

Letter from the Editors

In this issue of *Seminars in Nuclear Medicine*, we depart from our usual clinically oriented format to present an in-depth discussion of dosimetry or, as our guest editors prefer to call it, “radiation dose assessment.” Events of the past several years have greatly enhanced both physician and public awareness of the significance of radiation exposure associated with both x-ray and nuclear medicine procedures.

In May 2007, the American College of Radiology (ACR) issued a “white paper” dealing with the general issue of radiation exposure in medicine.¹ The article points out that the dramatic increase in x-ray and nuclear medicine utilization has carried with it a very significant increase in the cumulative exposure to ionizing radiation for the exposed population. From 1980 to 2005, there was a 20-fold increase in computed tomography exams (from 3 million to 60 million) as well as a 3-fold increase in radionuclide exams (from 7 million to 20 million). It has become increasingly important for us to assure that the benefit-to-risk ratio for performing our studies remains favorable for the patient.

We also are witnessing a significant growth in the number of therapeutic procedures being performed in nuclear medicine. Although thyroid cancer therapy with iodine-131 has been used for decades, antibodies labeled with beta-emitters to treat non-Hodgkin’s lymphoma are now FDA approved. Therapy using radioactive agents aimed at neuroendocrine tumor receptors is currently being used successfully in many European sites and may be available in the United States in the near future. It is clear that this increasing use of very large radiation exposures makes it mandatory to consider the exposure dose associated with each of our procedures, as well as the biologic effects associated with this radiation.

The determination of absorbed doses from ionizing radiation is not easy. Absorption in body tissues differs from patient to patient and it is certainly impractical to have radiation detectors inserted into each organ. For this reason, there has been considerable work developing biokinetic models and dose calculation methods to obtain the necessary exposure data. Several of the articles in this seminar provide in-depth insight into both existing and evolving methodologies. In their guest editorial, Drs. Stabin and Brill optimistically predict that these individual image-based patient-specific meth-

ods will eventually lead to dose calculations that will be as accurate and sophisticated as those available for external beam radiation therapy. Additional articles deal with the different forms of radiation employed in radiopharmaceutical therapy and the methodology available to calculate doses at the tissue and cellular levels.

In their article on nuclear medicine exposure, Mettler and coworkers point out that, in the past 25 years, a 50% growth in the U.S. population has been associated with a 300% growth in the number of nuclear medicine procedures that have been performed. It has been estimated that in 2006 (compared with 1982), “the per capita exposure from all medical exposure (not including radiotherapy) has increased almost 600% to about 3.0 mSv.” Although still not an alarming level, this increase certainly underscores the need for affirmative action by nuclear medicine physicians and radiologists. Also of interest is the fact that cardiac studies account for more than 70% of nuclear medicine procedures performed in 2005.

Finally, Dr. Henry Royal’s article deals with the relationship of radiation dose to radiation effects. He states that “radiation exposure from diagnostic medical studies is, by far, the largest source of radiation exposure from human activity.” He underscores the need for a sophisticated epidemiologic study to determine if there is truly an increase in cancer risk associated with our diagnostic procedures.

There is one thing that should be very clear to the reader after assimilating all of the important knowledge put forth in these articles. It is the responsibility of the imaging physician to educate our referring physicians. There is general agreement that too many imaging studies are being performed. Enhanced communication with our referring physicians concerning associated radiation exposure should go a long way toward them being more selective when requesting studies.

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Reference

1. Amis ES Jr, Butler PF, Applegate KE, et al: American College of Radiology white paper on radiation dose in medicine. *J Am Coll Radiol* 4:272-284, 2007