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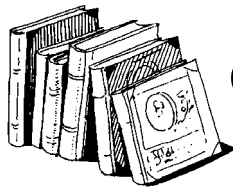
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Commentaries

“I Don’t Do Maintenance”

A PATIENT I’D SEEN ONCE BEFORE, WITH AN unusual gait and movement disorder, had sought a second opinion from a doctor at one of the more famous centers in Boston. The rendered opinion was quite similar to my own, which always makes my work easier, and the recommendation was to follow up with the local neurologist, namely me. There was no treatment to offer. Since neither of us can help this patient, why travel all the way to Boston and cope with the traffic, parking, etc? So I was a bit surprised when the patient said he’d be returning to Boston in a few weeks to see the other neurologist in follow up. I suggested that two neurologists was one too many and that there really was no reason for both of us to do nothing, when one of us doing nothing was adequate. “Oh, I won’t be seeing him again more than once or twice. He doesn’t do maintenance.” “Say what?” I thought to myself. “I’m sorry, can you repeat that?” I asked. “Dr. X says he doesn’t do maintenance,” he replied.

This caused several things to precipitate out in my brain, including the urge to write this exegesis (medicine has, I believe, a partly religious aspect, and the phrase, “I don’t do maintenance” has a meaning requiring explication). Being unfortunately thin skinned, I perceived an insult to myself. He was not feeling privileged to see this patient. He was not feeling flattered that his opinion was being sought out after seeing another (perhaps better known) expert, i.e., me. No, he was too busy to actually care for this patient. He provided advice only. Maybe he was too important.

I think that I am exercised by this because the phrase seems to be used as a pejorative. It is a way of reinforcing a prestige ladder within clinical academics. As we know, there are professors of neurology, who are the laboratory workers whose prestige is defined proportionally to the size of their NIH grants and inversely to their clinical load, and then there are, on a

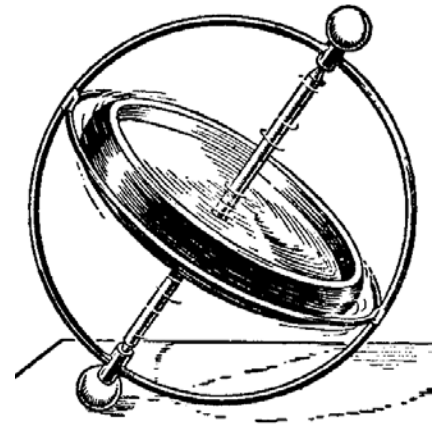
lower rung, depending on the institution, either professors of clinical neurology or clinical professors of neurology. So, now there is a group of us who provide diagnoses and advice, but don’t actually get involved with the less academic, less scientific, mundane stuff, like caregivers, physical therapy, deciding when to go on disability, being there for the storm, sure to come, that is, clinical care.

There is a role for the great diagnostician, for the doctor who is truly gifted beyond the rest of us, and who truly is needed to diagnose what others can’t, or provide treatment advice that is beyond the capabilities of the rest of us. I can easily see these few experts as being too busy to provide ongoing care, other than, perhaps, to get someone out of a crisis. I shudder to think that any of these would consider themselves too important to “fritter” away their time in ongoing clinical care. I am of the belief that the TV character, Dr. House, does not exist in real life.

I think of “I don’t do maintenance” as establishing a comparison akin to comparing Grease Monkey to the guys on the National Public Radio show, “Car Talk.” The Grease Monkey workers change the oil and the other various liquids in the engine, but don’t actually repair it. The average garage does repairs as well as the maintenance, such as oil and filter changes. When an engine malfunction is truly esoteric (or you feel you’re being rooked by your regular mechanic) you can call up “Click and Clack,” of *Car Talk* and get two super-expert, and entertaining opinions. I suspect that all doctors may have some resentment about being thought of as “Grease Monkey” doctors.

I think it is also a way of putting the patient in his place. The doctor is too busy to waste his time on cases like yours.

I wrote a column a few years ago about what patients want in a doctor. We all know about the three A’s, “availability, affability and ability,” and I had noted that



a fourth “A,” autonomy, as also important, but one study in Parkinson’s disease uncovered something even more important, a compact to be there when things go awry. Luckily I’ve not been afflicted with a progressive, incurable disorder like PD so I’ve never really been in the shoes of my patients, but I’ve certainly seen a lot of it, and this observation, the need for an emotional, unbreakable contract strikes me as correct. There is room for “I don’t do maintenance” kinds of doctors, and they serve a useful role. They are easier to grade than the rest of us since they find diagnoses when the rest of us can’t, whereas we cannot rate whether one doctor is a better support or more compassionate than another, but we need to be clear that “maintenance” is as important as diagnosis, more so, in fact, for diseases that are untreatable.

— JOSEPH H. FRIEDMAN, MD

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Two Stealth Triumphs in Global Health

AN OBSERVER—SITTING PERHAPS ON THE MOON TO ENSURE HIS objectivity—looks down upon the earth, closely watching its many happenings, good and bad. His sole responsibility is to write an objective history of the most recent half-century, the years between 1962 and 2012, specifying the most wonderful of events touching the lives of humans. It is a formidable task considering the numberless events both trivial and substantial. And what criterion does this critical observer adopt for an event to be ‘substantial’? He declares that anything that has materially enriched the lives and welfare of many millions—will meet the criterion of substantiality.

After sober deliberation and earnest review, this lunar observer identifies two discrete events that he regards as supremely significant in the affairs of humanity, one taking place on May 5, 1978, and the other on October 14, 2010; indeed, these were assuredly monumental events despite the fact that few living humans celebrate or even are aware of the profound meaning of these two happenings.

The first event occurred in Merca, Somali, when Ali Maalin, a local cook, contracted smallpox. He recovered and thus represented the last known case of natural smallpox, an infectious disease that has probably killed more humans in recorded history than any other disease. Through the 18th Century, for example, smallpox regularly killed over 400,000 persons, largely children, per year. The final eradication of smallpox was proclaimed by the United Nations in 1979, a year later.

And the second event also represented a triumph of concerted, scientifically-based strategies designed to overcome an economically disastrous infection called rinderpest. There are few global events to provoke the United Nations to express great joy. But in October of 2010, the UN proclaimed the utter extinction of the disease called rinderpest.

What is rinderpest? It is a German term describing cattle-plague, an infectious disease of domesticated cloven-hoofed cattle. For herds of cattle, rinderpest is a mortal contagion, known and feared since antiquity: Over the centuries it has been the periodic cause of much distress, and the wretched prelude to famine throughout Asia and Africa; and it is likely that murrain, the fifth plague of Moses (Exodus: 9) afflicting the herds of pharaoh, was rinderpest.

Mongol armies were vast, nomadic cities, accompanied by many civilians and herds of cattle. The Mongol invasions of eastern Europe, by the 13th Century, extended as far west as Poland and Hungary. It is probable that the merciless onslaught led by Batu Khan in 1237 brought the cattle pestilence to the heart of Europe. Rinderpest then entered the Europe’s morbid history in the 13th Century, plaguing its cattle relentlessly until the late 20th Century.

Its cause was generally ascribed to ill-fortune or past human sin, but the writings of Bernadino Ramazzini (1633-1714), the renown professor of medicine in Padua, Italy, contended that it was not a form of divine retribution but rather a banal contagion much like other plagues.

The Papal States, at this time, occupied much of central Italy, and the Papal cattle were largely destroyed by rinderpest. Pope Clement XI (1649–1721) charged his personal physician, G. M. Lancini, with finding ways of aborting the pestilence. Lancini accepted Ramazzini’s etiological presumption and conveyed this to the Pope who then ordered stern quarantine measures throughout territories under Roman Catholic jurisdiction. His papal edicts imposed the death penalty on farmers not immediately sacrificing sick animals and then quarantining their entire herd.

These stern measures proved to be effective, and in Catholic nations such as Italy, Spain and France, rinderpest was effectively controlled. In the Protestant nations of northwestern Europe, particularly the German states, however, the cattle plague continued unhindered. Transnational debates then ensued, alternately blaming the disease-discrepancies on a papal curse or the failings of Lutheran teachings. Ramazzini and his methods to abate contagion (human or cattle) were largely forgotten.

What is currently known about rinderpest? It is caused by a virus closely related to the measles virus and vulnerable to an effective vaccine. The obstacles hindering total eradication of rinderpest were not a lack of prophylactic vaccines but the unsettling effects of civil wars in Asia and Africa and the helter-skelter migration of refugees—and their cattle. Through transnational, concerted efforts, rinderpest was made extinct by October 14, 2010.

And thus, to one observer, the global eradication of two deadly viral diseases was identified as the most significant event of the 1962–2012 interval. Certainly, their eradication represents the first time that a communicable disease was made extinct through collective human action. Humanity may now hope to hear no further reference to their names other than in Sunday crossword puzzles.

– STANLEY M. ARONSON, MD

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Imaging Issue: Part I

Kevin J. Chang, MD

WHEN ASKED TO ASSEMBLE A COLLECTION OF INTERESTING CASE reports showcasing the impact of medical imaging upon the diagnosis and treatment of a variety of medical conditions, I wanted to focus on some new and cutting edge applications of imaging as well as show a gamut of interesting cases that would be of interest to physicians from all walks of life. After soliciting submissions from those both inside and outside of our department, I was initially overwhelmed by the eagerness of those wishing to share their favorite cases as well as the sheer number of cases submitted for publication. Rather than brutally paring down the number of excellent cases to a number than can be printed in a single issue, the editors have graciously allowed us to bring most of these beautiful cases to you in the form of a special double issue of which this is the first. In this issue, we touch upon the use of high-field 3.0 T MRI as well as advanced applications of CT including CT colonography and coronary CT angiography, microwave ablation for oncologic intervention, the use of MR in pregnant and pediatric populations, stroke intervention, as well as the public health issue of bisphosphonate-related insufficiency fractures. A few of the other cases not included in this double issue will also be shared as future “Images in Medicine” in the year to come. It is my hope that a few of these interesting case reports will raise your awareness of some of the new and exciting applications and interventions that medical imaging has to offer.

Like many other medical subspecialties, the field of medical imaging has undergone significant changes over the past decade. The **picture archival and communications system (PACS)** has allowed for instantaneous access to images for not just Radiologists but any referring physician. Voice recognition reporting software has resulted in near instantaneous reporting and notification. As a significant majority of imaging is now performed purely in the digital space and transmitted over electronic networks rather than transported in film jackets, film and paper reporting has increasingly fallen by the wayside. With federal incentives now in place for an even stronger push towards the all-encompassing electronic medical record, PACS and **health and radiology information systems (HIS/RIS)** can serve as a pioneering model to guide hospitals around the country towards this greater goal of digitizing the remainder of the patient’s medical information.

With the speed and efficiency gains made by diagnostic imaging, it often seems as if obtaining an imaging exam results in a quicker result than ordering a simple lab test (and in many cases, this is likely true). However the rapidity of radiologic testing can be a double-edged sword. We should not let imaging preclude a proper cost-effective clinical workup. A clinical history and physical exam should always precede an imaging exam. CT should not be ordered before a serum amylase or lipase in the workup of acute pancreatitis or before a urinalysis in someone with flank pain and hematuria. A CT angiogram of the pulmonary arteries shouldn’t be used to diagnose pneumonia.

Likewise, the widespread availability of PACS and an instantaneous report turn-around-time should not preclude referring physicians from directly consulting with a radiologist face-to-face or phone-to-phone when needed in managing the care of their patients. Radiologists are here not only to interpret imaging studies, but to act as the “consultant’s consultant” in deciding if, when, and how best to use imaging to reach a diagnosis as well as help guide treatment. It is rare when direct consultation with a radiologist does not result in a more relevant radiology report and, ultimately, better management of a patient’s care.

Nowhere is this truer than when trying to weigh the risks and benefits of the use of ionizing radiation in medical imaging, especially as it relates to the use of CT, X-ray, fluoroscopy, and mammography. While high dose radiation exposure (on the scale of Hiroshima, Nagasaki, Chernobyl, and perhaps even Fukushima) is well known to be associated with adverse health effects including an increased long term risk of developing cancer, when it comes to the low levels of radiation associated with medical imaging, the exact risks to long term health remain difficult to quantify. According to the latest position statement of the Health Physics Society, “below 5-10 rem (50-100 mSv), risks of health effects are either too small to be observed or are nonexistent.”¹ It is likely the fear and resultant avoidance of undergoing medically-indicated imaging studies has on aggregate done more harm than the theoretical dangers associated with the low levels of radiation related to CT and X-ray. To put the radiation risk into perspective, a single typical CT scan exposes a patient to approximately the same amount of radiation encountered as background environmental exposure over the course of one year (5-10 mSv). The associated estimated lifetime risk of developing a fatal cancer from this scan is 0.05%. When compared to the overall lifetime risk of developing a fatal cancer from all causes of 22.8%, it is easy to see that the risk attributable to imaging radiation is infinitesimally incremental.² This risk is also very much dependent on patient age as a younger population is more sensitive to the long term effects of radiation than an older population. For the older screening population, this lifetime risk of a fatal cancer from a CT scan is below 0.02%.³ Thus, when an examination is medically indicated, the risk-benefit ratio is very much largely in the favor of a net benefit. Another way to think about the risk-benefit balance is to consider whether the risk of not performing the examination outweighs the theoretical risks associated with the exam.⁴

Regardless of the difficulty of accurately quantifying radiation risks associated with medical imaging, many appropriate steps have already been taken to further decrease the amount of radiation associated with CT in keeping with the radiation biology principle of maintaining ionizing radiation **ALARA (as low as reasonably achievable)**. A myriad of technological advances in the last few years have included automatic dose modulation, iterative CT reconstruction techniques, bismuth body shielding, prospective ECG-gating, decreased kVp, and improved fluoroscopy techniques (including pulsed fluoroscopy). Other practical

changes have included a reduction in the number of scan phases for multiphase contrast studies, tailoring of CT protocols for sensitive patients (such as children and pregnant or reproductive-age women) and for specific indications (renal stone protocol, screening CT colonography, etc.), as well as consideration of alternative nonionizing imaging techniques such as ultrasound and MRI. At our own hospitals alone, application of many of these strategies have resulted in a roughly 50-80% reduction in radiation dose over the past five years depending on the scanner and type of examination performed. In addition to advances in imaging technique, an evolving electronic health record has also seen incorporation of cumulative data on the number and types of radiological studies performed over the course of a patient's medical history to allow referrers to better weigh the cumulative risks of multiple scans against the benefits.

In the end, it is the ordering physician who can best balance the cost, benefits, and risks of obtaining an imaging study or procedure. The diagnostic imaging community is always ready and willing to be consulted regarding how best to gauge these risks and benefits, whether there are better or lower-risk imaging options, as well as how to best perform these tests to answer the question at hand. While imagers would be the first to admit that over-imaging is a major concern in this climate of rising health care costs, let us not lose sight of the fact that medical imaging has vastly revolutionized the way medicine has been practiced over the last century. The benefits of an indicated study and its contribution to modern medical care cannot be overstated.

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Tracheobronchomalacia

Nicholas G. Kujala, MD, and Terrance T. Healey, MD

A 79 YEAR OLD FEMALE SMOKER WITH A past medical history of hypertension presented with gradually worsening shortness of breath, fever, and productive cough. Preliminary chest radiographs showed interstitial abnormalities in the periphery of the lungs, and further evaluation with a high-resolution chest CT was pursued during inspiratory (Figure 1) and expiratory phases (Figure 2). Peripheral subpleural honeycombing was consistent with fibrotic changes related to **usual interstitial pneumonia (UIP)**. On expiratory phase images, there was dramatic near-complete collapse of the trachea lumen, which was crescent-shaped and significantly narrowed. This appearance is diagnostic of tracheomalacia, which was an unsuspected, but contributory finding of shortness of breath for this patient.

The trachea is a vital dynamic airway structure that serves as a conduit from the upper aerodigestive tract to the lungs. It terminates at the carina as it branches into mainstem bronchi, which further divide into bronchioles and eventually alveoli as the airways move further into the lung parenchyma. Approximately 16-22 cartilaginous C-shaped rings, with a posterior membranous muscular wall make up the majority of the trachea. In transverse cross-section, the patent extrathoracic trachea assumes a circular or horseshoe-shaped morphology depending on the respiratory phase. Intrathoracic cross-sectional morphology is variable, but pathologic alteration can be a sign of intrinsic airway or lung disease.¹

Tracheobronchomalacia (TBM) (malakia, Greek for “softness”) is a disease process resulting in structural weakness and excessive collapsibility of the trachea and bronchi. There are many causes of TBM, the most common predisposing factors associated with its development are COPD, asthma, previous prolonged intubation, trauma, respiratory infections, or extrinsic airway compression. The clinical presentation is variable, ranging from coughing, wheezing, shortness of breath, or hemoptysis. It is not uncommon for TBM to be discovered incidentally on CT examinations where

pneumonia or pulmonary embolism was suspected. TBM is diagnosed when the airway lumen is less than 70% of its expected cross-sectional area. This is generally identified on CT examination with airway collapse in an end-expiratory or forced-expiratory phase or if the patient is coughing. The anteroposterior diameter

will be less than the transverse diameter on an axial image (see Figure 2). The previous gold-standard test for diagnosis was cine fluoroscopy of the airway or direct visualization with bronchoscopy. Dynamic CT imaging has proven to be efficacious in identifying TBM if patients are able to cooperate with inspiratory and

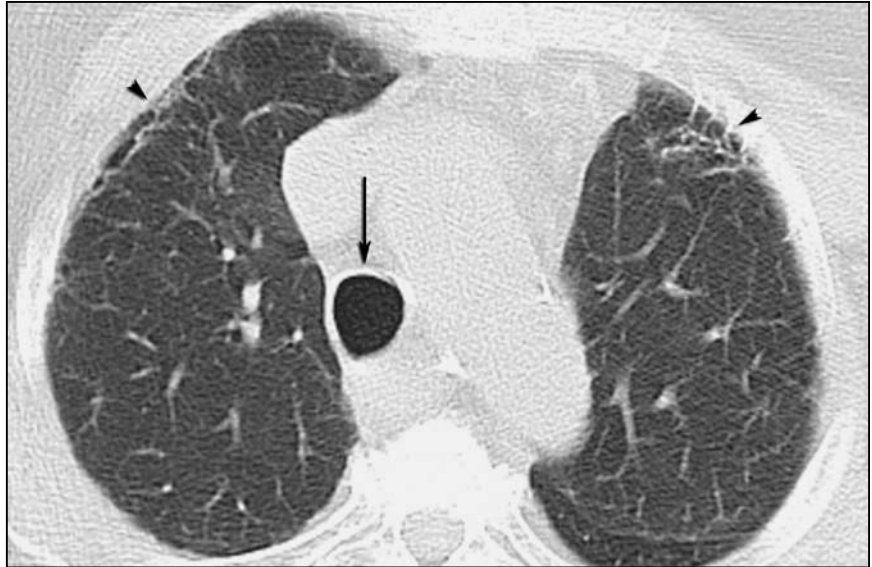


Figure 1. An axial CT image at the level of the aortic arch was obtained during the inspiratory phase. The trachea is widely patent (black arrow). Note peripheral subpleural fibrotic changes (black arrowheads).

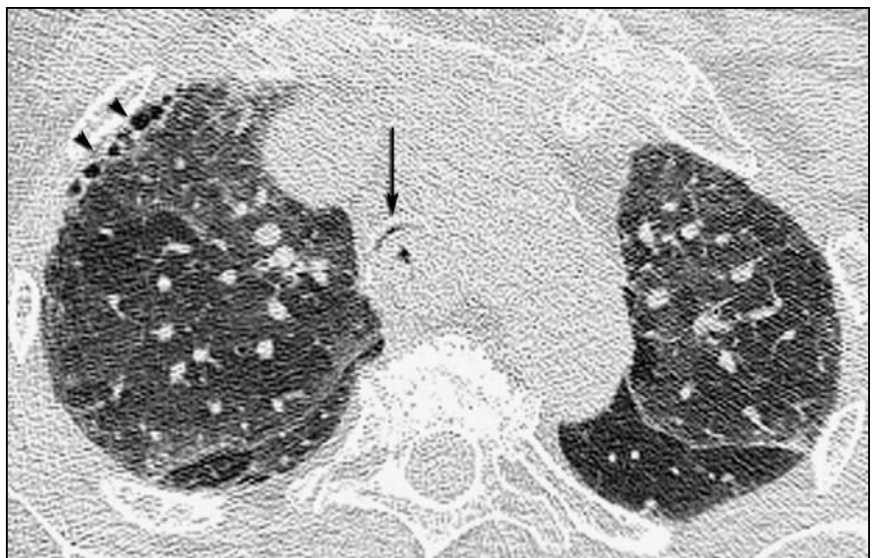


Figure 2. An axial CT slice at the same level was obtained during expiration. There is dramatic near-complete collapse of the trachea lumen, which is now crescent-shaped and significantly narrowed (black arrow). This appearance is diagnostic of tracheomalacia. This patient was also diagnosed with usual interstitial pneumonia (UIP). Note peripheral subpleural honeycombing in the right upper lobe (black arrowheads) and bilateral air-trapping (alveolar areas of decreased attenuation).

forced expiratory examinations (sensitivity >90%).² A study is currently underway at our institution using three additional low-dose CT images through the airway to determine the prevalence of TBM in a patient population clinically suspected of having a pulmonary embolism, as TBM remains an under-diagnosed condition in patients presenting to the emergency department with shortness of breath.

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MRI of Acute Appendicitis in the Pregnant Patient

Lucy B. Spalluto, MD, and David J. Grand, MD

A 34 YEAR OLD PREGNANT PATIENT PRESENTED to the emergency department with a one day history of right-sided abdominal pain, nausea, and vomiting. The patient reported a recent positive urine pregnancy test. At the time of presentation, the patient was afebrile, with heart rate of 90 bpm, and blood pressure of 122/74 mmHg. Physical examination revealed right lower quadrant tenderness superior to the expected location of McBurney's point. Laboratory analysis demonstrated a white blood cell count of $16.8 \times 10^3/\mu\text{L}$ (84% neutrophils), hemoglobin of 12.9 g/dL, and a platelet count of $282 \times 10^3/\mu\text{L}$.

Right upper quadrant and pelvic **ultrasound (US)** were performed. The right upper quadrant US was normal. Pelvic US demonstrated a six-week four-day live intra-uterine gestation. The appendix could not be visualized. Subsequently, a **magnetic resonance imaging (MRI)** study of the abdomen and pelvis was performed demonstrating a tubular, fluid filled structure (the appendix) arising from the posterior aspect of the base of the cecum (Figure 1, left). The retrocecal appendix measured up to eight mm in diameter. Fluid signal was also identified within the periappendiceal soft tissues (Figure 1, right).

Emergent laparoscopic appendectomy was performed. Pathology revealed acute appendicitis with mucosal ulceration, transmural inflammation and periappendicitis.

DISCUSSION

The evaluation of abdominal pain in the pregnant population is challenging due to confounding factors present in normal pregnancy including displacement of normal pelvic structures from their usual location, nonspecific nausea and vomiting, difficult abdominal exam, and physiologic leukocytosis.^{1,2} Given that appendicitis is the most common

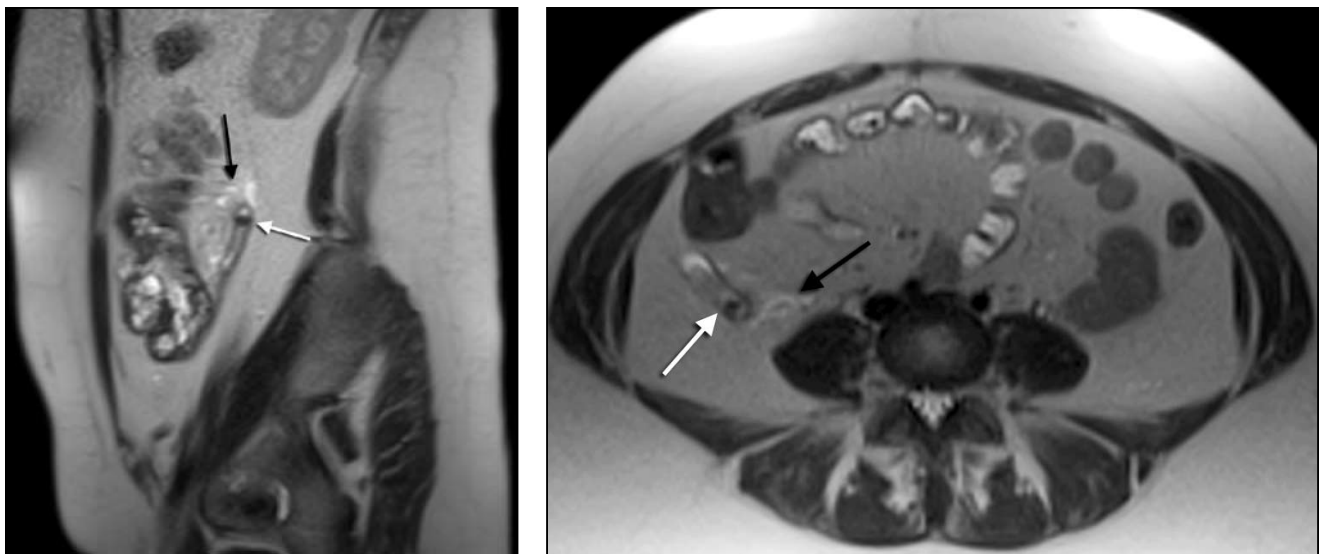


Figure 1. Acute appendicitis in a 34 year old pregnant patient with a six-week four-day gestation. Sagittal T2-weighted single shot fast spin echo (SSFSE) [left] and axial T2-weighted SSFSE [right] MR images demonstrate the retrocecal, dilated fluid filled appendix containing an appendicolith (white arrow) and peri-appendiceal inflammation (black arrow).

non-obstetric surgical emergency in pregnant patients, it is a critical diagnosis to exclude.³

MRI has a reported sensitivity of 100% and specificity of 93.6% for diagnosing acute appendicitis in the pregnant patient, without exposure to ionizing radiation.⁴ Described MR imaging features of acute appendicitis include an appendiceal diameter greater than 7 mm, an appendiceal wall thickness > 2mm, increased T2 signal representing fluid within the lumen of the appendix, and periappendiceal soft tissue inflammation.⁴ The retrocecal location of the appendix likely accounts for the somewhat atypical location of the right-sided abdominal pain in this patient.

Finally, MRI not only confidently diagnoses or excludes appendicitis, but can simultaneously evaluate other com-

mon, potential causes of abdominal pain in pregnant patients such as gallstones, choledocholithiasis and nephrolithiasis. At our institution, MRI is currently available at all times to diagnose or exclude the presence of appendicitis in pregnant patients during any trimester without the need for IV contrast.

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Pediatric Omental Infarction

Matthew F. Sandusky, MD, and Thaddeus W. Herliczek, MD

AN 11 YEAR OLD MALE PRESENTED TO THE pediatric emergency department with acute onset abdominal pain worsening over 24 hours. He denied trauma, nausea, vomiting, or diarrhea. He had no significant medical history, including no prior surgeries, medications or hospitalizations.

Upon arrival to the pediatric emergency department, he was noted to be awake, alert and uncomfortable. His initial vital signs were: temperature 38.3°C, blood pressure 115/69 mm Hg, pulse 113 beats per minute, respiratory rate 20

per minute and oxygen saturation 100% while breathing room air. His weight, height and **Body Mass Index (BMI)** were 52 kg (115 lbs), 142 cm (56 inches) and 25.8, respectively. Physical examination revealed tenderness to palpation in the right lower quadrant without rebound, guarding, masses or peritoneal signs. Laboratory analyses demonstrated a white blood cell count of 15.9×10^3 per microliter, hemoglobin of 13.6 grams per deciliter, and platelet count of 317×10^3 per microliter. Lipase and liver function tests were normal. **Sonography (US)** of

the abdomen, pelvis and appendix was performed given clinical concern for acute appendicitis. The abdominal and pelvic US were normal and the appendix US was inconclusive.

Given persistent pain, leukocytosis, and continued clinical concern for acute appendicitis, pediatric appendix **Magnetic Resonance Imaging (MRI)** without contrast was performed in accordance with the imaging algorithm for suspected appendicitis at Hasbro Children's Hospital. The MRI demonstrated the patient's normal appendix, without dilation, mural

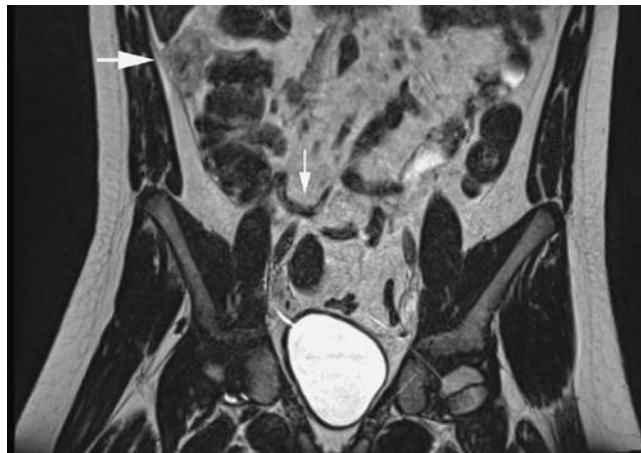


Figure 1. Coronal 3D T2-weighted TSE SPACE sequence from MRI. Omental infarct with adjacent inflammation (large arrow). Normal appendix (small arrow).

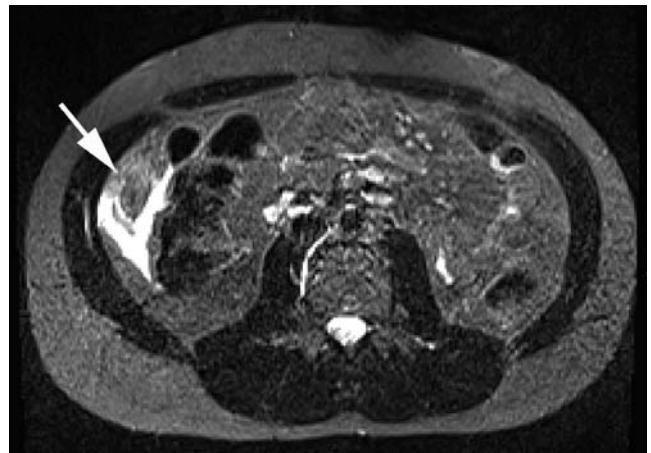


Figure 2. Axial STIR image from MRI. Omental infarct with surrounding inflammation and fluid (arrow).

thickening, intraluminal fluid, appendicolith or periappendiceal edema (Figure 1). The MRI demonstrated a focal region of heterogeneous fat with surrounding inflammation and fluid in the right side of the abdomen between the ascending colon and the abdominal wall (Figure 2). The adjacent right kidney, colon and small intestine were normal. The findings on MRI represent omental infarction.

The patient underwent conservative management with overnight hospital admission to the pediatric surgery service for pain control and observation. On the subsequent morning, the patient was tolerating a normal diet, ambulating, and had adequate pain control for discharge.

Omental infarction is a rare cause of pediatric right lower quadrant pain.¹⁻³ Children with omental infarction often present with acute pain localized to the right side of the abdomen.¹ It is typically a benign, self-limited condition, although it may heal with fibrosis and adhesions

leading to subsequent small bowel obstruction.¹ While the precise etiology is uncertain, omental torsion and venous thrombosis are potential causes.⁴ Obesity is a reported risk factor in the pediatric population.⁵ Therapy is typically conservative pain management, but controversy exists regarding the need for surgical resection given the potential for fibrosis and adhesions.⁵ While US may detect omental infarction, it is relatively insensitive.⁶ While **computed tomography (CT)** is sensitive for omental infarction and its appearance on CT is well known,²⁻⁴ MRI can exclude the presumptive clinical diagnosis of acute appendicitis and demonstrate omental infarction as well without the theoretical risks of radiation. Given the diagnostic capabilities of MRI and its lack of ionizing radiation, the utilization of MRI in pediatric patients with suspected appendicitis and inconclusive appendix US is likely to increase.

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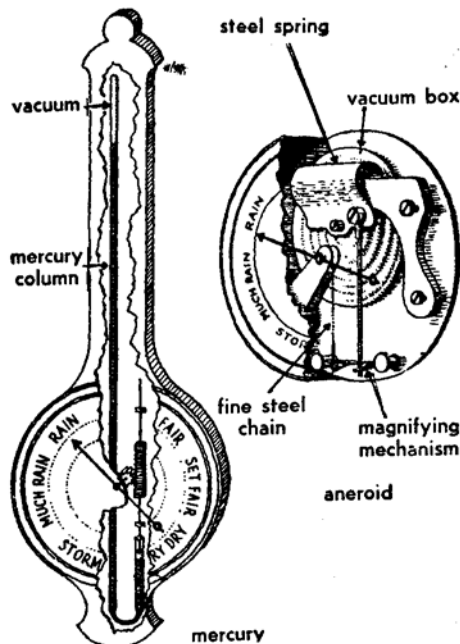
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Glioblastoma Multiforme: Utilization of Advanced MRI Techniques for Preoperative Planning

Deepak Raghavan, MD, Jerrold Boxerman, MD, Jeffrey Rogg, MD, and Rees Cosgrove, MD

A 45 YEAR-OLD RIGHT-HANDED FEMALE presented with five episodes of right upper extremity numbness beginning in the fingers and hands and progressing to involve the face, with facial twitching, over a period of five days. Each episode lasted no longer than two minutes and then resolved. She was completely aware throughout each event and was able to verbalize and comprehend language perfectly. On physical exam, language comprehension and expression were normal, with normal muscle bulk, power and tone bilaterally.

MRI examination demonstrated a well-circumscribed 18 x 16 x 18 mm enhancing lesion in the left posterior frontal lobe (Figure 1a) with moderate surrounding FLAIR and T2-weighted hyperintensity (Figure 1b). Perfusion weighted imaging demonstrates substantially elevated relative cerebral blood volume within the lesion, greater than six times that of the normal contralateral white matter (Figure 2). Functional MRI demonstrated that motor activation corresponding to finger tapping and tongue motion was located adjacent to the superomedial (Figure 3a) and anterolateral (Figure 3b) aspects of the lesion, respectively. Diffusion tensor imaging was also performed, with maps of fractional anisotropy demonstrating mass effect on and partial effacement of the left superior longitudinal fasciculus (Figure 4).

The patient underwent open surgical resection of the lesion. The histological diagnosis was glioblastoma multiforme, concordant with the imaging findings.

The patient was started on antiepileptic medication (Keppra) to control her presenting symptoms. She underwent radiation with concomitant temozolomide and steroid therapy.

DISCUSSION

Recent innovations in MRI have revolutionized the pre-operative imaging workup of brain neoplasms. In addition to the structural information provided

by conventional MR imaging, **perfusion weighted imaging (PWI)**, **functional MRI (fMRI)**, and **diffusion tensor imaging (DTI)** convey information about tumor grade, and the spatial relationship of tumor to eloquent cortex and major white matter tracts, respectively.

PWI utilizes transient microscopic magnetic field perturbations induced by a bolus injection of exogenous paramagnetic contrast material to measure cerebral perfusion using modified tracer kinetic principles.^{3,5} Rapid MRI acquisition permits estimation of contrast concentration-time curves, and computation of hemodynamic parameters including **relative cerebral blood volume (rCBV)** which has been shown to correlate significantly with histologic tumor grade.^{3,5} The lesion in our study had an extremely high rCBV, which is concordant with the histopathological diagnosis of glioblastoma multiforme.

fMRI is based on the known coupling between brain function and cerebral perfusion: neural activity results in localized increased blood flow and a consequent reduction in deoxyhemoglobin, increasing the MR signal to a small but significant degree.¹ By imaging the patient's brain during the active and resting phases of different tasks (e.g., visual stimulation, finger tapping, or various language processing tasks) and applying the appropriate statistical analyses, functional maps can be created.¹ With respect to neurosurgical planning, specific function of brain parenchyma surrounding the neoplasm can be elucidated, and resection of eloquent cortex responsible for language or motor control can be minimized or avoided.⁴ In our study, cortex adjacent to the tumor was seen to be responsible for hand as well as tongue movement, which may offer an explanation as to why the patient initially presented with facial twitching.

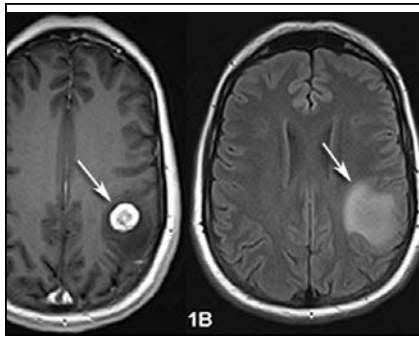
DTI uses spatially oriented magnetic field gradients to interrogate proton movement in brain tissue. Without any structural barriers, water diffusion is anisotropic.^{2,6}

Organized white matter fibers with directionality provide preferential paths for proton Brownian motion along fiber tracts, with restricted movement orthogonal to the tracts, leading to anisotropic diffusion and discernable tract anatomy on colorized maps of fractional anisotropy within each imaging voxel.^{2,6} Such information can be useful to the neurosurgeon who can plan an approach to the tumor that minimizes compromise of major white matter tracts.^{2,7} Additionally, this technology can play a diagnostic role in differentiating gliomas (infiltration and disruption of white matter tracts) from metastatic disease (displacement of white matter tracts).²

MRI has traditionally been the study of choice for evaluating tumor morphology for neurosurgical planning. Advanced MRI techniques are now being used to assess functional properties of the tumor, as well as relationship of the tumor to eloquent cortex and major white matter tracts, resulting in reduced post-operative morbidity.

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Figures 1a and 1b.



Figures 3a and 3b.

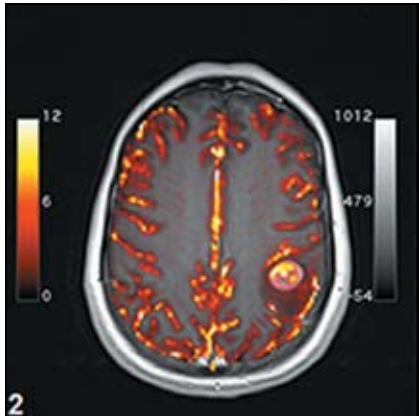


Figure 2.

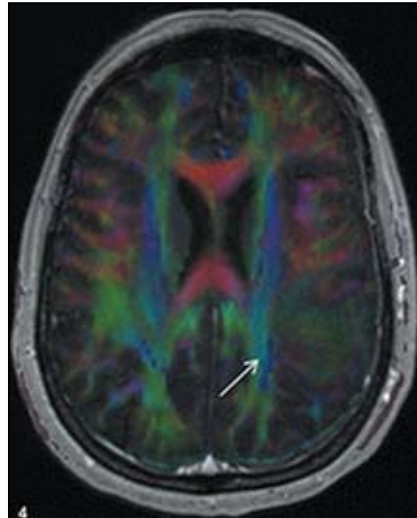


Figure 4.

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Focal Nodular Hyperplasia on MRI Using a Hepatocyte-Specific Contrast Agent at 1.5 Tesla vs. 3.0 Tesla Field Strength

Kevin J. Chang, MD

A TWENTY-NINE YEAR-OLD FEMALE WITH AN implantable contraceptive presented with right upper quadrant and right pleuritic chest pain. A right upper quadrant ultrasound showed no evidence for cholelithiasis or acute cholecystitis but showed a nine cm hypoechoic central liver mass (Figure 1). A CT pulmonary angiogram was then performed to evaluate her chest pain and demonstrated a pulmonary embolism. Images through the upper abdomen also confirmed the nine cm hypervascular central liver mass straddling the right dome and medial left lobes of the liver (Figure 2). Differential considerations at this point for a hypervascular liver mass included a cavernous

hemangioma, focal nodular hyperplasia, hepatic adenoma, or, less likely given the patient's age, a malignancy such as a hypervascular metastasis or hepatocellular carcinoma. A liver MRI using a hepatocyte-specific contrast agent, gadoxetate disodium (Eovist; Bayer Healthcare Pharmaceuticals), was then performed for definitive characterization. This scan performed at a 1.5 Tesla (1.5 T) magnetic field strength showed a background of diffuse

hepatic steatosis and redemonstrated a T1 isointense and mildly T2 hyperintense

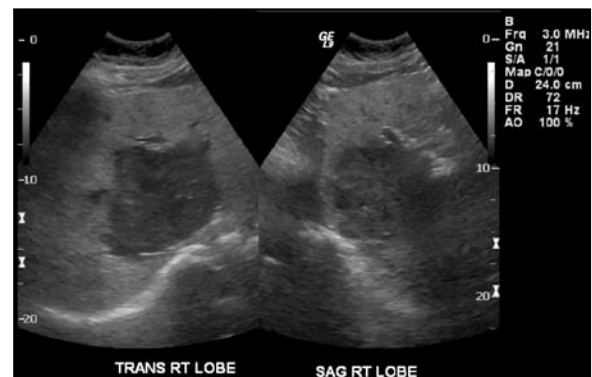


Figure 1. Transverse and sagittal ultrasound images through the right lobe of the liver demonstrates a solid hypoechoic central liver mass.

liver mass in the central liver (Figures 3a, 3b, 4, 5a, and 5e). Following contrast administration, the mass showed avid diffuse arterial phase enhancement which gradually washed out to become mildly hyperintense to background liver parenchyma.

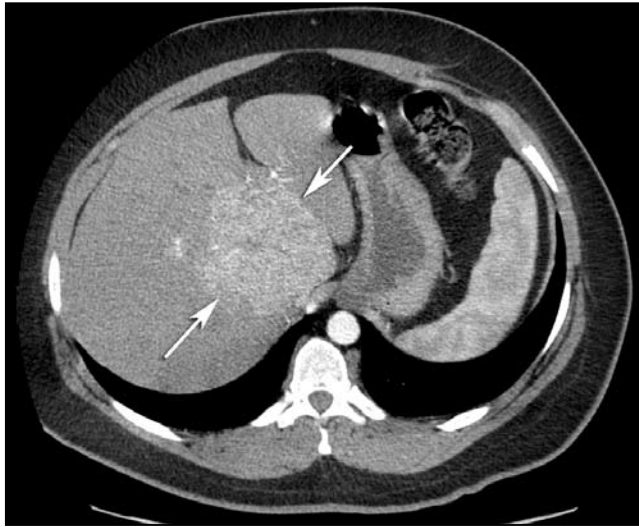
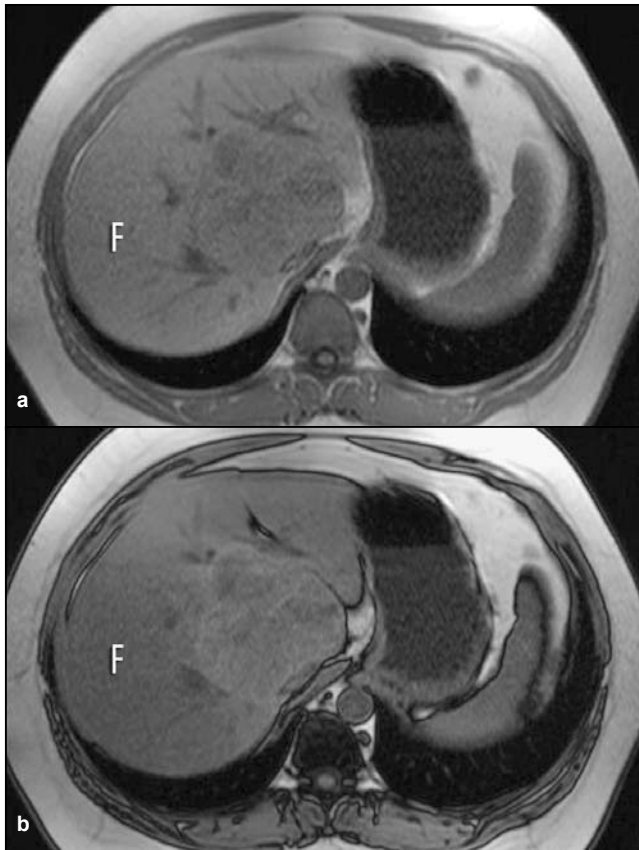


Figure 2. Axial CT image through the upper abdomen included during a CT angiogram of the pulmonary arteries shows a diffusely enhancing liver mass in the central liver (between white arrows).



Figures 3a and 3b. T1 weighted gradient echo in-phase (a) and out-of-phase (b) imaging of the liver at 1.5 T shows diffuse decrease in signal intensity in the background liver parenchyma (F) consistent with hepatic steatosis. The focal liver mass remains mildly T1 hypointense to fatty liver on in-phase imaging but hyperintense to fatty liver on out-of-phase imaging.

Background liver parenchyma likely remained hypointense to the mass on equilibrium phase images due to the underlying hepatic steatosis. 20 minute delayed hepatocyte phase imaging showed retention of contrast in the liver mass, a finding highly specific for a tumor of hepatocyte origin, particularly **focal nodular hyperplasia (FNH)** (Figures 5b-d). A repeat gadoxetate-enhanced liver MRI performed one year later on a newer 3.0 Tesla MRI unit confirmed stability of the FNH as well as demonstrates the higher sensitivity for contrast enhancement and improved signal inherent with imaging at a higher magnetic field strength (Figures 5e-h).

Focal nodular hyperplasia is a benign nonneoplastic liver tumor resulting from a hyperplastic response to a vascular anomaly, typically of developmental origin. FNH is the second most common solid tumor of the liver behind hepatic hemangiomas representing eight percent of all primary hepatic tumors. While oral contraceptives have not been implicated in the pathogenesis of FNH, they may play a trophic role in their growth and development of complications such as hemorrhage or necrosis. However, the vast majority of patients present asymptotically with FNH as an incidental finding and show a clinically silent course. Recognition of the imaging appearance of FNH is crucial to avoid unnecessary biopsy or surgery. No further evaluation or follow-up is necessary, however biopsy or follow-up may be justified when the diagnosis remains equivocal and the patient is acutely symptomatic.

Characterization of many solid liver masses remains limited by ultrasound and single-phase contrast enhanced CT. MRI remains the best imaging modality for the detection, delineation, and characterization of focal liver masses. Hepatocyte specific contrast agents such as mangafodipir trisodium (Teslascan, GE Healthcare, removed from the US market), gadobenate dimeglumine (MultiHance, Bracco), and gadoxetate disodium, are the most useful contrast agents to confirm tumors of hepatocyte origin, particular FNHs. Of these three, gadoxetate disodium is the only combined extracellular and hepatocyte-specific contrast agent to show 50% hepatobiliary uptake and excretion in a time-efficient manner allowing both dynamic phase imaging in the arterial and portal venous phases as well as hepatocyte phase imaging within ten to 20 minutes of contrast injection (and, hence, within the timespan of a single imaging session). FNH shows characteristic homogeneous arterial phase enhancement which

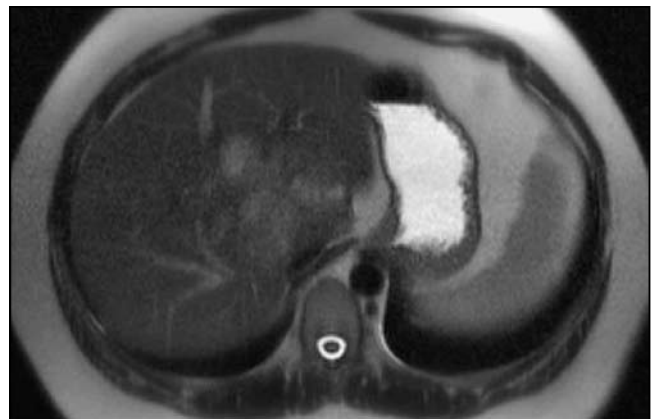


Figure 4. Single-shot T2 weighted image of the liver shows the central liver mass to have mild T2 signal hyperintensity.

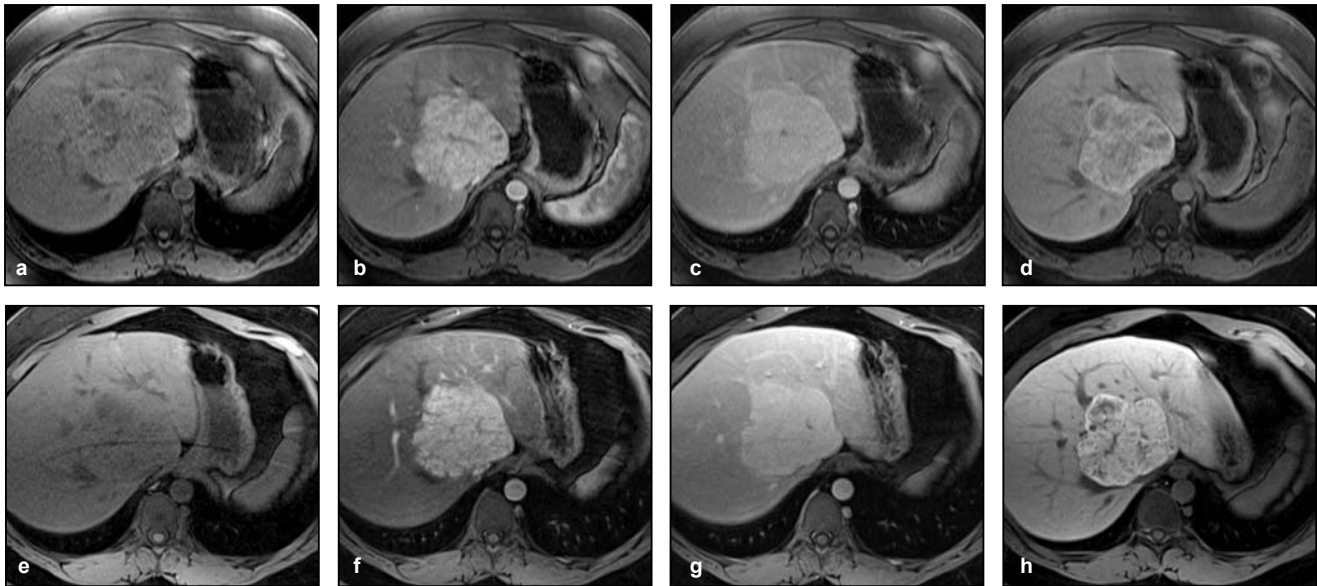


Figure 5a – 5h. T1 gradient-echo fat-saturated dynamic multi-phase gadoxetate disodium enhanced MRI of the liver mass. a. Precontrast at 1.5 T. b. Arterial phase at 1.5 T. c. Portal venous phase at 1.5 T. d. Delayed hepatocyte phase at 1.5 T. e. Precontrast at 3.0 T. f. Arterial phase at 3.0 T. g. Portal venous phase at 3.0 T. h. Delayed hepatocyte phase at 3.0 T. The mass shows avid diffuse arterial phase enhancement (b & f) which gradually washes out to become mildly hyperintense to background liver parenchyma (c & g). Background liver parenchyma likely remains hypointense to the mass on equilibrium phase images due to underlying hepatic steatosis. 20 minute delayed hepatocyte phase images show retention of contrast in the liver mass, a finding highly specific for a tumor of hepatocyte origin, particularly FNH (d & h). Note the improved signal, contrast, and spatial resolution at 3.0 T (e-h) compared to 1.5 T (a-d).

washes out to become more isoenhancing to background liver parenchyma on portal venous and equilibrium phase images. On delayed hepatocyte phase images, FNH retains contrast due to the presence of hepatocytes that are typically not present in other types of tumors (except for the rare exception of well-differentiated hepatocellular carcinomas which would generally have a different appearance on other T1 and T2 weighted pulse sequences).^{1,2}

In regards to MR imaging at higher field strengths, an increase in field strength is accompanied by an increase in signal to noise ratio resulting in higher quality images with the possibility of higher spatial resolution, higher temporal resolution, or a combination of the two. When comparing abdominal imaging at 3.0 T to 1.5 T, imaging at 3.0 T shows significantly higher sensitivity to Gadolinium enhancement with an improved contrast to noise ratio compared to 1.5 T. Higher spatial resolution can also be expected.³ This is evident in the current case when Figure 5d is compared to Figure 5h.

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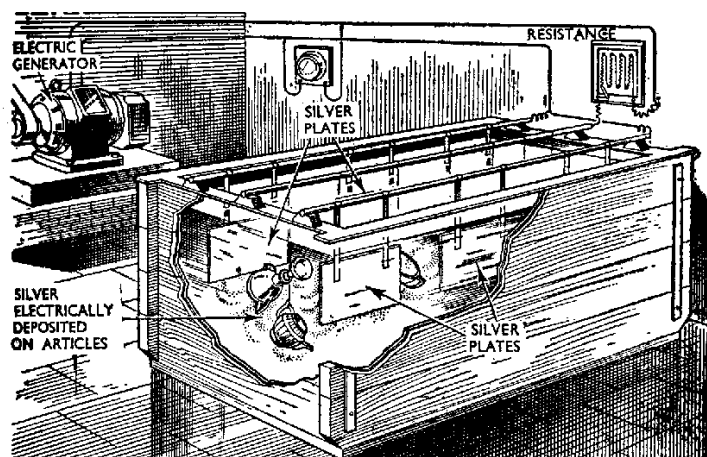
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Cardiac CT Angiography of an Anomalous Intramuscular Left Main Coronary Artery

Michael K. Atalay, MD, PhD, Philip Stockwell, MD, and Lloyd Feit, MD

A 13 YEAR-OLD GIRL WITH TALL STATURE AND increased flexibility underwent evaluation for Marfan's Syndrome. Echocardiography showed no evidence of Marfan's-related cardiac pathology, but incidentally demonstrated that the **left main coronary artery (LMCA)** arose anomalously from the right sinus of Valsalva and apparently passed between the aortic root and the main pulmonary artery. This course is considered 'malignant' because of an association with myocardial ischemia and **sudden cardiac death (SCD)**.^{1,2} Cardiac catheterization was subsequently performed. Based on the morphology of the vessel and its early rapid downward descent—presumably into the interventricular septum—the anomaly was felt at angiography to actually represent a more benign variant. Initial restrictions on the patient's activities were lifted.

More recently, the now 21 year-old-woman was referred for cardiac

CT angiography (CCTA) for definitive clarification of the three-dimension spatial relationships of the great vessels, coronary arteries, and myocardium (Figure 1). The LMCA is four cm long, arises from the right sinus of Valsalva, and clearly courses through myocardium (crista supraventricularis) on its way to the anterior interventricular groove where it gives rise to a small **left anterior descending coronary artery (LAD)**, the circumflex CA, and two ramus intermedius branches.

DISCUSSION

The prevalence of congenital coronary artery anomalies is estimated at one to two percent.³ Most anomalies are considered benign and require no intervention. However, if the anomalous vessel passes between the ascending aorta and main pulmonary artery the patient is at increased risk for SCD or ischemia and surgical

reimplantation may be indicated. Several possible factors have been proposed to explain these risks, including compression by the great vessels, a slit-like, hypoplastic orifice of the anomalous vessel (which can be challenging to appreciate on selective coronary angiography), and acute angulation of the proximal vessel segment.⁴ We present a case of a young patient where at first glance the anomalous LMCA appears to take a malignant course but is subsequently shown—first at conventional angiography and then at CCTA—to have a more benign, intramuscular path.

Recent remarkable advances in computed tomography technology now permit highly detailed, stop-action imaging of the heart. With a spatial resolution of ~0.5 mm, CCTA now provides accurate, non-invasive imaging of the coronary arteries. Because CCTA acquires three-dimensional volumetric data, spatial relationships are readily depicted, and this modality has quickly become the gold standard for imaging known or suspected coronary artery anomalies.⁵ Moreover, owing to its remarkably high negative predictive value (~99%) for the detection of significant coronary artery disease, CCTA has rapidly emerged as a useful tool in the assessment of low to intermediate risk patients with chest pain or equivocal stress tests.⁶

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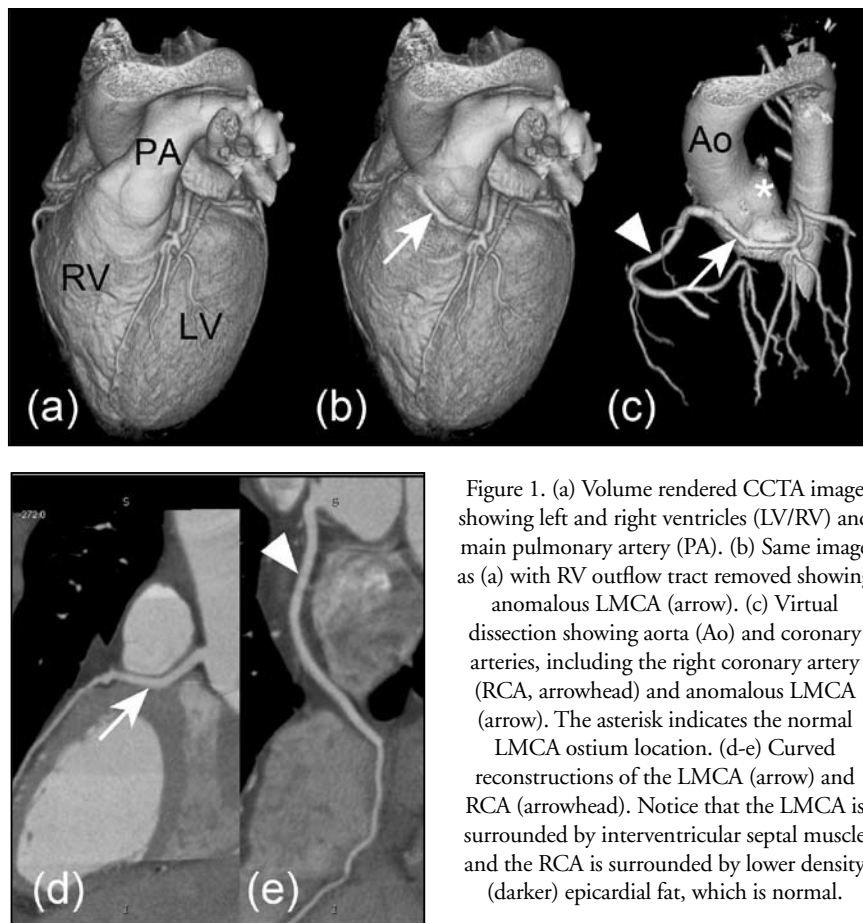


Figure 1. (a) Volume rendered CCTA image showing left and right ventricles (LV/RV) and main pulmonary artery (PA). (b) Same image as (a) with RV outflow tract removed showing anomalous LMCA (arrow). (c) Virtual dissection showing aorta (Ao) and coronary arteries, including the right coronary artery (RCA, arrowhead) and anomalous LMCA (arrow). The asterisk indicates the normal LMCA ostium location. (d-e) Curved reconstructions of the LMCA (arrow) and RCA (arrowhead). Notice that the LMCA is surrounded by interventricular septal muscle and the RCA is surrounded by lower density (darker) epicardial fat, which is normal.

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Ingested Foreign Body in the Sigmoid Colon: Detection and Localization by CT Colonography

Kevin J. Chang, MD, Steven Schechter, MD, Matthew Vrees, MD, and Sheldon Lidofsky, MD

A SEVENTY-SIX YEAR OLD FEMALE PRESENTED to her gastroenterologist for a workup of iron deficiency anemia, hematochezia, and newly diagnosed celiac disease. Other symptoms included fecal incontinence and anal discomfort thought to be related to hemorrhoids as well as mild bilateral lower abdominal pain. A colonoscopy revealed an endoluminal tubular foreign

body firmly embedded at either end in the colonic wall approximately 18 cm from the anal verge. At this point the risk of perforation with immediate colonoscopic foreign body retrieval was deemed to be high and removal was deferred until after a surgical consultation was obtained. CT colonography was ordered for preoperative evaluation prior to planning for

a combined endoscopic and laparoscopic approach to foreign body removal.

CT colonography (virtual colonoscopy) demonstrated a five cm long radiodense linear foreign body traversing the lumen of the distal sigmoid colon (Figures 1 and 2). The foreign body was calcific in density with the morphology of an ingested bone. Both ends of the foreign



Figure 1. Coronal Slab Maximum Intensity Projection (MIP) from a CT Colonography demonstrating a 5 cm curvilinear radiodense foreign body traversing the lumen of the distal sigmoid colon (white arrows). Both ends of this foreign body are deeply embedded in the focally thickened colonic wall. Inset image in the upper right corner shows the ingested bone in more detail.



Figure 2. 3D Endoluminal Volume Rendering from the CT Colonography showing the ingested bone lodged transversely within the lumen of the distal sigmoid colon (black arrow). There are also multiple adjacent diverticuli (white arrow points to an adjacent diverticulum).



Figure 3. Specimen photograph of the chicken bone after endoscopic removal (which required breaking it into two pieces).

body projected deep into the colonic wall and were associated with focal colonic wall thickening. As the ends of the bone did not project into the pericolonic fat, it was felt the foreign body had not yet perforated completely through the sigmoid wall. Colonic wall thickening may imply some chronicity and fibrosis. No adjacent abscess or evidence of perforation was present.

A combined endoscopic and laparoscopic approach was performed under general anesthesia in case the foreign body perforated the colon or could not be removed using an endoscopic approach. Laparoscopy confirmed the absence of any adjacent abscess or adhesions and aided in occluding the proximal sigmoid colon for colonoscopy. Colonoscopy confirmed a black tubular foreign body in the distal sigmoid colon with one end embedded within a diverticulum. Colonic wall fibrosis was present at both ends making removal of the foreign body difficult. An endoscopic snare was eventually used to dislodge and remove the foreign body after breaking it in two. Gross examination of the foreign body revealed it to likely represent an ingested chicken bone. Sterile saline was instilled into the peritoneal cavity and the distal colon was insufflated confirming no post-surgical leak.

The vast majority of ingested foreign bodies pass through the gastrointestinal tract without incident. About 10% may require endoscopic retrieval while less than 1% require surgery. Similarly, less than 1% result in perforation. Complications can also include bowel obstruction, severe hemorrhage, abscess, and sepsis.

Patients generally remain asymptomatic unless there is a complication. Metallic objects with the notable exception of aluminum, as well as most animal bones except fish bones are radiopaque on radiographs and CT. Sharp long objects are the most likely to perforate and the most common sites of perforation or obstruction include the gastroesophageal junction, duodenum, ileocecal valve or appendix, and the colonic flexures. Patient populations

predisposed to foreign body ingestions include children, the elderly, and the mentally handicapped.¹

If a sharp foreign object is swallowed and localized proximal to the ligament of Treitz, endoscopy is recommended for prompt removal. If the foreign body passes further into the small intestine, daily radiographs are recommended with surgical intervention considered if no progress is made after three days or the patient becomes acutely symptomatic.^{2,3} If the foreign body is localized to the colon, colonoscopic retrieval should be the procedure of choice. However, surgery remains an option in cases of failed endoscopic removal or in the setting of perforation or obstruction.⁴ While laparotomy had been the accepted surgical approach in the past, laparoscopy has more recently been accepted as an alternative with combined laparoscopic and endoscopic approaches described with success in the past.⁵

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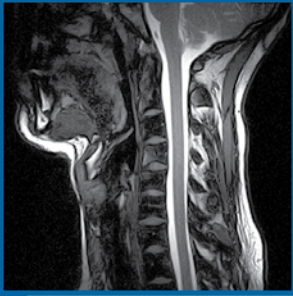


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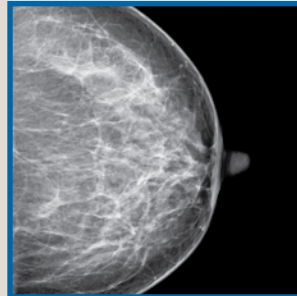
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Microwave Ablation for Lung Cancer

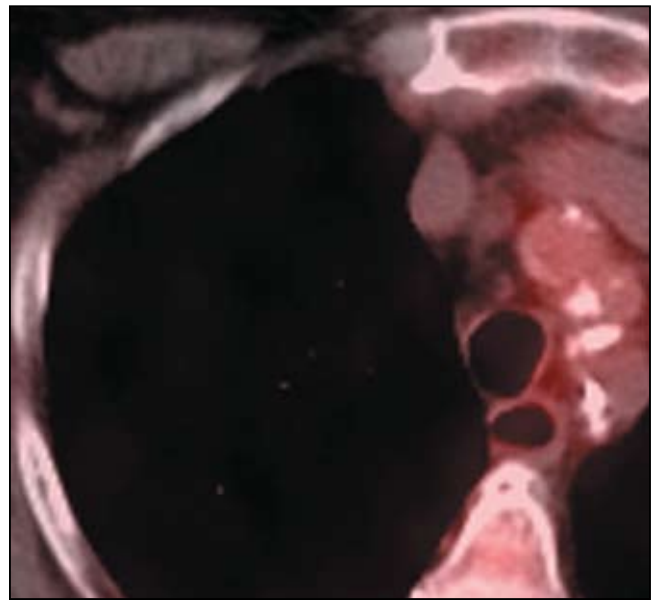
Terrance T. Healey, MD, and Damian E. Dupuy, MD

LUNG CANCER IS THE LEADING CAUSE OF CANCER-RELATED DEATH in the US surpassing the annual mortality rates from breast, colon and prostate cancer combined. This year 222,520 people will be diagnosed and 157,300 patients will die in the US from lung cancer.¹ Surgery remains the gold standard in treating patients with early stage lung cancer with five-year survival rates of 70%. However, due to medical co-morbidities, only about one third of patients diagnosed with early stage lung cancer are surgical candidates. Traditional therapy with external beam radiotherapy results in five-year survival ranging between zero and 42%. Therefore, alternative therapeutic options are being researched and used clinically in this patient population.

Thermal ablation using either radiofrequency or microwave energy can be performed with image guidance as an outpatient procedure. The underlying principle of thermal ablation is that coagulative necrosis and cell death occurs immediately at temperatures above 60 degrees Celsius. While **radiofrequency ablation (RFA)** creates heat using a high frequency alternating current (460-480kHz), **microwave ablation (MWA)** uses a much higher frequency (900-2450MHZ) creating frictional heat from rapidly oscillating water molecules.² Experimental data from a swine model demonstrated MWA to have larger and more circular ablation zone compared to RFA.³ Initial clinical data suggests MWA to be safe, effective and may offer better survival rates and



Figure 1. 1.3 cm right upper lobe adenocarcinoma.



Figures 3a (above) and 3b (below). Fused PET-CT and CT lung windows shows no evidence of local tumor progression three years following MWA. (a) Axial fused PET-CT. (b) Axial CT in lung windows.

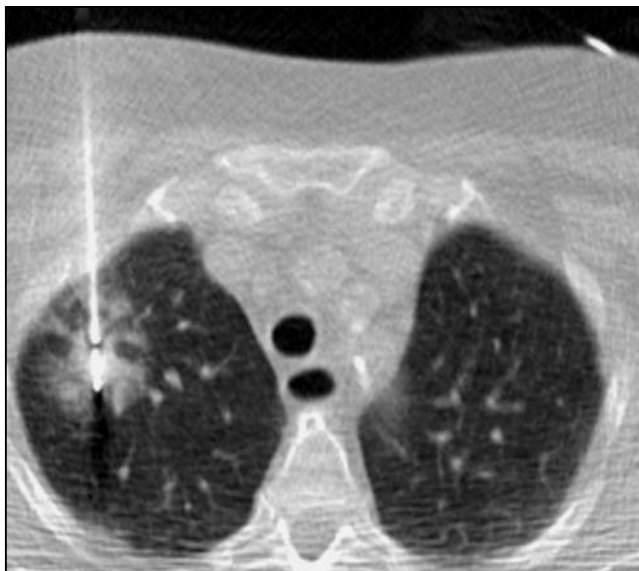


Figure 2. Microwave applicator within the tumor surrounded by ground glass opacity following a ten minute treatment.

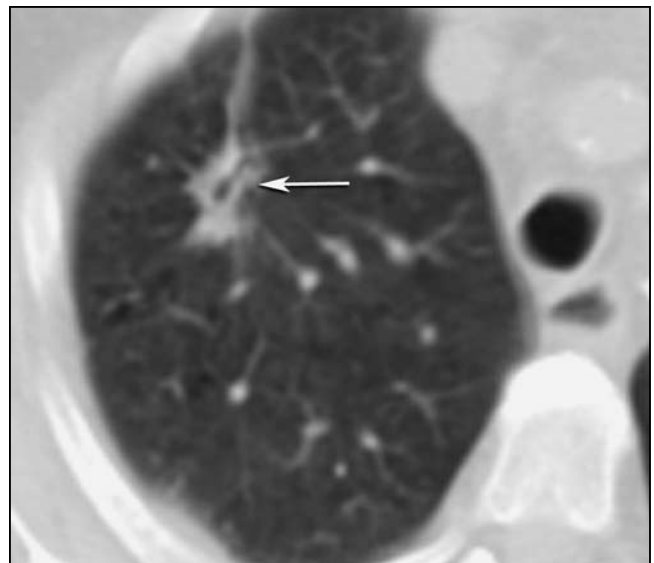




Figure 4. CT lung windows shows a stable ablation scar five years following MWA.

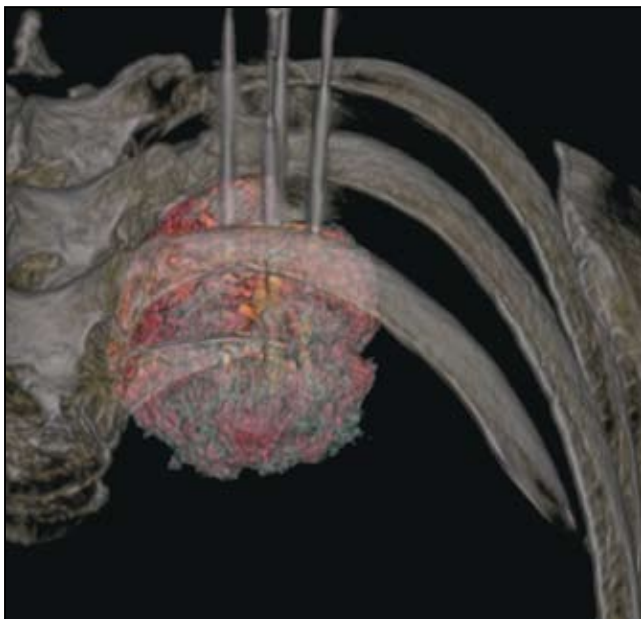


Figure 5. 3-D volume rendering from a different patient shows four applicators placed within a 7 cm adenocarcinoma.

local tumor control compared to RFA in non-surgical patients.⁴ We present one patient who was treated with MWA.

A 64 year-old female presented to her primary care physician complaining of a sore throat and a sense of “fullness.” On direct inspection a mass on the epiglottis was seen and biopsy confirmed squamous cell carcinoma of the epiglottis. The patient was treated with chemotherapy and radiation therapy for a T2N0M0 primary head and neck cancer. On subsequent CT follow-up a 1.3 x 1.3 x 1.2 cm nodule in the left upper lobe was discovered (Figure 1; white arrow). Biopsy confirmed the diagnosis of a primary bronchogenic adenocarcinoma T1N0M0. No distant metastatic lesions were discovered and the patient was declared a non-surgical candidate due to a cadre of coexisting

medical problems including COPD, diabetes, hypertension, and coronary artery disease with prior myocardial infarction. The patient was seen by the tumor ablation service at Rhode Island Hospital and after discussing the treatment options, risks and benefits, the patient chose to proceed with percutaneous thermal ablation. Using local anesthesia and conscious sedation, a single 14-gauge 3.7 cm active tip applicator was placed under direct CT-guidance and a ten minute treatment was performed. Peripheral ground glass opacity surrounding the tumor indicated an adequate ablation margin and the applicator was removed (Figure 2). After being observed in the radiology recovery room for two hours and a chest radiograph confirmed the absence of complication, the patient was discharged home. Close follow-up imaging with CT and PET-CT are used to monitor for tumor progression. A PET-CT at three years following the MWA demonstrated no FDG uptake within the ablation scar (Figure 3; white arrow). A CT five years following MWA demonstrates further involution of the scar without evidence of local tumor progression (Figure 4; white arrow). MWA has not only been applied to small tumors, as the ability to use multiple applicators simultaneously has allowed successful treatment of larger tumors. For example four applicators were used to treat this seven cm adenocarcinoma (Figure 5).

While the treatment of choice for patients with non-small cell lung cancer remains surgery, many alternate therapies have been shown to be safe and effective in non-surgical candidates. Early experience with MWA is very promising and long-term data will be necessary to prove its survival benefit and cost-effectiveness.

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Rheumatoid Arthritis Demonstrated on PET/CT as the Etiology of Hypercalcemia

Christopher S. Mudge, MD, Don C. Yoo, MD, and Richard B. Noto, MD

A 60 YEAR-OLD WOMAN WITH A HISTORY OF breast cancer status-post lumpectomy in 1997, hypothyroidism, rheumatoid arthritis, irritable bowel syndrome, and chronic fatigue syndrome was admitted to the hospital for hypercalcemia. At the time of admission serum chemistries were significant for elevated serum calcium of 11.1 mg/dL, decreased albumin of 2.5 g/dL, suppressed parathyroid hormone (PTH) of 6 pg/mL, elevated angiotensin converting enzyme (ACE) of 93 U/L, and elevated C reactive protein (CRP) of 13.4 mg/L. The patient was discharged after one day and referred to endocrinology.

A Technetium-99m-methylene diphosphonate bone scan was obtained to

assess for metastatic disease as an etiology of hypercalcemia and was remarkable only for left sided rib fractures without evidence of osseous metastatic disease (Figure 1). A chest CT was performed to assess for sarcoidosis, given the elevated serum ACE level, but did not show pulmonary parenchymal changes or adenopathy to confirm this diagnosis. A positron emission tomography/computed tomography (PET/CT) with 18F-fluorodeoxyglucose was then performed to assess for underlying malignancy (either breast cancer metastasis or another primary malignancy) or extrapulmonary sarcoidosis as the etiology of the patient's hypercalcemia. Maximum intensity projection (MIP) image (Figure 2), as well as axial and coronal images (Figure 3) from

the PET/CT scan showed increased activity at the atlantoaxial joint and symmetric markedly increased activity in the shoulders, scapulae, first costochondral joints, hips and ischia which were consistent with inflammatory changes from active rheumatoid arthritis. No additional abnormalities were seen on the PET/CT scan to indicate malignancy or sarcoidosis.

DISCUSSION

Rheumatoid arthritis is a systemic inflammatory disorder which symmetrically affects both large and small joints. It is the most common inflammatory arthritis, and accounts for nine million physician visits in the US annually.¹ Direct correlation between markers of

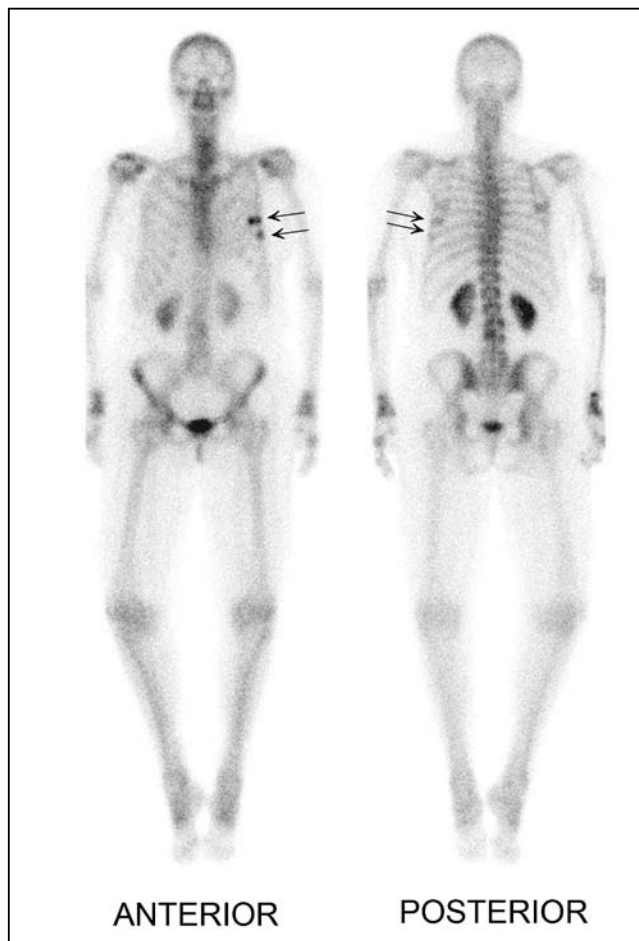


Figure 1. Anterior (left) and posterior (right) planar images from a Tc99m whole body bone scan shows left sided rib fractures (arrows - confirmed on subsequent CT), but no evidence of osseous metastatic disease.



Figure 2. MIP image from an FDG-PET CT demonstrates symmetrically increased activity at the shoulders, scapulae, hips, first costochondral joints, and atlantoaxial joint, findings compatible with active rheumatoid arthritis.

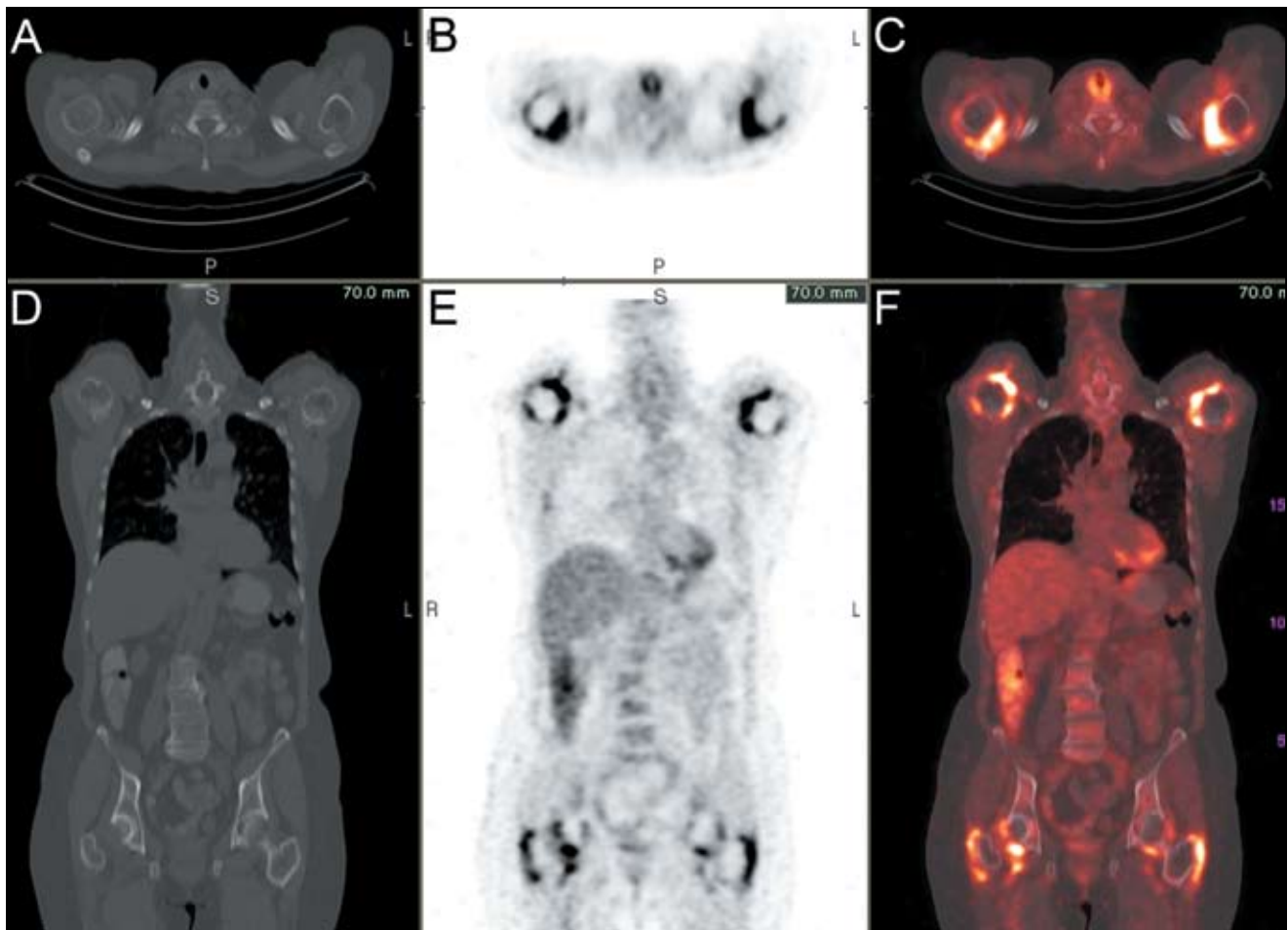


Figure 3. Axial CT (figure 3A) through the level of the shoulders showed no focal abnormalities, but axial PET (figure 3B) and fused PET/CT (figure 3C) images showed bilateral symmetric intensely increased activity around both shoulders. Coronal CT (figure 3D) also showed no significant abnormalities, but coronal PET (figure 3E), and fused PET/CT (figure 3F) images showed bilateral symmetric intensely increased activity around the shoulders and hips.

disease activity and serum hypercalcemia have been described, with the postulated mechanism involving the expression of inflammatory cytokines stimulating bone resorption, a similar mechanism to that responsible for hypercalcemia associated with malignancy.²

PET/CT with 18F-fluorodeoxyglucose is commonly used in the evaluation of many cancers due to increased glucose metabolism by a variety of tumors. Since there is also increased glucose utilization by most inflammatory processes, PET/CT will also typically identify sites of active inflammation and may be helpful for the evaluation of inflammatory disorders, although inflammatory processes are not currently considered reimbursable indications for PET/CT in the United States. Several authors have described the utility of PET/CT for rheumatoid arthritis in evaluation of disease activity, sites of in-

volvement, and evaluating the response to treatment.^{3,4,5,6} PET/CT can also be useful in the evaluation of sarcoidosis, another systemic inflammatory disorder associated with hypercalcemia. Multiple reports have described the use of PET/CT in determining extent of this disease as well as evaluating response to treatment.^{7,8,9} The appearance of rheumatoid arthritis on FDG-PET is quite different from that of sarcoidosis. Rheumatoid arthritis displays increased activity within the synovium of affected joints, as seen in this case, while sarcoidosis typically involves lymph nodes and the pulmonary parenchyma. PET/CT can be valuable for the diagnosis of inflammatory processes such as rheumatoid arthritis, however, more research is needed before there is sufficient evidence to support the routine use of PET/CT for inflammatory processes.

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Richard Noto, MD, discusses 18F-fluorodeoxyglucose use in inflammatory conditions.

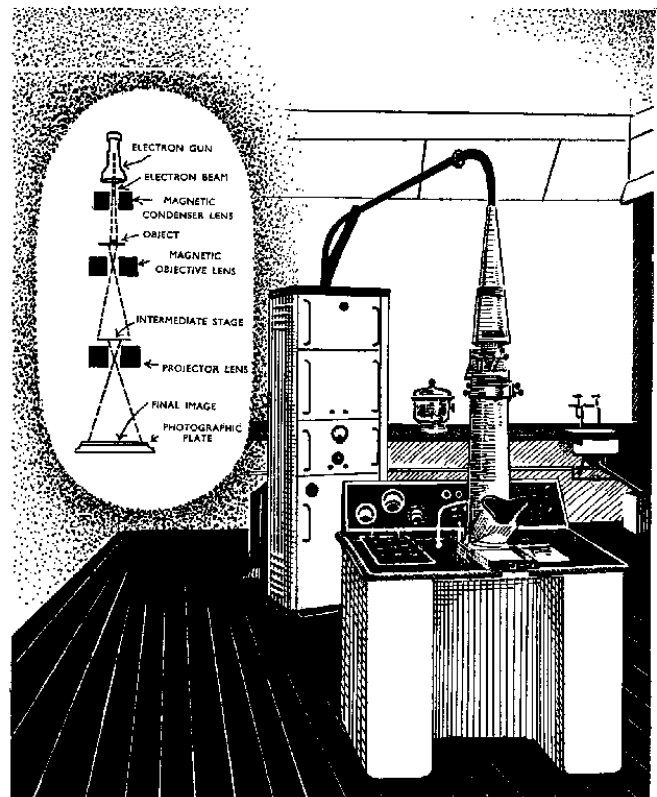
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Benign Ovarian Serous Cystadenoma Mimicking Papillary Thyroid Carcinoma Metastasis on I-131 SPECT/CT

Timothy L. Haaga, MD, Don C. Yoo, MD, Roberto Ortiz, MD, and Richard B. Noto, MD

CLINICAL PRESENTATION

A 34 year-old female patient was found on ultrasound to have multinodular goiter with a complex 1.3 cm thyroid nodule in the lower pole of the left thyroid lobe. Fine needle aspiration of this thyroid nodule revealed cytology that was highly suspicious for cystic papillary thyroid carcinoma. She underwent total thyroidectomy; surgical pathology showed an eight mm and a second seven mm papillary carcinoma within this nodule with negative margins. She was started on levothyroxine after thyroidectomy. A thyrogen-stimulated diagnostic I-131 scan (Figure 1) showed a single focus of

increased uptake in the mid thyroid bed consistent with residual thyroid tissue or tumor, with a 52-hour uptake of 0.4% without evidence of additional sites of metastatic disease. A rounded focus of activity in the mid pelvis was presumed to represent normal bladder activity. She was treated with 149.7 mCi of I-131. Post-treatment thyroid scan (Figure 2) at seven days showed a small amount of activity in the thyroid bed and a large focus of intense activity in the lower pelvis that was thought to represent a distended bladder, but which was more prominent compared to the diagnostic study. Straight catheterization of the

bladder was performed to decrease the radiation to the bladder. However, this large focus of activity (Figure 3) persisted after emptying the bladder by straight catheterization. SPECT/CT scan of the pelvis (Figure 4) showed increased uptake within a large mass immediately anterior to the uterus, with the bladder decompressed. The patient reported that she had a prior ultrasound performed at an outside institution that showed a large mass arising from her left ovary, which raised the possibility of a large struma ovarii. She underwent left salpingo-oophorectomy and pathology revealed a diagnosis of benign serous cystadenoma of the ovary

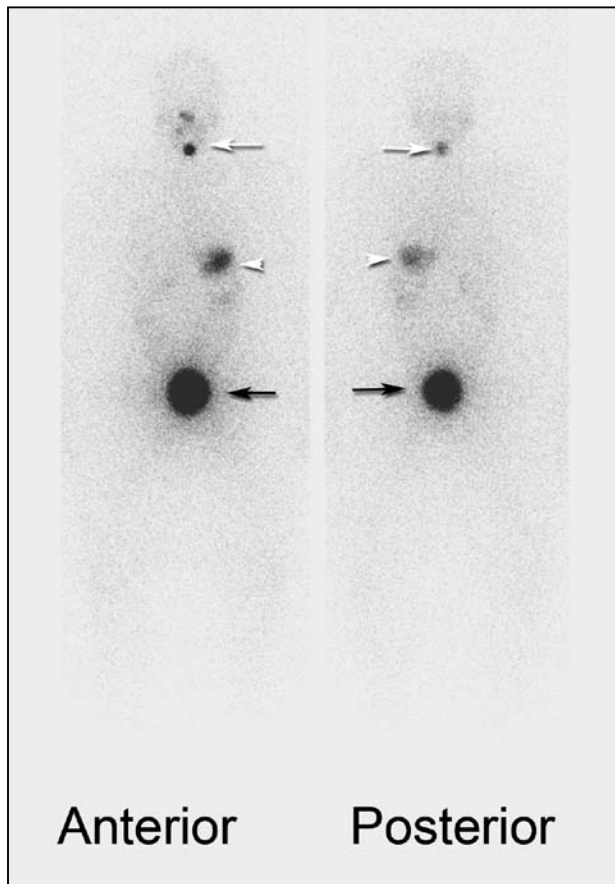


Figure 1. Anterior and posterior whole-body planar images from a thyrogen-stimulated diagnostic I-131 scan at 52 hours show a focus of uptake in the superior aspect of the thyroid bed (white arrow), physiologic activity in the stomach (white arrowhead), and activity in the lower pelvis (black arrow) which was thought to represent normal bladder activity.

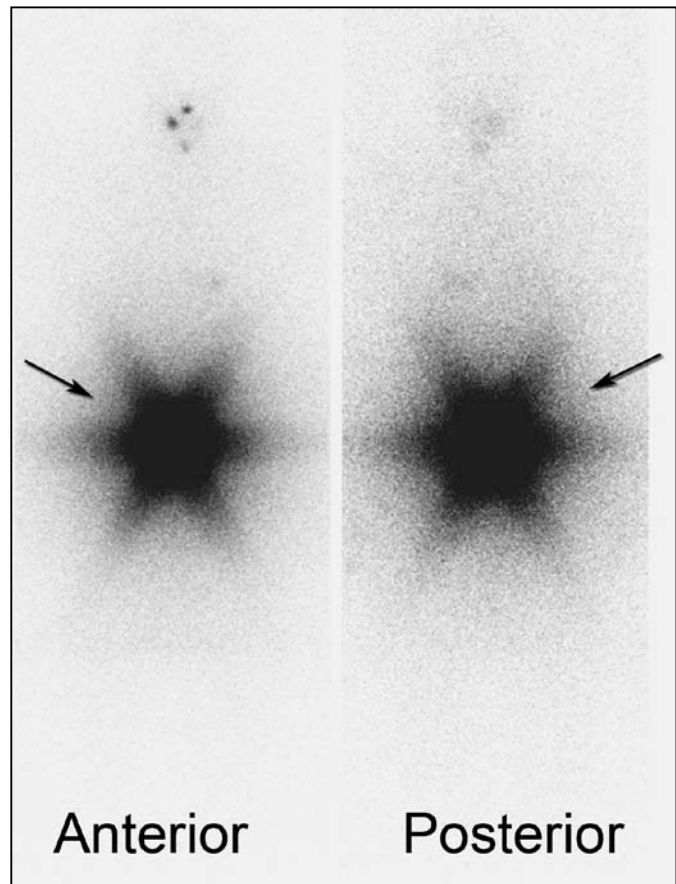


Figure 2. Anterior and posterior whole-body planar imaging 7 days after treatment with radioactive I-131 ablation shows a large focus of increased uptake in the lower pelvis (black arrow, with star artifact indicating the presence of a large amount of I-131 with extensive septal penetration) that was initially thought to represent a markedly distended bladder.



Figure 3. Anterior and posterior spot images of the pelvis after straight catheterization of the bladder again shows a large focus of activity in the lower pelvis.

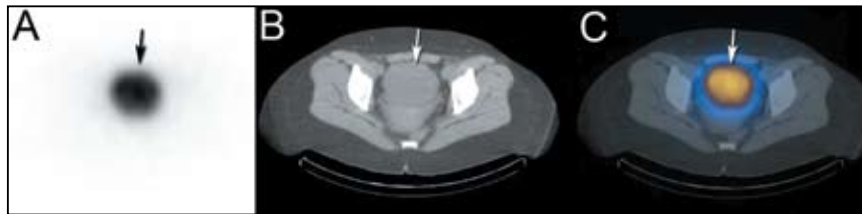


Figure 4. Axial SPECT (A), CT (B), and fused SPECT/CT (C) images show intense uptake in a round mass anterior to the pelvis (black arrow and white arrows, respectively).

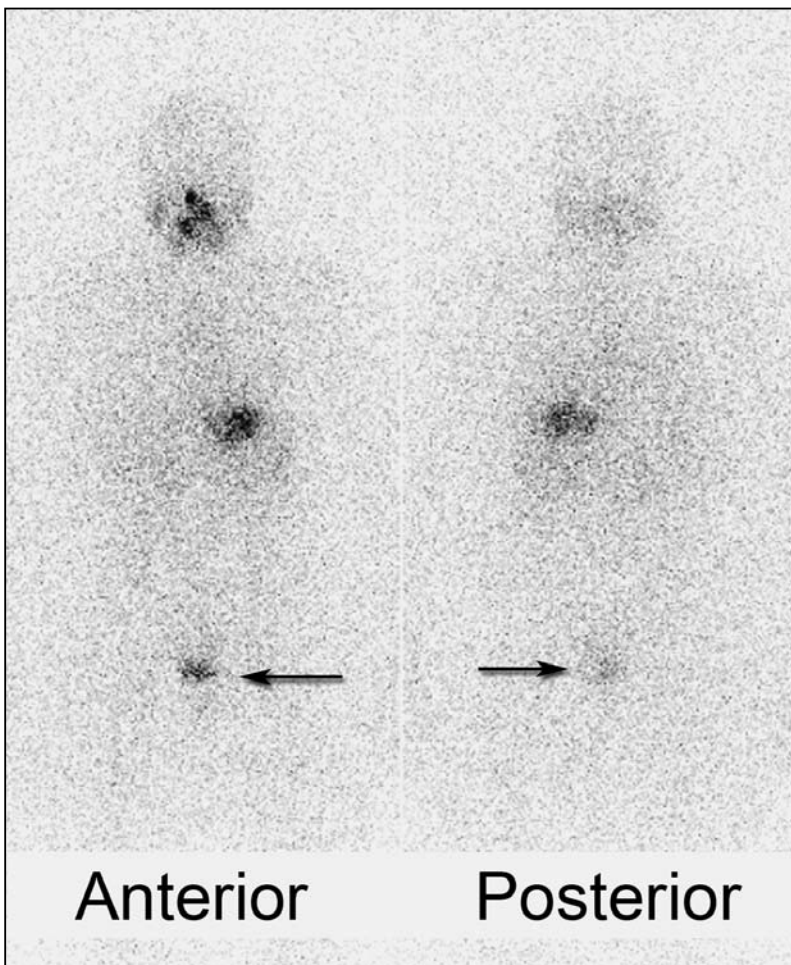


Figure 5. Anterior and posterior whole-body planar images 2 months after resection of the benign serous cystadenoma of the ovary show minimal normal activity in the bladder (black arrow) and normal physiologic distribution of activity in the rest of the study, including in the stomach and salivary glands.

without the presence of any thyroid tissue. Two months later, a repeat diagnostic thyrogen-stimulated I-131 scan (Figure 5) showed minimal normal activity in the bladder and no evidence of iodine-avid disease. The thyroglobulin level at this time was undetectable.

Thyroid carcinoma represents approximately 1.5% of cancers, with an incidence of 10.2 per 100,000 people per year, and papillary thyroid carcinoma constitutes 75-85% of cases of thyroid cancer.^{1,2} Survival for disease localized to the thyroid and with metastasis to regional lymph nodes is very good (five-year survival of 99.8% and 97.1%, respectively) but drops to 58.1% with the presence of distant metastatic disease.¹

Nuclear imaging using radioactive iodine takes advantage of the fact that well-differentiated thyroid tumors retain a degree of physiologic function inherent to the native thyroid gland, namely the ability to trap iodine to synthesize thyroid hormone. Planar scintigraphy using I-123 or I-131 is routinely used post-thyroidectomy to detect residual functioning thyroid tissue or tumor in the surgical bed, functioning metastases in the regional lymph nodes, and distant metastases, and assists in determining the dose of I-131 needed to most efficaciously ablate residual thyroid tissue or tumor.

The advantages of SPECT over planar scintigraphy include increased spatial resolution by focusing on a narrower section of tissue with less overlap of overlying and underlying structures, and absolute three-dimensional localization of radiotracer. SPECT/CT couples imaging of functional radiotracer accumulation with the spatial and tissue contrast of CT.

In the vast majority of patients (92%) with differentiated thyroid cancer and iodine-avid lesions outside of the neck that are equivocal by planar scintigraphy, SPECT/CT can definitively characterize such lesions as benign or malignant.³ Moreover, with regard to characterization of ovarian masses, struma ovarii and ovarian metastasis in the setting of papillary carcinoma can both present as having focally increased I-131 activity on SPECT/CT.^{4,5} In addition, there are several reports of benign iodine-avid ovarian masses, including mucinous and serous cystadenoma and cystadenofibroma.^{6,7,8} The fact that both benign and malignant ovarian lesions of varying histology can present with fo-

cally increased pelvic I-131 activity, as in the current case, underscores the utility of SPECT/CT for precise localization, the importance of retaining a broad differential diagnosis and the need to pursue histologic correlation for definitive diagnosis.

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Stroke Salvage Using a Suction Thrombectomy Device and Tissue Plasminogen Activator

Chad Thompson, MD, Timothy Murphy, MD, and Chris Hampson, MD

A 68-YEAR-OLD FEMALE WHO PRESENTED TO the emergency department 45 minutes after the witnessed onset of slurred speech and right-sided weakness. On physical exam, she was unable to repeat her name, read, or follow commands. She had a left gaze preference and flaccid right upper

and lower extremities. Her NIH Stroke Scale Score was 20. A non-contrast CT scan of the head showed a “dense” left middle cerebral artery sign indicative of acute thrombus.¹ She was immediately brought to the Interventional Radiology department for cerebral angiography and

possible acute stroke intervention. Arterial access was achieved at 1.5 hours after onset of symptoms. After endovascular stroke intervention, the patient was discharged three days later with 4/5 right upper extremity strength, 3/5 right lower extremity strength and a mild residual

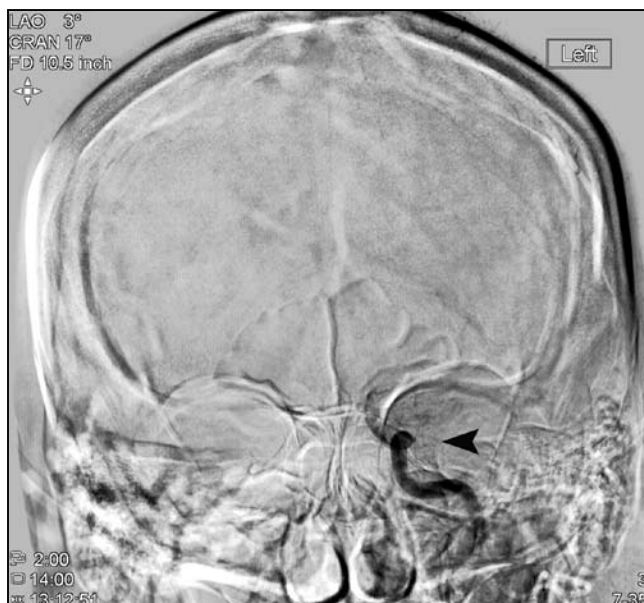


Figure 1. Left internal carotid artery (ICA) angiogram shows stasis of contrast and an extensive filling defect (arrowhead) within the left ICA consistent with acute clot.



Figure 2. Left internal carotid artery angiogram after suction thrombectomy of the ICA and left middle cerebral artery (MCA) with the Penumbra catheter (arrow). Flow is re-established within the left ICA and proximal middle cerebral artery with residual clot in the distal M1 segment of the MCA causing a cutoff appearance of the vessel.



Figure 3. Flow is reestablished within the left MCA after infusion of tPa. There is some residual clot indicated by filling defects (arrowhead) that resolved after continued thrombolytic infusion.

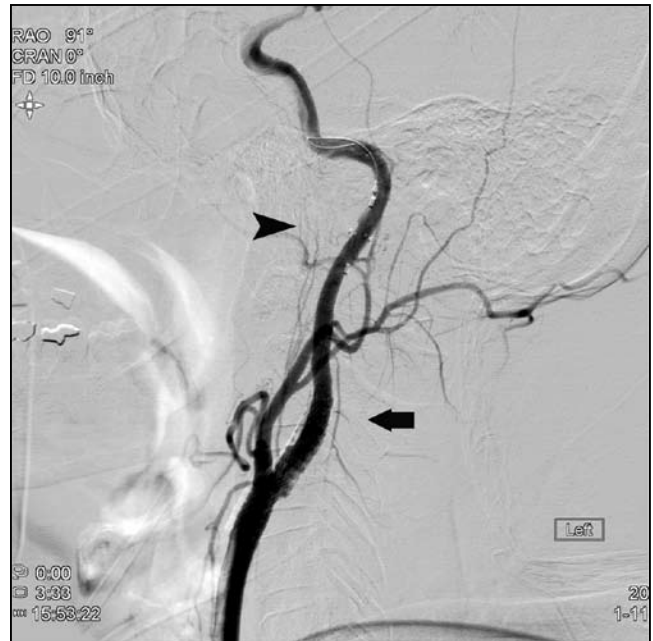


Figure 5. Successful deployment of a self-expanding stent (arrow) utilizing a distal protection device to preclude distal embolization of atheroma (arrowhead).

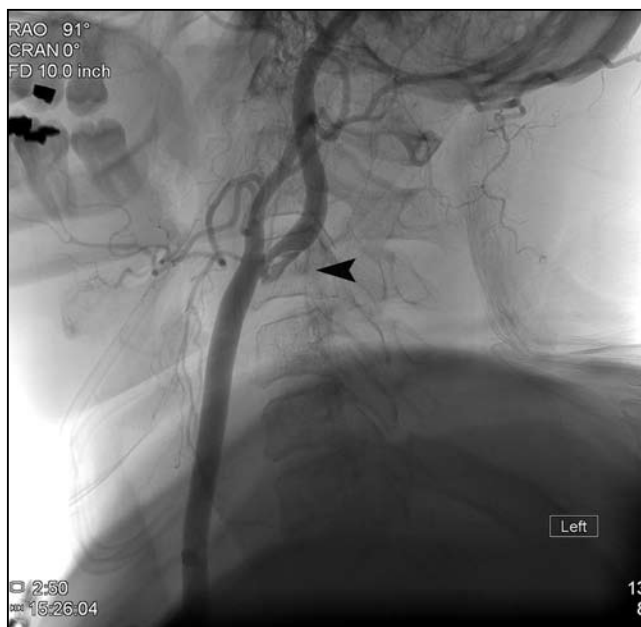


Figure 4. Abnormal appearance of the proximal left ICA consistent with ruptured atherosclerotic plaque (arrowhead).

expressive aphasia. She will undergo rehabilitation and be seen in follow-up at three months. A modified Rankin score of 3 or less (after rehabilitation) is expected.

Her angiogram showed acute clot extending from the proximal internal carotid artery to the proximal left middle cerebral artery (Figure 1). Mechanical thrombectomy of the left internal carotid artery and proximal M1 segment of the middle cerebral artery was performed using the Penumbra suction thrombectomy device (Figure 2). This was followed by infusion of tPA into the distal left middle cerebral artery to lyse residual clot (Figure 3). In this way, flow was re-established to the left cerebral

hemisphere. Upon completion angiography following left ICA and MCA thrombectomy and thrombolysis, a ruptured proximal left ICA atherosclerotic plaque (thought to be the cause of the embolus) was discovered (Figure 4) and successfully treated with a self-expanding metallic stent (Figure 5).

The goal of stroke intervention is to minimize tissue infarction by quickly restoring blood flow to ischemic brain tissue. This patient had a very high pre-treatment morbidity and mortality given the proximal location and extent of the thrombus.¹ If treated with intravenous tPa alone, the current standard of care, one would expect a 70% chance of failure in recanalizing such a large vessel occlusion.¹⁻³ Endovascular stroke intervention is employed at our institution in patients with large vessel occlusions who meet defined inclusion criteria to increase the rate of recanalization above that expected with IV tPa alone, in an attempt to improve long term clinical outcomes. The mainstay of endovascular stroke intervention is infusion of intra-arterial thrombolytic agent directly into the thrombus.⁴ Mechanical thrombectomy devices are increasingly being utilized in addition to or as an adjunct to infusion of thrombolytic agents.⁵ Carotid and cerebral artery stent placement is also utilized when appropriate. All of these methods were employed successfully to recanalize this patient's occluded vessels and resulted in an excellent clinical outcome.

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Atypical Insufficiency Type Femoral Stress Fractures in Patient on Bisphosphonates

Peter T. Evangelista, MD, and Scott M. Levine, MD

AN 86 YEAR-OLD WOMAN WITH HISTORY OF inflammatory breast cancer and osteoporosis presented with progressive right leg weakness and discomfort. Her medication regimen included monthly Zometa (zoledronate) infusion. She was not on corticosteroids.

The patient underwent a right thigh MR imaging examination which demonstrated an incomplete mid femoral diaphyseal insufficiency-type stress fracture with lateral cortical thickening and triangular ridging (cortical beaking), incomplete transverse fracture line and

associated periosteal and endosteal marrow edema (Figure 1). Six days later on her way to her orthopedic appointment her leg gave out and she fell from standing. Radiographs at that time (Figure 2) demonstrated a complete transverse lateral to oblique medial

lateral to oblique medial femoral diaphyseal fracture at the site of the insufficiency-type stress fracture. This was treated with intramedullary nailing. Radiographs of the left femur (Figure 3) were obtained two weeks later and demonstrated a focal area of lateral cortical thickening in the proximal femoral diaphysis suspicious for stress reaction. The patient subsequently underwent prophylactic nailing of the left femur.

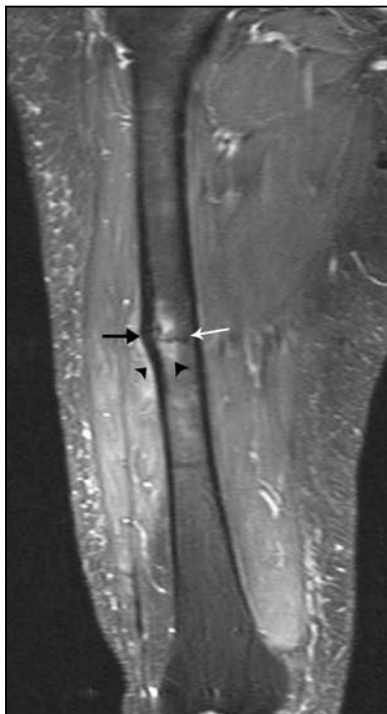


Figure 1. Coronal STIR image of the right thigh demonstrates incomplete right mid femoral diaphyseal insufficiency type stress fracture with lateral cortical thickening and triangular ridging (black arrow), incomplete transverse fracture line (white arrow) and periosteal and endosteal marrow edema (arrowheads).



Figure 2. Radiograph of the right proximal femur demonstrates a complete transverse lateral to oblique medial femoral diaphyseal fracture (arrow).

DISCUSSION

Osteoporotic fractures are typically low in energy and involve the wrist, proximal humerus or tibia, pelvis, and hip; they do not typically occur in the subtrochanteric or proximal femoral diaphyseal region as this area requires the application of considerable force to fracture.¹ There have been several case reports describing patients who develop fractures of the subtrochanteric or diaphyseal region



Figure 3. Radiograph of the left femur demonstrates focal area of lateral cortical thickening (arrow) in the proximal femoral diaphysis.

of the femur in the setting of long-term bisphosphonate therapy in the setting of minimal trauma. A recent population based, nested case control study found that among older woman treated for five or more years with bisphosphonates there was an increased risk of subtrochanteric or femoral shaft fractures, although the absolute risk of such fractures was low.² A proposed mechanism for these atypical

fractures is inadequate osteoclast activity which impairs bone remodeling and repair of normally occurring microdamage.¹

It is important that physicians have a high level of awareness of this entity. New onset thigh or hip pain in patients on long-term bisphosphonate therapy should be investigated with radiographs of the femur. Typical imaging features include focal cortical thickening laterally and classically with a triangular ridge or beak configuration along the subtrochanteric or diaphyseal region.³ Subsequently a discrete cortical break may develop. Some have advocated for routine radiographs of the contralateral femur to investigate for contralateral stress reaction.¹ In the setting of heightened clinical suspicion, more advanced imaging with magnetic resonance imaging or bone scintigraphy should

be considered. Prophylactic intramedullary nailing should be strongly considered as bone remodeling is impaired and patients have an increased risk of fracture completion with low energy trauma. More studies are necessary to determine whether discontinuing bisphosphonates and limited weight bearing is an acceptable alternative treatment option in the setting of stress reaction.

In summary, bisphosphonates have clearly been demonstrated to decrease the risk of osteoporotic fractures. There is now strong evidence that prolonged bisphosphonate therapy is associated with an increased risk of atypical subtrochanteric or femoral diaphyseal fracture although the absolute risk of these fractures is low. High clinical awareness of this entity in patients on long-term bisphosphonates presenting with new onset thigh or hip pain is warranted.

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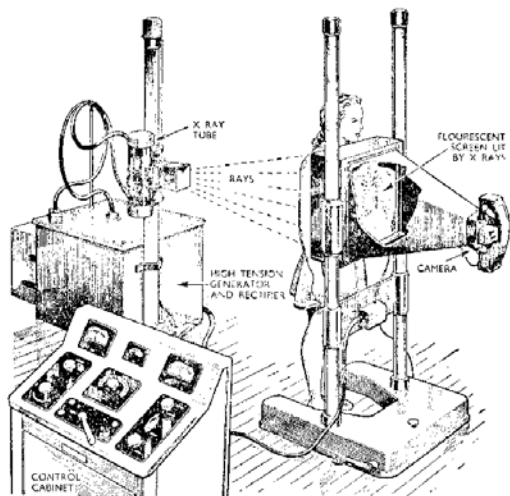
Disclosure of Financial Interests

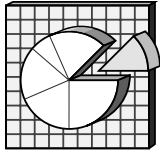
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Discussion of Health Topics During Prenatal Care in Rhode Island

Mei-Fen Yang, Hyun (Hanna) Kim, PhD, Rachel Cain, BA, and Samara Viner-Brown, MS

PRENATAL CARE IS A SERIES OF ASSESSMENTS AND INTERVENTIONS FOR pregnant women, to help ensure healthy pregnancies and birth outcomes, and to prevent any potential adverse health outcomes to mothers and their babies. The three basic components of prenatal care have been defined as 1) early and continuing risk assessment, 2) health promotion, and 3) medical and psychosocial intervention and follow-up.¹ It is recommended that prenatal care start in the first trimester of pregnancy, and continue throughout the whole pregnancy period.² Early prenatal care provides opportunities for detection, treatment, and management of medical and obstetric conditions, as well as opportunities for encouraging healthy behaviors by educating women in their pregnancies.²

The report describes 1) the timing of prenatal care initiation among pregnant women in Rhode Island, 2) health topics discussed with healthcare providers during prenatal care visits, and 3) the relationships between maternal behaviors and prenatal care discussions.

METHODS

The aggregated data from the 2004-2008 Rhode Island **Pregnancy Risk Assessment Monitoring System (PRAMS)** were analyzed. PRAMS is a survey of recent mothers, which collects state-specific, population-based data on maternal behaviors and experiences before, during, and after pregnancy.³ The survey is conducted two to six months after the baby's delivery. During 2004-2008 in Rhode Island, a total of 9,845 recent mothers were sampled and 6,959 completed the survey, yielding a 73.2% weighted response rate. For the flu vaccination, the 2010 PRAMS data (completed survey n=1,282) were analyzed.

The timing of prenatal care initiation was assessed using a survey question, "How many weeks or months pregnant were you when you had your first visit for prenatal care?" The responses were categorized as initiating prenatal care in the first trimester, second trimester, third trimester, and no prenatal care. To assess prenatal care discussions, mothers were asked whether their health care provider talked with them about 12 selected health topics during their prenatal care visits.

To identify disparities among subpopulations, the proportion of women who initiated prenatal care in the first trimester was examined by socio-demographic characteristics (i.e., age, race, ethnicity, education, household income, marital status, and insurance type). The health topics discussed during prenatal care visits were also examined by maternal education level. To determine the relationships between maternal behaviors and prenatal care discussions, the following maternal behaviors were examined: flu vaccination, HIV testing, breastfeeding, and postpartum birth control. Data analyses were performed using the STATA 10.0 software.⁴ The chi-square tests and the logistic regression analyses were employed to determine the statistical significance. All statistical results presented here were weighted to represent the Rhode Island PRAMS population.

	Prenatal Care in the 1 st Trimester (%) ¹	95% CI ²	P-Value
Overall	84.8	(83.8 – 85.8)	
Maternal Age			<0.0001
< 20	68.0	(63.5 – 72.1)	
20-29	83.6	(82.0 – 85.1)	
≥ 30	89.6	(88.3 – 90.8)	
Maternal Ethnicity			<0.0001
Hispanic	75.9	(73.2 – 78.4)	
Non-Hispanic	86.6	(85.4 – 87.8)	
Maternal Race			<0.0001
White	86.7	(85.6 – 87.7)	
Black	78.1	(74.1 – 81.7)	
Other	73.3	(68.3 – 77.8)	
Maternal Education			<0.0001
< High School	70.7	(67.4 – 73.8)	
High School	81.1	(78.9 – 83.1)	
> High School	91.8	(90.7 – 92.8)	
Household Income			<0.0001
< \$10K	72.5	(69.3 – 75.6)	
\$10k - <\$25K	79.3	(76.5 – 81.9)	
\$25K - <\$50K	87.0	(84.6 – 89.1)	
≥ \$50K	94.2	(93.1 – 95.2)	
Marital Status			<0.0001
Married	90.5	(89.4 – 91.5)	
Not married	76.3	(74.3 – 78.1)	
Insurance type			<0.0001
Public	77.8	(75.9 – 79.6)	
Private	91.7	(90.6 – 92.7)	

Data Source: Rhode Island Pregnancy Risk Assessment Monitoring System, 2004-2008.
¹ Weighted percentage
² 95% Confidence Interval

Table 1. Percentage of mothers who initiated their prenatal care in the first trimester by Socio-demographic Characteristics, Rhode Island, 2004–2008.

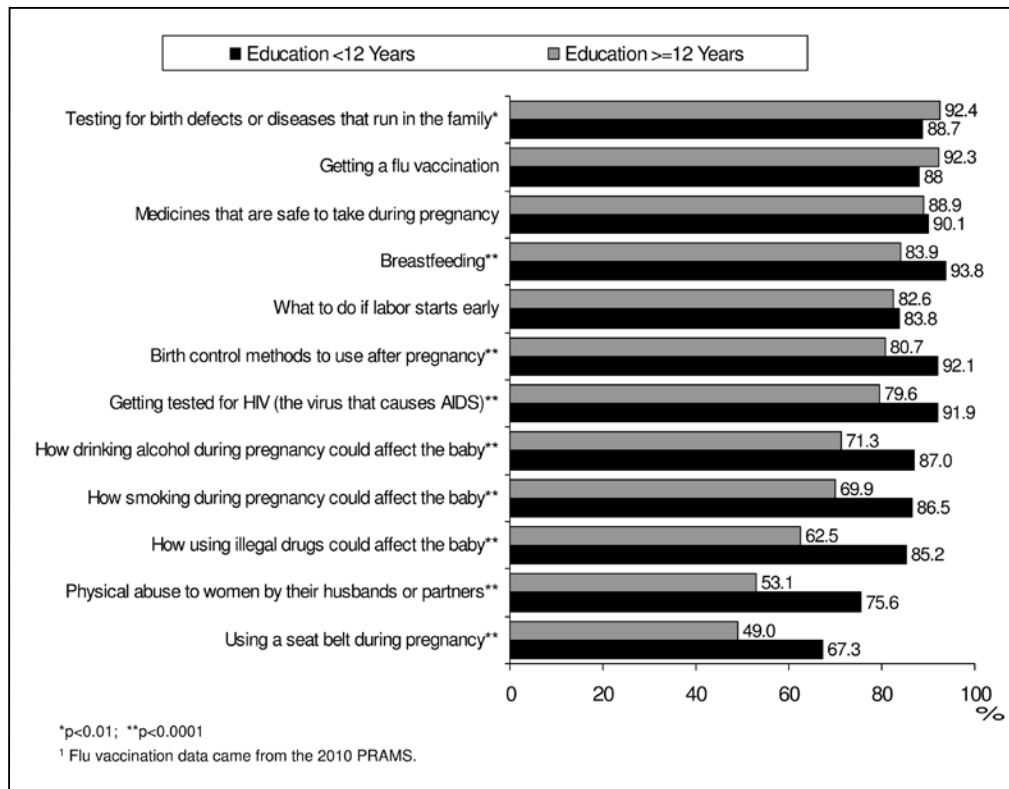


Figure 1. Health Topics Discussed with Healthcare Providers during Prenatal Care Visits by Mother's Education Level, Rhode Island, 2004-2008. (Flu vaccination data are from 2010 PRAMS)

RESULTS

Timing of Prenatal Care Initiation

Overall, 84.8% of Rhode Island mothers initiated their prenatal care in the first trimester, 13.3% in the second trimester, and 1.1% in the third trimester. A small proportion of mothers (0.7%) reported no prenatal care. The percentage of women who initiated prenatal care in the first trimester varied significantly by socio-demographic characteristics. Mothers who were 30 years or older (89.6%), white (86.7%), Non-Hispanic (86.6%), and married (90.5%) were more likely to initiate prenatal care in the first trimester, compared to their counterparts. Mothers who had more than a high school education (91.8%), annual household incomes greater than \$50,000 (94.2%), and private health insurance (91.7%) were also more likely to initiate prenatal care in the first trimester, compared to their counterparts. (Table 1)

Health Topics Discussed during Prenatal Care Visits

In general, some health topics, such as testing for birth defects (91.7%), flu vaccination (91.2%), or medicines that are safe to take during pregnancy (89.0%), were more frequently discussed during prenatal care visits than others, such as seat belt use (51.9%) or physical abuse by partners (57.0%). Health topics discussed during prenatal care visits varied by maternal education level. Mothers with less than high school education were more likely

than mothers with a high school education or higher to report the discussions of the following topics: breast-feeding (93.8% vs. 83.9%), birth control methods to use after pregnancy (92.1% vs. 80.7%), testing for HIV (91.9% vs. 79.6%), alcohol consumption (87.0% vs. 71.3%), tobacco use (86.5% vs. 69.9%), illegal drug use (85.2% vs. 62.5%), physical abuse by partners (75.6% vs. 53.1%), and seat belt use (67.3% vs. 49.0%). On the other hand, mothers with a high school education or higher were more likely to report the discussion of testing for birth defects or diseases that run in their family (92.4% vs. 88.7%). There were no significant differences between the two groups in the discussions of flu vaccination,

medicines that are safe to take during pregnancy, and what to do if their labor starts early. (Figure 1)

Relationship between Maternal Behaviors and Prenatal Care Discussions

Mothers reporting prenatal care discussions of flu vaccination and HIV testing were much more likely to have received a flu vaccination (78.5% vs. 21.1%; p<0.0001) and an HIV test (76.1% vs. 19.7%; p<0.0001) during their pregnancy, compared

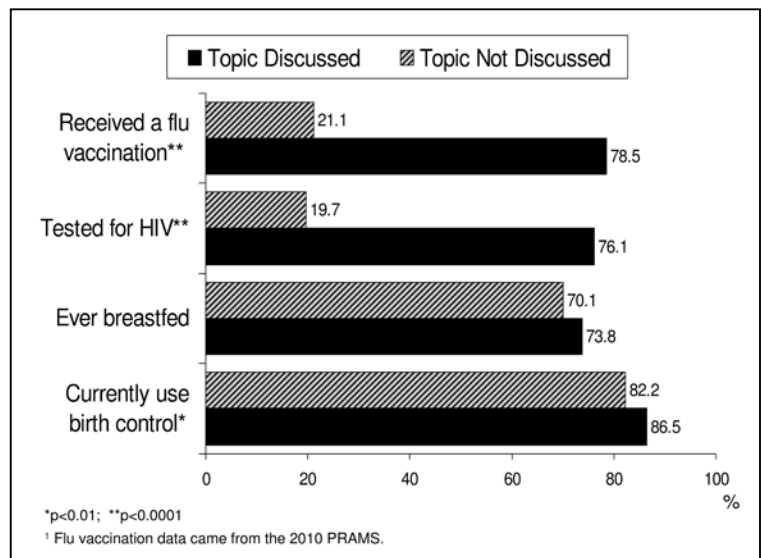


Figure 2. Maternal Behaviors by Prenatal Care Discussions, Rhode Island, 2004-2008. (Flu vaccination data are from 2010 PRAMS)

to those not reporting the discussion of these issues. Mothers who reported prenatal care discussion of birth control were also more likely to have used postpartum birth control (86.5% vs. 82.2%; $p < 0.01$), compared to those who did not report the discussion of this issue. However, there was no significant difference between these two groups in the rate of having ever breastfed. (Figure 2)

After adjusting for socio-demographic factors (age, race, ethnicity, education, marital status, and insurance type), all these maternal behaviors were significantly related to prenatal care discussions. Compared to mothers without discussions, mothers with discussions had significantly higher odds of receiving a flu vaccination (Adjusted Odds Ratio (aOR)=13.7; 95% CI=6.0-31.2; $p < 0.0001$), having an HIV test (aOR=11.6; 95% CI=9.1-14.7; $p < 0.0001$), using postpartum birth control (aOR=1.4; 95% CI=1.1-1.8; $p < 0.01$) and ever breastfeeding their new baby (aOR=1.4; 95% CI=1.1-1.7; $p < 0.01$).

DISCUSSION

The prevalence of initiating prenatal care in the first trimester among women with a live birth in Rhode Island was 84.8% during 2004-2008. However, there were disparities in initiation of prenatal care in the first trimester among subpopulations according to their demographic characteristics. Interventions that promote early prenatal care should especially target women who are teenagers, Hispanic, non-white, not married, and those who have low incomes, public health insurance, and less than a high school education.

Some health topics were not well discussed between health-care providers and pregnant women during their prenatal care visits, which may be due to several reasons. Healthcare providers might not discuss alcohol consumption, tobacco use, and illegal drug use with women who indicated not having these behaviors. Recall bias can also contribute to the results because mothers who do not have these behaviors during pregnancy may not accurately recall the discussion of these topics with their health-care providers. Healthcare providers were more likely to discuss health issues with less educated women, since low education is often associated with a high risk of adverse health behaviors or outcomes, such as tobacco use, alcohol consumption, partner violence, or an unintended pregnancy.

This report indicates that prenatal care providers play an important role to promote the healthy behaviors of pregnant women by discussing health issues during prenatal care visits. More women received a flu vaccination, had an HIV test, used postpartum birth control, and breastfed their baby when their health care providers discussed the benefits of these recommendations. This report also suggests that more healthcare providers should talk about intimate partner violence and use of a seat belt with all pregnant women during their prenatal care visits.

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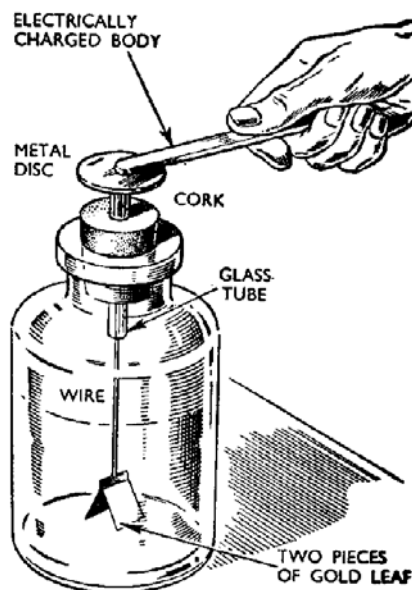
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Information for Contributors

Medicine & Health/Rhode Island is peer-reviewed, and listed in the *Index Medicus*. We welcome submissions in the following categories:

CONTRIBUTIONS

Contributions report on an issue of interest to clinicians in Rhode Island: new research, treatment options, collaborative interventions, review of controversies. Maximum length: 2500 words. Maximum number of references: 15. Tables, charts and figures should be submitted as separate electronic files (jpeg, tif, or pdf). Each submission should also be accompanied by a short (100-150 words) abstract.

CREATIVE CLINICIAN

Clinicians are invited to describe cases that defy textbook analysis. Maximum length: 1200 words. Maximum number of references: 6. Photographs, charts and figures may accompany the case.

POINT OF VIEW

Readers share their perspective on any issue facing clinicians (e.g., ethics, health care policy, relationships with patients). Maximum length: 1200 words.

ADVANCES IN PHARMACOLOGY

Authors discuss new treatments. Maximum length: 1200 words.

ADVANCES IN LABORATORY MEDICINE

Authors discuss a new laboratory technique. Maximum length: 1200 words.

IMAGES IN MEDICINE

Authors submit an interesting Image, with a 300-400 word explanation.

For the above articles: Please submit an electronic version (Microsoft Word or Text) with the author's name, mailing address, phone, fax, e-mail address, and clinical and/or academic positions to the managing editor, John Teehan, e-mail: jtteehan@rimed.org. For additional information, phone: (631) 903-3389. Faxes may be sent to (401) 826-1926.

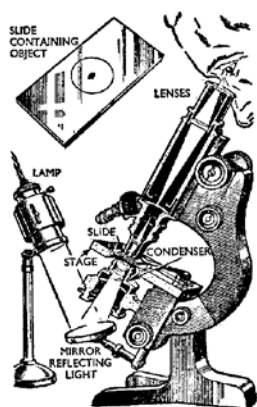
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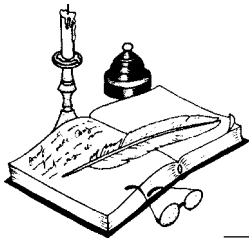
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Physician's Lexicon

Words in the Spiritual Domain

BREATHING, AS MUCH AS ANY HUMAN activity, has defined the sense of aliveness. And thus a number of ancient words denoting the act of breathing have come to form the vocabulary—medical and otherwise—of the many manifestations of life.

The Latin, *anima*, meaning the soul or breath of life and derived earlier from the Greek *animos*, has spawned a variety of nouns and adjectives of varied, and sometimes, contrary, meanings. Thus, to animate is to give life to, to enliven, to fill with breath, to exhibit vivacity. The mysterious process of instilling life into an otherwise non-living (inanimate) entity, whether it be Frankenstein's monster, Pinocchio or any one of the Disney Studio creatures, accordingly, is called animation.

But then we encounter the word, animosity, which currently means enmity

or ill-will. It seems to have arisen when the word, animus came also to mean vehemence or concerted boldness; and boldness, more often than not, leads to ill-will. And then there is animus, an English term currently defining antagonism, or hostile intent; and sometimes passionate courage or mission. Finally, there is animism which gives name to a religious belief that all living beings possess souls.

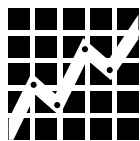
Words of breath-takingly varied meaning have been formed from the Latin, *anima*: equanimity, exhale, magnanimity, pusillanimous, even asthma.

The Latin, *spirare*, means to breathe. And from this word streamed a plethora of current English verbs including re-spire, expire, inspire, conspire, aspire, transpire and even perspire and spirometer.

The root defining breathing, *spiro-*, came gradually to represent the soul and thus arose the broader theological implications within the word, spirit and its companion words: spiritual and inspirational.

Spirits, a plural word now, takes on a much more banal meaning: intoxicating fluids. Thus, terms such as whiskey are from the Gaelic, *usquebaugh*; and the French words for brandy, *eau de vie*, both mean, water of life. The Latin for whiskey, *spiritus frumenti*, literally means the soul of the wheat. Brandy is a contraction of the Dutch, *brandewijn*, meaning distilled wine. Vodka, from the Russian diminutive, little water, also conveys the same illusion that alcohol is somehow life-affirming.

— STANLEY M. ARONSON, MD



RHODE ISLAND DEPARTMENT OF HEALTH
MICHAEL FINE, MD
DIRECTOR OF HEALTH

VITAL STATISTICS

EDITED BY COLLEEN FONTANA, STATE REGISTRAR

Rhode Island Monthly Vital Statistics Report Provisional Occurrence Data from the Division of Vital Records

Underlying Cause of Death	Reporting Period			
	February 2011	12 Months Ending with February 2011		
	Number (a)	Number (a)	Rates (b)	YPLL (c)
Diseases of the Heart	216	2,313	219.6	3,409.5
Malignant Neoplasms	177	2,318	220.1	5,829.0
Cerebrovascular Diseases	39	457	43.4	739.5
Injuries (Accidents/Suicide/Homicide)	43	622	59.1	9,492.0
COPD	57	529	50.2	455.0

Vital Events	Reporting Period		
	August 2011	12 Months Ending with August 2011	
	Number	Number	Rates
Live Births	1,115	11,825	11.2*
Deaths	769	9,963	9.5*
Infant Deaths	(5)	(67)	5.7#
Neonatal Deaths	(4)	(64)	5.4#
Marriages	781	6,166	5.9*
Divorces	278	3,390	3.2*
Induced Terminations	306	3,999	338.2#
Spontaneous Fetal Deaths	61	650	55.0#
Under 20 weeks gestation	(51)	(561)	56.3#
20+ weeks gestation	(10)	(87)	7.4#

(a) Cause of death statistics were derived from the underlying cause of death reported by physicians on death certificates.

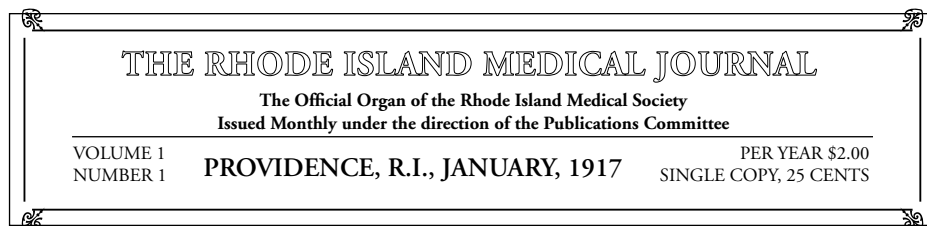
(b) Rates per 100,000 estimated population of 1,053,209. (www.census.gov)

(c) Years of Potential Life Lost (YPLL).

Note: Totals represent vital events that occurred in Rhode Island for the reporting periods listed above. Monthly provisional totals should be analyzed with caution because the numbers may be small and subject to seasonal variation.

* Rates per 1,000 estimated population

Rates per 1,000 live births



NINETY YEARS AGO, FEBRUARY, 1922

Jay Perkins, MD, discusses the various features and manifestations of asthma, examining a number of cases, and particularly looks at thyroid dysfunction with special reference to asthma. Not all cases can be explained in relation to the endocrine glands--possibly due to incomplete knowledge, or lack of demonstrated relation. He notes that in cases in which asthma has been present for a long time, other functions become impaired and the original case of the asthma disappears as glands atrophy with increasing age.

Roy Blosser, MD, looks at pruritus as both a symptom in many skin diseases, as something independent of lesions, as a symptom of internal disease, and as a condition without apparent cause. He briefly discusses generalized pruritus as well as pruritis of the face and genital region. Recommended treatment is typically gentle washing and lotions with an avoidance of wool clothing and too-frequent bathing. When all else fails, x-ray treatment is an assured treatment method, but one best employed by those with knowledge of the technique.

An editorial notes historical documents which reveal one Benjamin Marten, MD, of Holbourn in 1719 presenting a work entitled "New Theory of Consumptions: more especially of a Phthisis or Consumption of the Lungs, where ... Enquiry is made concerning the Prime, Essential and hitherto accounted Inexplicable Cause of that Disease, so very Endemick to this Nation, ..." in which he propounds an early germ theory applicable to not only tuberculosis, but also syphilis, rheumatism, smallpox, leprosy, plague, measles, and common colds. The author notes the modern ring of Dr. Marten's argument for a theory not proven until 1882.

Another editorial observes treatments among ancient works of medicine by Hippocrates up to Jenner in the late eighteenth century which suggest the informed use of antitoxins.

FIFTY YEARS AGO, FEBRUARY, 1962

The application of closed chest cardiac massage is introduced by Robert L. Curran, MD, Joseph R. Gaeta, MD, Frank Merlino, MD, and Lester L. Vargas, MD. The procedure described would be familiar to modern readers as a form of CPR in which rhythmic pressure is applied to the appropriate area over the ribs paired with simultaneous ventilation with the aim of improving oxygenated blood flow. While note a guarantee, it has advantages in speed of application. There exist potential complications in the form of fractured ribs and laceration of the abdominal viscera, but complications should be reduced as experience increases.

This issue includes the second of a two-part analysis by the Reverend Stanley Parry, CSC, PhD, of the University of Notre Dame regarding the King-Anderson Bill (H.R. 4222) brought before Congress addressing financing certain limited medical

care for the aged through Social Security. The author suggests that if the medically indigent could purchase health care insurance, insurance companies would have long ago sold it to them. Consequently, H.R. 422 would not qualify for the traditional meaning of the term "insurance." He concludes: "Ours indeed is an age of crisis. And there is in our times a deep source of insecurity. But that source is not economic. And no amount of state-supplied economic security will ever relieve the anxiety our people are trained to by public policy based on pessimism and rooted in the assumption that times are bad and getting worse. Never before in the history of man has a nation been at once so young, so strong and so fearful. H. R. 4222 offers an opportunity to increase that fear or to begin its conquest."

TWENTY-FIVE YEARS AGO, FEBRUARY, 1987

Robert W. Kates, PhD, talks about the program at Brown University to address world hunger problems of the present and future. He finds the current methods of measuring world hunger as unsatisfactory and introduces alternative definitions and taxonomies to be applied to the question. He also stresses the need for knowledge on the history of hunger, the factors involved, and what is to be learned from that. He notes the complexity of the issues, its varying factors and influences, but remains optimistic that persistence will win out.

Louise Aronson, BA, discusses, in detail, traditional Cambodian health beliefs and practice with the purpose of understanding Cambodian traditions in facilitating their care in a Western setting. Traditional Cambodian perceptions of illness and treatment practices are part of an ancient and complex medical system. American health care givers can do much to improve the appropriateness of health care for refugees if they have some understanding of the refugee mindset and expectations. The author concludes with the suggestion that acknowledgement of their medical system by Americans would contribute much toward Cambodian acceptance of American medicine.

H. Denman Scott, MD, Director of the Rhode Island Department of Health, gives an overview of health care from 1986-1987 in a paper subtitled "It Was the Best of Times, It Was the Worst of Times." He covers declining death rates, improvements in medical equipment and diagnostic techniques, but also takes a long look at the AIDS epidemic and how the disease burden has changed in which many health problems have no immediate prospects for biomedical solution or amelioration. He goes on to discuss ethical dilemmas in life support issues, affordability of health care costs, competition, and a sense of overall stress in the medical profession. Tried and true conservative practices will clash with new practices. Which will maintain? With care, progress will be slow, but sure.

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