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# Radiology Report

A Newsletter from the Saint Vincent Hospital Department of Radiology

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WINTER 2010

## 3D Virtual CT Bronchoscopy: Pulmonary Carcinoid Tumor



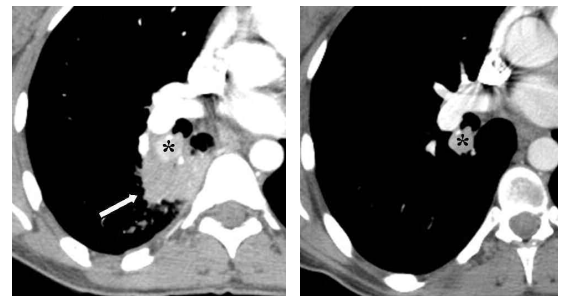
Welcome to the second issue of our quarterly departmental newsletter, Radiology Report. We begin this issue with an interesting imaging case of pulmonary carcinoid tumor diagnosed in a 33-year-old female patient who presented to our emergency department with shortness of breath, pleuritic chest pain, and fever. An initial computed tomography (CT) scan of the chest demonstrated pneumonia surrounding an endobronchial mass. The mass was also well-delineated on 3D virtual CT bronchoscopic images generated from the CT data, and this mass persisted on follow-up imaging.

Only accounting for 1-2% of all lung neoplasms, pulmonary carcinoid tumors are low-grade malignancies often presenting with hemoptysis, pulmonary lobe obstruction, and recurrent pneumonia. 80% of these tumors occur in the central bronchi, whereas the remaining 20% occur peripherally in the lung and appear as solitary pulmonary nodules. Detection of these tumors is important due to the possibility of local invasion or metastatic disease. A type of radionuclide scan using OctreoScan,™ also available in our department, can be used to detect carcinoid tumor with 80-100% sensitivity.

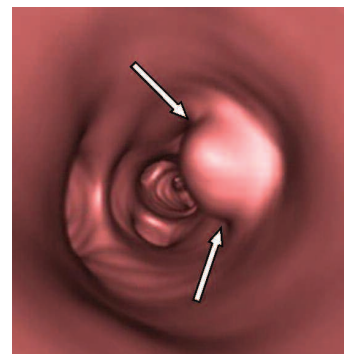
Virtual reality CT fly-through of the airways prior to actual bronchoscopy and/or transbronchial biopsy can be provided by our department, and may be helpful in identifying diseased airway anatomy, locating endobronchial masses, and evaluating the airway distal to an endobronchial tumor or stenosis.

Daniel J. Kowal, M.D.

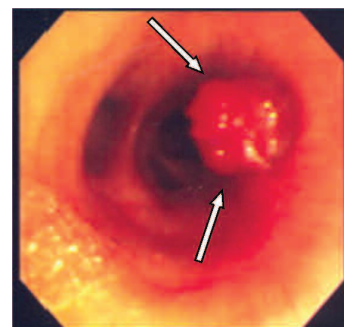
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2001; 221:531-536



Initial CT chest (left image) showing right lower lobe pneumonia (arrow) surrounding a hyperdense mass (\*); follow-up CT chest (right image) nearly 4 weeks later shows resolution of pneumonia, but persistent mass with endobronchial component

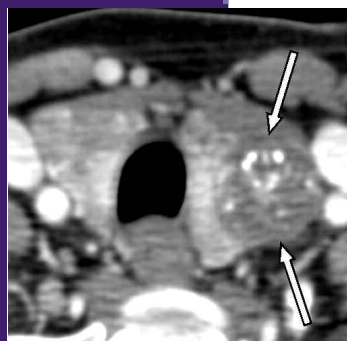


3D virtual CT bronchoscopic image showing endobronchial mass (arrows)

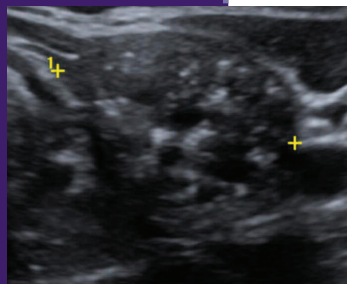


Correlative actual bronchoscopic image of same patient, courtesy of pulmonologist Daniel M. Steigman, M.D., showing endobronchial mass pathologically proven to represent carcinoid tumor

## Management of the Incidental Thyroid Nodule



CT scan showing a left thyroid nodule containing calcifications (arrows)



Subsequent ultrasound showing both microcalcifications and coarse calcifications in pathologically proven thyroid papillary carcinoma

With increased use of imaging and improvement in imaging techniques, visualization of 'incidental' lesions has become more common. Identification of thyroid nodules by ultrasound has increased, and often leads to consideration for ultrasound-guided fine needle aspiration (FNA).

Given the low malignancy rate of thyroid nodules (6-7%) and the lack of sensitivity of imaging features to reliably predict malignancy, the Society of Radiologists in Ultrasound (SRU) convened a large, multidisciplinary panel in October, 2004 including radiologists, endocrinologists, cytopathologists, and surgeons to address the management of incidentally-discovered thyroid nodules. As a group, they published a set of recommendations for ultrasound-guided FNA based on the ultrasound appearance and size of these incidentally-discovered nodules.

It should be noted that these recommendations pertain only to nodules incidentally discovered by ultrasound. Nodules identified clinically—for example, nodules identified during work-up of hyperthyroidism—should be managed according to the patient's history and other clinical parameters.

For nodules incidentally discovered by ultrasound, recommendations for management are listed in the table below.

For solitary nodules, FNA should be strongly considered if microcalcifications are present and the nodule is 1.0 cm in size or greater, as microcalcifications are the sonographic finding most strongly associated with malignancy (though there is a wide range in the sensitivity [26.1-59.1%] and positive predictive value [24.3-70.7%] of this finding). For other thyroid nodules, FNA is typically not recommended until they reach a size of 1.5 or 2.0 cm as listed.

For multiple nodules, the majority opinion of the panel is to consider FNA of one or more nodules, with prioritization for FNA based on the criteria for solid nodules in the order listed above.

Please note that the presence of abnormal lymph nodes overrides the ultrasound features of nodules and should prompt ultrasound-guided FNA/biopsy of the node and/or ipsilateral thyroid nodules.

*Brian D. Midkiff, M.D., M.P.H.*

### 2004 SRU Guidelines

#### Recommendations for Thyroid Nodules 1 cm or Larger in Maximum Diameter

US Feature	Recommendation
Solitary nodule	
Microcalcifications	Strongly consider US-guided FNA if $\geq$ 1 cm
Solid (or almost entirely solid) or coarse calcifications	Strongly consider US-guided FNA if $\geq$ 1.5 cm
Mixed solid and cystic or almost entirely cystic with solid mural component	Consider US-guided FNA if $\geq$ 2 cm
None of the above but substantial growth since prior US examination	Consider US-guided FNA
Almost entirely cystic and none of the above and no substantial growth (or no prior US)	US-guided FNA probably unnecessary
Multiple nodules	Consider US-guided FNA of one or more nodules, with selection prioritized on basis of criteria (in order listed) for solitary nodule

# Mammography Controversy: To Screen or Not to Screen

The recent article published in the *Annals of Internal Medicine* outlining new recommendations for mammography screening has caused much anger and confusion among women and their families, as well as physicians. According to the US Preventive Services Task Force (USPSTF), women are advised to start screening at age 50 rather than at age 40 and to have biennial rather than annual screening up to age 74. The panel also encouraged against teaching and encouraging women to do routine self examination. The cited concerns for these recommendations were anxiety created by false positive studies and anxiety over lumps that turn out not to be cancer.

Several professional organizations and expert groups have voiced their objections to the new recommendations. After these guidelines were released, responses from the American College of Radiology, American Cancer Society, Society of Breast Imaging, and other groups reaffirmed their support for regular screening of women starting at age 40.

The USPSTF is an independent panel of doctors and scientists who make recommendations. They do not set federal policy and do not determine what services are covered by the federal government. Notably, the panel that made these recommendations did not include a radiologist, oncologist, breast surgeon or any other clinician with expertise in breast cancer diagnosis and treatment.

According to the ACS, 17% of breast cancer deaths in 2006 were among women diagnosed between age 40 and 49. We also know that digital mammography significantly improves detection of cancer in young women and in women with dense breasts. These well-documented facts are not

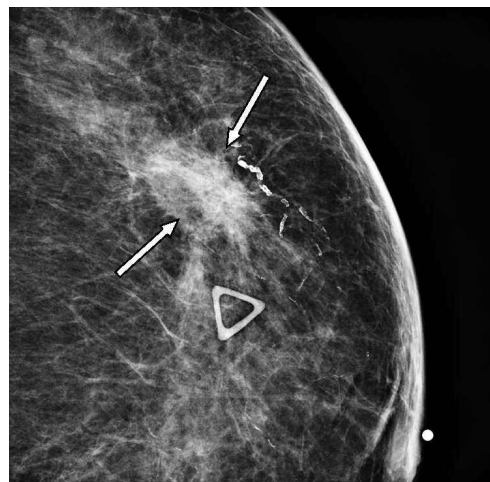
included in the analyses that led to the change in USPSTF recommendations.

Early detection offers a woman the best chance for a cure. Failing to identify those women in their 40s with cancer and having them wait until they are screened at age 50 is a disservice. By then, breast cancer can be advanced and more difficult to treat. Mammography is not a perfect test, but it has unquestionably been shown to save lives including in women ages 40 to 49.

Critics say that these new guidelines are a step backwards and will lead to more cancer deaths. Since the onset of regular mammography screening in the 1990s, the death rate from breast cancer has decreased by 30%. Many doctors are worried that insurance companies and government insurers will seize the recommendations as a way to control rising health costs.

The American Cancer Society recommends annual mammograms starting at age 40 years and continuing for as long as a woman is in good health. There is no specific upper age at which mammography screening should be discontinued. Rather, the decision to stop regular mammography screening should be made on an individual basis based on the potential benefits and risks of screening within the context of a patient's health status and estimated longevity.

*Noreen M. LaSalle, M.D.*



Mammogram showing a spiculated focal asymmetry (arrows) in the breast of a 92-year-old woman



Subsequent ultrasound demonstrated a hypoechoic (dark) mass in this region (\*), and ultrasound-guided biopsy (arrows pointing to needle) yielded invasive lobular carcinoma

## Imaging of Dural Sinus Thrombosis

Dural venous sinus thrombosis is a significant pathological event with up to 50% progressing to cerebral infarction. The presentation can be somewhat nonspecific and may include headaches, nausea, and vomiting with or without neurological deficits. In certain cases, death may result.

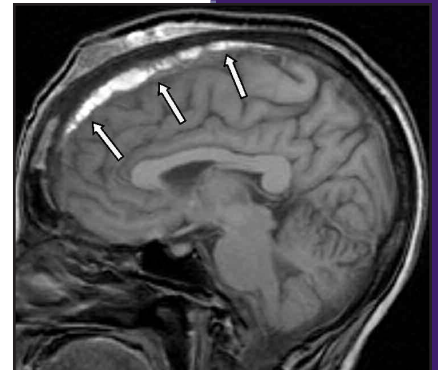
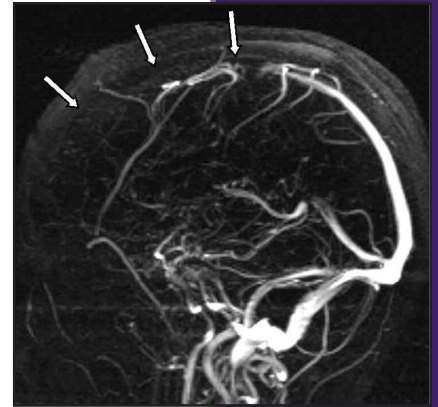
Occurring more commonly in females than males, Dural Sinus Thrombosis (DST) can be associated with factor Leiden V deficiency and resistance to activated Protein C, the most common cause of sporadic DST. Other associated factors include additional causes of a hypercoagulable state, dehydration, pregnancy and the postpartum state, local sinus invasion by tumor, and dural arteriovenous fistula. While the differential diagnosis would include various normal anatomic variations such as arachnoid granulations, the findings on cross sectional imaging are rather specific. MRI is best suited for evaluation of this condition.

CT findings of DST include a hyperdense sinus on unenhanced exam. An “empty delta” sign on enhanced examination may also be seen due to the appearance of contrast surrounding thrombus within the sinus. There may also be cortical or subcortical petechial hemorrhage. MRI findings include absence of flow on time-of-flight angiography, and varying T1 and T2 signal depending on the age of the thrombosis. 40% have hyperintense (bright) clot present. If the straight sinus or internal cerebral veins are involved, abnormal signal in the thalami and basal ganglia can be seen. Treatment typically involves anticoagulation with heparin initially, and with coumadin over the long term. In more severe cases, thrombectomy may be performed by interventional neuroradiologists.

*Douglas A. Burd, M.D.*  
Chief of Neuroradiology

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MR venogram of the brain (top) showing absence of flow in the superior sagittal sinus, and T1-weighted MRI of the brain (bottom) showing bright thrombus in this sinus

## Residents' Corner: Meet Dr. Mehra

Welcome to Residents' Corner, a column highlighting the activities and accomplishments of our outstanding radiology residents. Our independent radiology residency program has been fully accredited since its inception in 1972, and we currently have 12 residents. In this issue, we would like to introduce one of our senior radiology residents, Dr. Sohita Mehra. Dr. Mehra is a native of Long Island, New York. She graduated with departmental honors from Johns Hopkins University in 2001 with a Bachelor of Arts in Neuroscience. She attended SUNY Downstate Medical Center College of Medicine in Brooklyn, NY and graduated in 2005. After completing her Internal Medicine internship at Saint Vincent Hospital, she started her Radiology residency in July 2006.

When she is not working or studying, Sohita enjoys spending time with her husband and 18-month-old son. This summer she will begin a fellowship at Brown University/Rhode Island Hospital in Body Imaging to include cardiac imaging and non-vascular interventional procedures.



# Intravenous Contrast Media: Guidelines for Prevention of Allergic-Type Reactions in High-Risk Patients

Radiologic contrast media remain a cornerstone of diagnostic imaging, and have been in use for nearly 60 years. Allergic-type reactions to modern day intravenous iodinated contrast material are rare, and have markedly decreased with changes in usage from high-osmolality (ionic) agents to lower-osmolality (non-ionic) agents. Isovue® 370, a safe, low-osmolality contrast agent, is the primary intravenous contrast agent used for computed tomography scans in our department.

Contrast reactions can be classified as mild, moderate, or severe. Fortunately, the majority of contrast reactions are mild, and most occur in the immediate post-injection period, with nearly all life-threatening reactions occurring within the first 20 minutes post-injection. Serious contrast reactions only occur in 1-2 per 10,000 examinations using low-osmolality contrast media. For example, in a study of 84,928 intravenous contrast injections, there was only a 0.6% reaction rate. Of these reactions, 77% were mild, 21% were moderate, and only 2% were severe. Although the exact incidence of death related to intravenous contrast injection is not known, it is estimated at only 1 fatality per 170,000 contrast media injections.

Unfortunately, due to the complexity of the causative factors involved in the generation of contrast reactions, it is not yet possible to accurately predict which patients will develop a reaction. However, in order to reduce the risk of developing a contrast reaction, patients with any of the following histories should be premedicated with a corticosteroid regimen prior to receiving iodinated contrast:

## Indications for Premedication

- Prior allergic-like reaction to iodinated contrast media, even if mild
- Multiple food or medication allergies
- Severe allergic-like reaction to any substance
- Moderate-to-severe asthma

Despite previous beliefs, a history of shellfish allergy is currently not thought to add any additional risk for contrast reaction beyond that of other allergies. However, as above, a patient with a history of severe allergy to *any* food or substance is at increased risk and should be premedicated.

Although various protocols for dose and timing of steroid administration exist, the following premedication regimen is recommended by our department:

## Premedication Regimen

- Methylprednisolone (Medrol®) 32 mg by mouth both 12 hours and 2 hours before contrast media injection, *plus*
- Diphenhydramine (Benadryl®) 50 mg by mouth, intravenously or intramuscularly, 1 hour before contrast media injection
- Someone must accompany the patient to drive him/her home after an outpatient imaging examination

Prior history of reaction to intravenous contrast injection is the best predictor of a recurrent adverse event. However, it is important to note that even without premedication, repeat reactions do not always occur. Studies have shown that in patients with a history of prior adverse reaction to contrast media, the overall risk of having a breakthrough reaction despite steroid premedication is approximately 10%. Also, recurrent reactions are usually of similar severity to the patient's index reaction. However, patients with the following potential risk factors may have an increased risk of a moderate or severe breakthrough reaction despite premedication, and contrast should be given with caution in this subgroup: history of severe allergies, allergies to any 4 or more allergens, any drug allergy, and chronic use of oral corticosteroids.

In summary, the diagnostic value of intravenous contrast media is very high, and modern contrast agents are extremely safe. Adverse reactions are rare and generally mild, and steroid premedication regimens play an important role in prevention of these reactions.

*Daniel J. Kowal, M.D., Brian D. Midkiff, M.D., M.P.H.*

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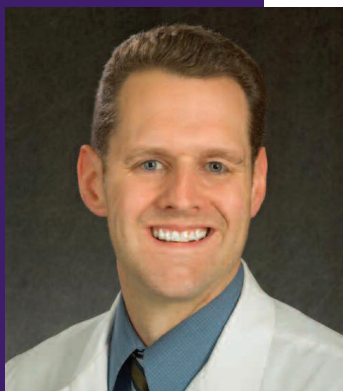
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### QUESTIONS, COMMENTS?

The goal of *Radiology Report* is to provide our medical community with up-to-date information regarding radiology examinations and procedures, including the latest imaging protocols available in our department. If you have a question or comment about a particular article in this issue, please feel free to contact any of our authors for further discussion. Also, if there are topics in radiology that you would like to see discussed in a future issue of *Radiology Report*, please email the editors at:

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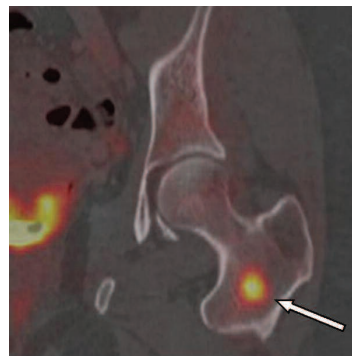
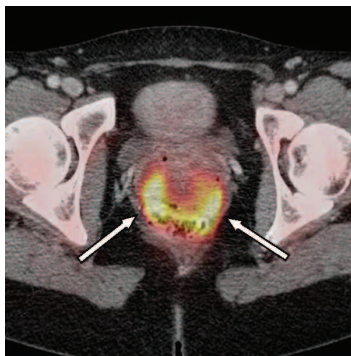
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## Meet Dr. Kowal, the Editor-In-Chief

A Worcester area native, Daniel J. Kowal, M.D. joined the staff of the radiology department in July of 2008. After completing an Internal Medicine internship at our own Saint Vincent Hospital, he trained in Diagnostic Radiology at Albert Einstein Medical Center in Philadelphia. Subsequently, he completed a fellowship in Abdominal Imaging at Massachusetts General Hospital, a fellowship that added to his experience in advanced MRI techniques, PET/CT, and also afforded him subspecialty training in Thoracic Imaging and Neuroradiology. Dr. Kowal's subspecialty teaching interests are Genitourinary & Gynecologic Imaging, as well as Head & Neck Imaging. In addition to editing the *Radiology Report* newsletter with Dr. Midkiff, Dr. Kowal is also the Computed Tomography (CT) Division Director, as well as the Radiology Elective Director at Saint Vincent Hospital.

## FDG-PET Approved for Cervical Cancer



PET/CT showing metabolically active squamous cell cervical carcinoma in a 46-year-old woman with parametrial invasion (left image), as well as an intertrochanteric osseous metastasis (right image) that was not visible on CT

The CMS (Centers for Medicare and Medicaid Services) recently gave final approval for the coverage of one FDG-positron emission tomography (PET) scan for the initial staging of biopsy-confirmed cervical cancer. The decision partially was based on data submitted by the National Oncologic PET Registry that showed FDG-PET scan during initial assessment of cervical cancer patients changed treatment plans in 36.1% of cases. According to Society of Nuclear Medicine president Dr. Michael Graham, this decision "will be especially helpful for gynecologists to effectively diagnose and treat cervical malignancies."

David A. Bader, M.D.