Artificial intelligence in molecular imaging: at the crossroads of revolutions in medical diagnosis

Progress in medical imaging evolves slowly but is occasionally punctuated by great leaps forward. Rarely do two such leaps coincide, thereby enabling synergistic improvements in detection, staging, and prognostication for patients. Yet, we are witnessing that in real-time, with rapid progress in both molecular imaging (MI) and artificial intelligence (AI).

This series of articles in *Annals of Translational Medicine* explores the intersection of MI and AI and hints at the future impact of these rapidly changing technologies. Manuscripts include both original research and review articles that cover topics such as the use of generative adversarial networks (GANs) in medical imaging, molecular neuroimaging, the use of AI for response assessment, and prostate-specific membrane antigen (PSMA)-based therapy in prostate cancer, among others.

As the number of clinically utilized radiotracers increases, the information available from inherently data-rich MI will expand, providing insight into physiology and pathology across systems that are working as independent networks yet in concert. Meanwhile, the sophistication of AI algorithms will increase as larger volumes of MI data are leveraged to guide patient management with unprecedented levels of precision.

Looking forward, progress in MI and AI will not occur independently, but will instead be inextricably linked. All aspects of MI will be impacted by AI and the field will accelerate as AI is brought to bear on new radiotracer development, the reconstruction of ultra-low-dose scans, and outcomes prediction from whole-body imaging metrics. Concurrently, the layered functional and molecular information available from MI will drive the development of AI algorithms whose predictive qualities will be dramatically improved over those possible with anatomic imaging alone. The articles in this series will serve as an introduction to these topics.

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