

THE SMIL RADIOLOGY REPORT

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CT Dose Optimization and Safety

QUESTION: What is SMIL's approach to reducing radiation dose in body CT?



Jared Allen, MD, PhD

ANSWER: Concerns about increased cancer risk attributable to computed tomography (CT) continue to grow as the number of CT examinations annually approaches 70 million, with a third of them involving abdominal and pelvic imaging.

In a series of reviews in the *American Journal of Radiology* on CT radiation, Pierre D. Maldjian and Alice R. Goldman outline dose reduction strategies based on the principle of ALARA (as low as reasonably achievable). The objective is to achieve diagnostic quality images while addressing the clinical question using the most dose-efficient methods.

Maldjian and Goldman propose small, incremental changes to dose parameters by indication, patient size and precise anatomic coverage as common-sense measures for dose reduction.

HOW SMIL IS KEEPING PATIENTS SAFE

Scottsdale Medical Imaging (SMIL) has long been committed to CT dose optimization and patient safety. In fact, SMIL maintains ongoing and continuous review of its protocols, training and dosing data to ensure patient safety, says radiologist Jared Allen, MD, PhD. SMIL also participates in a substantial list of national dose reduction initiatives, including Image Wisely and Image Gently (for pediatric patients), as well as the American College of Radiology's dose registry database.

SMIL's comprehensive approach to CT dose optimization covers indication- and weight-based scanning, database integration for dose monitoring, and ongoing technologist and radiologist training, which Allen says is key to continuous quality improvement.

"We can go on and say that we try to reduce the dose to patients as much as possible, but unless you track and measure, you don't have anything to look at in order to improve," Allen says.

To that end, SMIL uses system-wide software that, in real time, reports dosing for all of its patients. The radiologists and technologists review that data on a regular basis to ensure all of its machines are functioning properly and all optimized protocols are followed. They submit that anonymous data to the national dose registry through the American College of Radiology, which in turn gives SMIL information on how it performs in comparison to its peers regionally and nationally in terms of dose.

"All of that together gives us an advantage over other groups that don't have as unified or structured a plan for reducing CT dose," Allen says. •

SMIL's approach to CT dose optimization includes indication- and weight-based scanning, as well as ongoing training for staff.

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REFERENCE:

Maldjian P, Goldman A. Reducing radiation dose in body CT: A primer on dose metrics and key CT technical parameters. *AJR*. 2013;200:741-754.

SPECIAL ISSUE: Your Questions Answered

For this edition of *The SMIL Radiology Report*, we sifted through nearly 450 of your questions and comments. Here, we present the most common topics, including dose optimization and oncology imaging. Remember, you don't need to wait to ask us your questions. You can always call us at **480-425-5000** to speak to a radiologist.

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MRI and Forefoot Pain



Jimmy Leung, MD

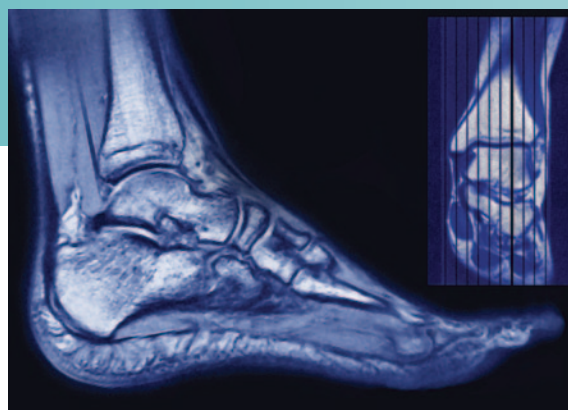
QUESTION: *What is SMIL's experience regarding imaging of the foot and ankle?*

ANSWER: Anterior foot pain is one of the most common conditions of patients referred to the Scottsdale Medical Imaging (SMIL) musculoskeletal radiology group, says Jimmy Leung, MD, a radiologist at SMIL.

"We have five radiologists specializing in musculoskeletal imaging," Leung says. "Over the years, we have developed a considerable amount of experience in imaging of foot pain from our patient population and our professional relationships with podiatrists and orthopedic surgeons."

The differential diagnosis for pain around the metatarsophalangeal joints (MTPJ) includes a Morton's neuroma, capsulitis or a plantar plate tear. MRI is excellent for distinguishing among these.

The challenges of MRI imaging of the foot are that there are many small joints and a lot of anatomic structures in a small area, Leung says.



MRI is an excellent tool for distinguishing among Morton's neuroma, capsulitis and a plantar plate tear. SCIENCE SOURCE

"You have to have good technical specifics to see small joints. There are many small details that need to be done right to intentionally maximize contrast and spatial resolution," Leung says. "One of the ways to maximize spatial resolution is to use a 3T MRI. SMIL has three of these units, two in Scottsdale and one in Gilbert."

The SMIL difference, however, boils down to care, Leung says. "We treat MRI as a tool to guide treatment, not to just image something that hurts. That really is an important difference." •

REFERENCE:

Saurabh Verma, et al. MR imaging for evaluation of plantar pain. *Contemporary Diagnostic Radiology*. 2014;37(10):3.

Ultrasound Imaging for Evaluating Thyroid Nodules

QUESTION: *What are SMIL's guidelines for performing a thyroid biopsy after an ultrasound?*



Chad Palmer, MD

ANSWER: Thyroid nodules are common, with palpable nodules found in 4 percent to 7 percent of the adult U.S. population, and solitary or multiple nodules found at much higher rates with ultrasound screening. While about 95 percent of these are benign, there is wide variation in their management, and determining which should be referred for biopsy remains a challenge.

Scottsdale Medical Imaging (SMIL) adheres to the guidelines of the 2005 Society of Radiologists in Ultrasound Consensus Conference, according to Chad Palmer, MD, a SMIL radiologist who specializes in thyroid imaging.

"Normally if a nodule has no worrisome features and it is solid, we will normally recommend it for biopsy at around 1.5 cm," Palmer says.

SMIL has established a subgroup of radiologists who specialize in thyroid imaging, which Palmer says adds a high degree of consistency in terms of reports and biopsy results. This subgroup of SMIL radiologists perform 20 to 30 thyroid nodule biopsies a week and 25 to 40 diagnostic thyroid ultrasounds a day.

"As a result, we have a core group of radiologists who do a lot of thyroid biopsies and, like anything, the more you do, the better you get," he says.

Five years ago, the group adopted additional protocols to decrease nondiagnostic rates, or the number of biopsies that are inconclusive on pathology. At that time, SMIL's diagnostic rate for thyroid nodules was close to the national average of 17 to 20 percent.

"One of the things we did was to take more samples, as that increases the odds that one or more samples will yield a diagnostic result," Palmer says. "We also changed how we process the samples—some are now dipped in a Carnoy's solution to reduce blood contamination. As a result, SMIL's non-diagnostic biopsy rate over the past year is 12 percent." •

REFERENCE:

Current trends in the practice of medicine. *Mayo Clinic Clinical Update*. 2011;27(1):1-2.

A Closer Look at Oncology Imaging

QUESTION: What is SMIL's process for imaging NETs?



Nishant Verma, MD

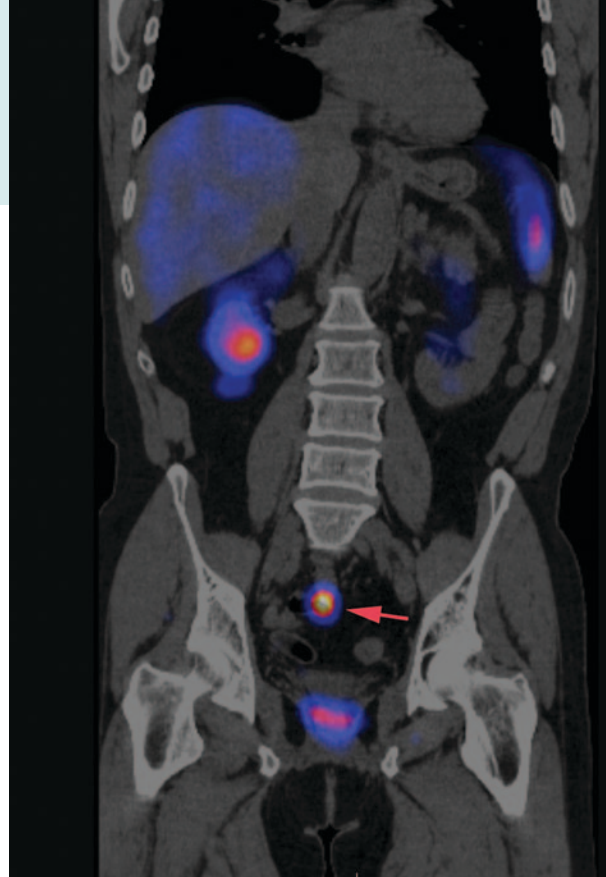
ANSWER: Neuroendocrine tumors (NETs) are rare malignancies that are increasing in incidence. Surveillance, Epidemiology, and End Results (SEER) data shows the age-adjusted incidence of NETs rose from 1.9 to 5.25 cases per 100,000 people between 1973 and 2004. Nearly a third of neuroendocrine tumors develop within the small bowel (SBNETs).

These SBNETs, also called carcinoids, are often small and lack symptoms until metastases develop. Surgery is the only cure in localized disease and may also play a role in advanced disease. As a result, preoperative imaging is important for staging, localization of unknown primaries and treatment planning.

The two most common imaging modalities are CT scan and octreotide scan, or somatostatin receptor scintigraphy (SRS). In a retrospective comparison of patients with SBNETs at the University of Iowa, researchers found that SRS found four primary tumors missed by CT, while CT identified five tumors missed by SRS. They concluded that the two modalities are complementary.

In the situation of inconclusive CT scan, an octreotide scan can resolve the question of malignancy. Nuclear Medicine Specialist Nishant Verma, MD, of Scottsdale Medical Imaging (SMIL), says the problem with SRS is that the resolution is very low.

"We can often see tumors but may have difficulty localizing them," Verma says. "To overcome that, we use SPECT-CT (single-photon emission computed tomography) to make a 3-D reconstruction of the octreotide data, and fuse it over the CT data. This allows us to look at both studies simultaneously and correlate the abnormality on the octreotide scan with the mass on the CT. It really adds a huge advantage in our ability to detect these lesions."



Here, SPECT-CT reveals a carcinoid tumor in the small bowel. SMIL uses this technology to localize tumors. CUSTOM MEDICAL STOCK PHOTO

SMIL is one of few radiology groups using SPECT-CT for NETs, Verma says. He recommends that it be the first step in investigating suspected endocrine tumors, in part because they can also treat the tumor using the octreotide receptors.

"Knowing a tumor is positive on our scan, we administer a similar molecule that binds to the somatostatin receptor and basically shuts the cell down. In this way, the imaging not only identifies the disease but can guide treatment as well." •

REFERENCES:

- Yao JC, et al. One hundred years after "carcinoid": Epidemiology of and prognostic factors for neuroendocrine tumors in 35,825 cases in the United States. *J Clin Oncol.* 2008;26(18):3063-72.
- Dahdaleh F, et al. The value of preoperative imaging in small bowel neuroendocrine tumors. *Ann Surg Oncol.* 2013;20:1912-1917.

"Knowing a tumor is positive on our scan, we administer a similar molecule that binds to the somatostatin receptor and basically shuts the cell down. In this way, the imaging not only identifies the disease but can guide treatment as well," says *Nishant Verma, MD.*



Welcoming a New Neuroradiologist

Scottsdale Medical Imaging (SMIL) welcomed Tyler Gasser, MD, to its staff in July. Gasser is a neuroradiologist specializing in brain and cranial imaging. He says that temporal bone pathology and anatomy, the inner ear and the cranial nerve pose some of the most interesting imaging problems.

"It is a very challenging and intricate anatomy," he says. "It poses a challenge and offers a broad breadth of pathology and interesting cases almost every day." *Continues online* ►



Tyler Gasser, MD

Diagnosing Deep Venous Thrombosis



John Neil, MD

The precise number of people affected by deep vein thrombosis and pulmonary embolism is unknown, but estimates range from 300,000 to 600,000 people annually in the United States.

John Neil, MD, a vascular and interventional radiologist at Scottsdale Medical Imaging (SMIL), says SMIL has the diagnostic imaging and interventional radiology expertise to both make the diagnosis and, in the appropriate setting, treat it.

"We're sort of a one-stop shop when it comes to the diagnosis and treatment of the full spectrum of venous diseases," Neil says. *Continues online* ►

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Breast Cancer Genetic Counseling

Scottsdale Medical Imaging (SMIL) has been working with area physicians and the Virginia G. Piper Cancer Center to improve identification of women at high risk for breast cancer and encourage them to see a genetic counselor, says Denise Hartoin Reddy, MD, a breast and women's imaging specialist at SMIL.

Still, about 50 percent of women who are high-risk decline counseling and testing, Reddy says, in part due to fear of knowing the answer, or fear of losing health insurance. Another barrier has been cost.

"Now some of those barriers have changed. Under the Affordable Care Act, exclusions for pre-existing conditions are banned," Reddy says. *Continues online* ►



Denise Hartoin Reddy, MD

Incidental Findings in Imaging Diagnostic Tests

With the rise in volume of imaging studies, there has been a corresponding rise in the number of incidental findings, sometimes referred to as "incidentalomas."

Sunil Ram, MD, a neuroradiologist at Scottsdale Medical Imaging (SMIL), says incidental findings are a daily occurrence at SMIL due to an aging population and the increased utilization of cross-sectional imaging.

"The challenge of incidental findings is recognizing the appropriate next step," Ram says.

"We discourage unnecessary workups for findings that we deem are likely insignificant." *Continues online* ►



Sunil Ram, MD



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