Preface to 2017 focused issue: *Translational Imaging in Cancer Patient Care*

Medical imaging is involved in almost every aspect of clinical care for cancer patients, ranging from early detection and grading of cancers, risk assessment, therapeutic monitoring, as well as image-guided treatment. The importance of objective, reproducible, and quantifiable imaging is particularly motivated by the growing need for individualized precision medicine (1,2).

Application of morphological imaging to the evaluation of tumor response to treatment has led to the emergence of response criteria such as those proposed by the Response Evaluation Criteria in Solid Tumors (RECIST) working group (3,4). However, there is increasing awareness that anatomical approaches based on measurements of tumor size have significant limitations including the presence of tumors that cannot be measured and mass lesions that persist following effective therapy (5-9). Functional imaging techniques are increasingly being used to monitor response to therapies with novel mechanisms of action, often predicting the success of therapy before conventional measurements of size have changed. The consequences of altered angiogenesis, glucose metabolism and cell death can be imaged in patients using techniques such as dynamic contrast-enhanced magnetic resonance imaging (DCE-MRI), fluorine-18 positron emission tomography, diffusion-weighted magnetic resonance imaging (DW-MRI), Chemical Exchange Saturation Transfer (CEST) (5-18). However, the ever-expanding number of potential imaging and molecular biomarkers that seemingly correlate with the pathologic processes in question has the potential to produce random statistical parameters, waste scientific efforts, and drive up the cost of health care (11). A deep understanding and validation of the pathophysiologic basis of the correlation between a biomarker and the underlying condition is vitally important (6).

This focused issue of *Translational Imaging in Cancer Patient Care* highlights current topics in the field of imaging addressing many common and debilitating oncological conditions. The authors have succeeded in covering a wide range of quantitative morphometric and compositional methods, particularly DW-MRI and ultrasound (US) imaging. Among the various functional imaging techniques, diffusion weighted imaging has the particular appeal that this method is widely available and completely non-invasive (without the injection of a contrast agent or a radioisotope). Water motion in tissues is not random but instead is modified by flows within conduits (for example, blood vessels, glandular ducts) and by interactions with cellular components such as hydrophobic phospholipid-containing cellular membranes, intracellular organelles. DW-MRI provides information on tissue cellularity, extracellular space tortuosity, and the integrity of cellular membranes by measuring the random motion of the water molecules in tissue. With increasing cell density, the confining effect of membranes increases and growing tumors typically have lower signal on apparent diffusion constant (ADC) maps than healthy cells due to restricted water diffusion (19-21). Intravoxel incoherent motion (IVIM) analysis allows for the separation of diffusion and perfusion parameters from diffusion weighted imaging with multi b values by compartmentalizing fast and slow moving spins (22-24). US is advantageous in a variety of scenarios of cancer management because it is of low cost and is widely available. US can reach both superficial and deep tissues depending on the frequency utilized for imaging, and microbubble agents provide tissue blood flow information (25-29). US contrast agents can also be targeted and used as carriers for local gene or drug delivery (30-32). US is also convenient for guided biopsy and guided minimally invasive therapy (27,33-38). In this special issue, serum blood biomarkers, such as HIF-1α, VEGF, and tryptase in assessing image-guided interventional treatment are also explored in two articles; a CT scan protocol is explored for gastrointestinal tumor post-surgery surveillance to reduce radiation exposure to patients.

We hope readers find the progress on Translational Imaging reported in this special issue interesting and stimulating. We would like to extend our sincere gratitude to all authors who devoted their time and expertise in putting together excellent contributions to this work. We also thank the Editorial Board of *Translational Cancer Research* for the opportunity to serve as the guest editor for this issue.

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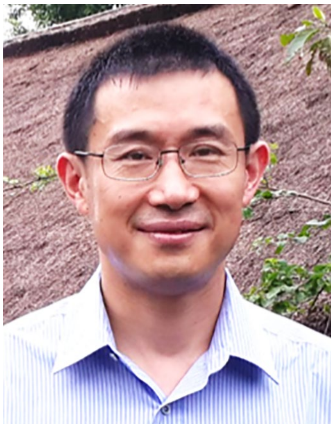
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