Case 10753

Acute renal cortical necrosis
Published on 08.04.2013

DOI: 10.1594/EURORAD/CASE.10753
ISSN: 1563-4086
Section: Uroradiology & genital male imaging
Area of Interest: Kidney Veins / Vena cava
Procedure: Diagnostic procedure
Procedure: Filter insertions
Imaging Technique: CT
Special Focus: Haematologic diseases Ischaemia / Infarction Embolism / Thrombosis Case Type: Clinical
Cases
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Patient: 34 years, female

Clinical History:

Our patient was a 34-year-old woman without any particular medical history, having presented uterine atony during cesarian section. There was uncontrollable bleeding with haemorrhagic shock necessitating hysterectomy. Further complications included two episodes of cardiac arrest and multi-organ failure (MOF) with disseminated intravascular coagulation (DIVC), hepatocellular dysfunction, and acute renal failure (ARF).

Imaging Findings:

Contrast-enhanced computed tomography (CT) was performed several times during the patient's hospitalisation, the first of which showed bilateral inversion of the renal nephrogram with stronger enhancement of the renal medulla than of the cortex (Fig. 1a), which may be referred to as the "reverse rim" sign [1]. Particularly well-seen on one of the follow-up CTs, there was also a fine linear enhancement of the peripheral, sub-capsular region of the kidneys (Fig. 2a and 2b), the "cortical rim" sign [1]. Furthermore, an unstable thrombus was noted in the inferior vena cava (Fig. 1b), for which an inferior vena cava (IVC) filter was deployed (Fig. 2a).

Discussion:

Acute cortical necrosis (ACN) is a rare cause of ARF, accounting for 2-7% of cases [5]. It is caused by a significant reduction of renal blood flow, with relative sparing of the renal medulla. Most cases are bilateral [2]. Microscopic physiopathology of ACN includes small vessel vasospasm, damaged glomerular endothelium, and clot formation [2, 3, 4]. The outer 1-2 mm of the cortex are spared [4, 6]. ACN can manifest in any condition of severe and prolonged shock, including hypovolemia, sepsis, transfusion reaction, dehydration, following contrast injection, and in renal transplant rejection [2, 3]. It is also associated with complicated pregnancy, in particular intrapartum haemorrhage, abruptio placenta, and septic abortion [4, 6]. Other aetiologies are microangiopathy, and DIVC [2].

In ACN, patients present with protracted and severe oliguria, or anuria [4]. Imaging is essential in renal failure, allowing differentiation between acute and chronic forms as well as delineating aetiology early in the disease course. Ultrasound is the exam of first intention in ACN, showing diffusely enlarged kidneys as well as loss of cortico-medullary differentiation. On arterial phase CT, there may be an abrupt termination of contrast material in the renal artery referred to as the "arterial cut-off" sign. Parenchymal phase CT typically shows characteristic enhancement of renal medulla and a silent hypo attenuating cortex, the "reverse rim" sign. A thin millimetric rim of sub capsular cortical enhancement, resulting from collateral flow from capsular perforating vessels [2] is referred to as the "cortical rim" sign. The "cortical rim" sign is not pathognomonic for ACN; also called the "rim of vascular compromise" it has been described with renal vein thrombosis and acute tubular necrosis. Excretion is absent on delayed-phase
images [5]. Low signal intensity of the inner renal cortex and the columns of Bertin on any magnetic resonance (MR) imaging sequence is the major characteristic finding of renal cortical necrosis [3]. In chronic stages, kidneys become small, and cortical calcifications appear in 25% of cases [2, 3, 5].

Renal failure due to ACN is usually irreversible [4] and no specific treatment is recommended. Thrombolytic therapy is warranted in cases of associated renal vein thrombosis and vena cava filter placement may be considered in patients with thrombosis in the IVC [2].

Renal cortical necrosis is a rare cause of ARF with death of the renal cortex and spared medulla. Radiologic signs seen in this condition include the "reverse rim" and the "cortical rim" signs.  

**Differential Diagnosis List:**  
Acute renal cortical necrosis, Acute tubular necrosis, Renal vein occlusion

**Final Diagnosis:**  
Acute renal cortical necrosis

**References:**


Akira Kawashima, MD • Carl M. Sandler, MD • Randy D. Ernst, MD Eric P. Tamm, MD • Stanford M. Goldman, MD • Elliot K. Fishman, MD (2000) CT Evaluation of Renovascular Disease. RadioGraphics 20:1321–1340 (PMID: 10992021)


Description: Contrast-enhanced follow-up CT with persisting "reverse rim" sign and more evident "cortical rim" sign (white arrow). Note IVC filter. Origin: Geneva University Hospitals, Department of Radiology
Description: Coronal reconstruction of follow-up CT with bilateral "reverse rim" and "cortical rim" signs. Origin: Geneva University Hospitals, Department of Radiology
Description: Initial contrast-enhanced axial CT obtained during portal phase shows characteristic "reverse rim" sign of both kidneys. Origin: Geneva University Hospitals, Department of Radiology
Description: Sagittal reconstruction with thrombus in the IVC lumen (red arrow). Origin: Geneva University Hospitals, Department of Radiology