Bilateral renal cell carcinoma: 
Advantages of multidetector CT

Published on 13.05.2009

DOI: 10.1594/EURORAD/CASE.7517
ISSN: 1563-4086
Section: Urорadiology & genital male imaging
Case Type: Clinical Cases
Authors: Tsili AC1, Argyropoulou MI1, Tsagou V1, Giannakis D2, Loutsaris K2, Sofikitis N2, Tsampoulas K1.1) Department of Clinical Radiology, 2) Department of Urology, University Hospital of Ioannina, Ioannina, Greece.
Patient: 74 years, male

Clinical History:
Synchronous bilateral renal cell carcinomas (RCCs) occur in approximately 4% of all patients with RCCs. Multidetector CT examination provides all the necessary information for preoperative planning in these patients.

Imaging Findings:
A 74 year old man was admitted to the urology clinic for an incidentally found non-cystic left renal mass on sonography. Laboratory data analysis was unremarkable. Multidetector CT examination of the abdomen showed a sharply-demarcated mass of the lower pole of the left kidney (Fig 1, 2). The lesion was heterogeneous on plain images (Fig 1b), and enhanced strongly and inhomogeneously after contrast administration (Fig 2a). A second smaller mass, relatively homogeneous on unenhanced scanning (Fig 1a), enhancing strongly and heterogeneously (Fig 2b), was found to coexist in the upper pole of the right kidney. Patterns of enhancement of both lesions were strongly suggestive for the presence of synchronous bilateral RCCs. There was irregularity of the perinephric fat in the proximity of tumours, a finding that could not exclude neoplastic infiltration (Fig 1b). The inferior vena cava and both renal veins were patent. Neither lymphomatous involvement, nor distant metastases were seen.
The patient underwent left radical nephrectomy and right partial nephrectomy. Histology revealed bilateral renal cell carcinomas of clear cell type. The pathologic stage was T1NX. The patient is now well, without signs of recurrence on follow-up CT, two years after surgery.

Discussion:
Renal cell carcinoma (RCC) is the commonest primary malignancy of the kidney, accounting for more than 90% of renal tumours and for about 2% of adult malignancies [1-3]. The advantages of imaging allowed the detection as many as one-half of RCCs at an early stage [1-3]. Bilateral synchronous RCCs occur rarely, reported either in a hereditary form (von Hippel-Lindau disease, hereditary RCC) or in a sporadic form [4, 5]. Sporadic bilateral synchronous RCCs are rarer than the hereditary ones, reported in less than 2% of patients with RCCs [4, 5]. Nephron-sparing surgery (NSS) has emerged as a successful type of treatment in patients with RCC, when there is the need to preserve functioning renal parenchyma [6-10]. The indications of nephron-sparing surgery include bilateral RCCs, as it was this case, RCC involving a solitary functioning kidney, and a unilateral RCC and a functioning contralateral kidney at risk of future impairment [6-10]. The technical success rate of NSS is satisfactory, and the 5-year survival rate is reported comparable with that obtained with radical nephrectomy [6-10]. The main disadvantage of NSS is the risk of local tumour recurrence, which is reported in 4-6% of patients, mainly due to undetected microscopic multifocal RCC in the remaining kidney [6-10]. The introduction of multidetector CT (MDCT) scanners was a major technological innovation [11-13]. MDCT
scanners made it possible to cover substantial anatomic volumes with isotropic submillimeter spatial resolution and enabled the generation of large volumetric data sets, to allow for multiplanar reformatted images and 3D renderings of outstanding quality [11-13]. Multidetector CT is considered the examination of choice, not only for detecting and characterizing renal malignancies, but also for staging of the disease [1-3,14,15]. In cases of nephron-sparing surgery, a detailed preoperative imaging evaluation is mandatory to obtain the required anatomic information regarding kidney position (Fig 3), renal vasculature (Fig 4), and tumour location with respect to normal renal parenchyma (Fig 5) and pelvicaliceal system (Fig 2c,d) [14,15]. Multidetector CT and 3D-reconstructed images can be used as a single imaging examination, providing the urologists the required information for preoperative planning in cases of NSS, as in this case. 3D reconstructed images, using the volume rendering technique depict renal position, with respect to lower ribs, iliac crest and spine (Fig 3), guiding the surgeons to plan the initial incision [14]. Volume renderings also illustrate neoplasm location and depth of extension (Fig 5), to ensure complete tumour excision and preservation of the remaining normal renal parenchyma [14]. Renal vascular anatomy (Fig 4) and their variants can be preoperatively identified on CT examination (Fig 4). An evaluation of the relationship of the neoplasm to the pelvicaliceal system (Fig 2c,d) is also necessary to minimize intraoperative complications, and is accurately depicted both on multiplanar reformatted images and three-dimensional reconstructions (Fig 2c,d) [14,15].

**Differential Diagnosis List:** Synchronous bilateral renal cell carcinoma.

**Final Diagnosis:** Synchronous bilateral renal cell carcinoma.

**References:**


Zincke H, Ghavamian R. Partial nephrectomy for renal cell cancer is here to stay: more data on this issue (editorial). J Urol 1998; 159: 1161-1162. (PMID: 9507822)


Prokop M. General principles of MDCT. Eur J Rad 2000; 45: S4-S10.


Description: Transverse (a, b) plain images show bilateral renal mass lesions (arrow). A soft-tissue mass deforming the contour of the upper pole of the right kidney (arrow, a) and a larger, slightly heterogeneous exophytic mass of the lower pole of the left kidney (arrow, b) is seen. There is perinephric stranding near the lower pole of the left kidney (small arrow), a finding raising the possibility of neoplastic infiltration, although not confirmed on pathology. Origin:
Description: Transverse (a, b) plain images show bilateral renal mass lesions (arrow). A soft-tissue mass deforming the contour of the upper pole of the right kidney (arrow, a) and a larger, slightly heterogeneous exophytic mass of the lower pole of the left kidney (arrow, b) is seen. There is perinephric stranding near the lower pole of the left kidney (small arrow), a finding raising the possibility of neoplastic infiltration, although not confirmed on pathology. Origin:
Description: Coronal (a) and transverse (b) portal-phase, coronal (c) and transverse (d) nephrographic-phase multiplanar reformatted images depict both tumors strongly and heterogeneously enhancing after contrast material administration (arrow), a finding strongly suggestive for the presence of bilateral renal cell carcinomas. Origin:
Description: Coronal (a) and transverse (b) portal-phase, coronal (c) and transverse (d) nephrographic-phase multiplanar reformatted images depict both tumors strongly and heterogeneously enhancing after contrast material administration (arrow), a finding strongly suggestive for the presence of bilateral renal cell carcinomas. Origin:
Description: Coronal (a) and transverse (b) portal-phase, coronal (c) and transverse (d) nephrographic-phase multiplanar reformatted images depict both tumors strongly and heterogeneously enhancing after contrast material administration (arrow), a finding strongly suggestive for the presence of bilateral renal cell carcinomas. Renal malignancies are detected in close proximity to the pelvicaliceal system (small arrow, c, d). Origin:
Description: Coronal (a) and transverse (b) portal-phase, coronal (c) and transverse (d) nephrographic-phase multiplanar reformatted images depict both tumors strongly and heterogeneously enhancing after contrast material administration (arrow), a finding strongly suggestive for the presence of bilateral renal cell carcinomas. Renal malignancies are detected in close proximity to the pelvicaliceal system (small arrow, c, d). Origin:
Description: Three-dimensional (3D) reconstructed image (volume-rendering technique, arterial phase) shows normal position of both kidneys. Left renal neoplasm (arrow). Origin:
Description: Coronal (a) multiplanar reformatted image and (b) 3D-reconstructed image (arterial phase) depicts renal arteries for both kidneys. Left renal neoplasm (arrow). Origin:
Description: Coronal (a) multiplanar reformatted image and (b) 3D-reconstructed image (arterial phase) depicts renal arteries for both kidneys. Left renal neoplasm (arrow). Origin:
Description: (a) 3D-reconstructed image (portal phase) depicts the lower pole left renal neoplasm (arrow). Origin:
Description: (b) Sagittal three-dimensional volume-rendered image (nephrographic phase) obtained with a clip plane shows the upper pole right renal tumor (arrow). Origin: