SNMMI 2013 Image of the Year: Radium-223 Dichloride Response in Bone Metastases in Breast Cancer Patients

Research shows effectiveness of $^{18}$F-FDG PET for measuring therapeutic response.

Vancouver, British Columbia – An $^{18}$F-FDG positron emission tomography/computed tomography (PET/CT) scan illustrating the effectiveness of radium-223 dichloride in treating bone metastases in breast cancer patients with bone-dominant disease has been selected as the Society of Nuclear Medicine and Molecular Imaging’s (SNMMI) 2013 Image of the Year. Researchers selected this image from more than 2,000 studies presented over the course of four days during SNMMI’s 2013 Annual Meeting in Vancouver, British Columbia, Canada.

Each year, SNMMI chooses an image that exemplifies the most cutting-edge nuclear medicine or molecular imaging research today and that demonstrates the ability of molecular imaging to detect, diagnose and treat disease and help select the most appropriate therapy. “Radium-223 dichloride was recently approved by the U.S. Food and Drug Administration for use in castration-resistant prostate cancer patients with bone metastases, and has the potential to help other patients as well,” said Peter Herscovitch, MD, chair of SNMMI’s Scientific Program Committee. “This image was selected as the Image of the Year as it shows how the combination of nuclear medicine and molecular imaging applications—radium-223 dichloride as therapy and $^{18}$F-FDG PET/CT for monitoring therapy response—can be beneficial for patients.”

Up to 80 percent of patients with metastatic breast cancer develop bone metastases, which often result in skeletal complications carrying poor prognosis and significant morbidity. Radium-223 dichloride—an alpha-emitting therapeutic radiopharmaceutical—targets osteoblastic bone metastases with high energy alpha particles with a short range, sparing healthy tissues and bone marrow. Its efficacy has recently been demonstrated in bone metastases in patients with prostate cancer, prolonging survival and significantly decreasing skeletal related events.
In the study, “[¹⁸F] FDG PET: Changes in uptake as a method to assess radium-223 dichloride (Ra-223) response in bone metastases of breast cancer patients with bone-dominant disease,” 23 metastatic breast cancer patients with bone-dominant disease received either four (19/23 patients), three (15/23 patients) or two (23/23 patients) treatments of radium-223 dichloride. Imaging with ¹⁸F-FDG PET/CT was conducted at baseline, after the second treatment and after treatment discontinuation to assess metabolic changes in target bone lesions. Target lesions were defined as osteoblastic (showing high uptake on bone scan) and having increased metabolic activity (intense uptake on baseline FDG PET/CT).

PET/CT imaging showed a total of 155 bone target lesions at baseline. After two treatments with radium-223 dichloride, one-third (32.3 percent) of target lesions showed significant metabolic decrease. Patients who received four treatments of radium-223 dichloride continued to see benefit from the therapy with a 41.5 percent response rate of target lesions. Most other analyzed target lesions showed stable disease.

Patrick Flamen, MD, PhD, head of the Department of Nuclear Medicine at Institut Jules Bordet in Brussels, Belgium, and lead author of the study, noted, “Radium-223 dichloride, administered in a preventive or micro-metastatic setting, has been shown to prevent progression of breast cancer bone metastases, and increased survival in a preclinical model. Response assessed with ¹⁸F-FDG PET/CT clearly shows the benefit of this therapy for metastatic breast cancer patients with bone-dominant disease, with a greater than 25 percent reduction in targeted bone lesions activity in a significant number of patients. The potential for this therapy to help cancer patients of all types is promising and should be studied further.”

*Scientific Paper 647:* P. Flamen, C. Garcia and M. Piccart, Institut Jules Bordet, Brussels, Belgium; R. Coleman, Weston Park Hospital, Sheffield, United Kingdom; B. Naume, Oslo University Hospital, Oslo, Norway; G. Jerusalem, CHU Sart Tilman, Liege, Belgium; and A. Aksnes, Algeta ASA, Oslo, Norway, “[¹⁸F] FDG PET: Changes in uptake as a method to assess radium-223 dichloride (Ra-223) response in bone metastases of breast cancer patients with bone-dominant disease.” SNM’s 60th Annual Meeting, June 8-12, 2013, Vancouver, British Columbia.