

CASE REPORT

## Renal Oncocytoma Mimicking Renal Carcinoma

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**ABBREVIATION LIST:**  
RO: Renal Oncocytoma  
RCC: Renal Cell Carcinoma

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ABSTRACT

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Renal Oncocytomas are rare benign renal masses. They can be easily mistaken for Renal Cell Cancers and patients usually undergo a radical nephrectomy. We present a case of a female patient who was admitted with a large mass originating from the right kidney. The results from the CT (stellate scar) and the angiography (spoke-wheel pattern) were consistent with Renal Oncocytoma, but still a radical nephrectomy was performed. This decision was made due to the inability of the current diagnostic procedures to safely differentiate Renal Oncocytomas from Renal Cell Cancers.

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INTRODUCTION

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The first case of Renal Oncocytoma (RO) was described in 1942 by Zippel.<sup>1</sup> ROs represent highly differentiated granular cell renal parenchymal tumors. They are characterized by an eosinophilic cytoplasm caused by an abundance of mitochondria. The cell of origin is the intercalated cell of the cortical portion of the collecting tubule.<sup>2</sup> RO is a benign neoplasm that only rarely metastasizes and has an excellent prognosis.<sup>3</sup> Their clinical manifestation and radiologic findings have not yet proven consistently reliable to safely differentiate ROs from Renal Cell Carcinomas (RCC). We present a case of a 74 year-old female patient who underwent radical nephrectomy for a large mass originating from the right kidney, which was revealed to be a RO.

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CASE PRESENTATION

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A 74 year-old female was admitted with a 1 year history of abdominal pain, mainly localized in the right flank and right loin. The patient also experienced a weight loss of 8 kg within 8 months. On examination, there was a firm, palpable abdominal mass in

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the right flank and loin and no other remarkable physical findings. Laboratory tests were normal. Tumor markers were all normal. CT scan of the abdomen showed a large, multilobular, well demarcated mass which occupied the anatomical space between the right liver lobe and the right kidney, displacing the latter antero-inferiorly. The mass had a dense homogenous circumference and a hypo-dense stellate center (stellate scar) (Figure 1). Digital subtraction angiography revealed a large vascularized mass, associated with the right kidney. Early arterial phase showed a spoke-wheel arterial configuration which refers to the radial arrangement of the vessels from the periphery to the central portion of the tumor (Figure 2). In the nephrogram phase a homogenous blush and a central stellate lucency within the mass were noted. The left kidney was normal. Due to the characteristic findings from the CT and angiography, the preoperative diagnosis of RO was highly suggestive. Once the investigations were complete, the patient was taken to the operational theatre, where a right radical nephrectomy, which included the proximal 2/3 of the ureter, was performed (Figure 3). There was no macroscopic evidence of any secondary deposits to the rest of the intra-abdominal structures. The patient's postoperative course was uneventful.

Gross pathologic examination revealed a 19 X 15 X 11 cm mass originating from the right kidney. A central whitish stellate scar was characteristically present (Figure 4). The histological examination of the specimen showed a renal neoplasm with morphological characteristics consistent with RO. The specimen was positive for CK 8,18 and CD 10, and negative for CK 20, VIM and RCC. The patient is doing well 3 years after the operation.

## DISCUSSION

ROs are usually solitary masses and account for approximately 5% of all renal tumors. ROs are multifocal in 2.5% to 16% of cases and bilateral in 4% to 12% of cases.<sup>4</sup> Metachronous tumors occur in 4% of patients. Very rarely, a diffuse form of innumerable, small bilateral ROs can occur.<sup>5</sup> Genetic predisposition to developing ROs is seen in the rare condition of familial RO, where bilateral tumors develop, varying from milder forms of the disorder, to severe cases where renal function is compromised.<sup>6</sup>

There is a peak incidence in the seventh decade. Approximately 70% of these tumors are discovered as incidental findings by investigations performed for an unrelated problem, while 30% of patients may present flank pain, palpable renal mass and gross or microscopic hematuria.<sup>7</sup>

The increasing use of CT scans for small renal masses has led to a diagnostic dilemma of accurately characterizing the nature of these renal lesions and their subsequent management. On CT scanning, ROs typically show a well-defined, smooth, relatively homogeneous solid mass with a central area of hypoattenuation due to the presence of a central stellate scar, and rarely show any extension to the renal vein, inferior vena cava or the adrenals. Classically, if renal angiography on ROs were performed, it would show a typical spoke-wheel pattern, highlighting the marked peripheral vascularity in contrast with the relatively hypovascular central part of the tumor. However, classical hypoattenuation of the central stellate scar on CT scan is seen in less than one-third of ROs, and although characteristic of ROs, it is not diagnostic. Moreover, there are no consistently reliable pathognomic CT scan features that can



FIGURE 1. CT imaging. Stellate scar.

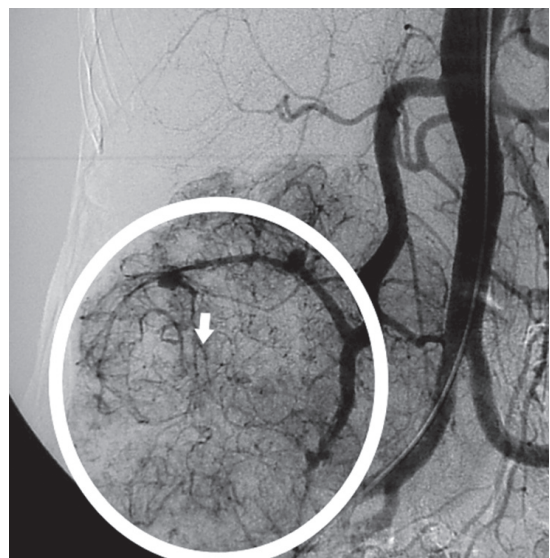
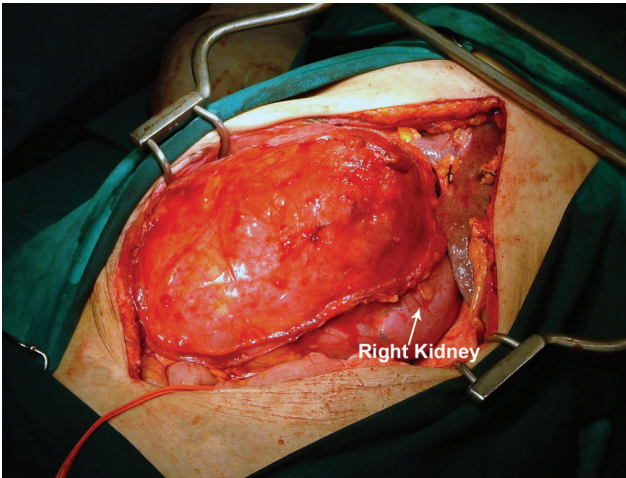


FIGURE 2. Renal angiography. Spoke-Wheel pattern.



**FIGURE 3.** Operative findings of a large mass originating from the right kidney.



**FIGURE 4.** Pathologic examination. Stellate scar

safely differentiate ROs from RCCs.<sup>8</sup>

Davidson and colleagues proposed the CT criteria of a homogeneously enhancing kidney with a central, sharply defined stellate area of low attenuation as predictors of a RO. Using these criteria, they reviewed 53 cases of ROs and 63 cases of RCCs but only found 67% of ROs to fulfill the criteria whereas 16% of RCCs were incorrectly predicted to be ROs. The accuracy was even poorer for smaller lesions (less than 3 cm), with ROs being misclassified in 18% and RCCs misclassified in 42% of cases.<sup>9</sup> Additionally, of 11 patients with the pathologic diagnosis of RO in a study by Maatman, only one patient had a spoke-wheel pattern on conventional angiography and no patient had sufficient angiographic features to establish the preoperative diagnosis of RO.<sup>7</sup>

Even needle biopsy or frozen section are not sufficient to exclude RO with focal oncocytic differentiation, although accuracy does increase when multiple core specimens are obtained.<sup>10</sup> Additionally, to date, none of the histochemical, IHC or cytogenetic features has been proven to be reliable and specific.<sup>8</sup>

Some recent advances in imaging can maybe help alleviate the difficulty in the differential diagnosis between RO and RCC. ROs are composed of cells with numerous mitochondria and thus retain <sup>99m</sup>Tc-MIBI in their cells resulting in a 1.44-fold increase in <sup>99m</sup>Tc-MIBI uptake, whereas it is shown that RCC have been shown to actively excrete <sup>99m</sup>Tc-MIBI from their cells. Some studies suggest that <sup>99m</sup>Tc-MIBI SPECT/CT could offer a preoperative advantage in the diagnosis of benign solid renal tumors.<sup>11</sup>

The classical approach to a solid renal mass has generally been a radical nephrectomy, due to the high risk of lesion being an RCC. Certain situations, however (patients with an anatomic or functional solitary kidney, patients with bilateral

renal masses or patients with renal insufficiency) mandate nephron-sparing surgery. To those situations, initial results with radiofrequency ablation are promising alternative therapies, as are minimally invasive surgical techniques including laparoscopic nephron-sparing surgery and laparoscopic cryosurgery.<sup>12,13</sup>

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## CONCLUSION

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The possibility of a RO should always be considered in the evaluation of a solid renal mass. The presence of a central stellate scar in the CT scan and a spoke-wheel arterial configuration followed by a homogenous angiographic blush in the angiography, although not pathognomonic, should raise the suspicion of RO. Further advances in radiologic imaging are essential in order to safely differentiate ROs from RCCs, so that a nephron-sparing surgical technique may be employed for the treatment of ROs due to its benign nature.

## REFERENCES

1. Zippel J. Zur kenntnis der onkocyten. *Virchows Archiv für pathologische Anatomie und Physiologie und für klinische Medizin.* 1941; 308:360-382.
2. Lieber MM, Tomera KM, Farrow GM. Renal oncocytoma. *The Journal of urology* 1981; 125:481-485.
3. Alamara C, Karapanagiotou EM, Tourkantonis I, Xyla V, Maurer CC, Lykourinas M, et al. Renal oncocytoma: a case report and short review of the literature. *European journal of internal medicine* 2008; 19:e67-e9.
4. Chao DH, Zisman A, Pantuck AJ, Freedland SJ, Said JW, Belldegrun AS. Changing concepts in the management of renal

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- oncocytoma. *Urology* 2002; 59:635-642.
5. Katz DS, Gharagozloo AM, Peebles TR, Oliphant M. Renal oncocytomatosis. *American Journal of Kidney Diseases* 1996; 27:579-582.
  6. Choyke PL, Glenn GM, Walther MM, Zbar B, Linehan WM. Hereditary renal cancers. *Radiology* 2003; 226:33-46.
  7. Maatman TJ, Novick AC, Tancinco BF, Vesoulis Z, Levin HS, Montie JE, et al. Renal oncocytoma: a diagnostic and therapeutic dilemma. *The Journal of Urology* 1984; 132:878-81.
  8. Ng KL, Rajandram R, Morais C, Yap NY, Samaratunga H, Gobe GC, et al. Differentiation of oncocytoma from chromophobe renal cell carcinoma (RCC): can novel molecular biomarkers help solve an old problem? *Journal of Clinical Pathology* 2014; 67:97-104.
  9. Davidson A, Hayes W, Hartman D, McCarthy W, Davis Jr C. Renal oncocytoma and carcinoma: failure of differentiation with CT. *Radiology* 1993; 186:693-696.
  10. Caoili EM, Bude RO, Higgins EJ, Hoff DL, Nghiem HV. Evaluation of sonographically guided percutaneous core biopsy of renal masses. *American Journal of Roentgenology* 2002; 179:373-378.
  11. Reynolds AM, Porter KK. Characterizing Indeterminate Renal Masses with Molecular Imaging: the Role of Tc-99m-MIBI SPECT/CT. *Curr Urol Rep* 2017; 18:86.
  12. Nadler RB, Kim SC, Rubenstein JN, Yap RL, Campbell SC, User HM. Laparoscopic renal cryosurgery: the Northwestern experience. *The Journal of Urology* 2003; 170(4 Part 1):1121-1125.
  13. Simon SD, Ferrigni RG, Novicki DE, Lamm DL, Swanson SS, Andrews PE. Mayo Clinic Scottsdale experience with laparoscopic nephron sparing surgery for renal tumors. *The Journal of Urology* 2003; 169:2059-2062.