Letter to the Editor

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Hybrid Translational Imaging: Many Hands Make Light Work

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ABSTRACT

Keywords: Artificial Intelligence; CT; Hybrid Imaging; Interventional Oncology; MR; PET/CT; PSMA; PET/MR; SPECT/CT; US/CT

Abbreviations: SPECT/CT: Single-Photon Emission Computed Tomography / Computed Tomography; PET/CT: Positron Emission Tomography / Computed Tomography; PET/MR: Positron Emission Tomography / Magnetic Resonance; US/CT; Ultrasound / Computed Tomography; PSMA: Prostate-Specific Membrane Antigen

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Personalized medicine is a new area of medicine aimed at improving diagnostic accuracy and reducing treatment failures. Medical imaging has progressed from simple visualization of the human body to a primary source of analytical approaches for in vivo disease characterization. To date, hybrid imaging describes the physical combination of complementary imaging systems, such as Single-Photon Emission Computed Tomography / Computed Tomography (SPECT/CT), Positron Emission Tomography / Computed Tomography (PET/CT), Positron Emission Tomography / Magnetic Resonance (PET/MR), and Ultrasound / Computed Tomography (US/CT). These tools provide combined anatomical and metabolic images, which are based on intrinsically aligned morphological and functional data. The field of hybrid imaging is rapidly expanding to include PET with contrast-enhanced CT [1] or diagnostic MR [2] on a routine basis. Combining different imaging modalities such as PET, and SPECT, with CT or MR, can provide complementary information that has potentially beneficial clinical applications, providing efficient diagnosis, radio-genomics, and therapy planning. Moreover, developing novel radiopharmaceuticals expands the range of diagnostic applications for hybrid scanners to molecular imaging, where biological probes enable disease tracking and monitoring across oncology, neurology, neuro-oncology, and cardiology. PET/CT leads to a significant change in multidisciplinary team management for malignant tumors [3].

Hybrid imaging is also a major development in planning radiotherapy through PET/CT and PET/MR systems to gather information about tumors and create individualized radiation therapy [4-6]. This approach is especially useful for intensity-modulated radiotherapy and is expected to have a significant impact in the future.

Furthermore, hybrid multimodality lesion visualization is constantly improving for targeting-guided biopsies and assessing percutaneous interventions or image-guided surgery [7-9]. The development of radioligands for therapy in nuclear medicine represents the ideal "square the circle", allowing in vivo systemic administration of a radiolabeled peptide designed to selectively target receptors that are overexpressed on cancer cells, with effects of disease-specific precision medicine, focused on patient care rather than the underlying disease, with a personalized approach. The synergy between diagnostic tracers in nuclear medicine and their therapeutic counterparts is expanding the application of theranostics in prostate cancer with radiolabeled prostate-specific membrane antigen (PSMA) and in neuroendocrine tumors with 68Ga/177Lu-labeled somatostatin analogues [10,11]. Thus, the development of radiological or hybrid tools will help to better target treatment and personalize therapies. Furthermore, in the upcoming decade, Artificial Intelligence-based approaches will mainly deal with detecting and segmenting lesions, diagnosing whether they are benign or malignant, determining the stages of the disease, and predicting the prognosis [12].

The prospected challenge requires a translational approach in all professionals involved: scientific progress over the last two decades demonstrated that both nuclear physicians and radiologists approaching hybrid imaging need to perform a personal revolution in the diagnostic attitude and clinical approach intrinsically linked to their field of specialization. The result of this process of innovation is a new generation of diagnosticians, who have acquired the capability to overcome the limits and advantages of the specialization, in strengthening mutual invasibility, during the experience with clinical practice, professional updates, and scientific literature.

References

1. Antoch G, Freudenberg LS, Beyer T, Bockisch A, Debatin JF, et al. (2004) To enhance or not to enhance? 18F-FDG and CT contrast agents in dual-modality 18F-FDG PET/CT. J Nucl Med 45 Suppl 1: 56S-65S.
2. Li M, Huang Z, Yu H, Wang Y, Zhang Y, et al. (2019) Comparison of PET/MRI with multiparametric MRI in diagnosis of primary prostate cancer: A meta-analysis. Eur J Radiol 113: 225-231.
3. Brown E, Patel M, Gupta K, Farrell A, Patlas M, et al. (2026) Impact of 18-FDG PET/CT on Multidisciplinary Decision-Making and Management in Abdominal Malignancies: A Systematic Review and Meta-Analysis. Curr Oncol Rep 28(1): 54.
4. Manapov F, Eze C, Holzgreve A, Käsmann L, Nieto A, et al. (2022) PET/CT for Target Delineation of Lung Cancer Before Radiation Therapy. Semin Nucl Med 52(6): 673-680.
5. McKay MJ, Taubman KL, Lee S, Scott AM (2022) Radiotherapy planning of lymphomas: role of metabolic imaging with PET/CT. Ann Nucl Med 36(2): 162-171.
6. Deantonio L, Castronovo F, Paone G, Treglia G, Zilli T, et al. (2023) Metabolic Imaging for Radiation Therapy Treatment Planning: The Role of Hybrid PET/MR Imaging. Magn Reson Imaging Clin N Am 31(4): 637-654.
7. Nihayah S, Shammas A, Vali R, Parra D, Alexander S, et al. (2017) Correlation of PET/CT and Image-Guided Biopsies of Pediatric Malignancies. AJR Am J Roentgenol 208(3): 656-662.
8. Bogoni M, Cerci JJ, Cornelis FH, Nanni C, Tabacchi E, et al. (2021) Practice and prospects for PET/CT guided interventions. Q J Nucl Med Mol Imaging 65(1): 20-31.
9. Shyn PB, Bhagavatula SK (2025) PET/CT-Guided Tumor Ablation, From the AJR "How We Do It" Special Series. AJR Am J Roentgenol 224(1): e2430952.
10. Sartor O, De Bono J, Chi KN, Fizazi K, Herrmann K, et al. (2021) Lutetium-177-PSMA-617 for Metastatic Castration-Resistant Prostate Cancer. N Engl J Med 385(12): 1091-1103.
11. Jia AY, Kashani R, Zaorsky NG, Spratt DE, Kiess AP, et al. (2022) Lutetium-177 DOTATATE: A Practical Review. Pract Radiat Oncol 12(4): 305-311.
12. Zhang Q, Huang Z, Jin Y, Li W, Zheng H, et al. (2025) Total-Body PET/CT: A Role of Artificial. Semin Nucl Med 55(1): 124-136.
13. Lyons K S, Lee C S (2018) The theory of dyadic illness management. Journal of Family Nursing 24(1): 8-28.

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