Surgical pathology reports confirmed pathology as the reference standard. Whether other breast imaging studies were performed including mammography, MRI, or sonography was noted. Radiologists who interpreted the images were all experienced breast imagers. BSGI was performed under standard protocol using Technetium 99m sestamibi and a high-resolution breast-specific gamma camera. Results of BSGI were rated positive or negative by 1 radiologist who was experienced in all techniques of breast imaging. Radiology reports from the medical records were reviewed rather than having the radiologists re-evaluate the images.

Results: 28 biopsy-proven invasive lobular carcinomas in 26 women were evaluated; mean size was 22.3 mm. All patients underwent mammography which was negative in 6 cancers, resulting in an overall sensitivity of 79%. Twenty-five of the patients underwent sonography and 8 of the lesions were not seen. Sonographic sensitivity was calculated to be 68%. Twelve of 26 patients were evaluated using MRI and 10 of 12 lesions were identified resulting in a sensitivity of 83.3%. BSGI was positive in 26 of 28 lesions, yielding a sensitivity of 93%. Of note, in 6 instances where mammography failed to detect the cancer, BSGI was positive.

Conclusions: BSGI has the highest sensitivity for the detection of invasive lobular carcinoma with a sensitivity of 93%, whereas mammography, sonography, and MRI showed sensitivities of 79%, 68%, and 83%, respectively. BSGI is an effective technique that should be used to evaluate patients with suspected cancer and has a promising role in the diagnosis of invasive lobular carcinoma.

Reviewer's Comments: This is remarkable early data on a disease that has challenged radiologists and clinicians. The addition of physiology-based examinations such as MRI and BSGI in addition to anatomy-based examinations such as mammography and ultrasound in recent years is helping to further increase the diagnostic accuracy of breast cancer. Breast imaging is starting to progress in exciting ways.

Additional Keywords: Detection

print tag: () Refer to original journal article.
Mammography Usage Declines in Mid to Western U.S.


Miller JW, King JB, et al:
AJR Am J Roentgenol; 192 (February): 352-360

There are few statistically significant trends in mammography usage on the state level to help define a factor for the nationwide trend.

**Objective:** To examine the data from the Behavioral Risk Factor Surveillance System (BRFSS) by state to determine if there are geographical trends to the widely accepted observation of declining mammography use.

**Methods:** The Behavioral Risk Factor Surveillance System is a telephone survey supported by the Centers for Disease Control and Prevention which gathers information about health behavior. Among the questions asked on the survey are whether female respondents have had a mammogram and how often they undergo mammography examination. Data from the BRFSS survey, gathered from 2000 to 2006, were analyzed for trends in mammography utilization per state. Corresponding state breast cancer incidence rates were also analyzed. Furthermore, since ductal carcinoma in situ is more likely to be identified on mammography, the time trends for breast cancers was conducted with separate categories for in situ and invasive cancers. These data were obtained from the CDC National Program of Cancer Registries as well as the National Cancer Institute's Surveillance, Epidemiology, and End Results Program.

**Results:** In regard to mammography utilization by women aged 40 years, there was marked variability between the states. There was an overall decrease in mammography utilization in 30% of states over the 6-year period studied. The states that tended to trend toward decreased mammography utilization were generally in the mid- to western portion of the country. Tennessee was the only state that had a statistically significant increase in mammography usage. Two states, New Mexico and Delaware, had statistically significant decreases in mammography decline. Only 1 state had an overall increase in cancer incidence rates, with the remaining reporting decreased incidence. There was no statistically significant trend in incidence rates for invasive versus in situ carcinomas. There was a correlation between mammography use and overall breast cancer incidence per state; however, this correlation was not statistically significant on a nationwide basis.

**Conclusions:** There was little statistically significant change in self-reported mammography use from 2000 to 2006. Continued monitoring of breast cancer screening practices and breast cancer incidence trends is important for targeting at-risk populations with effective interventions to improve breast cancer prevention and early detection.

**Reviewer’s Comments:** The study does not draw hard conclusions or trends when analyzing the data on a state-by-state basis. Although there is variability between states regarding mammography usage and in which direction it's trending, there is an overall decrease in usage when taking the nation as a whole. Essentially, the cause for declining utilization of mammography in recent years is still elusive.

**Additional Keywords:** Geographical Trends & Incidence Rates

**print tag:** () Refer to original journal article.
Can MRI Differentiate Between Subtypes of Mucinous Breast Carcinoma?

Mucinous Carcinoma of the Breast: MRI Features of Pure and Mixed Forms With Histopathologic Correlation.

Certain MRI characteristics do favor the pure subtype of mucinous carcinoma.

**Background:** In mucinous carcinoma of the breast, there are 2 main pathologic categories: pure and mixed. The mixed form has nonmucinous components, usually consisting of common histopathologic diagnoses such as invasive ductal carcinoma. Since the pure form does not metastasize as frequently, it is treated differently.

**Objective:** To determine if MRI characteristics can help differentiate between the pure or mixed subtypes.

**Design:** Retrospective study.

**Methods:** Patients with a diagnosis of mucinous carcinoma of the breast were identified in a pathology database. Two radiologists reviewed the breast MR images and determined certain variables such as size, morphology, signal intensity, and enhancement patterns of the tumors. Only patients who had MRI of the breast prior to neoadjuvant chemotherapy were included in the study. Descriptive terms used were based on BI-RADS terms for MRI. One pathologist who was blinded to MRI findings interpreted the sectioned surgical specimens of the tumors.

**Results:** 20 patients and 20 tumors were included in the study; 17 tumors were pathologically designated as pure mucinous tumors. Both the pure and mixed forms had various shapes. All mixed tumors had irregular margins. In total, 59% of pure tumors had smooth margins. Both subtypes had marked increased T2-weighted signal intensity, as would be expected for mucin-containing tumors. Hypocellular pure tumors had a gradual enhancement pattern, whereas hypercellular pure tumors did not significantly differ from mixed tumors in their enhancement characteristics.

**Conclusions:** Both the pure and mixed forms of mucinous carcinoma have various shapes. Pure tumors have smooth or irregular margins and all mixed tumors have irregular margins. It is important to make the distinction between the pure and mixed forms because mixed mucinous carcinoma more frequently undergoes lymph node metastasis and has a poorer prognosis as compared to pure mucinous carcinoma.

**Reviewer's Comments:** Although the findings imply that MRI may help in differentiating the subtypes of mucinous carcinomas of the breast, the study also acts to present the various MRI characteristics of both subtypes. Although the recent literature has presented morphology of breast masses on MRI as opposed to enhancement kinetics, this study reminds us that both factors are still necessary for a thorough characterization.

**Additional Keywords:** Mucinous Carcinoma

**print tag:** () Refer to original journal article.
Radiologist Enjoyment of Interpreting Mammo Results Does Not Affect Quality

Radiologists' Performance and Their Enjoyment of Interpreting Screening Mammograms.

Geller BM, Bowles EJ, et al:

AJR Am J Roentgenol; 192 (February): 361-369

| Table | Whether or not a radiologist reports enjoying interpreting mammograms does not affect interpretation quality. |

**Objective**: To determine if there is a relationship between attitudes toward mammography and interpretive accuracy among radiologists.

**Design**: Survey with correlation.

**Methods**: Radiologists identified through the Breast Cancer Surveillance Consortium were invited to participate in a survey posing questions regarding enjoyment in interpreting mammograms. Survey data were linked with screening and diagnostic mammogram interpretations via the Breast Cancer Surveillance Consortium over a 7-year period. In addition to answering questions on demographic data, radiologists rated a statement regarding enjoyment of interpreting mammograms on a 5-point Likert scale, with 5 signifying strong agreement. The survey also included an instrument assessing physicians' reactions to uncertainty associated with clinical care. As for interpretive accuracy, the results of screening mammograms were considered positive for any BI-RADS category of 0, 4, or 5. Category 3 was considered positive if a surgical consultation was also recommended. A positive final assessment for diagnostic mammograms was considered for any category 4 or 5, or a category 3 or 0 with a biopsy recommendation. A positive breast cancer result was determined if invasive carcinoma or ductal carcinoma in situ was found in the pathology or cancer registry data within 365 days of mammography. Abnormal interpretation was calculated to be the number of positive examinations divided by the total number of mammograms. Cancer detection rate was defined as number of positive examinations among women with breast cancer divided by total number of examinations.

**Results**: The average abnormal interpretation rate among all radiologists for screening mammograms was 11.2% of screening mammograms. As for diagnostic mammograms, abnormal interpretation rate was calculated to be 8.6%. Cancer detection rate was 30.9 per 1000 diagnostic examinations. Overall, just over 50% of radiologists reported enjoying interpreting screening mammograms. Those who enjoyed interpreting mammograms more tended to be older women who work part-time. Radiologists less likely to enjoy interpreting mammograms considered mammography tedious or felt a high degree of uncertainty during interpretation. These radiologists also tended to be younger men who spent <20% of their time in mammography. Of note, there was no statistically significant difference in cancer detection rate, sensitivity, specificity, or abnormal interpretation rate between those who reported enjoying interpreting mammograms and those who did not.

**Conclusions**: Almost half of radiologists actively interpreting mammograms said they do not enjoy that part of their job. Once radiologist and patient characteristics were adjusted, the authors found that reported enjoyment was not related to performance, although suggestive trends were noted.

**Reviewer's Comments**: Thankfully, the study data show no decrease in quality of mammographic interpretation simply based on enjoyment of the task at hand. Although that was the question the study sought to answer from the outset, it is also noteworthy to recognize the data showing who tended to enjoy interpreting mammograms more. With the dearth of breast imagers available, using the data from the survey by individual practices may help to increase overall job satisfaction and therefore aid in recruiting and retaining radiologists willing to interpret mammograms.

**Additional Keywords**: Radiologist Performance
**MDCT Can Help Predict Joint Stability After Ankle or Subtalar Joint Arthrodesis**

*Correlation of Arthrodesis Stability With Degree of Joint Fusion on MDCT.*

Dorsey ML, Liu PT, et al:

AJR Am J Roentgenol; 192 (February): 496-499

Utilizing a 33% fusion ratio threshold, MDCT is a highly accurate means of predicting joint stability after ankle or subtalar joint arthrodesis. More than 33% bone fusion predicts joint stability with a high level of accuracy.

**Objective:** To demonstrate how well multi-detector CT examination could predict joint stability on clinical examination based on the degree of fusion across the ankle or subtalar joint post-arthrodesis.

**Design/Participants:** This study was a retrospective evaluation of 42 joints in 29 patients.

**Methods:** CT scans were performed for recurrent or persistent hindfoot pain after ankle or subtalar joint arthrodesis. Clinical criteria were established to determine joint stability or instability and 2-mm sagittal reformatted images were obtained from axial source images through the ankle or subtalar joints. Subsequently, images were reviewed by 2 musculoskeletal radiologists who were blinded to the patient data. Utilizing a previously determined CT grading scale to assess degree of bone fusion, length of joint surface and length of joint fusion were measured. Instrumentation was not included in measurements of joint fusion; however, bone grafts were. A fusion ratio score was calculated from the aforementioned measurements.

**Results:** There were 12 clinically unstable joints and 30 clinically stable joints. By CT examination, stable joints had fusion ratios ranging from 33.2% to 100%. Unstable joints had fusion ratios ranging from 0% to 32.8%. Therefore, a cut-off, or fusion ratio threshold of 33% was utilized to predict joint stability. The positive and negative predictive values were both 100%, employing a fusion ratio threshold of 33%.

**Conclusions:** After arthrodesis of the ankle or subtalar joint, MDCT scans can be used to determine whether that joint is likely to be stable if >33% of the joint has visible bone fusion on sagittal images.

**Reviewer's Comments:** In the past, a CT grading scale was devised to assess degree of joint fusion. However, the purpose was to discern the benefit of ultrasound stimulation for nonunion after arthrodesis. The authors of this study adopted this grading scale in order to predict joint stability versus instability as determined by clinical exam. Despite the small patient sample size, the sensitivity and specificity values were 100% utilizing the fusion ratio threshold of 33%. Another limitation was the selection bias, given that no asymptomatic patients were included in the study. Nevertheless, this study is significant since distinguishing, or predicting, stable from unstable joint unions can alter management. After arthrodesis, joints that have fusion ratios <33% could benefit from surgical revision and/or prolonged immobilization. It is important to note that, despite the higher predictive values of MDCT in this clinical setting, plain radiographs remain the first-line imaging modality since they are inexpensive and easily accessible.

**Additional Keywords:** Joint Fusion

**print tag:** () Refer to original journal article.
Sonography Vital in Evaluating Hemiplegic Shoulder Pain After Stroke

Sonography of Patients With Hemiplegic Shoulder Pain After Stroke: Correlation with Motor Recovery Stage.

Lee IS, Shin YB, et al:
AJR Am J Roentgenol; 192 (February): W40-W44

Despite not providing a correlation with motor recovery stage, shoulder sonography is valuable in determining the etiology of hemiplegic shoulder pain, thus serving as a guide for therapeutic management.

**Objective:** To elucidate the etiology of hemiplegic shoulder pain utilizing shoulder sonography and to determine if there is a parallel between motor recovery stage and ultrasound findings.

**Design/Participants:** This was a prospective study which included 71 patients whom had suffered cerebrovascular accidents and developed hemiplegic shoulder pain.

**Methods:** Employing a 12 to 17 MHz high-resolution linear-array transducer, all patients underwent shoulder ultrasound by 1 of 2 radiologists with years of dedicated musculoskeletal sonography experience. The biceps tendon, rotator cuff muscles, rotator cuff interval, subacromial-subdeltoid bursae, acromioclavicular joints, and posterior glenohumeral joint were evaluated. Ultrasound findings were then categorized into 5 grades of clinical significance. Brunnstrom staging was used to evaluate motor recovery; however, a modified version was adopted for this study with only 3 stages of motor recovery classified. An effort was made to determine if there was a relationship between findings on shoulder ultrasound and stages of motor recovery.

**Results:** 36 patients had subacromial-subdeltoid bursae effusions (the most common abnormality detected). Seven patients had supraspinatus tendinosis, 6 had partial-thickness tears of the supraspinatus tendon, and 2 patients had full-thickness tears of the supraspinatus tendon. Of note, asymptomatic contralateral shoulders were also evaluated for purposes of comparison. Sonography of hemiplegic shoulders demonstrated a higher number of abnormalities relative to the contralateral size. However, statistical analysis demonstrated no significant correlation between stages of motor recovery based on the Brunnstrom model and sonographic findings.

**Conclusions:** The cause of shoulder pain was variable and there was no correlation between the stages of motor recovery and the grades of sonographic findings in patients with hemiplegic shoulder pain.

**Reviewer’s Comments:** A considerable number of patients who have suffered cerebrovascular accidents suffer from hemiplegic shoulder pain. Myriad etiologies have been cited as causes of this type of pain. For the clinician, knowing what the anatomic and functional abnormalities are can be pivotal in deciding on treatment options. According to the authors, many physicians treat their patients without a clear understanding of the pathology involved (for example, intra-articular steroid injections for hemiplegic shoulder pain are suboptimal unless utilized for inflammatory lesions). This study has demonstrated the vital role ultrasound plays in evaluating hemiplegic shoulder pain by serving as a guide for determining therapeutic options based on visualized shoulder pathology. Unfortunately, no significant relationship between stages of motor recovery and sonographic findings was demonstrated. This may have been attributed to the small sample size and short duration of the study. In addition, not all patients with shoulder pain had abnormal sonograms.

**Additional Keywords:** Motor Recovery Stage

**print tag:** () Refer to original journal article.
Jugular Paraganglioma—Radiotherapy Is Viable Alternative but Surgery Is Mainstay

Huy PTB, Kania R, et al:
Skull Base; 19 (January): 83-91

Radiotherapy is a viable alternative for many jugular paragangliomas, although surgery is still the mainstay for tumors with significant intracranial extension.

Background: Surgical treatment of jugular paragangliomas (also known as glomus jugulare tumors) has improved over several decades due to microsurgical technique, neuromonitoring, and endovascular embolization. Nevertheless, the traditional surgical approach for these lesions (Fisch's infratemporal fossa approach type A) is still associated with significant morbidity.

Objective: To evaluate the results of surgery versus radiotherapy in the treatment of jugular paragangliomas.

Design: Retrospective chart review.

Participants: 47 patients underwent surgery for a jugular paraganglioma at the University of Paris Hospital from 1984 to 1998; 41 underwent radiotherapy from 1988 to 2003.

Methods: All surgical patients underwent preoperative embolization of the tumor prior to surgery. Eighteen patients had a Fisch infratemporal fossa type A approach with facial nerve rerouting. Fourteen patients had an intracranial extension that required neurosurgical resection. In 24 patients, the facial nerve was not transposed. In the radiotherapy group, patients received focal field or conformal radiotherapy totaling 45 Gy, given in 1.8-Gy fractions over 5 weeks. Follow-up imaging was performed for at least 5 years.

Results: In the surgery group, a gross total resection was accomplished in 70% of patients and subtotal resection in 30%. In the radiotherapy group, a complete response was seen in 1 patient. A partial response of >20% reduction in tumor volume was seen in 11 patients, and the remaining had a stable tumor. In the surgery group, facial paralysis was a common complication following the facial nerve transposition procedure, and most patients did not make a full recovery. Without facial nerve rerouting, the incidence of significant weakness was much less, approximately 8%. In addition, the incidence of vocal cord immotility and swallowing difficulty was about 20%. Cerebrospinal fluid leak occurred in about 50% of patients undergoing an intracranial resection. In the radiotherapy group, the incidence of complications was low (<10%).

Conclusions: The authors note that radiotherapy for jugular paragangliomas offers long-term stabilization without tumor eradication. For young patients (aged <45 years), particularly those with intracranial extension of the tumor, surgery should probably still be considered first-line treatment since the possibility of tumor eradication exists. The outcome of radiated tumors over very long follow-up such as 3 or 4 decades is still unknown.

Reviewer's Comments: This is an interesting article that highlights the results of an experienced group treating jugular paragangliomas or glomus jugulare tumors. It makes the point that surgery for skull-base tumors such as jugular paragangliomas may become second-line therapy in patients past the fifth decade of life, since radiotherapy in these tumors is so effective. It is a challenge to skull-base surgeons to work together to try to improve results such that tumors can be removed with less morbidity than before.

Additional Keywords: Surgery vs Radiotherapy

print tag: () Refer to original journal article.
Could Imaging Services Become Open to Global Competition?

Medical Tourism: Opportunities for American Radiologists?

Stephen R. Baker, MD
-Special Presentation: ()-

Given the excellence of our training in the United States and the high quality of our radiologists, opportunities could abound for American radiologists to gain significant, and even abundant, business from other countries from those seeking our expertise.

The growth of medical tourism offers both a challenge and an opportunity for American radiologists. The challenges are stark, although not immediate. The frequency of hospital encounters for elective surgery by Americans traveling purposively to foreign hospitals is now a trickle, but will likely soon be a flood for those with comprehensive insurance. The combination of high quality amenity provision and low cost will be hard to beat stateside. A result could be the lowering of the price of hospitalization as well as physician charges, including those for radiologic interpretation. A less obvious consequence of the free flow of patients to comparable facilities overseas or across the border will be an increasingly compelling urge to make licensure universal and thus to also make board certification universal, given that foreign training programs for both medical and graduate medical education meet tests of similarity with American programs. Then, imaging services would become like other luxury goods open to global competition. Given the excellence of our training in the United States and the high quality of our radiologists, opportunities could abound for American radiologists to gain significant—even abundant—business from other countries from those seeking our expertise. This review is an abstract of an audio presentation from Practical Reviews in Radiology. If you do not have access to this presentation and would like to purchase a copy, please call 1-800-633-4743, email service@oakstonepub.com, or write Oakstone Medical Publishing, 100 Corporate Parkway, Suite 600, Birmingham, Alabama 35242.

Additional Keywords: Opportunities

print tag: ()