The Interesting Case

The diagnosis of renal vein thrombosis by magnetic resonance angiography

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Introduction

Renal vein thrombosis (RVT) is a common complication of the nephrotic syndrome [1] and may occur in up to 50% of cases with membranous glomerulonephritis [2]. Although it may present acutely with flank pain and macroscopic haematuria, the majority of cases run an indolent course [1,2] and diagnosis therefore requires a high index of clinical suspicion. Until relatively recently, the diagnosis could only be confidently confirmed or excluded with selective renal venography but, more recently, computerized tomography (CT) and magnetic resonance imaging (MRI) have been used [3,4]. We describe a case of bilateral RVT diagnosed by the new technique of magnetic resonance angiography (MRA) and discuss its implications in relation to existing diagnostic modalities.

Case report

A 62-year-old man with an 8 month history of idiopathic, biopsy-proven membranous glomerulonephritis resulting in the nephrotic syndrome presented with a 2 day history of painless, frank haematuria associated with clots, and a worsening of his ankle oedema. Steroid therapy had been commenced 1 month prior to admission following the development of renal impairment (plasma creatinine 159 μmol/l [normal 50–140 μmol/l]). Two weeks later, at which time plasma creatinine had risen to 189 μmol/l, a symptomatic right pleural transudate required aspiration as an in-patient.

At the time of his current admission renal function had deteriorated further (plasma creatinine 327 μmol/l). Flexible cystoscopy failed to reveal a cause for his haematuria. Duplex ultrasonography showed normal-sized kidneys with preserved venous Doppler signal in the intrarenal veins bilaterally, however, the main renal veins were poorly visualized although the right was thought to be patent. Contrast-enhanced CT showed poor renal parenchymal perfusion bilaterally with somewhat reduced contrast enhancement of the proximal left main renal vein. As these appearances may have merely reflected poor renal cortical perfusion, MRA was undertaken. Three-dimensional angiographic images during the venous phases were obtained following an intravenous bolus of 40 ml of dimeglumine gadopentate. Extensive clot was noted within both renal veins with clot extending from the ostium of the right renal vein into the inferior vena cava where it was free floating. Both kidneys were equally perfused and of normal size (see Figure 1).

The patient was formally anticoagulated, initially with heparin then with warfarin, and, although he remained nephrotic, plasma creatinine returned to 158 μmol/l 1 month after admission.

Discussion

Renal vein thrombosis is a well recognized, but often clinically silent, complication of the nephrotic syndrome [1,2]. Establishing the diagnosis is essential both because of possible sequelae (pulmonary embolism or progressive renal impairment related to vascular compromise) and because of the risks of subjecting patients without the disorder to potentially harmful treatment (anticoagulation or thrombolysis).

The investigation of RVT has been hampered by the lack of an accurate, non-invasive, but readily available method for diagnosis. Selective renal venography is the gold standard for diagnosis but is unpopular because of its invasiveness and small but definite risk [5]. Complications include further compromise of renal function related to the nephrotoxic effects of iodine and direct retrograde injection into the renal vein, in addition to the risk of dislodging clots into the pulmon-
Renal vein thrombosis diagnosis by MRA

Fig. 1. Gadolinium-enhanced venous phase MRA. (a) Extensive thrombus within the left renal vein extending from the hilum to the midline (white arrows) with almost complete occlusion of the vessel. There is a segment of patent vein proximal to the inferior vena cava. (b) Free-floating clot extending from the ostium of the right main renal vein into the inferior vena cava (black arrows). (A=aorta).

Both contrast-enhanced CT and MRI have also been used to establish the diagnosis of RVT. Both are less invasive than catheter venography [3], but CT also uses ionizing radiation and requires the administration of a large dose of iodinated contrast agent, a potential hazard in patients with impaired renal function. MRI uses neither ionizing radiation nor iodinated contrast material and thus has significant potential advantages over CT; however, low signal from the renal veins and pseudo-filling defects due to slow flow mimicking thrombus makes interpretation difficult and may give rise to false positive results [4]. Neither CT nor MRI have been evaluated in comparison to the ‘gold standard’ of venography.

This case illustrates the effective use of gadolinium-enhanced MRI in diagnosing bilateral RVT after duplex ultrasonography and contrast-enhanced CT had failed to confirm or refute the diagnosis beyond reasonable doubt. This technique relies on a bolus of gadolinium (the contrast agent used for MRI) to overcome the limitation of poor signal from the renal vessels and is now widely used for diagnosing renal artery stenosis. By performing a delayed second scan the venous anatomy in addition to the arterial anatomy is well demonstrated. Although we did not have ‘gold-standard’ proof, the convincing findings of filling defects within both renal veins was accepted as definitive proof of RVT; furthermore, the presence of clot protruding into the IVC was thought to be an absolute contraindication to catheter venography.

The MRA technique has several advantages over other imaging modalities: gadolinium has an extremely good safety profile with no evidence of nephrotoxicity [9] and as MRI does not employ ionizing radiation the test can be repeated for follow-up purposes. By imaging both during the arterial and venous phase, occult renal artery stenosis can also be disclosed [10]. The test takes approximately 10–15 min to perform but at present is only available on state-of-the-art 1.5 Tesla magnets. Despite the limited availability of this method and current lack of comparative data with established diagnostic techniques, we believe that MRA offers promise as a safe, accurate, and cost-effective means of diagnosing renal vein thrombosis.

References


