

Letter from the Editors

This is the second of a two-part issue of *Seminars in Nuclear Medicine* devoted to normal changes in organs observed with positron emission tomography/computed tomography (PET/CT) and magnetic resonance imaging. It brings to a conclusion the tour de force of Abass Alavi, Drew Torigian, and their collaborators. Although *Seminars* is a review journal, it is noteworthy that a great deal of the data presented in this issue and the March 2007 issue concerning normal structure and function has never been published elsewhere. It is difficult to publish normal findings in peer-reviewed journals. As a result, many important observations that play a role in our day-to-day practice may not appear in the literature and are passed down only in textbooks and in didactic teaching sessions. This is a significant problem given the fact that one of the greatest challenges facing the imaging physician is the differentiation between normal and abnormal findings. "Normal" is a broad term and often is associated with a spectrum of variants. Most changes in the body occur as a continuum. The wide range of normal findings that exist is determined in part by our genetic makeup and in part by our environment. Beyond this range, there is "abnormal," which is also part of the continuum. It is not difficult to determine something that is markedly abnormal, but then it may be too late to do anything useful to correct the condition. The challenge is to determine minor changes which may foretell serious medical problems. This is the conundrum that is always with us when confronting the balance between true positives and false positives. If we seek to increase the sensitivity of a test, the false positives increase as well. Using this model, we would be faced with missing fewer cases of disease but diagnosing more normal patients as having something that is not really significant. If we tend to err conservatively in order to reduce the false positives, we will miss many cases of true disease.

A very firm understanding of what is normal and what can be expected to change with a patient as he/she becomes older is important in minimizing this tradeoff of false positives with true positives and helps to maximize both the sensitivity and specificity of the tests we perform. This is not a simple task, as exemplified by the large number of authors on each of these articles that was required in order to put the data together in a meaningful way that would best serve clinicians. The organs that are covered in this issue, including the breast and organs of the abdomen and pelvis, all change significantly as

we grow older both in function and in morphology. Changes in the bone marrow with time are profound as the proportion of red and yellow marrow changes in relation to age and sex. Perhaps the most easily appreciated changes related to age and sex occur in the skin, adipose tissue, and skeletal muscle. Here, it is impossible not to observe the loss of subcutaneous tissue as we age. The loss or elasticity of the skin, loss of muscle mass, and other significant changes that we all face are an inevitable consequence of aging that must be differentiated from the abnormal. This is a continuing process and it varies greatly from individual to individual, but each of us is subject to this general pattern.

One of the articles in this issue proposes some approaches for quantitative assessment of regional and global functions to further help simplify qualitative visual assessment. Quantization always has the advantage of providing a more concrete number that can be readily assessed, but this must be approached with caution. All numbers have levels of confidence and standard deviations. Within any given population for any quantitative measurement there will be a significant number of values that overlap between normal and abnormal simply by nature of the statistical process.

Another problem that we face is in the evaluation of lesions that are abnormal but do not have serious prognostic implications. It is impossible to avoid benign lesions that will show uptake in routine fluorodeoxyglucose imaging. Here, the combination of CT with PET is particularly helpful and informative, as reviewed in the article by Metser and Even-Sapir. Unlike the recognition of normal changes that occur with aging, these are clearly abnormal lesions but are benign and require a different algorithm for clinical management. This article complements the coverage of these two issues so that the reader has an appreciation of changes that represent serendipitous PET/CT abnormalities that are clearly not related to age or sex, but are not malignant and do not have dire prognostic implications.

Armed with a firm understanding of the material covered in the March and May issues of *Seminars*, we should be able to avoid image interpretations that will result in additional unnecessary testing and patient anxiety, thus leading us directly toward the correct diagnosis.

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