Guest Editorial on PET of Benign Musculoskeletal Conditions

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The musculoskeletal system includes the bones of the skeleton, joints, muscles, tendons and ligaments, and bursae. These structures can be affected by many malignant and benign conditions. One of the roles of the imaging physician is to differentiate the former from the latter and to refer equivocal cases for further diagnostic tests (including additional imaging tests and biopsy) or follow-up if clinically indicated. PET with the radiotracer FDG plays an important clinical role in the evaluation of human diseases, particularly in oncology. However, not every musculoskeletal “hot spot” on FDG-PET represents a malignant lesion. For example, in one study that included 102 patients with suspicious FDG-avid bone lesions, CT-guided bone biopsy showed a malignant lesion in 91 patients, whereas benign bone lesions were encountered in 11 patients. Clinical information, along with ancillary structural imaging findings (either by means of radiography, ultrasonography, CT, or MRI), may aid in the characterization or narrowing of the differential diagnosis of FDG-avid musculoskeletal lesions. Such knowledge is crucial to minimize unnecessary expensive and invasive additional tests and to avoid incorrect treatment planning. This issue of Seminars in Nuclear Medicine is therefore devoted to PET of benign musculoskeletal conditions.

The first aim of this issue was to (re-)acquaint the reader with a wide spectrum of frequently and less frequently encountered benign musculoskeletal lesions that can be metabolically active on FDG-PET and thus mimic malignancy. In their article, Kwee et al provide an extensive overview of various benign FDG-avid bone lesions, their differential diagnosis, and how clinical and other structural imaging findings may be diagnostically helpful. Metser and Tau present a similar overview for benign cutaneous and subcutaneous lesions on FDG-PET. Parida et al describe and illustrate normal physiological variations of FDG uptake in muscles and benign and malignant pathologic muscle diseases on FDG-PET. Although some previously published articles have addressed physiological FDG uptake and benign FDG-avid lesions that may be mistaken for cancer, these articles were either not exclusively focused on the musculoskeletal system or not as comprehensive as the articles by Kwee et al, Metser and Tau, and Parida et al. We therefore believe the latter trilogy of articles to be a very useful update for daily clinical practice. A commonly debated topic is whether dual time point and delayed FDG-PET imaging are helpful in differentiating benign from malignant lesions. Parghane and Basu discuss the added value of dual time point and delayed FDG-PET imaging to standard FDG-PET in the discrimination between benign and malignant musculoskeletal pathology based on the literature and their own experience. This approach of FDG-PET acquisition will not always overcome the overlap between benign and malignant entities, but can be useful in specific situations as Parghane and Basu describe. Parghane and Basu also appropriately indicate that further research on this topic is necessary and that adoption of uniform protocol and interpretation criteria is equally important to define the role of dual time point and delayed FDG-PET in routine clinical practice. Although this edition of Seminars in Nuclear Medicine focuses mainly on PET with FDG, the article by Rohren and Macapinlac provides an overview of a spectrum of benign bone conditions, which can result in increased uptake on NaF-PET. NaF-PET is increasingly performed in clinical practice, in part due to the (looming) global shortage of technetium-99m for conventional bone scintigraphy and in part due to the relative superior spatial resolution of PET, hence the inclusion of this article in this issue.

The second aim of this issue was to demonstrate that musculoskeletal PET can be used not only for differentiation of benign from malignant disease but also for the whole-body evaluation of several benign musculoskeletal entities, as illustrated by the reviews by van der Bruggen et al and Kubota et al. van der Bruggen et al describe and illustrate the clinical indications for the use of PET in benign bone marrow disorders, including the detection of extramedullary hematopoiesis, evaluation of patients with a discrepancy between bone marrow histology and clinical status, visualization of bone marrow infarctions, location of the optimal site for bone marrow biopsy, diagnosis and staging of other hematological bone marrow disorders, evaluation of radiation therapy effects on bone marrow, and evaluation of bone marrow transplantation. Kubota et al provide another in-depth review...
of the clinical value of FDG-PET for the evaluation of rheumatic diseases, in particular rheumatoid arthritis, polymyalgia rheumatica, and relapsing polychondritis. The articles by van der Bruggen et al\textsuperscript{10} and Kubota et al\textsuperscript{11} both provide useful information for daily clinical practice and show that PET has a wide range of other applications beyond musculoskeletal oncology.

Given the expanding clinical applications of PET, the increasing use of combined PET/CT and PET/MRI systems, and the fact that any imaging subspecialization deals with musculoskeletal pathology, we believe this edition of *Seminars in Nuclear Medicine* to be of interest to any imaging physician. The expert contributors to this issue and the respected editors-in-chief of this journal, Dr Freeman and Dr Blaufox, are thanked for their hard work in composing this issue, which will be useful both for clinical practice and for opening horizons for future research.

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