FROM THE PRESIDENT

NMRO is gearing up for a great 4 days in Palm Springs at the ACNM Annual/SNMMI Mid-Winter Meeting! Thank you to everyone who submitted an abstract and congratulations to those accepted for presentations. Be sure to attend the Awards Banquet on Thursday night as the ACNM will be awarding 3 best essay awards ($500 each) and 2 travel grants ($750 each). NMRO and YPC will also be hosting a Networking Happy Hour during the meeting; be on the lookout for time and location!

If you can’t make it to the Mid-Winter meeting, registration for the Annual meeting is already open! This year’s meeting will be in St. Louis, MO from June 7-11. If you are planning to take the ABNM certification exam in October, you may want to consider registering for SNMMI’s Nuclear Medicine Review Course to be held Saturday-Sunday June 7th-8th. More information about Annual Meeting events, including the NMRO Annual Luncheon, will be provided at a later date.

We are all familiar with the current job shortage, and it is important to make yourself the most attractive candidate for any potential employer. The NMRO is here to help you by providing opportunities for abstract presentations, literature publications, up to date news and literature reviews, board-style study questions, networking and mentoring opportunities... the list goes on! Please visit our website at www.acnmonline.org under the “Residents” tab and make sure that you are a registered member. Be sure to also join our Facebook page “Nuclear Medicine Resident Organization” for news briefs and scholarship opportunities.

On behalf of the NMRO Board of Directors, I would like to wish everyone a Happy and Healthy New Year! See you in Palm Springs!

Erica J Cohen, DO, MPH, CCD  
NMRO President  
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CARDIAC SARCOIDOSIS

Sarcoidosis is a systemic chronic granulomatous disease with a wide variety of clinical and imaging manifestations. It commonly affects young adults, often involving multiple organ systems. The diagnosis is usually made on the basis of clinical and radiographic manifestations supported by pathologic findings (noncaseating granulomas). When sarcoidosis involves the heart, it can lead to complications such as congestive heart failure, conduction abnormalities, and sudden death. Clinical evidence of cardiac sarcoidosis is reported present in approximately 5% of patients, but autopsy studies have described myocardial involvement in at least 25% of sarcoid patients. While sarcoid more often involves lymph nodes, pulmonary parenchyma, and other organs, isolated cardiac sarcoid involvement has been described.

Cardiac involvement of sarcoidosis is associated with a poorer prognosis, making the diagnosis and management of the utmost importance. The finding of noncaseating granulomas on endocardial biopsy is virtually pathognomonic for the diagnosis. However, endomyocardial biopsy is limited by the invasive nature of the procedure and the well recognized phenomenon that endomyocardial biopsy may often be falsely negative in cardiac sarcoidosis. This has commonly been attributed to the patchy distribution of granulomas as well as the extensive myocardial fibrosis associated with disease progression. Imaging techniques traditionally used to evaluate cardiac sarcoidosis have included both traditional nuclear medicine (Ga-67, Tc-99m and Tl-201) and cardiac MRI, which looks for patchy areas of myocardial enhancement in a non-vascular territory distribution. However, enhancing fibrotic lesions on MRI do not necessarily indicate active disease and early active inflammatory lesions may be unapparent. Additionally, patients with implanted pacemakers or AICDs due to arrhythmias often cannot undergo evaluation.

A number of recent papers have advocated for the use of FDG PET in evaluation of cardiac sarcoidosis. A major advantage is the ability of FDG PET to document metabolically active lesions to aid in diagnosis, as well as show metabolic response of lesions following corticosteroids or additional immunosuppressive treatments. We will briefly review the technique and rationale for FDG PET imaging in cardiac sarcoidosis, as you will likely see this application of PET imaging in the future if you haven’t already.

Active sarcoid inflammatory lesions are FDG avid, secondary to uptake by macrophages and other inflammatory cells. Therefore, if glucose metabolism of the normal myocardium can be suppressed, then active sarcoid lesions in the myocardium will be conspicuous against low background activity. There are several protocols advocated to suppress background FDG uptake in the myocardium. A common theme is a no-carbohydrate diet before scanning to drive the heart from glucose to fatty acid metabolism. Some studies advocate for a no-carbohydrate, high fat-protein meal the night before and then 3-5 hours before the scan. Others advocate for fasting starting the night before. Regardless of the technique your

Continued on page 2. See Cardiac Sarcoidosis.
Leadership Tips for Residents as Future Leaders

Simin Dadparvar, MD, FACNM

Congratulations on starting nuclear medicine residency or fellowship at your institution. During your training, you will learn about this great field of medicine and get ready to practice in a university hospital, private practice, or industry. Your long journey can be very productive by practicing the following leadership tips:

• Communicate with your referring physicians for patient outcome
• Take constructive criticism; it is meant to improve patient care
• Volunteer to serve on a committee in your hospital
• Attend tumor and multi-disciplinary board meetings at your institution
• Get to know your department and hospital administrators
• Learn about the financial aspects of the clinical practice in your department
• Learn about new equipment, procedures, and pharmaceuticals
• Identify mentor(s) both within your department and outside of your institution. A Mentorship Program is available for residents within the American College of Nuclear Medicine.
• Be a mentor to medical students
• Apply for membership in professional societies, both regional and national
• Get involved in research projects within your department
• Have at least two research projects of your own per year
• Ask for help from attending physicians, residents, and medical students, and include them as authors in your publications
• Present your scientific abstracts at the ACNM and SNMMI Annual meetings
• Enhance your CV by publishing scientific papers
• Network with physicians and industry at the international meetings
• Learn about contract negotiation
• Be a member of NMRO and communicate with U.S. and international colleagues. This will provide opportunities to share information and collaborate in the future.
• Serve on the ACNM via participation in the NMRO board

Looking back, the valuable lessons I have learned through my leadership training and many efforts with colleagues at multiple national professional organizations have strengthened me and enriched my life. The leadership experiences have emboldened me to accept many new challenges big or small, and, however I can, to move my profession and a variety of wonderful organizations such as ACNM forward.

Simin Dadparvar, MD, FACNM, FACR
NMRO Founder and Chair

Cardiac Sarcoidosis continued from page 1.

institution chooses, remember the common theme is a no-carbohydrate diet prior to scanning. The administration of heparin (50 IU/kg 15 minutes prior to FDG injection) to increase hepatic lipolysis and serum free fatty acids has also been advocated by some groups who reported good success with this technique. Many institutions, however, have avoided heparin given its potential complications and contraindications such as no concurrent warfarin, bleeding risk, or stroke/surgery during the past 3 months. In my personal experience at Stanford, we generally saw good suppression of background myocardial activity with a no-carbohydrate meal the night before, followed by fasting until the completion of imaging. We chose not to administer heparin, although this is a point of debate as previously discussed. A resting myocardial perfusion study prior to FDG PET has also been advocated to improve diagnostic accuracy. The theory is that larger sarcoid lesions will be evident as perfusion defects in a non-vascular territory, and burnt out granulomas may only manifest as perfusion defects. A counter argument is it would be better to avoid the extra radiation. The ideal protocol is likely an area of continued debate and evolution.

Now that you understand the rationale and technique, here is a brief overview to help guide you through initial image interpretation. During readouts, look for patchy areas of FDG uptake in the myocardium in non-vascular distributions. Sarcoidosis granulomas in the heart are generally patchy, but less often can be diffuse. There is a spectrum of patterns one might come across; previous authors have classified myocardial uptake into 4 patterns you should know. These patterns of uptake include: 1) None, 2) Diffuse, 3) Focal, and 4) Focal on diffuse. Numbers 3 and 4 are considered positive for cardiac sarcoidosis. Keep in mind that advanced disease can also produce LV dysfunction, wall motion abnormalities, and pericardial effusion. Often, accuracy will be improved by findings of sarcoidosis in other organs, particularly the lungs and lymph nodes. For this reason, standard whole body oncologic PET imaging from skull base to thigh can be helpful in addition to limited views of the heart. Potential pitfalls to remember include myocardial FDG uptake that was not completely suppressed or hibernating myocardium accumulating FDG. The distribution of FDG uptake and clinical scenario should help in distinguishing sarcoid uptake from ischemic heart disease. Physiologic uptake in the left ventricular lateral wall in healthy individuals has also been reported and can confound interpretation.

Hopefully this has provided a brief introduction and/or review to FDG PET imaging of cardiac sarcoidosis that you will find helpful.
Smoking is tied to 85/100 deaths from lung cancer as well as bladder, neck, and esophageal cancer. It is the leading cause of cancer related death in the US, and a likely contributor to many other top 10 killers. 1 in 14 people, in the US will develop lung cancer. 1 of 3 Americans currently or previously smoke. Half of all US combat veterans smoke. 160,000 Americans will die of lung cancer this year, and it is estimated that between 8,000 and 22,000 of those deaths would be prevented by this intervention. If detected early, No- Small Cell Lung Cancer has a better prognosis and can be surgically treated. However, until recently it has remained unclear if the potential for early detection was a balance worth striking, compared to the increased radiation exposure from a “screening” radiologic study. To jump ahead slightly, on average, US citizens are exposed to 2.4mSv/y. Radiation exposure from LDCT is ~1mSv, mammography is ~0.7 mSv, and radiation exposure from head computed tomography is ~1.7 mSv.

This summer, the United States Preventive Services Task Force (USPSTF) recommended considering Low Dose CT (LDCT) for screening of high risk patients, who were at risk for lung cancer. On 12.31.13, the public comment period ended, and USPSTF issued a final guideline (also published in Annals of Internal Medicine -- Ann Intern Med. Published online 31 December 2013 doi:10.7326/ M13-2771); “The USPSTF recommends annual screening for lung cancer with low-dose computed tomography in adults aged 55 to 80 years who have a 30 pack-year smoking history and currently smoke or have quit within the past 15 years. Screening should be discontinued once a person has not smoked for 15 years or develops a health problem that substantially limits life expectancy or the ability or willingness to have curative lung surgery. (B recommendation)” 

As practitioners and subject matter experts in nuclear medicine, the ability to address benign versus malignant nodules is critical to the process. NCCN recommends for lung nodules >8mm, consider evaluation with PET/CT. The flood gates are opening for LDCT screening of lung cancer, in high risk smokers—which will most likely result in increased orders for PET/CT evaluation for single pulmonary nodule. For brushing up on evaluation of single pulmonary nodules, one might consider: http://www.ncbi.nlm.nih.gov/pubmed/17268017

This recurring section will feature the latest news from the SNMMI-ACNM Joint Health Policy and Regulatory Affairs Committee in a simple, bullet point format, highlighting the issues that are most important to Residents and Young Professionals! More detailed information can always be found on the Committee’s website by visiting www.snmmi.org and clicking on the “Issues and Advocacy” tab. Here are your top stories:

- The Senate and House of Representatives finally passed a health care budget agreement including a 3 month SGR (sustainable growth rate) patch. The patch serves to postpone a 24% cut in Medicare payments to physicians. The old payment system is now being replaced with a system that focuses on quality driven healthcare, with an emphasis on appropriate use criteria and evidence based medicine.
- The FDA has approved F-18 flutemetamol (Vizamyl) as the second PET imaging agent designed to estimate amyloid deposition in the brain. Similar to F-18 florbetapir (Amyvid), FDA approval does not guarantee CMS approval for reimbursement.
- The nuclear medicine industry continues to face challenges in global supply of Molybdenum-99. The NNSA’s Office of Global Threat Reduction is working to improve the reliability of domestic medical isotope supply by providing assistance to accelerate U.S. domestic commercial production of Mo-99 without the use of HEU (Highly Enriched Uranium).
Erica J Cohen, DO, MPH, CCD

As the new Resident Member of the NM-RRC (Nuclear Medicine Residency Review Committee), I would like to provide you with a few updates from the most recent Committee meeting in November.

There are currently 47 accredited Nuclear Medicine programs with 111 on-duty Residents. There has been a downward trend in the number of active residents over the past several years, likely as a result of decreasing job opportunities within the profession. With radiology residency training programs now trending toward sub-specialization, there may be an increase in the utility of Nuclear Medicine trained physicians over the coming years.

The NM-RRC sympathizes with resident and attending concerns regarding the ACGME case log system. While we are unable to change the mandated individual case logging system, we will likely be removing PET/CT from the log requirements. This will hopefully ease some of the burden of the log system. Case logging is designed to tell the ACGME the volume of studies being performed across institutions. Over several years, this collection of data will be used to establish residency requirements. Please be honest in your case logging as this will directly impact our training! You should be logging I-131 therapies, parenteral therapies, pediatric exams, and myocardial stress exams for which you participated in the actual stress portion of the exam.

Nuclear medicine residency requirements and other information about nuclear medicine training programs can be found at www.acgme.org.

E.O. LAWRENCE (The Inventor of the Cyclotron)

Ernest Orlando Lawrence was born on 8th August, 1901, at Canton, South Dakota (United States). His parents, Carl Gustavus and Gunda (née Jacobson) Lawrence, were the children of Norwegian immigrants, his father being a Superintendent of Schools. Ernest Lawrence was “born grown up,” Gunda Jacobson often said when speaking of her eldest son. He never outgrew his incessant curiosity and boyish enthusiasm. “Ernest was always of a happy disposition and life to him seemed to be one thrill after another, but he was also always persistent and insistent!”

Lawrence received a B.S. degree in chemistry in 1922 from the University of South Dakota followed by M.A. from the University of Minnesota. He spent a year at University of Chicago doing physics and was awarded his Ph.D. from Yale University in 1925. In 1928 he was appointed Associate Professor of Physics at the University of California, Berkeley, soon after his 27th birthday and two years later he became Professor, being the youngest professor at Berkeley.

Lawrence’s research centered on nuclear physics. In 1929 he invented the cyclotron, a device for accelerating nuclear particles to very high velocities without the use of high voltages. The swiftly moving particles were used to bombard atoms of various elements, disintegrating the atoms to form, in some cases, completely new elements. Hundreds of radioactive isotopes of the known elements were also discovered. The cyclotron would be patented in Lawrence’s name, but he never asked for any royalties, and he encouraged and helped other laboratories throughout the world to build cyclotrons. Lawrence was also the legal inventor of the Calutron isotope separator - but he assigned the patent rights to the U.S. government for a fee of one dollar.

In 1939, Lawrence became the first person to win a Nobel Prize for work done entirely on a U.C. campus; he was also the first professor from a public university as well as the first native of South Dakota to do so. During World War II he made vital contributions to the development of the atomic bomb, holding several official appointments in the project. After the war he played a part in the attempt to obtain international agreement on the suspension of atomic-bomb testing, being a member of the U.S. delegation at the 1958 Geneva Conference on this subject.

The strain put too much pressure on him and caused flare up of his chronic colitis. Ultimately, Ernest Lawrence died on Aug. 27, 1958, at the age of 57. Upon his death, Luis Alvarez wrote:

“Lawrence will always be remembered as the inventor of the cyclotron, but more importantly, he should be remembered as the inventor of the modern way of doing science.”

—Luis Alvarez, winner of the 1968 Nobel Prize for Physics


ACGME Update

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The NM-RRC sympathizes with resident and attending

Kanta Saha, MD

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"Name" that answer!

Across
1. low thyroid hormone levels caused by ingestion of a large amount of iodine
2. 1901 Nobel prize in physics
3. left supraclavicular node
4. cold wave
5. clenched fist sign

Down
1. "Fast" radiation
2. braking radiation
3. both alive and dead cat
4. Designed Chicago Pile-1
5. Lid lag sign

Answers

Across
1. Cherenkov
2. Bremsstrahlung
3. Schrodinger
4. Fermi
5. Von Engel

Down
1. Wolff-Chaikoff
2. Tomogen
3. Virchow
4. Osborn
5. Levine