Cancer is one of the leading causes of death all over the world. The research of cancer has always been a major focus in the medical imaging field. Modern imaging technology such as molecular imaging has already been shown to be useful in enhancing cancer management, including early detection, more accurate diagnosis, better treatment planning, and treatment monitoring in an early stage. Molecular imaging enables in vivo visualization and measurement of biological process at the cellular and molecular level. It allows not only localization of tumor lesions but also visualization of the expression and activity of specific molecules, which have great influence on tumor behavior and response to treatment. Many different modalities, such as MRI, SPECT, and PET, have been developed and used for noninvasive molecular imaging and have played a critical role in clinical oncology. However, due to large intersubject variability and various parameters in molecular images, it is generally infeasible to derive a single analytic method or simple equations that can describe the targets such as lesions and anatomies in all the images. Hence, in order to facilitate further the application of molecular imaging in clinical oncology, image processing techniques have become a major focus in molecular imaging research, so that we can make better use of the rich information in the molecular image data.

The aim of this special issue is to provide a platform for high quality works on image processing and molecular imaging of cancer. Original papers and review articles focusing on the latest application of image processing techniques in multimodality cancer molecular imaging were submitted. The topics included pharmacokinetic modeling approaches, computer-aided detection/diagnosis of cancer, treatment evaluation and prognostication of cancer, segmentation/delineation of tumor lesions, correlation between molecular image data and other medical data of cancer from a medical perspective, advantages and limitations of existing and new imaging processing software/techniques, the importance of molecular image processing within the entire cycle of cancer patient management, and some other image processing techniques applied in cancer molecular imaging. We received a total of 16 submissions, and after two rounds of rigorous review, 5 papers were accepted for publications in this special issue.

In the paper “Head and Neck Cancer Tumor Segmentation Using Support Vector Machine in Dynamic Contrast-Enhanced MRI,” W. Deng et al. proposed an automatic method based on Support Vector Machine (SVM) and Dynamic Contrast-Enhanced Magnetic Resonance Imaging (DCE-MRI) to segment the tumor lesions of head and neck cancer (HNC). They calculated five curve features and
two principal components of the normalized time-intensity
curve (TIC) and trained three SVM classifiers. Compared to
similar studies in literature, their method has achieved higher
accuracy, and the average area overlap measure (AOM) with
the testing dataset was 0.76 ± 0.08. This proposed method is
of potential in the clinical practice for HNC.

In the paper “PET Imaging of FSHR Expression in
Tumors with 68Ga-Labeled FSH1 Peptide,” D. Pan et al.
developed 68Ga labeled FSH1 peptide for imaging of FSHR
in cancers. 68Ga-NOTA-MAL-FSH1 was produced within
20 min and the radiochemical purity was greater than 95%.
In vitro studies and MicroPET imaging were performed in
PC-3 prostate tumor model. It showed that 68Ga -NOTA-
MAL-FSH1 possessed FSHR binding affinities. The tracer was
stable in human serum for at least 2 hours. MicroPET imaging
revealed that the PC-3 xenografts were clearly visualized.
FSHR binding specificity was also demonstrated by reduced
tumor uptake of 68Ga-NOTA-MAL-FSH1 after coinjecting
excess unlabeled FSH1 peptide. The favorable characters of
68Ga-NOTA-MAL-FSH1 such as convenient synthesis and
specific tumor uptake warrant its further investigation for
FSHR expression imaging.

In the paper “An Individually Optimized Protocol of
Contrast Medium Injection in Enhanced CT Scan for Liver
Imaging,” S.-T. Feng et al. investigated the effectiveness of a
new individualized contrast medium injection protocol for
enhanced liver CT scan. Patients who underwent plain and
dual phase enhanced liver CT were randomly assigned to 2
groups, one with individualized contrast medium injection
protocol and the other with standard contrast medium injec-
tion. The mean contrast medium dose was statistically lower
with the individualized protocol. There were no significant
differences in CT values and ΔHU (CT value difference
between plain and enhanced CT) of liver parenchyma and
tumor-liver contrast between two groups. Two independent
radiologists were in substantial conformity in grading tumor
conspicuity. The authors concluded that using the individ-
ually optimized injection protocol might reduce contrast
medium dose without impacting on the imaging quality in
enhanced liver CT.

In the paper “Dynamic Contrast-Enhanced Magnetic
Resonance Imaging of Regional Nodal Metastasis in Na-
sopharyngeal Carcinoma: Correlation with Nodal Staging,”
B. Huang et al. determined if the perfusion parameters
by DCE-MRI of regional nodal metastasis were helpful
in characterizing nodal status and to understand the rela-
tionship with those of primary tumor of nasopharyngeal
carcinoma (NPC). 26 newly diagnosed patients with enlarged
retropharyngeal/cervical lymph nodes suggestive of nodal
disease were recruited and DCE-MRI was performed. Three
quantitative parameters, $K_{trans}$, $v_e$, and $k_{ep}$, were calculated
for the largest node in each patient and analyzed. $K_{trans}$ was
significantly different among the patients of N stages. There
was no significant correlation between the parameters in
nodes and primary tumors. The authors concluded that DCE-
MRI may play a distinct role in characterizing the metastatic
cervical lymph nodes of NPC.

In the review article “Application of Deep Learning
in Automated Analysis of Molecular Images in Cancer:
A Survey,” Y. Xue et al. review the applications of deep
learning in molecular imaging in terms of tumor lesion
segmentation, tumor classification, and survival prediction.
They also outline some future directions in which researchers
may develop more powerful deep learning models for better
performance in the applications in cancer molecular imaging.

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thank the professional reviewers for their precious help with
review assignments. They hope the papers of this special
issue contribute to this interesting and fast-moving field of
molecular imaging.

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