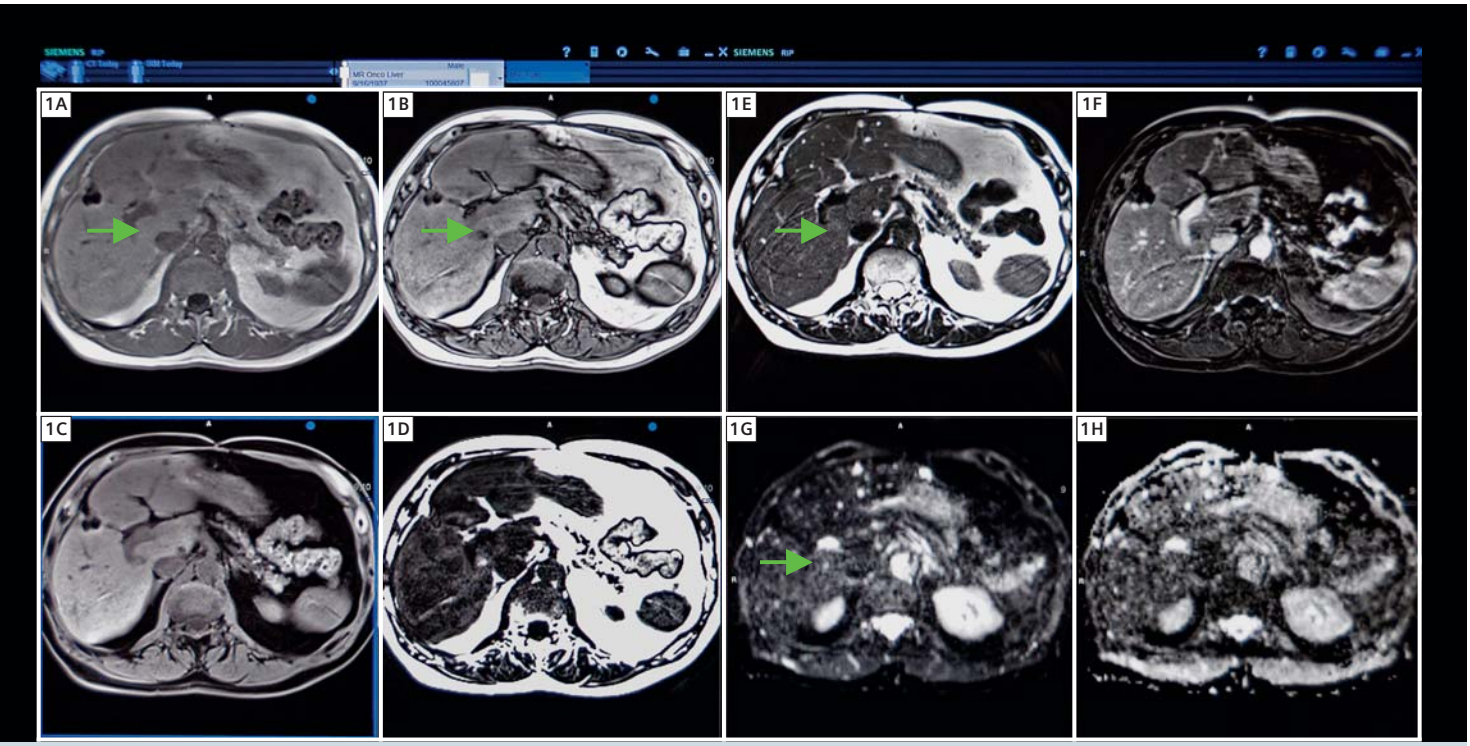
Dixon Sequence: Liver MRI and *syngo*.via Layouts

Jean-Paul Abécassis, M.D.; Denis Parienté, M.D.

Imagerie Paris Centre, Paris, France



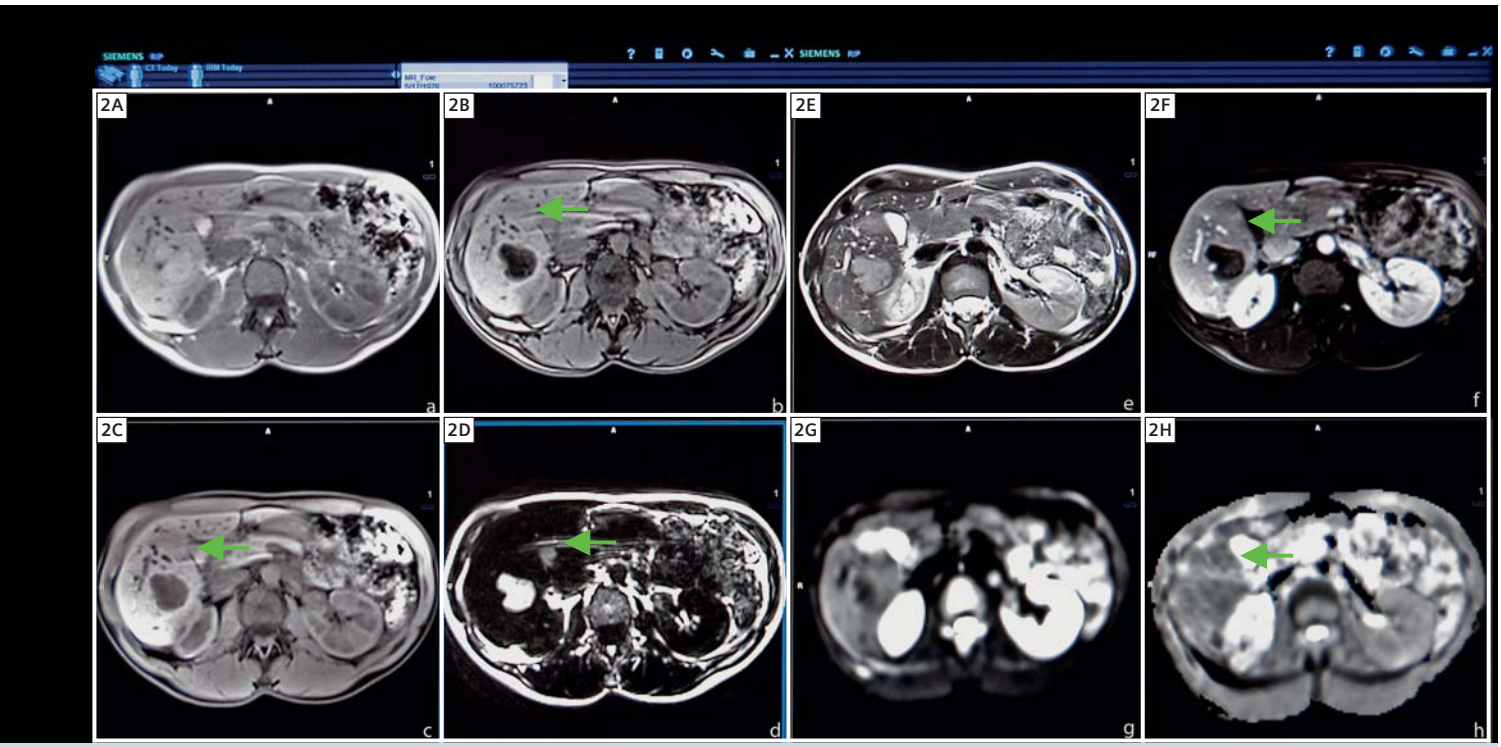
1 MRI of the liver in a 67-year-old patient, treated for hemochromatosis, operated 3 years ago for hepatocarcinoma. In phase T1 **(1A)**, T2 **(1E)** and DWI **(1G)** show simple cysts and scarring from surgery; opposed phase T1 **(1B)** and water T1 **(1C)** show unspecific hypointense signal internally to the right branch of the portal vein (arrow); fat T1 **(1D)** show the abnormality as a hyperintense signal compatible with lipid rich hepatocarcinoma, confirmed by the VIBE sequence **(1F)**.

Purpose

The purpose of this article in to illustrate the benefit of the Dixon T1 sequence in liver MRI and to emphasize the specific layouts that have been adapted from factory supplied *syngo*.via layouts to display its results.

Introduction

The Dixon sequence allows separation of fat and water in spin echo T1 images. Previous to the development of this sequence, application of a dephasing gradient resulted in two images, one with fat and water in phase (standard T1) and one with fat and water dephased (opposed phase image). Recent technical developments have widened the field of utilisation, with breathhold acquisition and by generating, from a 3 point acquisition a water-only image and a fat-only image.
A variety of liver lesions ranging from benign to malignant may contain fat. The most common benign liver lesions containing fat are hepatocellular adenoma, focal steatosis, lipoma, and pseudo-lipoma of the Glisson capsule. Examples of malignant tumors include hepatocellular carcinoma and liposarcoma. Identification of fat within a liver lesion can be critical in characterization of a lesion.



2 MRI of the liver in a 35-year-old woman, referred for multiple incidental lesions at ultrasound, with a history of 15 years of oral contraception: T1 **(1A)** displays an isointense 3 cm lesion in the right lobe of the liver; T2 **(2E)**, VIBE **(2F)** and DWI **(2G)** are unspecific, but the fat-only T1 image shows bright signal typical of hepatocellular adenoma **(2H)**.

Sequence details

Images have been acquired using a 1.5T MAGNETOM Aera, with the following parameters: field-of-view 380 mm², TR 6.77 ms, TE 2.38 ms, slice thickness 3 mm, breathhold acquisition time 21 s, results in 4 T1w images at each slice level: in phase image (standard T1), opposed phase image, water-only image (fat suppressed T1), fat-only image. An axial Dixon T1 sequence is part of our routine abdominal protocol, and also includes an axial T2 BLADE, axial diffusion-weighted imaging (DWI) sequence with 3 b-values (100, 400, 800) and axial T1 post contrast VIBE dynamic sequence at 0, 30s, 60s and 180s.

Conclusion

T1 Dixon images are an essential part of liver examinations, allowing immediate recognition of intra-tumoral macroscopic fat or intracellular lipid using a specific 4D *syngo*.via layout.

syngo.via Layouts

In order to diagnose the cases in this study, we used the onco-liver workflow* and its 'dynamic' layout. In the dual monitor version of this layout, each screen is divided into 4 windows, synchronised for zooming and navigation but not for windowing. The left screen displays the 4 Dixon images (in phase, opposed phase, water-image, fat-image). The windows of the right screen are assigned to T2 BLADE, VIBE, DWI and the ADC map. An important aspect to understand when working with *syngo*.via is that the layouts not only arrange images in a certain order, but they also assign certain functions to the image segments. In this case, with the 'dynamic' layout, the VIBE and DWI segments are 4D windows, allowing to scroll through space (up and down) and through time (left to right) from one b-value to another (diffusion) or from one injection time to another (contrast images).

Another example for how we have adapted *syngo*.via layouts is in our prostate MR workflow.

In imaging the prostate, there are roughly 2 different indications: either the patient has a known cancer and we need to assess the extent of the lesion, or the patient is suspected of having cancer but prior biopsies are negative and the question is "is there a target lesion for a new set of biopsies?" To assess the extension, we have adapted a layout, with axial, coronal and sagittal T2, diffusion and ADC map, T1, to assess post biopsy hemorrhage and axial T2 of the pelvis to look for adenopathies (Fig. 3).

3

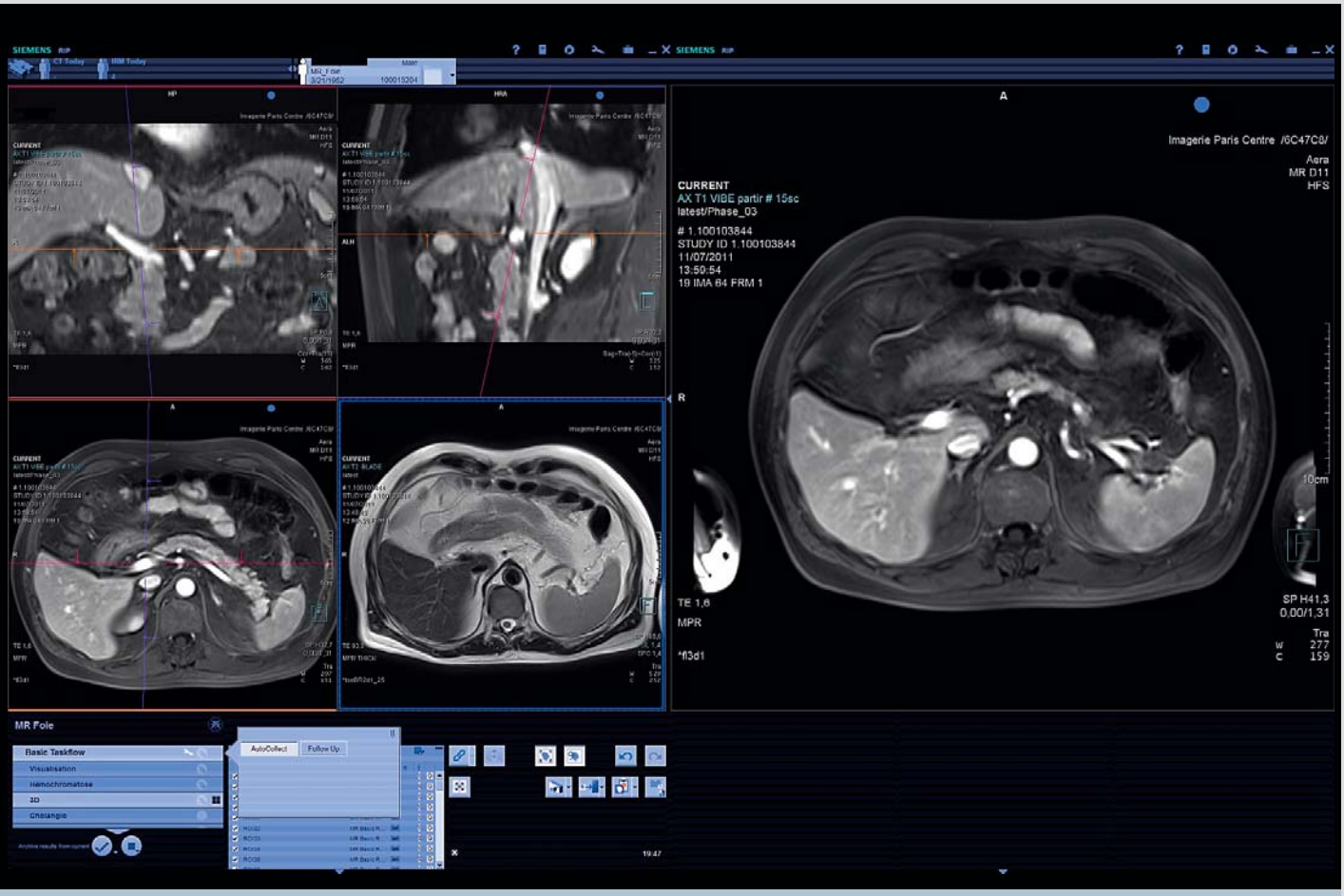
3 *syngo*.via layout to read prostate examinations.

In this last example we have taken a standard taskflow and adapted it in order to visualize the VIBE sequence in all 3D planes. This layout has proved to be very useful to quickly assess the vessels (Fig. 4).
The ability to structure our own workflows and layouts in *syngo*.via has helped us to improve the diagnostic process in our practice. As with any software, the more we use it, the more possibilities we discover, and the more efficient we become.

Contact
Denis Parienté, M.D.
Imagerie Paris Centre
102 Avenue Denfert-Rochereau
75014 Paris
France
Phone +33 (0)1 43 35 55 20
denisparіente@gmail.com

*This feature is work in progress and is not commercially available in the US.

4



4 *syngo*.via layout to visualize the VIBE sequence in all 3D planes.