Introduction

DWI in cancer prostate
Carcinoma of the prostate is an important health problem (Engelhard et al., 2000) Prostate carcinoma is the second most frequent cause of cancer related death in men. The increase in the number of the aged, as well as the advent and the ever more frequent use of the prostate-specific antigen serum test for detection, has resulted in an increase in prostate cancer incidence (Füitterer et al., 2005).

The major goal for prostate cancer imaging in the next decade is more accurate disease characterization through the synthesis of anatomic, functional, and molecular imaging information (Hricak et al., 2007).

It is unfortunate that there is no single imaging method that embodies all of the optimal characteristics for the integration of diagnostic and interventional procedures for prostatic cancer detection and staging (Atalar and Menard, 2005).

Routine tools for early diagnosis and localization of cancer within the prostate include digital rectal examination and assessment of serum prostate-specific antigen followed by transrectal ultrasonographically (US) guided biopsy (Testa et al., 2007).

The US is of low accuracy for prostate cancer detection and localization so a random biopsy is usually performed instead of a targeted biopsy. However, a random biopsy has several disadvantages as it may lead to an increase in complications because of the unnecessary sampling of normal prostate tissue. Moreover, cancer located outside the routine biopsy site may be missed. In addition, there may be difficulty in determining the site of a previous biopsy when repeating biopsy in a patient with a previous negative result and continuously high prostate-specific antigen levels. For these reasons, an imaging modality is needed that allows the accurate detection and localization of prostate cancer, as well as local staging, guidance of biopsy, and adequate follow-up after treatment (Young et al., 2007).
Magnetic resonance (MR) imaging has shown great promise as a noninvasive diagnostic tool in the evaluation and management of prostate cancer (Mazaheri et al., 2008).

Furthermore, MRI has been used for follow-up of prostate cancer after irradiation therapy and cryosurgery (Graser et al., 2007).

Although T2-weighted MR imaging has been used widely for the pretreatment work-up of prostate cancer, the technique is limited by unsatisfactory sensitivity and specificity for cancer detection and localization. To improve the diagnostic performance of MR imaging in evaluations for prostate cancer, various other techniques have been applied. These include dynamic contrast material–enhanced MR imaging, diffusion-weighted imaging, and MR spectroscopy (Young et al., 2007).

The gradual introduction of 3T scanners into clinical practice provides a potential opportunity to improve the quality and usefulness of prostate imaging. Improvement at 3T involves more advanced techniques, such as spectroscopy, diffusion weighted imaging and dynamic contrast imaging (Daniel M et al. 2007).

DW imaging is a relatively new functional imaging technique complementary to conventional MR imaging in the evaluation of prostate cancer. Diffusion weighted imaging is certain to become an important option for prostate cancer detection and characterization (Hayat, 2008).

Diffusion weighted imaging demonstrates the restriction of diffusion and the reduction of apparent diffusion coefficient values in cancerous tissue. This technique allows short acquisition time and provides high contrast resolution between cancer and normal tissue (Young et al., 2007).

The addition of diffusion-weighted imaging to conventional T2-weighted MR imaging has been found to improve the detection of prostate cancer (Mazaheri et al., 2008).