Editorial

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Photon-Counting Detector Computed Tomography: A Promising New Technique for Multiple Myeloma Evaluation That Warrants Further Investigation

Young Han Lee[1], In Sook Lee[2,3]

[1]Department of Radiology, Research Institute of Radiological Science and Center for Clinical Imaging Data Science, Yonsei University College of Medicine, Seoul, Republic of Korea
[2]Pusan National University School of Medicine, Busan, Republic of Korea
[3]Department of Radiology, Pusan National University Hospital, Biomedical Research Institute, Busan, Republic of Korea

See the corresponding article "Impact of Photon-Counting Detector Computed Tomography on Image Quality and Radiation Dose in Patients with Multiple Myeloma" by Rau et al., in volume 24(10) on page 1006 to 1016, https://doi.org/10.3348/kjr.2023.0211.

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We read with interest the article by Dr. Rau and colleagues [1], which delved into the early clinical application of photon-counting detector (PCD) computed tomography (CT) for whole-body imaging in patients with multiple myeloma. Dr. Rau and colleagues [1] enrolled 35 patients with multiple myeloma who underwent PCD-CT. PCD-CT has emerged as a novel imaging technique with promising results in early clinical applications in abdominal, cardiovascular, and musculoskeletal imaging [2,3]. Dr. Rau and colleagues [1] investigated patients with multiple myeloma in terms of potential strengths in image quality, diagnostic confidence, and radiation dose compared with energy-integrating detector CT (EID-CT). We applaud their potential clinically beneficial contributions, while raising some concerns.

PCD-CT offers several advantages over conventional EID-CT in musculoskeletal imaging: improved spatial resolution with smaller spatial pixels, advanced multienergy spectral CT imaging capabilities enabling quantification of gout imaging and virtual non-calcium images for bone marrow edema visualization, enhanced metal artifact reduction, a higher contrast-to-noise ratio (CNR) with effective suppression of electronic noise, and lower radiation dose [3-5].

High-spatial-resolution CT imaging can reveal complex details within musculoskeletal tissues and organs. The ability of high spatial resolution to visualize small structures allows detailed evaluation of the cortex, cartilage, joint space, trabecular details [5,6], and high-resolution dedicated joint imaging would provide even greater benefits in PCD-CT. Dr. Rau and colleagues showed superior image quality in whole-body CT using relatively low spatial resolution imaging of the skull, ribs, vertebrae, pelvic bone, humerus, and femur [1]. Further studies on dedicated musculoskeletal CT imaging that require ultrahigh-resolution capabilities are needed to explore the clinical potential of PCD-CT in musculoskeletal imaging.

Although CT imaging plays a crucial role in diagnosis and treatment, radiation exposure is inevitable. Radiologists should minimize radiation exposure using optimized protocols and ensure that the diagnostic benefits of CT

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Corresponding author: In Sook Lee, MD, Department of Radiology, Pusan National University Hospital, 179 Gudeok-ro, Seo-gu, Busan 49241, Republic of Korea
• E-mail: lis@pusan.ac.kr

outweigh the associated radiation risks [7]. In this study, the radiation dose reduction of PCD-CT was not significantly different from that of EID-CT for a single energy subset [1]. This could be due to the small number of patients and the lack of optimized CT protocols, as stated in the limitations section. For further expansion of PCD-CT applications, CT protocol optimization for PCD-CT and the target joint/region is necessary. To address radiation dose concerns, the authors emphasized the importance of optimizing CT protocols to maximize the radiation dose reduction potential of PCD-CT. Further research is needed to optimize CT protocols for PCD-CT and specific joint/region-dedicated imaging, expand its applications, and improve patient safety.

Virtual monoenergetic images (VMIs) from PCD-CT show a significant increase in iodine CNR [8]. The research by Rau et al. [1] analyzed non-contrast PCD-CTs. However, contrast-enhanced CT, which provides enhanced visualization of vascular and tissue structures and pathological changes, could maximize the advantages of PCD-CT. Future studies on contrast-enhanced PCD-CT are expected to achieve better utilization of VMIs and a high spatial resolution capability.

PCD-CT offers enhanced spatial resolution, improved iodine CNR, and reduced radiation dose [3,4]. Applications to joint imaging, which focuses on visualizing intricate structures, require higher spatial resolution in dedicated musculoskeletal imaging and encourage ongoing research into high-spatial-resolution imaging techniques. PCD-CT protocols need to be optimized for minimal radiation doses, while stressing the need for optimized protocols to mitigate radiation risks. Moreover, the exploration of contrast-enhanced PCD-CT for enhanced visualization and iodine CNR may reveal additional benefits for clinical use. Future studies on contrast-enhanced PCD-CT are required to maximize the utility of PCD-CT and VMIs in clinical practice.

Conflicts of Interest

In Sook Lee, the section editor, and Young Han Lee, the editor board member of the *Korean Journal of Radiology*, were not involved in the editorial evaluation or decision to publish this article. All authors have declared no conflicts of interest.

Author Contributions

Conceptualization: all authors. Data curation: Young Han Lee. Formal analysis: Young Han Lee. Investigation: Young Han Lee. Methodology: Young Han Lee. Porject administration: all authors. Resources: Young Han Lee. Supervision: In Sook Lee. Validation: all authors. Visualization: Young Han Lee. Wristing—original draft: Young Han Lee. Writing—review & editing: all authors.

ORCID IDs

Young Han Lee
https://orcid.org/0000-0002-5602-391X
In Sook Lee
https://orcid.org/0000-0001-7295-600X

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