NMRO

ACNM
A merged organization of the American College of Nuclear Physicians and the American College of Nuclear Medicine.

Scintillator

October 2013

FROM THE PRESIDENT

Erica Cohen, DO, MPH, CCD

The NMRO is already gearing up for the 2014 ACNM annual/SNMMI mid-winter meeting on February 6–9 in Palm Springs, California! The ACNM program, which will be held on Thursday, February 6, has many great sessions of relevance to residents and young professionals. The morning plenary session will give an update on how health-care reform and the SGR will affect imaging and nuclear medicine. This will be followed by two hours of your submitted abstract presentations in competition for two $750 travel grants, two $500 essay awards, and one $500 poster award! Surrounding the lunch hour will be two lectures on radiation emergency management. The first lecture will focus on preparedness of the hospital emergency department, and the second lecture will focus on medical management of internal radiologic contamination. Dr. Albert Wiley, Director of REAC/TS, will be leading this discussion. The afternoon discussions will focus on how to negotiate nuclear medicine jobs under the current circumstances, the nuts and bolts of developing clinical research, and the hodgepodge of things you need to know when starting out as a new attending physician (e.g., state licensure, accreditation, malpractice insurance, and contracts). The ACNM has worked very hard on developing this program—you will not want to miss it! In addition, we will be partnering with the Young Professionals Committee (YPC) of SNMMI for our second networking happy hour event! I hope that all of you will be able to experience this great program (and the great weather) in Palm Springs.

The NMRO Government Relations Task Force is still under development. We will be partnering with the YPC and SNMMI Guidelines Committee to develop evidence-based guidelines and

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BIOLOGICAL EFFECTS OF RADIATION

Rafay Ahmed

Rafay Ahmed

Understanding the effects of radiation will benefit our clinical practice by enabling us to:

- Recognize them when they occur
- Serve as an information resource for referring clinicians
- Counsel patients on the risk of radiation
- Balance radiation risk versus medical benefit

Ionizing radiation (α particles, β particles, neutrons, γ-rays, and x-rays) can cause damage to living cells, which can result in cell death or alteration in the DNA and may lead to a wide variety of manifestations known as **biological effects**.

Biological effects of radiation have classically been categorized as:

- **Probabilistic (Stochastic):** These effects have no minimum threshold. They are more likely to occur with increasing dose, but once they occur, the severity of the effect **is independent of the dose**. Examples are **genetic defects** and **cancer**.
- **Deterministic (Nonstochastic):** These effects have a dose threshold above which they will occur and below which they will not occur. The severity of deterministic effects, or the amount of damage induced, depends on the dose. Deterministic effects include **skin erythema, cataracts, infertility,** and **acute radiation sickness (ARS)**.
- **Hereditary (Genetic):** These effects assume stochastic incidence, but they manifest in future generations by inducing gene mutations or chromosomal alterations that can be inherited by the children of someone exposed to radiation. It should be noted that radiation increases the frequencies of mutations that already occur naturally.

Path of Radiation Damage

The radiation that produces biological damage enters the cells of the body and interacts with components of the cells, producing a physical effect or energy deposition.

- The two most common interactions of x-rays with matter are Compton scatter and the photoelectric effect.
- The most important point about these interactions is that the x-ray energy is transferred to an electron, and in most cases the entire biological effect is due to the interactions of the electrons with matter.

Continued on page 2. See Biological Effects.

SAVE THE DATE

ACNM 40TH Annual Meeting
February 6–9, 2014
Palm Springs, California
www.acnmonline.org

ACNM Annual Meeting 2013—Scientific Abstract Highlights

January 23-27—New Orleans, Louisiana

Simin Dadparvar, MD, FACNM

In 2004, the American College of Nuclear Physicians launched its first scientific abstract presentation by the residents and fellows. Disciplines such as nuclear medicine, diagnostic radiology, radiation oncology, and nuclear cardiology were invited to participate. The forum was intended to be a teaching tool for residents to learn from one another, and to make it more attractive, two travel grants of $750.00 each and three Best Essay Awards of $500.00 each were offered. We originally had only six abstract presentations; since then, the number of abstract presentations has increased and many nuclear medicine program directors have encouraged residents to present their scientific abstracts at the ACNM Annual Meeting and, later, to publish them in Clinical Nuclear Medicine.

The 2013 Annual Meeting was very successful. For the first time, ACNM held a conjoint meeting with SNMMI for the second Sino-American Conference at the mid-winter meeting in New Orleans. Chinese delegates presented 12 outstanding scientific abstracts in basic and clinical research. As part of the conference, residents and young professionals from the United States and China competed for various awards, including a top prize for two individuals from the United States to travel to China to continue the exchange of education and knowledge. A panel of physicians from the United States and China served as judges for the young investigators' oral and poster presentations of their abstracts. The top two oral abstract presenters from the United States were chosen for the exchange program with the Chinese Society of Nuclear Medicine.

This year, 50 abstracts from U.S. institutions were submitted, and 42 were accepted for presentation. We had 12 oral and 30 poster presentations. The awards were granted to the following individuals:

Travel Grant Winners

- Prashant Jolepalem, MD, Beaumont Health System – Improvement of Hepatic Metastasis Detection by 18F-FDG PET/CT with the Use of the Lesion to Background Liver Activity Ration
- Erin Grady, MD, Christiana Care Health System – Impact of Measuring the Right Hip Bone Mineral Density on Final Diagnosis by Dual Energy X-Ray Absorptiometry (DXA)

Best Essay Winners

- Vasvavi Paidpally, MD, Johns Hopkins University School of Medicine – Value of Follow-up FDG PET/CT to Clinical Assessment and Prediction of Overall Survival: A Study with up to Twelve Year Follow Up In Head and Neck Squamous Cell Cancer Patients
- Chiayi Ni, MD, VA Greater Los Angeles Hospital – Added Value of Using 18F-FDG-PET in Pulmonary Sarcoidosis
- Nicholas Plaxton, MD, Emory University – Thyroid Cancer Patients Treated with I-131

Sino-American Exchange Program Winners

- Erica Cohen, DO, MPH, Loyola University Medical Center – Evaluation of Redundant Studies for the Diagnosis of Pulmonary Embolism
- Guido Davidzon, MD, Stanford University Medical Center – Biodistribution and Kinetics of 1F FPPRGD2 PET/CT in the Evaluation of Suspected Recurrence in Glioblastoma Multiforme

Simin Dadparvar, MD–Chair, Scientific Abstracts
ACNM Annual Meeting

Continued on page 2. See Biological Effects.

- These effects then produce free radicals, which in turn produce chemical effects leading to cellular changes in the DNA, ultimately producing the end biological effects.

Conversion of the Energy Delivered to Biological Damage

Radiation delivered to tissues causes damage in two ways:

- **Direct Damage:** In some cases, radiation damage is direct. This is unusual in x-ray imaging. Radiation interacts directly with the nucleus and damages the DNA directly. For example, this is the way that the protons used in proton therapy produce DNA damage.
- **Free Radical Damage (Indirect):** The most common cause of cellular damage is the creation of free radicals, which are atoms, molecules, or ions with unpaired electrons. The hydroxyl radical is especially important in causing damage from ionizing radiation. In this case, the ionization of a water molecule leads to the formation of a hydroxyl radical, which causes damage to the nuclear DNA.

Outcomes of Radiation Effects

Most of the radiation-induced damage to the DNA is repaired without consequence, but in some circumstances the repair is not effective and DNA is permanently damaged, leading to cell death or mutation. The three most common outcomes of radiation damage are:

- **DNA Damage Repaired,** leading to a viable, functioning cell.
- Defective DNA Repair Process, resulting in a viable but mutated cell leading to cancer.
- **Radiation-Induced Cell Death,** the most common form of which is mitotic death, which occurs when cells attempt to divide. This is a result of damaged chromosomes. The other form of cell death associated with radiation is apoptosis, or programmed cell death. It commonly occurs in hematopoietic and lymphoid cells. Apoptosis is a well-developed mechanism for cell death and is programmed into many organisms.

From the President continued from page 1.

appropriateness criteria for nuclear medicine imaging studies. The most labor-intensive part of this process is gathering research, and we are looking for volunteers to help us! If you would like to get involved, please send me an email indicating your interest. The NMRO also sent a letter to the ACGME regarding the current case log system and its requirement of logging each individual PET, cardiac, and pediatric case. This letter outlined the amount of time that it takes residents to log individual cases and explained that this takes away from our clinical duties. We unfortunately have yet to receive a response from the ACGME but hope that they will take our concerns into consideration. Finally, we are very excited about our upcoming Virtual Journal Club in October. This quarter's topic will be "The Future of Nuclear Medicine," with a focus on integrated nuclear medicine/radiology residency pathways, hosted by this year's ACNM intern, Anthony Fotenos, MD.

The NMRO continues its efforts in both domestic and international membership recruitment. Please encourage your fellow residents to join the NMRO and get involved. We have many projects under way and can always use some extra hands! Our membership application can be found at www.acnmonline.org under the "Residents" tab. You can also reach me personally at ericajill@gmail.com. Membership for residents of the United States and Canada is FREE. Membership for international residents is $25 USD and can be paid on our website. Don't forget that membership includes subscription to the journal *Clinical Nuclear Medicine*, A $460 VALUE!! Membership in the NMRO is also a stepping stone to membership in the ACNM. Did you know that to obtain Fellowship in the College, a minimum 3 years of full membership in the ACNM is required? If you are a recent or upcoming graduate, I suggest that you do not miss out on this opportunity!

Thank you for your continued work and dedication to the field of nuclear medicine.

Erica Cohen, DO, MPH, CCD
NMRO President

Radium 223 – Xofigo

Anthony Fotenos, MD

Anthony Fotenos, MD

It seems fair to say that Øyvind Bruland is an alpha male, even though I've never met him. Professor of Clinical Oncology at the Norwegian Radium Hospital, not only does his first name start with the letter that comes after Z in the Norwegian alphabet, not only do pictures of massive game and fishing trophies and philosophical musings about the gods Thor and Apollo grace his website (http://www.bruland.info), but he's also the co-inventor of the first-ever alpha emitter to be FDA-approved for therapeutic use, Xofigo, developed by Algeta of Oslo (Norway) and Bayer of Leverkusen (Germany) and approved this May (1-2).

According to UpToDate, between 30 and 80% of all men in the United States will have some evidence of prostate cancer at autopsy, approximately 17% will be diagnosed with prostate cancer during their lifetimes, and approximately 3% will die as a result of prostate cancer, which almost universally metastasizes to bone, with complications including severe pain, spinal cord injury, renal failure, and lethal immobility. Xofigo does not cure prostate cancer, but it prolongs survival, defers symptomatic bone events, and improves quality of life in men with advanced disease, according to the Alpharadin in Symptomatic Prostate Cancer Patients (ALSYMPCA) trial, the results of which were published in the New England Journal of Medicine on July 23 (3).

ALSYMPCA represents a tour de force, almost certainly among the most ambitious research projects ever undertaken in nuclear medicine. Think big words and big numbers: double-blinded, randomized, placebo-controlled, 921 patients, 274 investigators, 136 study centers, 19 countries, 4 years (starting in 2008), and 358 pages reporting it all in the New England Journal (main paper + appendix + protocol + editorial). I've always wished publications would divulge some estimate of what they cost, but there's little doubt that with ALSYMPCA, we're talking many millions of dollars. The payoff? Strong evidence that Xofigo gives men with advanced prostate cancer meeting 12 inclusion and 13 exclusion criteria free time. Time free from what? Free from death (from 11 to 15 months), free from skeletal events (ie, radiation, fracture, and surgery, from 10 to 16 months), and free from more rapidly declining quality of life scores (at 16 weeks, the Xofigo group's score, inclusive of questions about pain, declined over twice as slowly as the placebo group's).

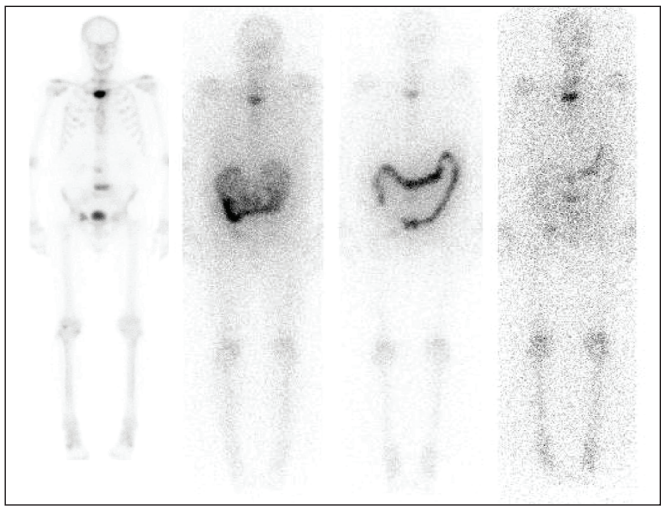
It's worth unpacking some of these numbers. First, let's start with the study's 12 inclusion and 13 exclusion criteria. Remember, randomized controlled trials may be called the gold standard, but it's fool's gold to extrapolate their results beyond populations specifically studied, a basic limitation of evidence-based medicine.

Here were some key inclusion criteria: prostate cancer, two hot lesions on bone scan, rising PSA refractory to androgen deprivation therapy and doclitaxel (or no plans for doxlitaxel in the next six months), bone pain requiring regular analgesics or prior radiation, labs (ANC ≥ 1500, platelets ≥ 100, hemoglobin ≥ 10, total bilirubin ≤1.5 normal, AST/ALT ≤ 2.5 normal, creatinine ≤ 1.5 normal, and albumin > 25), and patient ambulatory for more than 50% of waking hours with life expectancy > 6 months. Here were some key exclusion criteria: no visceral (ie, organ) metastases on CT or MRI, adenopathy > 3 cm, prior hemibody radiation, and Metastron (strontium-89) or Quadramet (samarium-153) within 24 weeks. Interestingly, the FDA-approved label considerably simplifies these 25 criteria, indicating only that, 1) "Xofigo is indicated for the treatment of patients with castration-resistant prostate cancer, symptomatic bone metastases, and no known visceral metastatic disease" and 2) "Hematologic evaluation of patients must be performed at baseline and prior to every dose of Xofigo" based on three cut-offs (baseline/follow-up): ANC ≥ 1500/1000, platelets ≥ 100/50, and hemoglobin ≥ 10/10 (2). Note no mention of imaging, doxlitaxel, or overall health status. (However, the FDA-approved label does clarify that in case men with metastatic prostate cancer are pregnant or nursing, these are contraindications.)

Second, it's worth unpacking some of the main reported outcome measures. The true magnitude of Xofigo's effects are likely better than

Continued on page 4. See Radium 223 – Xofigo.

Radium 223 – Xofigo continued from page 3.



Planar gamma imaging of technetium-99 MDP (left image) and radium-223 on days 0, 2, and 6 (right images). Note early gastrointestinal excretion and co-localization to sternal and lower spinal ostoblastic foci. Also, note poor image quality from radium-223, dosed according to its predominant non-imaged alpha emissions.

reported, assuming effective drugs work better when they actually get into patients. Why? Because 387 of the 921 ALSYMPCA participants didn't receive the six injections they signed up for, even though the study's intention-to-treat data analyses assumes they did. I'm reading between the lines here, but for ALSYMPCA, trial designers elected to test the smallest possible dose over the maximum number of cycles, more cycles than they had explored in their phase I and II studies, thus lengthening the overall duration of therapy to 24 weeks. Though this decision was undoubtedly financially and theoretically possibly even therapeutically advantageous, one is left wondering whether Xofigo might work even better following a more efficient dose/cycle protocol.

Finally, let's unpack a few more numbers of interest to readers who may like to administer Xofigo at the nuts-and-bolts level. Xofigo costs roughly $70 thousand for six dose. For each, you'll receive a plastic syringe containing a ready-to-inject dose of 50 kBq/kg. Xofigo emits a small proportion of its energy as 154 kEv gamma rays, so the dose can be confirmed using a standard dose calibrator. Gamma camera imaging is even possible on an experimental basis (see figure). After flushing with saline, injecting intravenously over one minute, flushing again, and repeating five times every four weeks, you can expect your patient will live longer and with a better quality of life than if you had injected only saline (again, assuming he's representative of the ALSYMPCA population). Except for diarrhea and a slightly higher rate of tolerable neutropenia, your patient is unlikely to experience any short-term adverse reactions. Would he do better on alternatives for castrate resistant prostate cancer such as Abiraterone, Enzalutamide, or Sipuleucel-T? We don't know, since these haven't been and are unlikely ever to be compared to Xofigo in a head-to-head trial. What about Metastron and Quadramet? Again, there's no clinical evidence to date that Xofigo is better, just better evidence that Xofigo is clinically effective.

That leaves us with preclinical evidence for questions regarding comparative effectiveness. The generic name for Xofigo is radium-223 dichloride. Radium is what Marie and Pierre Curie discovered and manually extracted from many tons of pitchblende starting in 1898.

What the Curies did not appreciate at that time is that radium exists as at least four isotopes: radium-223, radium-224, radium-226, and radium-228 (6). All emit multiple alpha (ie, helium nuclei) and beta (ie, electron) particles on their decay path toward stable lead. All make a pitstop as a noble alpha-emitting radon gas along the way.

Radioactive noble gases are bogeyman haunting the dream of targeted alpha therapy because they diffuse freely in tissue. What the Curies purified, radium-226, has a half-life of 584 thousand days, the first 3 of which are spent wandering around or out of the body as gaseous radon-222, likely important reasons why radium-226 was linked to cancer and fell out of widespread use early last century. We now know radium-223 has a half-life of 11 days (perfect for shipping in a ready-made syringe) and decays into a radon-219 gas for just 4 seconds. Thus, one hundred years after the Curies, the key discovery Øyvind Bruland and his colleagues Roy Larsen and Gjermund Henriksen made was as follows: The short life of radium-223's gaseous daughter keeps the decay family sufficiently close to its in home in bone that when alpha bombs go flying, each 7000 times heavier than Metastron's or Quadramet's puny beta emissions, their massive, high-LET, DNA-shattering ordinance remains near target. Boom! (Recall I began saying Øyvind Bruland is an alpha male who likes hunting). In a mysteriously untraceable autobiography penned in 1920, Marie Curie wrote, "It is easy to understand how important for me is the conviction that our discovery is a blessing for humankind not only by its scientific importance but also because it permits us to reduce human suffering and treat a terrible disease. This is indeed a great reward for the years of our enormous effort." Thanks to the additional enormous effort of those responsible for developing Xofigo and the ALSYMPCA trial, the true potential of radium therapy may have only just begun.

REFERENCES (available at xofigo.fotenos.com)

1. Bruland Ø.S. (2003). The concept of targeting. From mythology to modern medicine. In: Targeted Cancer Therapies - An Odyssey.
University Library of Tromsø, Ravnetrykk No. 29: 18-23.
2. Xofigo (package insert). Bayer Pharmaceuticals, Germany; May 2013. http://pi.lilly.com/us/byetta-pi.pdf. Accessed March 18, 2008. http://www.accessdata.fda.gov/scripts/cder/drugsatfda/index.cfm?fuseaction=Search.Label_ApprovalHistory#labelinfo.
Accessed 9/7/2013.
3. Parker et al. (2013). Alpha emitter radium-223 and survival in metastatic prostate cancer. NEJM 369;3: 213-222.
4. Nilsson et al. (2005). First clinical experience with α-emitting radium-223 in the treatment of skeletal metastases. Clin Cancer Res 11:4451-4459.
5. Nilsson et al. (2007). Bone-targeted radium-223 in symptomatic, hormone refractory prostate cancer: a randomised, multicentre, placebo-controlled phase II study. Lancet Oncol 8: 587–94.
6. Bruland, et al. (2008). Radium-223: from radiochemical development to clinical applications in targeted cancer cherapy. Current Radiopharmaceuticals:1:203-208.
7. Mould (1999). Marie and Pierre Curie and radium: history, mystery, and discovery. Medical Physics 26;9:1766-1772.
8. Sartor, et al. (2012). Targeted radionuclide therapy of skeletal metastases. Caner Treatment Reviews 39;1:18-26.

ACNM Corner

Simin Dadparvar, MD, FACNM

Simin Dadparvar, MD, FACNM

This year, the American College of Nuclear Medicine celebrates its 41st year. Four decades ago, two new organizations were founded to fulfill the practical functions of nuclear medicine: in 1972 the American College of Nuclear Medicine was established to support the education of nuclear radiologists, and in 1974 the American College of Nuclear Physicians was established to support physicians and scientists in nuclear medicine through advocacy, socioeconomics, and government relations. On September 1, 2009, the colleges joined their efforts to promote best practices in nuclear medicine and molecular imaging before legislative and regulatory bodies, other medical organizations, the media, and the general public.

About a decade ago, the need was identified for a resident organization, which then was established through the dedication of ACNM leadership, residents, and fellows in nuclear medicine across the country. Over the years, many talented and dedicated individuals have joined the leadership of the residents and created great programs such as mentorship, lectures, job placement, a knowledge bowl, virtual journal clubs, a board review questionnaire, the newsletter, and more.

As the field of molecular imaging is growing around the world, ACNM is reaching out to the international community to bring in more members to strengthen the field. The mentorship program assists residents with research, publications, networking, and employment opportunities; access to publication in the journal *Clinical Nuclear Medicine*; and beyond. Several leadership opportunities are provided by serving on the NMRO board. All residents have the opportunity to join ACNM as full members upon completion of their training.

Full membership in the college has many advantages, including networking, employment, publication in Clinical Nuclear Medicine, and, most importantly, fellowship in the college. Many outstanding members with leadership skills have had the chance to serve on the ACNM board and give back to the community.

I urge you to become an ACNM resident member as a part of NMRO and, upon completion of your training, to join as a full member. As the field of nuclear medicine and molecular imaging grows, ACNM can provide for communication among physicians and scientists around the world.

Hal Oscar Anger: The Inventor of the Gamma Camera

Kanta Saha, MD

Hal Oscar Anger, an electrical engineer and biophysicist, was the inventor of the gamma camera, the much-used everyday workhorse in the nuclear medicine department. He was born in Denver, Colorado, on May 24, 1920. In his early childhood, his family moved to Long Beach, California, and, showing an early interest in electronics, he built a television set from scratch in the late 1930s when the technology was relatively new.

The first of Anger's major contributions to nuclear medicine was the invention of the well counter in 1950. The device used anthracene crystals arranged around a well-like compartment to assay radioactivity in liquids placed in a small glass vial. Well counters soon became the most widely used instruments in radiation chemistry. While working in the Donner Lab (part of the larger Lawrence Berkeley National Laboratory), he discovered that the rectilinear scanner was limited in that only photons directly under the moving scanner could be detected at any given time, the rest of the emissions being wasted. He soon went on to invent the first Anger scintillation camera in 1957, which used a sodium iodide crystal 4 inches in diameter optically coupled with 7 photomultiplier tubes. Despite early problems with the small detector size and relatively poor detection efficiency, the invention was well received and went on to meet with great commercial success.

After a long and fruitful tenure at the Berkeley Laboratory, Anger retired in 1982. He published 22 book chapters and more than 90 journal articles during his career, and he held 14 U.S. patents. This unassuming, original, and inventive individual died on October 31, 2005, in Berkeley, California. In 2006, the Education and Research Foundation of the Society of Nuclear Medicine and Molecular Imaging received $6 million from the Hal Anger estate, the largest gift ever received for advancing the field of nuclear medicine, leading to the development of a Hal Anger Prize and Lecture.

Source: JNM, Vol. 44, No. 11, November 2003

Abnormal Immediate Diffuse Radiotracer Uptake by the Spine, Pelvis, Liver, and Spleen in a Tc-99m MAG3 Renal Scan

Lachin Hatemi, MD, and Feraas Jabi, MD—Buffalo General Hospital, Buffalo, New York

A 71-year-old man was admitted to our hospital for treatment of a new onset of atrial fibrillation and shortness of breath. The patient had a recent hospital admission in a different institution due to similar symptoms. During the current hospital admission, the patient also developed hematuria and hypokalemia, which initiated a consult with the nephrology service.

The nephrologist suggested that hematuria was most likely due to traumatic urinary catheterization and concurrent thrombocytopenia. The patient was diagnosed with chronic kidney disease by the nephrologist, consistent with a current serum creatinine level of 3.2 mg/dL. A renal ultrasound was subsequently performed, which revealed bilaterally increased echogenicity of the kidneys and bilateral cysts suggesting medical renal disease.

A Tc-99m MAG3 renal scan was ordered for further evaluation. On the immediate dynamic images, diffuse radiotracer uptake by the liver, spleen, spine, pelvis, and sacroiliac joints was noted. During the evaluation process, we reviewed the hematologic serum studies, which revealed anemia, thrombocytopenia, and a persistently elevated white blood cell count.

In our report, we concluded that the findings were consistent with severe chronic renal parenchymal disease with an overlying acute parenchymal process. Diffuse increased flow to the liver, spleen, spine, pelvis, and sacroiliac joints was consistent with either active hematopoiesis or myeloproliferative disorder.

Following the renal scan, comprehensive urine analysis revealed a total protein level of 312 mg/dL, with a large monoclonal peak being noted (comprising 69% of the total urine protein). These findings were interpreted as kappa Bence Jones proteinuria. Further serum analysis revealed IgA kappa monoclonal immunoglobulinemia. These results confirmed our suspicion of an underlying myeloproliferative disorder.

Enhanced hepatobiliary uptake is a common finding in patients with renal insufficiency related to azotemia. However, bone marrow uptake is a rare finding that should be further investigated in correlation with serum and urine laboratory parameters. A retrospective study by the researcher at the Albert Einstein College of Medicine (1) concluded that increased marrow uptake is most likely due to both enhanced marrow perfusion suggesting marrow hyperplasia and increased blood concentration of the Tc-99m MAG3 due to poor renal clearance. Postchemotherapy recovery of the bone marrow was also reported as a possible cause of diffuse spinal radiotracer uptake during a renal scan in a pediatric cancer patient (2).

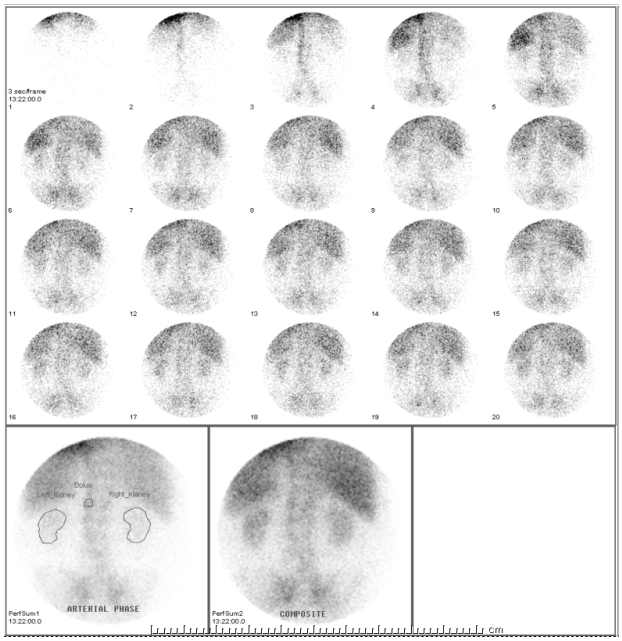


Figure 1. A Tc-99m MAG3 renal scan was performed on a 71-year-old man with recent-onset atrial fibrillation and shortness of breath. During the initial dynamic flow images (3 seconds/frame), diffuse radiotracer uptake was noted within the liver, spleen, spine, pelvis, and sacroiliac joints.

Bio Sketch

Mickaila Johnston, MD

Hello, my name is Mickaila Johnston, and despite the sound of my name, I am a 40-something-year-old white male with a loving wife and 2 wonderful daughters. This past summer, I finished a 3-year residency at the University of Arkansas for Medical Sciences. Go Hogs! However, I am from Bend, Oregon. Go Lava Bears!

After high school, I enlisted in the Navy on submarines, mostly out of San Diego. Go Navy! Beat Army! Later, I matriculated into a yearlong officer accession program, followed by 4 years at Oregon State University. Go Beavers! As a Beaver, I studied both in the University Honors College and in the Department of Nuclear Engineering/Radiation Health Physics. That was followed by medical school, in Bethesda, Maryland. The Uniformed Services University of the Health Sciences positively shaped my life in more ways than ever imaginable. After graduation from medical school and a follow-on year as a pediatrics intern in Virginia, I went back to the operational side of the Navy as a Diving Medical Officer. Hooyah Deep Sea! My job assignments—with Navy EOD and Naval Special Warfare in multiple countries—lasted about 5 years. Some were beautiful, some were not. Fortunately, in the middle of all that, my wife, Amanda, decided to marry me. We now have 2 wonderful daughters and have moved back out to San Diego, where I am an NM staff physician in the Navy.

If you find yourself in So Cal, drop me a line and we can go surfing or SCUBA diving, eat fish tacos, make some motors crank, or whatever…??…??

GOVERNMENT CORNER

Erica J. Cohen, DO, MPH, CCD

Erica J. Cohen, DO, MPH, CCD

Each issue, we bring you the most recent and relevant updates from the SNMMI/ACNM Health Policy and Regulatory Affairs Committee. Here are your top stories for August 2013:

- On June 28, the House Energy and Commerce Committee voted to repeal the Sustainable Growth Rate (SGR) system and replace it with a fee-for-service system based on quality measures. While the AMA looks favorably on this new system, it is uncertain how imagers such as radiologists and nuclear medicine physicians will be affected by this change, as we currently do not have many measures of "quality" developed. SNMMI has developed a task force for this purpose.
- On June 27, the Senate Appropriations Committee finalized its version of the Fiscal Year 2014 Energy and Water Appropriations Bill and included $5 million for nuclear medicine research. Unfortunately, the House did not include funding in its version of the bill. We are currently awaiting the final version of the bill. Department of Energy funding was one issue discussed with congressional representatives during the SNMMI Capitol Hill Day in April.
- On June 11, the Centers for Medicare and Medicaid Services (CMS) released the final decision to end the "coverage with evidence development" requirement for FDG PET of solid tumors. Originally, CMS determined that FDG PET coverage for patient management would be limited to one nationally covered scan per patient. SNMMI, ACNM, ACR, ASN, and WMIS were able to increase coverage to three scans, with coverage of any further scans to be determined by local Medicare administrative contractors.
- On July 3, CMS voted against coverage for beta-amyloid plaque imaging (i.e., Amyvid), stating that there is insufficient evidence that the scan will improve health outcomes for patients with dementia or other neurodegenerative diseases. This decision was made in spite of the Appropriate Use Criteria for imaging that were developed by SNMMI and the Alzheimer's Association. SNMMI and ACNM continue to work with CMS on this coverage issue.

Bio Sketch

Prashant Jolepalem, MD

I was born and raised in the suburbs of Detroit, Michigan, and attended the University of Michigan, where I majored in economics and was pursuing a career in finance. After an epiphany, I realized I wanted to do something more meaningful and rewarding with my life. So I enrolled at St. Matthews University School of Medicine in the Cayman Islands.

I was always interested in diagnostic imaging because of my fascination with anatomy and the form and function of the human body. I initially started my nuclear medicine residency at Oakland University William Beaumont to strengthen my application for radiology. However, I immediately found my niche in this field. I love that nuclear medicine and molecular imaging have the unique ability to image physiologic processes, which in many ways is more important than just imaging anatomy. I also enjoy that I have a chance to use my clinical knowledge and judgment by incorporating patient history and other available data to be more specific in my interpretations.

My primary interest is oncology and neuropsychiatric imaging. I have published several papers that have demonstrated different ways that molecular imaging techniques can solve challenging clinical questions. One of my mentors, Dr. Helena Balon, always says, "Any problem can be solved by nuclear medicine; you just have to think of the pathophysiology and tailor the study." My long-term plan is to join an academic institution or private practice where I can continue to read PET/CT and pursue my research interests.

In the short term, I would like to see nuclear medicine physicians, young and old, continue to work together to revitalize our field and distinguish our specialty as one that can be of immense value to clinicians. I look forward to continuing to help the NMRO connect with all nuclear medicine residents and accomplish our goals!

Diagnosing Osteomyelitis

Erica Cohen, DO, MPH, CCD

Match the clinical situation with the most appropriate scintigraphic study.
Some answers may be used more than once.

1. Normal radiograph
2. Neonates
3. Vertebral osteomyelitis
4. Osteomyelitis in mid and hind foot

A. Three-phase bone scan
B. Ga-67 citrate
C. Leukocyte study
D. Marrow study
E. F-18 FDG

Answers: (1) A; (2) A and, if negative, C; (3) B or E; (4) C and D