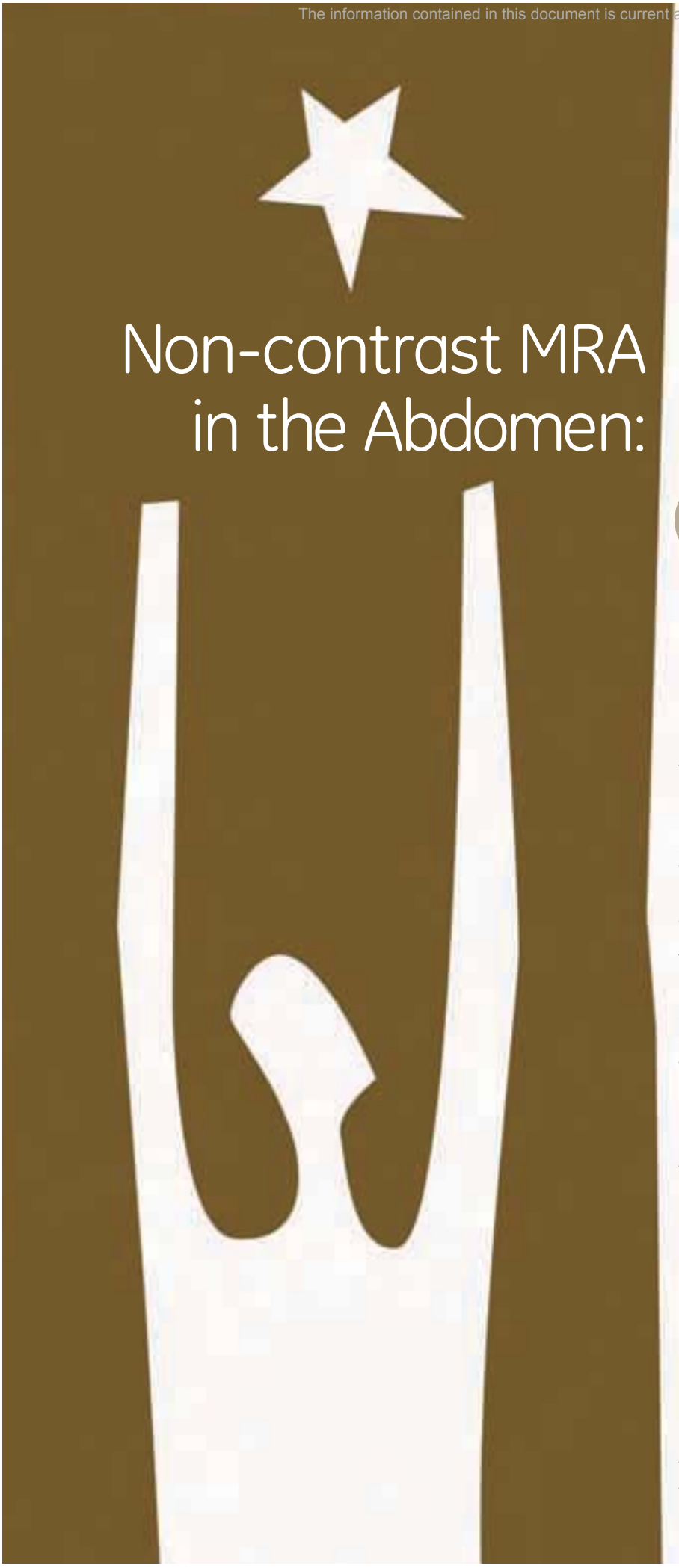

Non-contrast MRA in the Abdomen: Ready for Clinical Use

By Takayuki Masui, MD, PhD

Due to concerns over adverse reactions to contrast agents such as nephrogenic systemic fibrosis, further advancement of non contrast-enhanced MR Angiography (NCE-MRA) is attracting particular attention. Several methods of NCE-MRA have been suggested, and stable results have been produced. Very promising results have been reported with the Inhance Inflow IR technique, especially for the visualization of the renal arteries.

The Inhance Inflow IR method utilizes the in-flow effect to image arterial flow. Inversion pulse is selectively applied to the acquisition volume to help suppress stationary tissue and venous flow signal, while respiratory triggering help minimize breathing artifacts. Targeted blood vessels can be depicted by utilizing the in-flow effect of unsaturated blood, which enters the acquisition volume at higher velocity and, therefore, is not affected by the inversion pulse (Figure 1). After the saturation of venous blood is achieved, the arterial network is then imaged using 3D FIESTA with spectrally selected inversion recovery pulse for fat in the transverse plane.

Dynamic contrast MRA has been one of the most often utilized radiation-free methods for the detection of stenosis or peripheral aneurysmal dilatation of the renal artery. To selectively visualize the renal arteries against the renal veins and parenchyma, optimal acquisition timing is critical. Even with the use of fluoro-triggering or "SmartPrep" techniques, optimal timing for capturing dynamic arterial phase of renal

arteries is occasionally missed. This may result in overlapped visualization of the renal arteries, veins, and parenchyma when using a maximum intensity projection algorithm for MRA. Therefore, applications such as TRICKS that require an injection of the gadolinium chelate contrast media to capture flow dynamics of the entire arterial and venous filling have been used to visualize the renal arteries without overlaps.

NCE-MRA may provide two major benefits. One is the capability to easily repeat image acquisition with different imaging parameters settings for sufficient image quality to make a confident diagnosis. Second is the excellent contrast between the renal vasculature and the parenchyma (since the latter is never enhanced without contrast media), resulting in good suppression of the background tissue. High-quality images are pivotal for the accuracy of the diagnosis when assessing stenosis (Figure 2) or the aneurysm of the renal artery (Figures 3, 4).

Inhance Inflow IR can become the sequence of choice for the evaluation of the renal artery in patients with stable respiration, eliminating the need for contrast media. This technique enables the potential for further development to visualize vascular structures in the entire body. ■

Figure 1. Inhance Inflow IR method utilizes the in-flow effect to image arterial flow.

Orange frame: Acquisition volume
Green frame: Inversion Pulse prep volume
Red arrow: Artery
Blue arrow: Vein

Figure 2. Stenosis of the right proximal section of renal artery, which caused by the surrounding soft tissue tumor is apparent in the Inhance Inflow IR image (left) and confirmed by the CE-MRA image (right).

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About the facility

Seirei Hamamatsu General Hospital is a core hospital of Seirei Social Welfare Community. As the largest community in Japan, it was established in 1930 and offers more than 100 facilities and 200 services, including five major hospitals, two medical check-up facilities and seven clinics.

Located between Tokyo and Kyoto, Seirei Hamamatsu General Hospital has 744 beds and employs more than 1,500 active medical staff who serve 1,800 outpatients and 700 inpatients each day. Seirei Hamamatsu General Hospital is certified by the Japan Council for Quality Healthcare and Japan Accreditation Council for Healthcare Information Certification, and received the Healthcare Quality Encouragement award.

Figure 3. Aneurysm in the periphery of the left renal artery is apparent on the Inhance Inflow IR image (left) and confirmed by the CE-MRA (right).

Figure 4. Saccular aneurismal dilatation of the periphery of the right renal artery is well visualized on NCE-MRA (left). Aneurysmal lesions are obscured on CE-MRA (right), due to overlaps with the enhanced renal parenchyma.