Preface

Fluorodeoxyglucose versus Non-Fluorodeoxyglucose PET-Computed Tomography in Less-Explored Domains: An Appraisal

The past two decades have witnessed remarkable growth of molecular PET imaging in cancer and other noncancerous disorders. The combined structure-function approach based on metabolic/anatomic information through integrated PET and computed tomographic (CT) scanners (PET-CT) was a milestone development in the field that led to its widespread application in the clinical workup of patients with cancer. Among the different PET tracers in the clinical arena, fluorodeoxyglucose (FDG) has been at the forefront and dominated the clinical practice, with FDG-PET-CT becoming an integral part of routine patient care in a plethora of clinical conditions. The metrics and change in glucose consumption by the tumor cells were found useful in a number of applications of FDG-PET beyond diagnostic staging, which includes treatment response monitoring early in the course of treatment, aiding in assessing and predicting treatment outcome, treatment planning including radiation therapy, and so on. New drug development is one area that has immensely benefited through the effective evaluation of new therapeutic modalities made possible through molecular PET.

Over time, a number of non-FDG-PET tracers have also been developed and employed clinically, that explored tumor cell proliferation and angiogenesis, certain specific metabolic characteristics of tumor cells, such as amino acid metabolism, radio-labeled receptor ligands for assessing specific receptor-protein overexpression on tumor cells (somatostatin receptors and Prostate Specific Membrane Antigen are some notable examples that provided boost to the development of clinical theranostics), and more recently, tracers targeting stromal cells of the tumor microenvironment by small molecule inhibitors of fibroblast activation protein (FAPI). The non-FDG-PET tracers have been of particular interest and have been examined more where FDG demonstrates limitations, either due to the physiologic distribution of the radiotracer (such as brain, liver, renal system) or due to tumors exhibiting low-glycolytic activity and hence low 18F-FDG avidity and uptake (such as mucin-producing low-grade carcinomas, such as ovarian and gastric malignancies, grade 1 and grade 2 neuroendocrine tumors, endocrine malignancies, such as thyroid carcinoma, hormonally sensitive malignancies, such as prostate carcinoma and breast carcinoma).

This issue of PET Clinics endeavors to provide an update and a comparative appraisal of FDG and non-FDG-PET tracers, in areas where the
use of FDG has been relatively limited and critically examined for its feasibility on a routine clinical basis. In these relatively less-employed clinical domains, the recent advances and development of newer PET radiotracers for imaging have been discussed vis-à-vis FDG with regard to the current status and place in assessment of different aspects of tumor biology, and molecular targets, and also in nonmalignant conditions, including nonmalignant thoracic disorders, infectious and inflammatory conditions, and certain benign conditions within the central nervous system. The reviews have been sequenced in a similar order, such as cancerous conditions first, followed by the nonmalignant conditions. Three related and relevant articles have been interposed in between that describe (a) current status of FAPI-based PET imaging and its potential future applications, (b) PET-CT-based quantitative parameters for assessment of treatment response and disease activity in cancer and noncancerous disorders, along with two articles that describe current and (c) future state of FDG-PET applications in the field of interventional radiology.

We hope the collection of articles provide the readers a balanced view of the value and limitations of the different PET tracers in the enlisted domains and also sustain insight regarding their potential future applications. Finally, the editors would like to extend thanks to all contributors of this issue of PET Clinics for their sincere commitments and support.

Sandip Basu, MBBS, DRM, DNB, MNAMS
Radiation Medicine Centre (B.A.R.C.)
Tata Memorial Hospital Annexe
Jerbai Wadia Road, Parel
Mumbai 400012, India

Homi Bhabha National Institute
Mumbai, Maharashtra, India

Rakesh Kumar, MBBS, DRM, DNB, MNAMS, PhD
Division of Diagnostic Nuclear Medicine
Department of Nuclear Medicine
All India Institute of Medical Sciences
New Delhi 110029, India

Abass Alavi, MD, MD (Hon), PhD (Hon), DSc (Hon)
Division of Nuclear Medicine
Department of Radiology
University of Pennsylvania School of Medicine
Hospital of the University of Pennsylvania
3400 Spruce Street
Philadelphia, PA 19104, USA

E-mail addresses:
drsanb@yahoo.com (S. Basu)
rkphulia@yahoo.com (R. Kumar)
Abass.Alavi@pennmedicine.upenn.edu (A. Alavi)