

ADDED VALUE OF DIFFUSION WEIGHTED MR IMAGING IN THE DIAGNOSIS OF POSTPARTUM OVARIAN VEIN THROMBOSIS

K. De Cuyper¹, M. Eyselbergs^{1,2}, P. Bernard¹, L. Clabout³, F.M. Vanhoenacker^{1,2,4}

Postpartum ovarian vein thrombosis (POVT) is a rare cause of right fossa pain but the diagnosis should be considered in the clinical setting of persistent fever and lower quadrant tenderness in the postpartum period. Although ultrasound is the initial step in the diagnostic work-up right fossa pain, it is often limited by overlying bowel gas and an enlarged puerperal uterus. Therefore, most authors recommend Computed Tomography (CT) as the imaging technique of choice to confirm the clinical suspicion of POVT. Because Magnetic Resonance Imaging (MRI) is less readily available, it is rarely performed for this indication. However, MRI allows not only to make the diagnosis as accurate as CT, but moreover it provides 2 important advantages in compared to CT. First, it avoids ionizing radiation. Secondly, the use of diffusion weighted imaging (DWI) may obviate the administration of intravenous contrast.

Key-words: Veins, ovarian – Veins, thrombosis – Veins, MR.

Case report

A previously well 31-year-old woman who had given birth to a healthy baby eleven days previously, presented with a undulating fever and nausea that started immediately in the postpartal period after an uncomplicated vaginal delivery. Clinical examination revealed an elective tenderness in the right fossa without rebound tenderness. Rovsing's sign, Murphy's sign, Murphy's punch sign and the psoas sign were all negative. Plain films of the abdomen were normal. Abdominal ultrasound examination showed a hypoechogenic polylobulated heterogeneous ovoid soft tissue mass within the pelvis (Fig. 1). The lesion was partially vascularized, as shown on a color Doppler ultrasound (Fig. 2) and remarkably tender at compression with the transducer. Besides a right hydro-ureteronephrosis, a normal enlarged postpartal uterus could be seen. Laboratory results showed an elevated CRP of 22 mg/dL (normal value < 0,5) and a mild leukocytosis of $9,9 * 10^3/\mu\text{L}$ (normal value $4-10 * 10^3/\mu\text{L}$) without a left-shift. Urinalysis was normal and particularly couldn't reveal any pyuria nor haematuria. Fibrin D-dimers however showed to be strongly increased to 3179 ng/mL (normal value 0-500 ng/mL).

On MRI, the right ovarian vein was enlarged and its lumen was hyperintense on T2-weighted images (WI) (Fig. 3). The retroperitoneal fat surrounding the vein was replaced

by an irregularly delineated hypointense mass. On DWI (b value = 800), the lumen of the vein was hyperintense, in keeping with diffusion restriction (Fig. 4A). The ADC map showed a focal intraluminal hypointensity (Fig. 4B). On contrast enhanced T1-WI, there was absence of luminal enhancement in the right ovarian vein in keeping with thrombus formation (Fig. 5).

The patient was treated with subcutaneous low molecular weight

heparin and broad spectrum antibiotics for 7 days. Further recovery was uneventful. The patient was discharged from the hospital and a control MRI examination one month later, showed a normal right ovarian vein. Thrombophilia screening tests at that time were within normal limits.

Discussion

Ovarian vein thrombosis is associated with a variety of pelvic conditions (1) – most notably, recent childbirth, but also pelvic inflammatory disease, malignancies, and pelvic surgery. The coincidence of predisposing etiopathogenic factors for venous thrombosis such as hypercoagulability, hemodynamic changes (stasis and turbulence) and endothe-

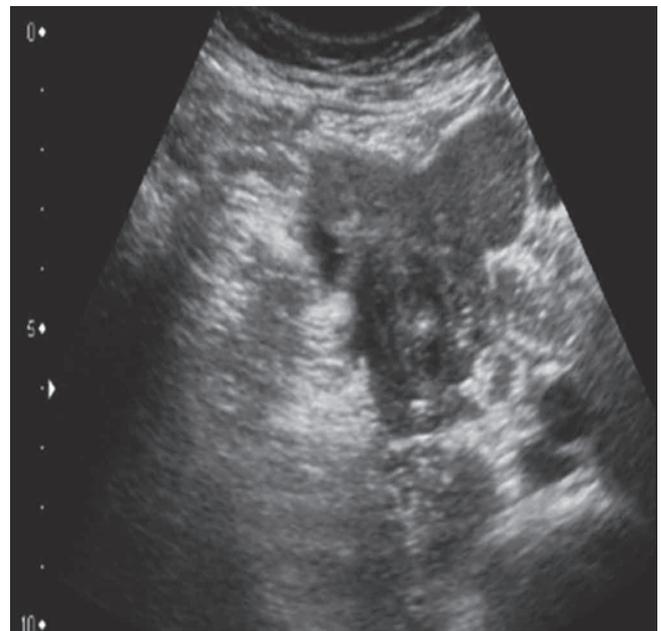


Fig. 1. — Axial ultrasound shows a nonspecific cloverleaf-shaped mass in the right iliac fossa.

From: 1. Department of Radiology, AZ Sint-Maarten, Mechelen-Duffel, 2. Department of Radiology, UZ Antwerpen, Edegem, 3. Department of Gynaecology, AZ Sint-Maarten, Mechelen-Duffel, 4. Faculty of Medicine and Health Sciences, University of Ghent, Ghent, Belgium.

Address for correspondence: Prof dr F.M. Vanhoenacker, M.D., Ph.D., Department of Radiology, AZ Sint-Maarten, Rooienberg 25, 2570 Duffel, Belgium.
E-mail: filip.vanhoenacker@telenet.be

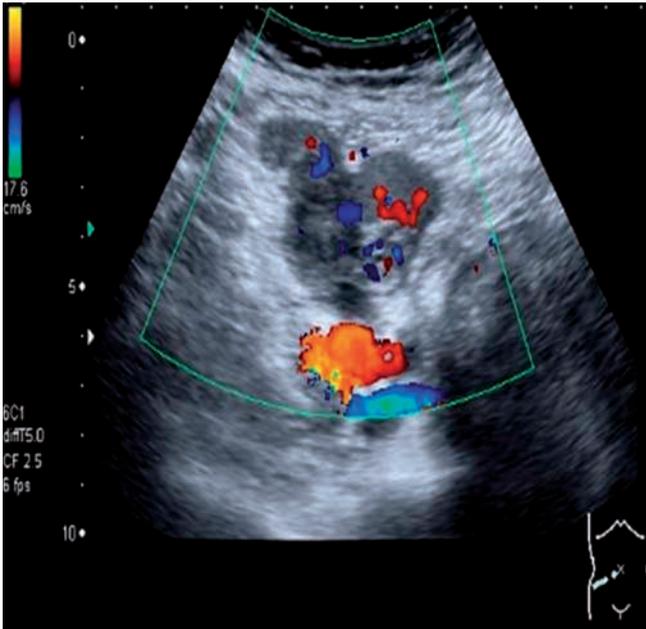


Fig. 2. — Axial color Doppler ultrasound shows the mass is partially vascularized.

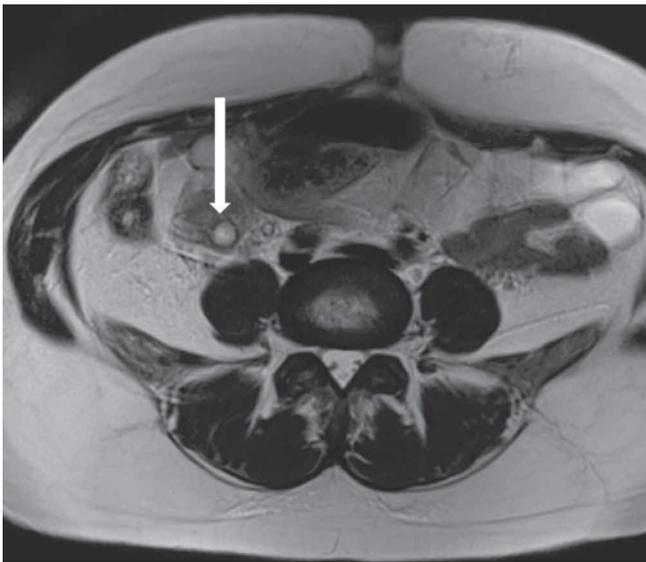


Fig. 3. — Axial T2-weighted image shows a rounded hyperintense structure (arrow) in the center of an ill-defined mass located at the ventral aspect of the right psoas muscle. This focal area of hyperintense signal corresponds to thrombus formation within the right ovarian vein.

lial injury (due to septic thrombophlebitis) – also known as the Virchow triad—are particularly present in POVT.

POVT has a reported incidence of 1:600-1:7000 deliveries. However, the real incidence is probably higher due to the nonspecific symptoms of puerperal fever and postpartal pain. Early diagnosis of POVT is of utmost importance, since complications as

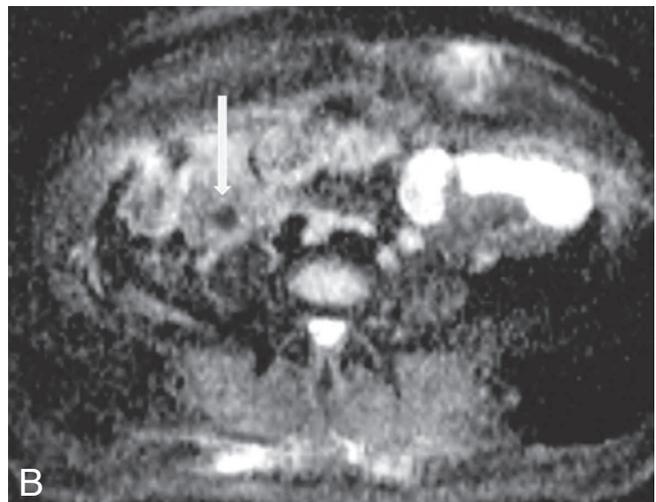
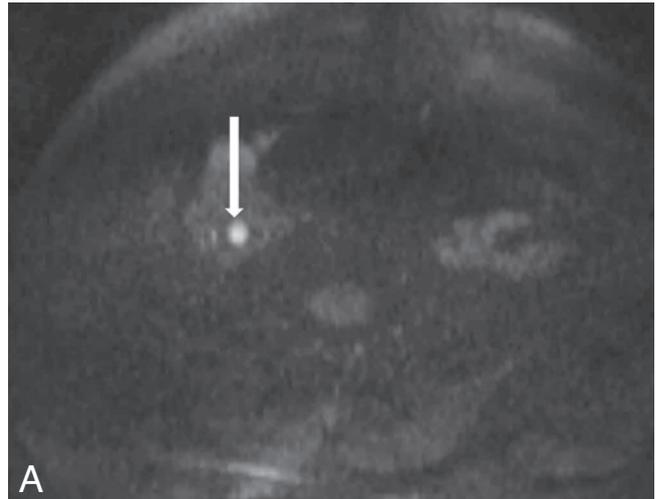


Fig. 4. — Axial diffusion-weighted image (b value = 800) (A) and corresponding ADC map (B). Figure A demonstrates a focal area of hyperintensity (arrow). Figure B shows the corresponding ADC map with a hypointense signal along the course of the right ovarian vein (arrow).

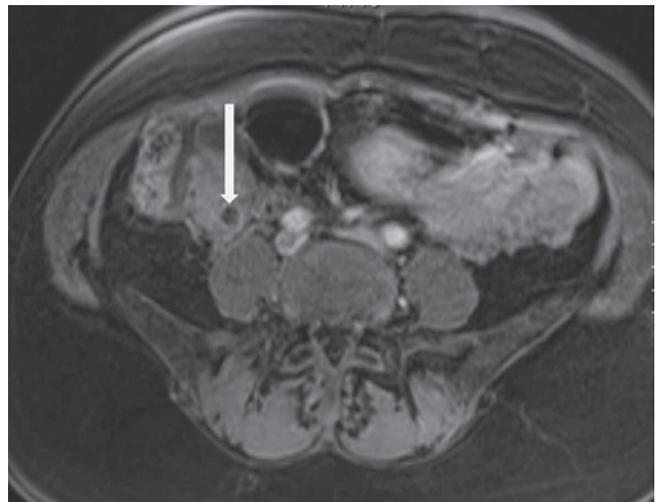


Fig. 5. — Axial gadolinium contrast enhanced T1-WI confirms the lack of enhancement in the right ovarian vein (arrow) due to thrombus.

thrombus extension into the inferior vena cava or renal veins, sepsis and septic pulmonary embolism are all potentially life threatening. In the United States, POVT is estimated to cause 18 maternal deaths per million pregnancies. POVT involves the right ovarian vein in 80-90% of patients (2, 3). Ultrasound and color-Doppler may show a tubular anechoic to hypoechoic structure extending superiorly from the adnex and with absence of central Doppler flow (2, 4).

Ultrasound – however – is limited due to overlying bowel gas. The diagnosis is most commonly made with contrast-enhanced CT, but CT and magnetic resonance imaging (MRI) are equally sensitive for detecting this disorder, and both are more sensitive than ultrasound (5).

With unenhanced CT imaging, an ovarian thrombosis appears as a hyperdense mass or isodense thrombus in the lumen of an enlarged vessel. After injection of intravenous contrast, a hypodense filling defect is seen within an enlarged vein, and there may be a variable amount of venous wall enhancement. There is often perivascular edema and venous tortuosity. On MRI, the venous thrombus in the large, tortuous puerperal ovarian vein may appear as a hypointense filling defect on contrast enhanced T1-weighted images and may appear hyperintense on T2-weighted images. This current report

describes the potential benefit of DWI in the diagnosis of PVOT, showing intraluminal diffusion restriction in the thrombosed ovarian vein. A major advantage of MRI compared to CT is that the diagnosis can be made without the need of the application of an ionizing radiation. Moreover, the use of DWI may obviate the administration of intravenous contrast on MRI, whereas intravenous administration of a iodinated contrast medium is needed on CT to confirm thrombosis of the ovarian vein. Less than 1% contrast media is excreted into breast milk, out of which only 1% is absorbed by the infant's gut and hence, according to ACR recommendations (6), it is safe for the mother and infant to continue breast-feeding after receiving contrast media. However, abstention from breast feeding for 24 hours after contrast administration is recommended in most institutions. Since the DWI sequence is able to make the diagnosis without the need of an intravenous contrast agent, any potential harm to the infant can be eliminated and continuous breast feeding can be allowed.

Conclusion

In conclusion, septic ovarian vein thrombophlebitis is a potentially life threatening emergency, which should be diagnosed without any delay.

DWI may be a promising imaging tool to confirm the clinical suspicion without using radiation and obviating intravenous administration of contrast.

References

1. Chellman-Jeffers M.R., <http://emedicine.medscape.com/article/404364-overview>, Updated: May 27, 2011.
2. Kubik-Huch R.A., Hebisch G., Huch R., Hilfiker P., Debatin J.F., Krestin G.P.: Role of duplex color Doppler ultrasound, computed tomography, and MR angiography in the diagnosis of septic puerperal ovarian vein thrombosis. *Abdom Imaging*, 1999, 24: 85-91.
3. Dessole S., Capobianco G., Arru A., Demurtas P., Ambrosini G.: Postpartum ovarian vein thrombosis: an unpredictable event: two case reports and review of the literature. *Arch Gyn Obst*, 2003, 267: 242-246.
4. Hadas-Halpern I., Patlas M., Fisher D.: Postpartum ovarian vein thrombophlebitis: sonographic diagnosis. *Abdom Imaging*, 2002, 27: 93-95.
5. Twickler D.M., Setiawan A.T., Evans R.S., et al.: Imaging of puerperal septic thrombophlebitis: Prospective comparison of MR imaging, CT, and sonography. *AJR Am J Roentgenol*, 1997, 169: 1039-1043.
6. Namasivayam S., Kalra M.K., Torres W.E., Small W.C.: Adverse reactions to intravenous iodinated contrast media: a primer for radiologists. *Emerg Radiol*, 2006, 12: 210-215.