

Whole-body DWI Shows Promise for Monitoring Oncology Treatment

By Trevor La Folie, MD, lead for MRI Oncology imaging, Laveran Hospital

Whole-body MR Imaging and PET-CT both provide a systemic and functional approach to tumor imaging, with clear advantages over the long established sequential, multimodal diagnostic algorithms. Recent innovations in whole-body examinations with high spatial resolution, T1, STIR, contrast media dynamics, and diffusion-weighted imaging (DWI) has led to routine MR imaging at numerous oncology centers. As a result, whole-body MRI with DWI can be a useful technique in monitoring the response to chemotherapy and is an alternative to a PET-CT examination.

Whole-body MRI can assess individual organs with multiple complementary tissue contrasts without contrast injection or radiation exposure to the patient. Therefore, whole-body MR can be performed one month after the treatment begins and repeated monthly. This ability to evaluate treatment response earlier with MRI is important for patient outcomes.

In our facility, we have found that the high image quality of the Signa® HDxt along with the new STIR-DWI sequence and apparent diffusion coefficient (ADC) mapping feature are applicable for a broad range of oncology staging and treatment monitoring.

Patient case

A 65-year-old male with ganglionic and visceral metastases originating from small-cell carcinoma was referred for a whole-body MR exam for therapy follow up.

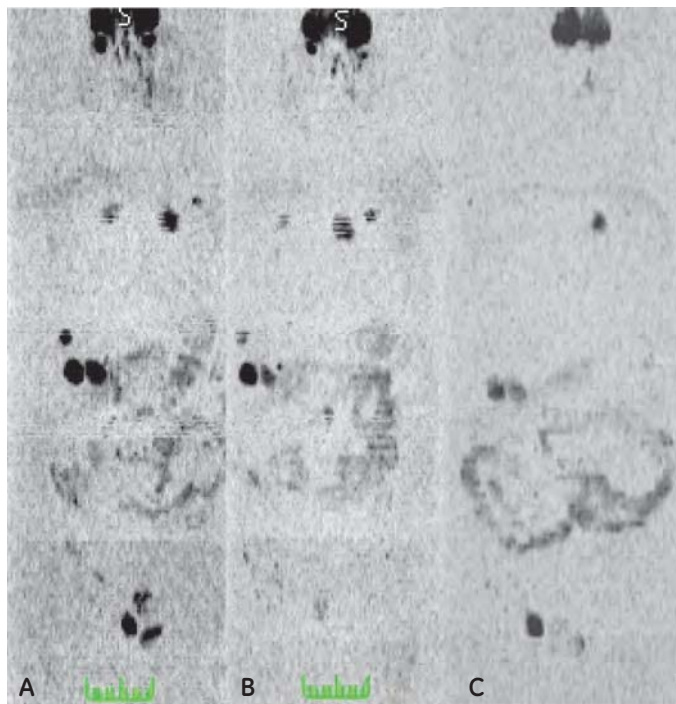


Figure 1. Axial whole-body DWI acquisition reformatted in coronal plane, showing the same characteristics (size) of the lesions after one month of chemotherapy but with a significant signal decrease and ADC increase after two months of chemotherapy.

- A. Baseline before treatment
- B. One month of chemotherapy
- C. Two months of chemotherapy

Conclusion

This case illustrates the value of DWI for whole-body therapy follow up as an alternative to PET-CT. In addition to demonstrating the tumor's morphological criteria, DWI provides functional criteria with ADC calculation. The modification of the ADC values before and after treatment can predict early response to treatment and therefore, we are consistently using ADC mapping to visualize the conspicuity and lesion size to evaluate the severity of disease. ■

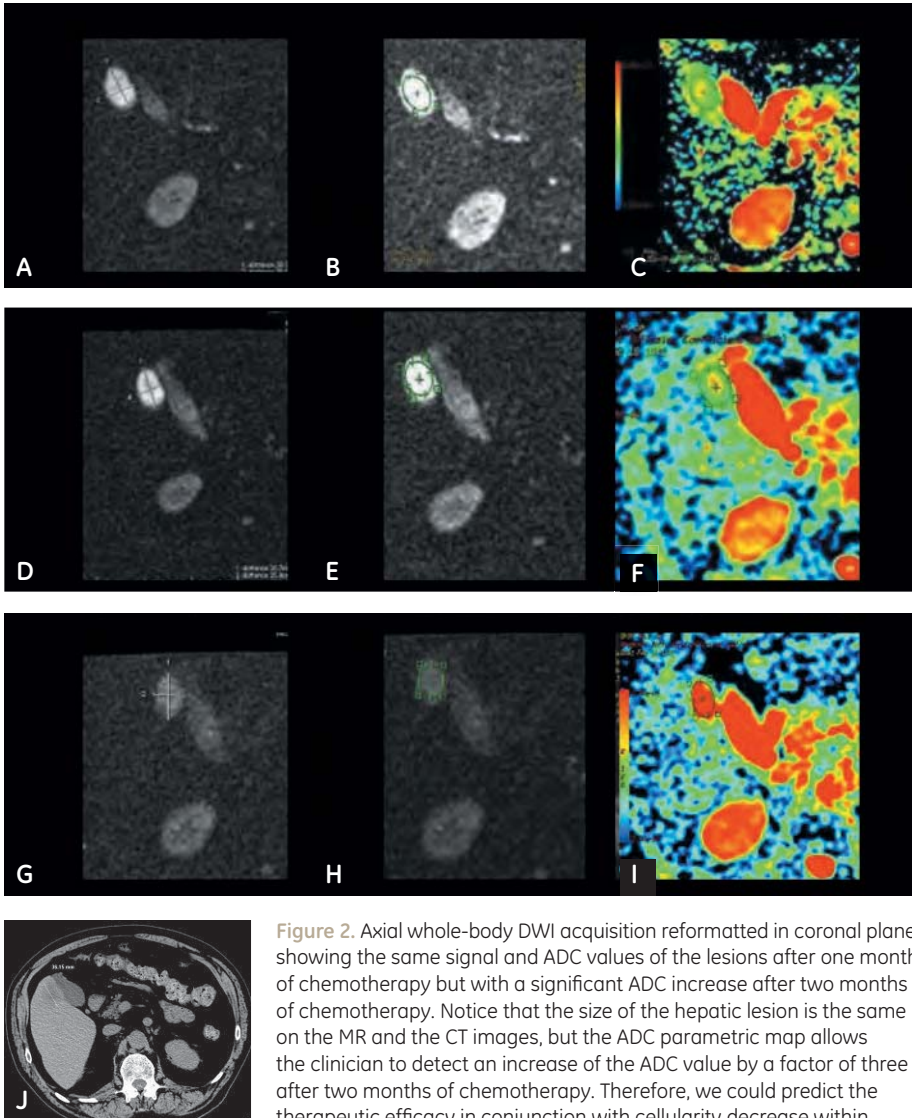


Figure 2. Axial whole-body DWI acquisition reformatted in coronal plane, showing the same signal and ADC values of the lesions after one month of chemotherapy but with a significant ADC increase after two months of chemotherapy. Notice that the size of the hepatic lesion is the same on the MR and the CT images, but the ADC parametric map allows the clinician to detect an increase of the ADC value by a factor of three after two months of chemotherapy. Therefore, we could predict the therapeutic efficacy in conjunction with cellularity decrease within the lesion.

Baseline images before treatment

- A, B: STIR-DWI images, $b=600s/mm^2$ with lesion and ROI measurements
 C: ADC map with ROI measurement ($1.32 \times 10^{-3} mm^2/sec$) within the lesion

After one month of chemotherapy

- D, E: STIR-DWI images, $b=600s/mm^2$ with lesion and ROI measurements
 F: ADC map with ROI measurement ($1.34 \times 10^{-3} mm^2/sec$) within the lesion

After two months of chemotherapy

- G, H: STIR-DWI images, $b=600s/mm^2$ with lesion and ROI measurements
 I: ADC map with ROI measurement ($3.2 \times 10^{-3} mm^2/sec$) within the lesion
 J: CT image showing the same lesion, without significant decrease in size compared to pre-therapeutic images



Dr. Trevor La Folie

Trevor La Folie, MD, is the lead for oncological imaging in Laveran and Sainte Anne Hospitals. His research interests focus on developing new MRI techniques that will allow better staging and therapeutic follow up with potential immediate applications to clinical practice. Dr. La Folie and his associates have used and developed whole-body MRI and especially whole-body diffusion in clinical practice since 2003.

About the facility

The Laveran Hospital, built in 1963, is a multispecialty military institution with 316 beds. It bears the name of the army medical officer Charles Louis Alphonse Laveran, who discovered the parasite of paludism in 1880 in Algeria. The MR system was initially installed in 2001 by GE as a Signa® 1.5T MR and upgraded to the Signa HDx platform in 2006.