Preface

Challenging but Clinically Useful: Fluorodeoxyglucose PET/Computed Tomography in Inflammatory and Infectious Diseases

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Contemporary fluorodeoxyglucose (FDG) PET/computed tomography (CT) is a valued and integrated part of staging and treatment monitoring of malignant diseases, a development permitted by decades-long massive investment in PET/CT systems by tertiary medical centers worldwide. It was recognized early in the history of PET/CT that as a glucose analogue, FDG was taken up by inflammatory cells as well as by malignant tissue, but initially this nonspecific property of the tracer was considered a nuisance since it caused false positive findings in the oncologic population.¹ Despite early positive reports of FDG-PET imaging used to diagnose bacterial abscesses,² promising autoradiography studies demonstrating FDG uptake in neutrophil leukocytes, and evidence of increased glucose transporter activity during inflammation,^{3,4} FDG was not widely explored clinically: the nuclear medicine armamentarium already included several much more widely available and allegedly more specific gamma-camera-based infection and inflammation tracers. Nevertheless, in parallel with the increasing demand for oncology FDG-PET/CT scans, excess scanner capacity has gradually allowed for a broader exploration and clinical use of FDG-PET/CT in a range of inflammatory and infectious diseases, such as large vessel vasculitis (LVV), polymyalgia rheumatica

(PMR), sarcoidosis, prosthesis infections, and more heterogeneous entities like fever of unknown origin (FUO).

However, correct acquisition and interpretation of nononcology FDG-PET/CT are associated with several challenges. First, even though a joint European Association of Nuclear Medicine and Molecular Imaging/Society of Nuclear Medicine and Molecular Imaging procedure guideline on FDG-PET/CT for infectious and inflammation is available,⁵ optimal scan parameters are still largely unexplored; they are usually extrapolated from the oncologic setting, but the distribution of some infectious or inflammatory diseases may require more focused imaging on specific areas (eg, extremities or cranial arteries). Second, some populations are very heterogeneous, and consequently, scan indications may be just as wide; this is especially evident in FUO with very diverse patient characteristics, definitions, baseline tests, and image interpretation, which renders direct comparison and pooling of data exceedingly difficult. Third, nononcology FDG-PET/CT scans are rarely performed at first presentation of disease; it may in fact be the clinician's last diagnostic resort. As a result, FDG-PET/CT images of inflammatory diseases, for example, reflect widely differing stages of disease, and images consequently may differ

substantially visually. Fourth, since nononcology FDG-PET/CT is typically used as an adjunct imaging technique, patients have often been treated by either corticosteroids or antibiotics prior to referral, which may result in suppression of FDG uptake by inflammatory cells. Fifth, pathologic FDG uptake indicating a specific inflammatory or infectious disease is rarely confirmed by biopsy but rather by clinical outcome.

As a result of these particular challenges, it has been difficult to establish robust threshold values for what constitutes pathologic FDG uptake and also to agree on particular patterns of FDG distribution specific for each inflammatory or infectious disease.

In this issue of *PET Clinics*, we aim to address these problems and present the most up-to-date knowledge of when and how to use FDG-PET/CT in inflammatory and infectious diseases. We have included an initial article detailing correct patient preparation and the caveats associated with concurrent treatment with metformin and corticosteroids (Hess, “Patient Preparation and Patient-Related Challenges in Infectious/Inflammatory Disease”). Optimal use of FDG-PET/CT to diagnose the inflammatory diseases LVV (Nielsen), PMR (Betrains), inflammatory bowel disease (Brodersen), and sarcoidosis (Basu) are discussed in separate articles. Infectious diseases are discussed in articles concerning FUO, bacteremia, and febrile neutropenia (Hess, “Systemic Infections [Fever/Bacteremia of Unknown Origin, Immunocompromised]”), the infected heart (Scholtens), and bone-related infections (Kwee). Finally, 3 articles discuss more experimental approaches to nononcology PET/CT (low-grade inflammation [Reddy], inflammation beyond FDG [Lapa], and quantification in tuberculosis [Deogaonkar]).

As cliché and generic as it may sound, it is imperative that we raise the scientific bar within the overall clinical entity of FDG-PET/CT imaging of infectious and inflammatory diseases. In particular, future efforts should focus on generating valid

and robust data from well-designed prospective studies on well-established indications with well-prepared and relevant patient populations.

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