Clinical breakthroughs with 3T MRI and 320 Detector row CT

Saturday, 27th September 2014, 12:00-13:00
Room 3 (KOBE PORTPIA HOTEL, Ohwada C, South Wing)

Chair
Kazuo Awai, M.D., Ph.D.
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Lecture 1
State-of-the-Art Body Imaging on 3T MRI: From Morphological to Functional and Metabolic Imaging
Yoshiharu Ohno, M.D., Ph.D.
Advanced Biomedical Imaging Research Center Division of Functional and Diagnostic Imaging Research, Department of Radiology
Kobe University Graduate School of Medicine

Lecture 2
Area detector CT – recent developments
Mathias Prokop M.D., Ph.D.
Department of Radiology, Radboud University Nijmegen Medical Centre

TOSHIBA MEDICAL SYSTEMS CORPORATION
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State-of-the-Art Body Imaging on 3T MRI: From Morphological to Functional and Metabolic Imaging

Yoshiharu Ohno, M.D., Ph.D.
Advanced Biomedical Imaging Research Center Division of Functional and Diagnostic Imaging Research, Department of Radiology, Kobe University Graduate School of Medicine

When magnetic resonance (MR) imaging using 3T MR system has been implemented, many investigators have been interested in this new technique for not only brain, but also other body areas including chest. However, when 3T MR systems were firstly applied to body, the MR systems, sequences and other applications at that time were very primitive and limited. Therefore, adequate image quality within an appropriate examination time could not be realized, and continuous improvements have been tired by vendors in the last decade.

In this situation, Toshiba Medical Systems Corporation provides “Vantage Titan™ 3T” as the new 3T MR system, which has new gradient and RF systems with large bore, advanced scan techniques and newly developed post-processing tools for answering various clinical and academic questions. Since 2011, we have collaborated with Toshiba, and developed new techniques for not only morphological assessment, but also functional and molecular evaluations in body fields. By using this new MR system, we can clinically apply the following state-of-the-art MR techniques including 1) non-contrast-enhanced MR angiography and perfusion imaging, 2) quantitatively assessed contrast-enhanced perfusion MR imaging, 3) computed diffusion-weighted MR imaging (cDWI) with various b-values, 4) whole-body MR imaging for oncologic patients, 5) thin-section MR imaging with ultra-short echo time (TE), and 6) chemical exchange saturation transfer (CEST), and show their clinical utilities and preliminary results in various diseases and body fields including chest in this lecture.

We hope the audiences will gain further insights into the progress that has been made in state-of-the-art MR imaging on Vantage Titan 3T, and be able to use these information for their own practice where applicable.

Area detector CT – recent developments

Mathias Prokop M.D., Ph.D.
Department of Radiology, Radboud University Nijmegen Medical Centre

This lecture will give an update on recent developments in area detector CT. These scanners have seen a substantial increase in clinical applications in the past years. The 16 cm coverage of 320-row area detector not only allows for one-shot imaging in various areas of the body but also for highly flexible perfusion protocols, dynamic and subtraction imaging.

Perfusion imaging is a rapidly growing area of application of area detector imaging. It can be used for physiologic tumor characterization, prognostication, and early prediction of treatment response. CT perfusion imaging might ultimately gain an important role for choice of appropriate treatment. Area detector imaging provides flexible tools that even allow for combining perfusion imaging with standard morphologic imaging in one interleaved acquisition sequence. Combining cardiac CTA with CT perfusion during stress makes cardiac CT a comprehensive technique for rapid workup of patients with suspected coronary heart disease. Brain perfusion imaging is already standard practice. New developments make it possible to substitute the sequence of pre-contrast CT, CTA and CTP by a single CTP acquisition interleaved with a cervical CTA (one-step stroke protocol). Continuous scanning with 320-row scanners makes it possible to evaluate complex vascular malformations at high temporal resolution and guide proper treatment. Continuous scanning also allows for pulsatility assessment of vascular structures, such as cerebral aneurysms, providing information about increased risk of rupture.

Subtraction imaging using area-detector scanners provides iodine maps of higher signal-to-noise ratios than dual energy. It can be used to create enhancement maps, for example of lung tissue, but also remove bones and calcifications from CTA. Even for coronary imaging, first results are extremely promising.

Dynamic imaging with area-detector CT is still in its infancy but has proven valuable for evaluation joint movement and complex instabilities, distinguishing treatment-resistant asthma from laryngeal dysfunction or vascular compression syndromes, to name but a few. In summary, unique applications of area detector CT are now entering the radiologic mainstream. We expect to see a substantial increase in the future.