

DWIBS technique yields highly sensitive images in MR whole body scans

Kumamoto Chuo Hospital uses whole body diffusion method to assess lesions



Kazuhiro Katahira, M.D.

Kumamoto Chuo Hospital (Kumamoto City, Kumamoto Prefecture, Japan) has been using DWIBS for the last two years. Kumamoto's DWIBS protocol is based on a free-breathing DWI acquisition with STIR fat suppression, which clinicians have used either as a local or whole-body imaging tool to evaluate patients with malignancies in a variety of regions, including prostate, liver and bladder, according to Kumamoto radiologist, Kazuhiro Katahira, M.D.

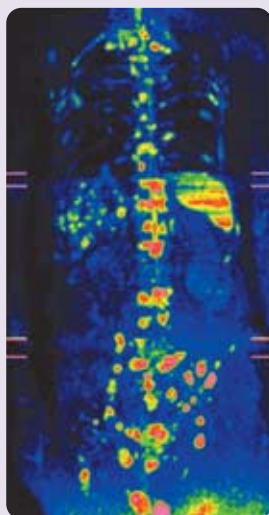
Kumamoto radiologists are evaluating DWIBS (diffusion-weighted whole body imaging with background body signal suppression) to assist in the detection and evaluation of disease throughout the entire body in a single scan. In many centers, DWIBS is now used in routine clinical practice and for follow-up studies because the MR technique does not require ionizing radiation, a contrast agent or a requirement for the patient to be motionless.

Achieva 1.5T Nova Dual is ideal for DWIBS

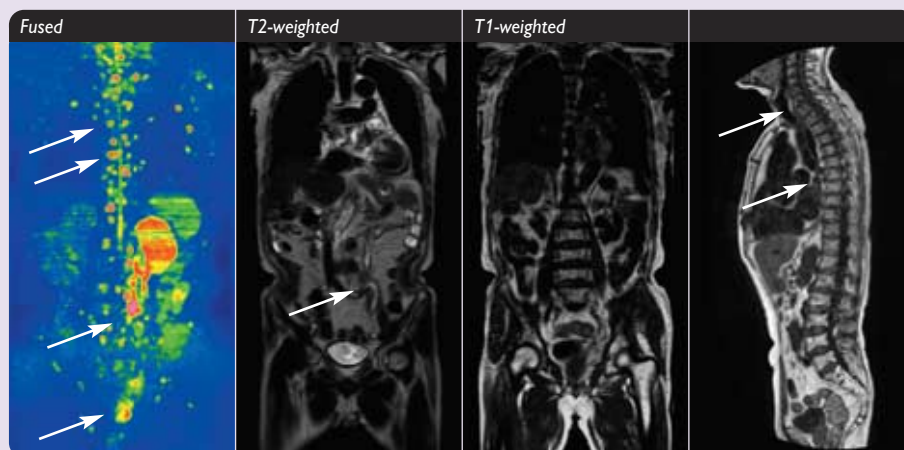
At Kumamoto Chuo Hospital, DWIBS is performed on an Achieva 1.5T system with Nova Dual gradients, a system-gradient combination that seems ideal for DWIBS, according to Kumamoto radiologist Kazuhiro Katahira, M.D.

“Technically, the most important feature is the optimal gradient configuration offered

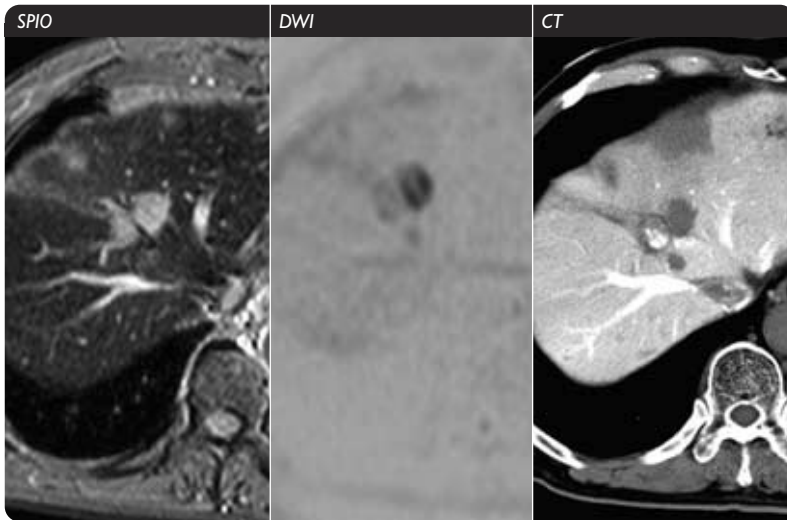
Kumamoto Chuo Hospital



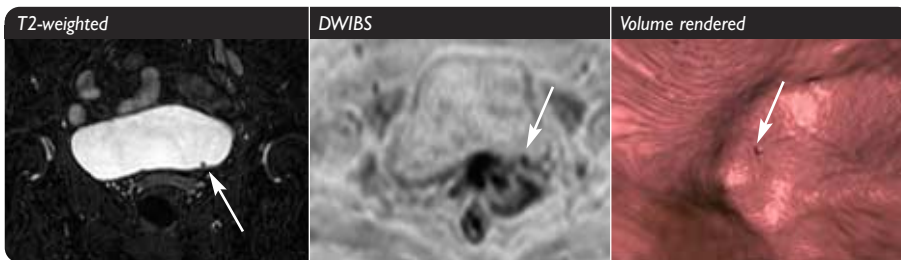
Three contiguous coronal DWIBS acquisitions joined together and colorized with a third-party DICOM viewer for enhanced interpretation. The patient has bone-liver metastases.



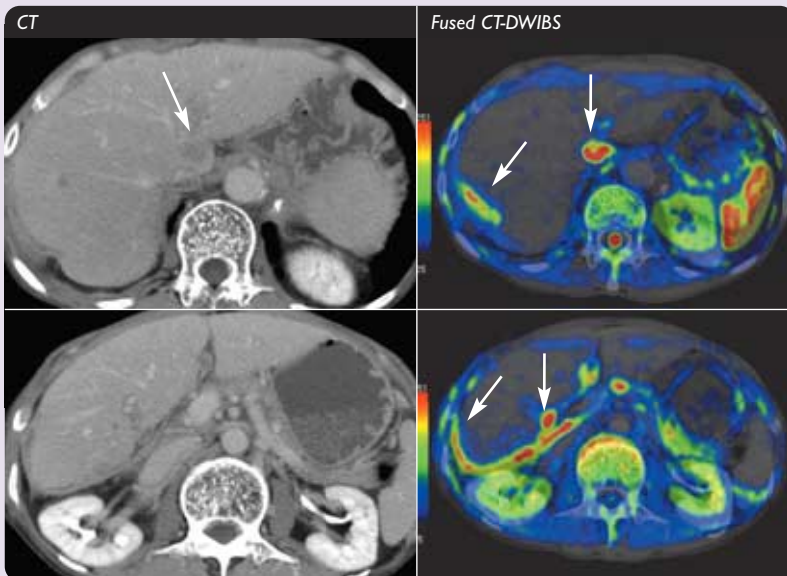
In this series, much like fusion of PET-CT data sets, the DWIBS and conventional MRI images are fused and aligned with T2-weighted and T1-weighted images acquired in the same plane. The acquisition time for all images is about 30 minutes.



This image series is after transcatheter arterial chemo-embolization (TACE). The SPIO image shows the lesions with very good CNR, although both lesions are isointense. The DWI image suggests that one lesion is still active, while in the other the embolization has been successful. The CT arterial portography image confirms this finding. The conclusion is that DWIBS also can provide information about the success of an embolization procedure.



The high-resolution T2-weighted, Balanced FFE anatomical image, shows a very small lesion. This lesion also is seen on the volume-rendered image. Notably, the superlative CNR of DWIBS enables visualization of this small lesion, despite lower DWIBS spatial resolution.



The images at right are CT-DWI fusion images. This illustration shows that on the CT images the large lesions are easily detected, but the dissemination can only be seen on DWIBS. This is important information for further therapy planning. The lesions are metastases of a colon cancer.

by Nova Dual,” Dr. Kazuhiro says. “The fast gradients help enormously in minimizing the susceptibility and magnetic field inhomogeneity induced distortions inherent in diffusion-weighted single shot EPI acquisitions. Also, the high gradient amplitude results in much improved SNR, especially at high b-values. We found that in many cases a b-value of 2000 gives much better contrast than a b-value of 1000. You do, however, absolutely need the gradient power of Nova Dual to get good image quality and diagnostic value for these high b-value images.

“Moreover, the flexibility in choosing between two excellent fat suppression techniques is very important,” he continues. “STIR is used for whole body acquisitions, while SPIR is employed in local scans, such as the prostate.”

DWIBS is usually combined with anatomical images

The anatomy-localized version of DWIBS

is now used as an additional scan for almost any examination. The DWIBS diffusion-weighted sequence plus SPIR fat suppression can be fused with standard MRI images to help in diagnosis. Thanks to the exceptional contrast-to-noise ratio of DWIBS, even relatively small lesions can be seen with DWIBS, although spatial resolution is lower than in the high resolution anatomical images.

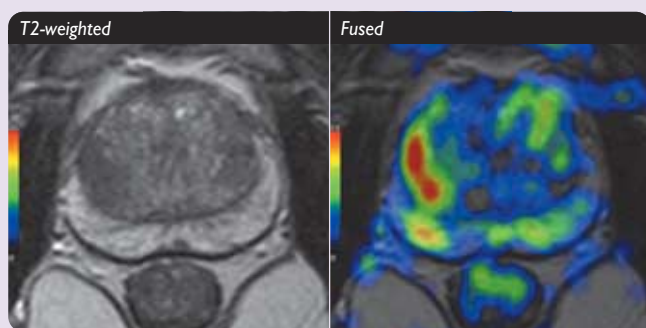
Also, for whole-body DWIBS studies, T1- and T2-weighted anatomical images are usually acquired to facilitate DWIBS interpretation. Respiratory triggering is used for the abdominal area. The total examination time is approximately 30 minutes.

“Judging from the images we’ve acquired with DWIBS, it is clear that this non-invasive technique has real advantages over PET and CT in surveying for tumors in the body and could be quite useful in following patients who are having chemotherapy,” Dr. Katahira says. ■

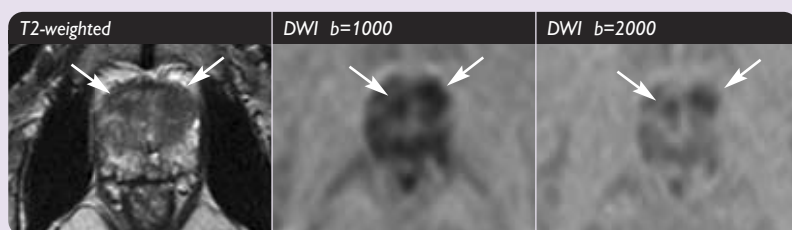


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These are a T2-weighted axial image centered on the prostate and the fused T2-weighted and DWI image. On the T2-weighted image there are two hypointense regions in the inner zone. DWI enables determination of one as BPH, while the other is malignant, both confirmed by histology. Since introduction of the Philips prostate T2W+DWI protocols for prostate imaging at Kumamoto Chuo, the use of contrast agent has been discontinued, resulting in cost savings.



On the T2-weighted axial image of the prostate, diagnosis is fairly difficult. However, using DWI making the diagnosis can be more definitive, as confirmed on the histology. Note that a b-value of 2000 affords clearly better contrast than a b-value of 1000.