

CASE REPORT

Water-Fat Separation: Examination Efficiency and Clinical Usefulness



Akihiko Arakawa
Central Radiology Department,
Saiseikai Kumamoto Hospital

Introduction

The acquisition of fat suppression images is essential in certain clinical cases. However, longer examination time is required for the acquisition of such images because a larger number of scans must be performed. In addition, the examination efficiency may be further reduced if repeat acquisition is necessary due to insufficient fat suppression caused by magnetic field inhomogeneity.

In the Water-Fat Separation method named WFS DIXON, signals from water and fat are separated based on the phase differences between the resonance frequencies of water and fat. This allows four types of images to be obtained: In Phase images, Out of Phase images, Water images, and Fat images. Images with a variety of tissue contrast characteristics can be obtained from the data acquired in a single scan, making it possible to reduce overall examination time. In this paper, we report on our initial experience using a WFS DIXON sequence technology developed by Canon Medical.

Improved examination efficiency

Figure 1 shows a clinical case of carcinomatous meningitis and bone metastases from a primary lung cancer. Such patients must undergo periodic MR scanning of the entire spine, but they may experience discomfort due long examinations times. Previously, the acquisition of two types of images (T1-Weighted images and T1-Weighted fat suppression images) required a total examination time of approximately 15 minutes. When

WFS DIXON is used, on the other hand, T1-Weighted images and T1-Weighted fat suppression images can be obtained in a single scan, resulting in a significantly shorter examination time. The advantages of a shorter examination time in contrast imaging of the entire spine (which tends to be relatively time consuming) are a significant reduction in the burden on the patient as well as shorter occupancy of the examination room.



Figure 1. Whole-spine T1-Weighted imaging using WFS DIXON. Left: In Phase image. Right: Water image. Two types of images can be obtained in a single whole-spine scan, resulting in a shorter examination time.

Extremely accurate fat suppression technology

Figure 2 shows a clinical case of osteoarthritis of the hip. Rather than performing three separate scans to acquire three types of images (T2-Weighted, STIR, and T1-Weighted images), two scans were performed using WFS DIXON to obtain four types of images. A subcartilaginous cyst of the right hip can be clearly seen due to the excellent SNR.

Figure 3 shows a clinical case of polycystic kidney disease. Nonuniform fat suppression is sometimes observed in abdominal T2-Weighted fat suppression images, but fat is suppressed with high accuracy when

WFS DIXON is used. The margins of the lesion are clearly depicted, which makes it easier to obtain accurate measurements of kidney volume.

Conclusion

With WFS DIXON, examination times can be substantially reduced and very accurate fat suppression images can be obtained. Canon Medical's WFS DIXON not only improves image reading efficiency due to the clearer depiction of lesions, but also reduces the burden on patients by shortening examination times. This method is applicable to the entire body and is expected to be useful in a wide variety of clinical situations in the future.

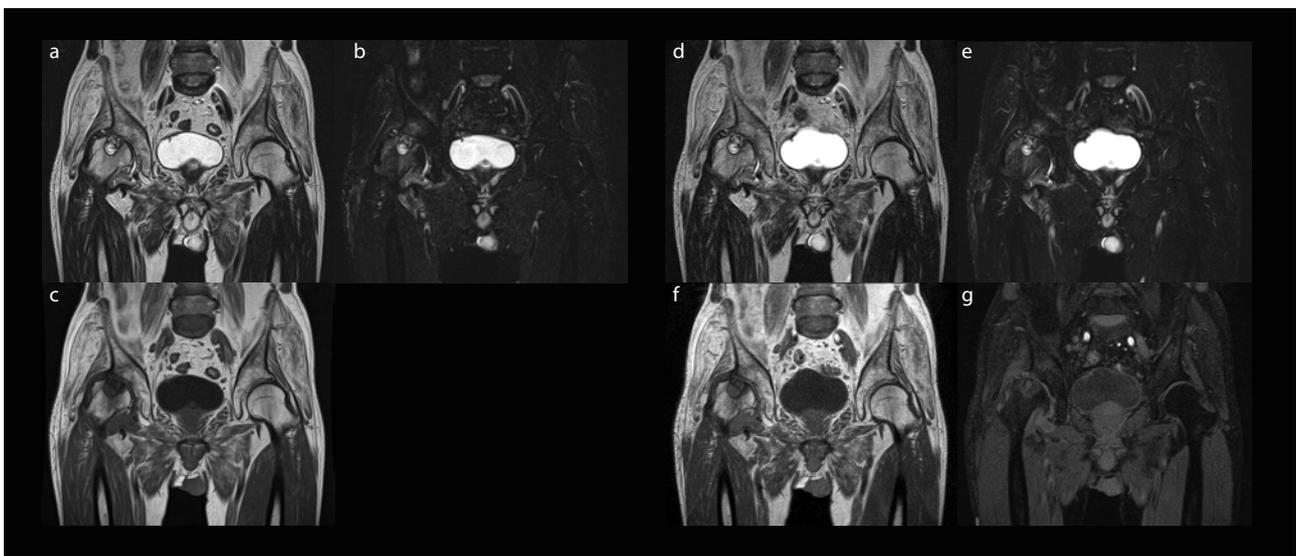


Figure 2.

Left: Images acquired using the conventional method. (a) T2WI, (b) T2WI STIR, (c) T1WI
Right: Images obtained using WFS DIXON. (Upper row: T2WI WFS DIXON, Lower row: T1WI WFS DIXON)
(d), (f): In Phase image, (e), (g): Water image

The acquisition time was approximately 5 minutes for both methods, but WFS DIXON provides four types of images while the conventional method provides only three types of images.

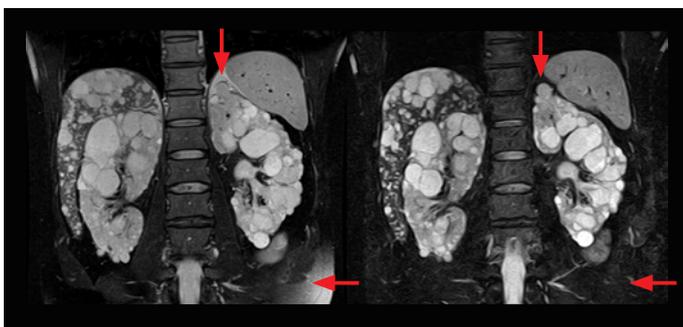


Figure 3.

Comparison of a T2-Weighted fat suppression image (left) and a Water image (right).

In the Water image, fat in the abdominal cavity is effectively suppressed with high accuracy (arrows).

CANON MEDICAL SYSTEMS CORPORATION

<https://global.medical.canon>

©Canon Medical Systems Corporation 2019. All rights reserved.
Design and specifications are subject to change without notice.
MOIMR0109EA 2019-02 CMSC/Produced in Japan

Canon Medical Systems Corporation meets internationally recognized standards for Quality Management System ISO 9001, ISO 13485. Canon Medical Systems Corporation meets the Environmental Management System standard ISO 14001.

Made for Life is a trademark of Canon Medical Systems Corporation.

The results in this document are the findings of the author. Clinical outcomes may vary dependent upon clinical use and environment.

Made For life