Neuroimaging 2: Recent Issues in Neuroimaging (I)

SY08-1

Recent issues in neuroimaging

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Quantitative imaging data will enable computerized decision-support systems to improve diagnostic and prognostic accuracy, according to experts in the rapidly expanding field of radiomics. Radiomics is the high-throughput extraction of large amounts of data from medical images and applies advanced computational methods to convert medical images into a large number of quantitative descriptors of oncologic tissues. Computers can extract hundreds of descriptive quantitative features. These features can then be combined with medical and genomic data to create a comprehensive database. The core belief of radiomics is that images aren't pictures but data. The motivating factor spurring radiomics is rooted in cancer genetics. Genetic heterogeneity of tumors, which arises from genome instability in combination with highly selective microenvironments, is a major cause of therapy resistance. Radiomics can have a potential to quantify tumor microenvironments and the extent of genetic heterogeneity.

In terms of clinical relevance of radiomics, quantitative imaging features can improve diagnostic accuracy and prediction of treatment response. Prediction is important because that actually leads to actionable consequences. The use of in vivo, quantitative prognostic and predictive imaging biomarkers, such as those provided by radiomics analyses, will be essential to selecting the right patient for the right treatment in the era of precision medicine. In the correlation with genomics, radiogenomics could help radiologists identify key prognostic imaging features, better understand tumor heterogeneity and guide molecularly-driven biopsies.

To explore the full potential of radiomics, imaging bioinformatics is critical to enter the era of big data. However, a key challenge for successful implementation of radiomics is the extraction of stable and comparable quantitative image features among different patients as the inherent variability of CT and MRI data. Next, image features have to be extracted automatically in a high-throughput setting, requiring a substantial amount of computational capacity. Moreover, in radiomics the number of features greatly exceeds the number of patients and conventional regression techniques may produce unsatisfactory results.

Keywords : Radiomics, Machine learning, Brain tumor

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SY08-2

Recent Issues in Stroke

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1. Treatment of acute ischemic stroke

- Imaging for selection of endovascular therapy in acute ischemic stroke

a)Image more to save more

b) Advanced modality imaging evaluation in acute ischemic stroke may lead to delayed endovascular reperfusion therapy without improvement in clinical outcomes

2. Non-invasive cerebral perfusion technique

a) Is ASL a useful perfusion technique for evaluating perfusion status in patients who have acute stroke? Versus DSC-MR perfusion

b) What is the added value of ASL perfusion in the evaluation of stroke?

c) Can ASL measure the cerebrovascular reactivity without stress test?

Keywords : Ischemic stroke, Advanced stroke imaging, ASL

Neuroimaging 2: Recent Issues in Neuroimaging (I)

SY08-3

Recent issues in dementia

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Recently, magnetic resonance imaging (MRI) is playing an increasingly important role in the study of neurodegenerative disease, delineating the structural and functional alterations. Especially in dementia, as structural alteration in MRI was integrated in the revised diagnostic criteria, the imaging study became essential for the diagnostic work-up in the current clinical practice.

Last year, as the several researches with new drugs targeting either amyloid-β or tau protein showed promising results in the dementia field, there are huge clinical demands for the new imaging biomarkers which can identify at-risk population at the early stage and can play a role as a drug target. In the present lecture, we provide a brief overview of Alzheimer's disease and explore recent neuroimaging developments including quantitative susceptibility mapping (QSM), task-related and task-free functional MRI, MR elastography, arterial spin labeling (ASL), dynamic contrast-enhanced (DCE) MRI, focused on its possible role as an early diagnostic biomarker and hopefully drug target beyond structural MRI.

Keywords : Dementia, Advanced imaging