Original Research Article

Renal cell carcinoma - A spectrum of radiological findings

Jayesh Shah[1], Ruju Bavishi[2*], C. Raychaudhuri[3]

[1]Associate Professor, [2]1st Year Resident, [3]Professor and HOD, Radiology Department, SBKS Medical Institute and Research Centre, Sumandeep Vidhyapeeth, Vadodara, Gujarat, India
[*]Corresponding author email: **ruju.bavishi1993@gmail.com**

International Archives of Integrated Medicine, Vol. 4, Issue 12, December, 2017.
Copy right © 2017, IAIM, All Rights Reserved.
Available online at http://iaimjournal.com/
ISSN: 2394-0026 (P) **ISSN: 2394-0034 (O)**
Received on: 12-11-2017 **Accepted on:** 20-11-2017
Source of support: Nil **Conflict of interest:** None declared.
How to cite this article: Jayesh Shah, Ruju Bavishi, C. Raychaudhuri. Renal cell carcinoma - A spectrum of radiological findings. IAIM, 2017; 4(12): 26-31.

Abstract

Background: Renal cell carcinomas (RCC) are primary malignant adenocarcinomas derived from the renal tubular epithelium and are the most common malignant renal tumor. They usually occur in 50-70-year-old patients.
Aim: Radiological evaluation of patients of renal cell carcinoma by modalities like USG, CT-Scan and MRI.
Materials and methods: All the patients were cases of renal cell carcinoma that had come to Department of Radiology in Dhiraj Hospital. They were evaluated by different modalities like USG, CT-Scan and MRI after taking consent when and where needed.
Results: Renal cell carcinoma followed age and sex trends which means 72% patients were males and 28% patients were females and most of the patients were above 50 years of age.
Conclusion: CECT is the modality of choice for evaluation of renal cell carcinoma patients as it gives the information not only about the localization but also the distant spread of tumor. MRI can be used as an alternative and also to know about the renal vein and IVC invasion by the tumor. USG as is a cheap and easily available method can be used to screen the patients with a palpable flank mass and those with hematuria.

Key words

CECT, MRI, USG, Renal cell carcinoma, Metastasis.

Introduction

Renal cell carcinomas (RCC) are primary malignant adenocarcinomas derived from the renal tubular epithelium and are the most common malignant renal tumor. They usually occur in 50-70-year-old patients and macroscopic haematuria occurs in 60% of the cases.

On imaging, they have a variety of radiographic appearances, from solid and relatively homogeneous to markedly heterogeneous with areas of necrosis, cystic change, and hemorrhage.

Patients are typically 50-70 years of age at presentation [1, 2], with a moderate male predilection of 2:1 [2]. Renal cell carcinomas are thought to be the 8th most common adult malignancy, representing 2% of all cancers, and account for 80-90% of primary malignant adult renal neoplasms [3, 4].

Presentation is classically described as the triad of:

1. macroscopic haematuria
2. flank pain
3. palpable flank mass

This triad is however only found in 10-15% of patients [1, 2], and increasingly the diagnosis is being made on CT for assessment of hematuria alone or as an incidental finding. The majority of cases are sporadic. In most situations renal cell carcinomas are found incidentally on imaging performed for other purposes.

Around 25% of RCC patients will develop a paraneoplastic syndrome [5, 6]:

- hypercalcaemia
- hypertension
- polycythaemia: from erythropoietin secretion
- Stauffer syndrome: hepatic dysfunction not related to metastases
- feminisation
- limbic encephalitis

Risk factors

- cigarette smoking [2]
- dialysis-related cystic disease [2]
- obesity
- treatment with cyclophosphamide (chemotherapy agent) [7]

Renal cell carcinomas arise from tubular epithelium, and encompass a number of distinct histological varieties, including

- clear cell renal carcinoma (conventional): 70-80%
- papillary renal cell carcinoma: 13-20%
- chromophobe renal cell carcinoma: 5%
- collecting duct renal cell carcinoma (Bellini duct): <1%
- renal medullary carcinoma: rare
- sarcomatoid renal cell carcinoma (sRCC) [8]

The most common sites for metastasis are the lymph nodes, lung, bones, liver and brain. Renal cell carcinoma is one of the more common causes of cannonball metastases to the lung.
In some instances RCCs are associated with [2]

- von Hippel-Lindau syndrome: greater tendency for bilateral RCC as well as a presentation at a younger age; clear cell subtype
- Xp11.2 translocation
- familial clear cell cancer
- tuberous sclerosis
- hereditary renal cell cancer syndromes

Ultrasound is very frequently used to assess the renal tract; however it is not as sensitive or specific as CT or MRI.

CT is also frequently used to diagnose renal cell carcinomas. On non-contrast CT the lesions appear of soft tissue attenuation. Larger lesions frequently have areas of necrosis. Approximately 30% demonstrate some calcification.

MRI is an excellent technique for imaging the kidneys and can even suggest the likely histology. Treatment of renal cell carcinomas is usually with radical nephrectomy if feasible. However, in elderly patients or those with co-morbidities, and especially those with smaller tumors suggestive of papillary histology, then organ-sparing treatment can be entertained.

Aim and objectives

- To facilitate early diagnosis of the disease

- To ascertain various radiological features in patients of renal cell carcinoma by USG, CT-Scan and MRI.
- To evaluate the extent of disease and prognosis after treatment.

Materials and methods

Study area

The study was carried out in the Department of Radiodiagnosis, S.B.K.S. Medical Institute and Research Centre, Waghodia, Vadodara.

Study design

Type of the study: An Observational, Cross-Sectional Hospital Based Study.
Sample size: 25 patients.

Selection of subject

Inclusion criteria

- Only those patients who were willing to participate in the study were included after taking a written informed consent.
- Patients with known cases of renal cell carcinoma were included.
- Patient referred to the Radiology Department with palpable renal mass and hematuria; found to have positive findings were included in the study.

Exclusion criteria

- All patients unwilling were excluded from this study.

Study protocol

25 patients were included in this study. While some were already diagnosed beforehand, the others were diagnosed at the time of this study. Different modalities used during this study were

- GE LOGIQ P9 USG machine
- SIEMENS CT SCAN machine (16-slices)
- 1.5 TESLA PHILLIPS MRI machine

Results

In our study, we found that out of 25 patients with renal cell carcinoma, 18 patients were males and 7 patients were females (**Figure – 1**).

In our study, we found that 15 patients were between 65 and 70 years of age while 8 patients were between 50 to 65 years of age and only 2 patients were less than 50 years old.

We also took detailed history of the patients and found that out of 25 patients, 17 patients had complaints of hematuria and 10 patients had palpable flank mass.

Renal cell carcinoma was found to have varying sonographic appearance from solid to partially cystic appearance, and in different patients was hyper, iso, or hypoechogenic to the surrounding renal parenchyma.

On non-contrast CT the lesions appeared of soft tissue attenuation. 5 patients of RCC with larger lesions had areas of necrosis. 5 patients showed some calcification. However, different patients with renal cell carcinomas demonstrated variable enhancement, usually less than the normal cortex.

The appearance of MRI was found as following

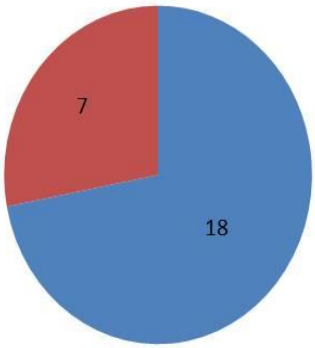
- **T1:** some patients showed heterogeneous appearance due to necrosis, hemorrhage and solid components
- **T2:** 18 patients showed hyperintense appearance which may indicate clear cell carcinoma while 5 patients showed hypointense appearance which might indicate papillary carcinoma.
- One patient showed renal vein tumor thrombus which could be detected by MRI.

Conclusion

RCC also called as hypernephroma and renal adenocarcinoma is the most common type of kidney cancer found in adults. Early diagnosis and proper treatment can be very useful in patients to improve the 5-year survival rate. Ultrasound is the imaging modality that is easily available and cheap so it remains as the tool to screen the patients with hematuria and palpable

flank mass. However it cannot be used to assess the local or distant spread of disease. So the modality of choice remains the CT-SCAN. CT scans have the potential to distinguish solid masses from cystic masses and can provide information on the localization and spread of the cancer to the other organs of the patient. MRI can also be used as an alternative to CT-Scan however it is more expensive for the patient and also time-consuming. The major advantage of MRI is that it can tell us about the spread of tumour to the renal vein and the inferior vena-cava.

Figure – 1: Sex distribution in study.



Case

A 70 year old male patient presented with left palpable renal mass since 3 years and complaints of hematuria since 15 days. He initially was advised USG by the clinician. USG showed the appearance of RCC on which the patient was advised to get further evaluation done CECT (**Figure – 2 to 10**).

Figure – 2: Large renal mass (RCC) on sonography.

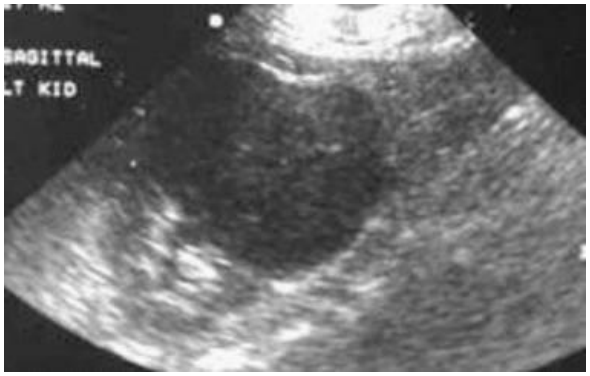


Figure – 3: Large left RCC- contrast enhanced CT scan.

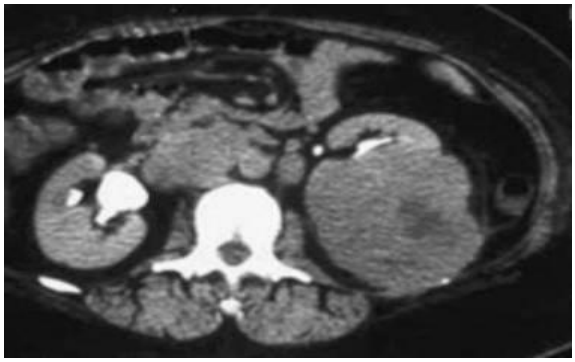


Figure – 4: RCC seen in left kidney (contrast enhanced) CT image.

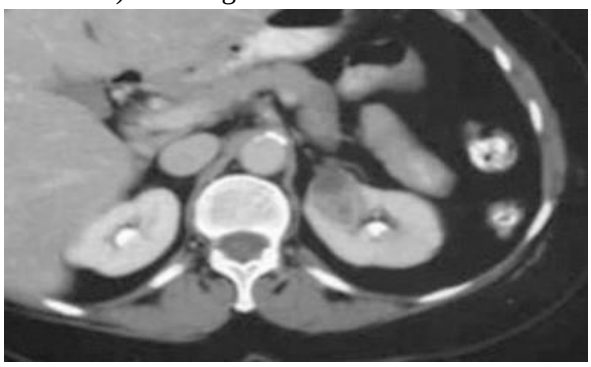


Figure – 5: Coronal section of CT scan showing right renal mass.

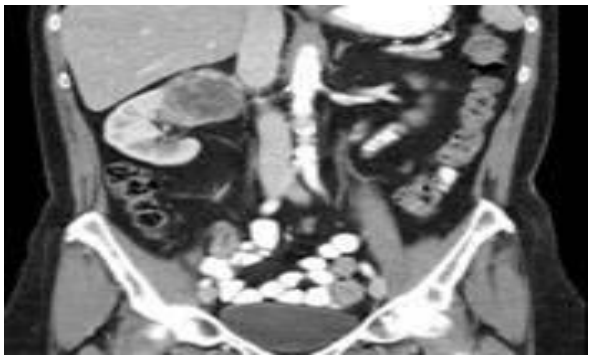


Figure – 6: Sagittal section of CT-scan showing right renal mass.

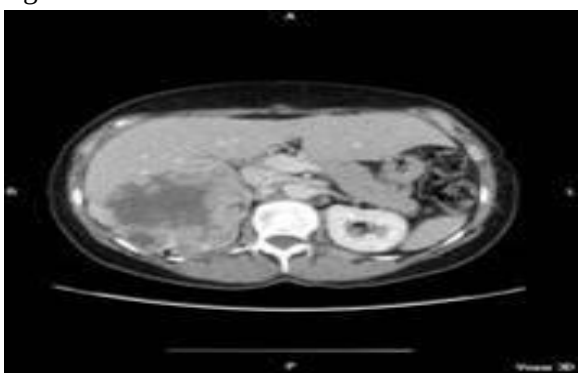


Figure – 7: Multicystic RCC.

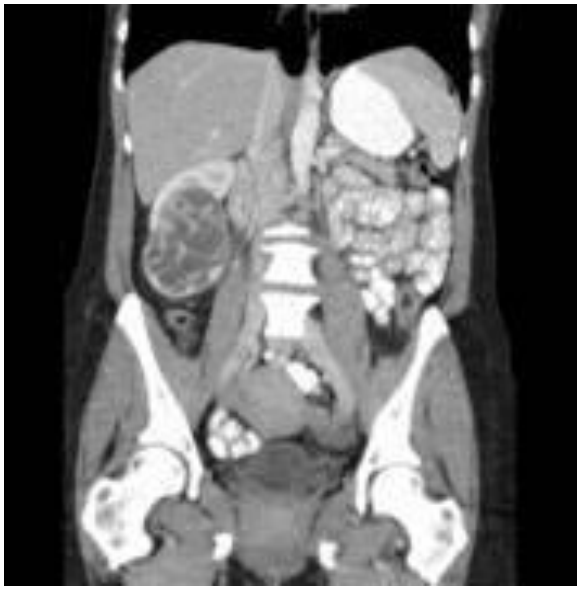


Figure – 8: RCC with lung metastasis.

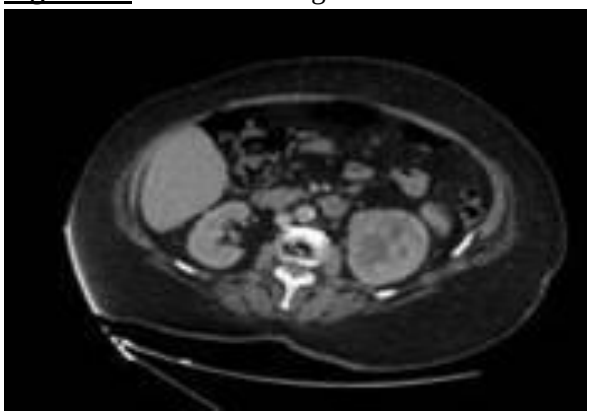


Figure – 9: Left RCC on T-1 weighted MRI image.

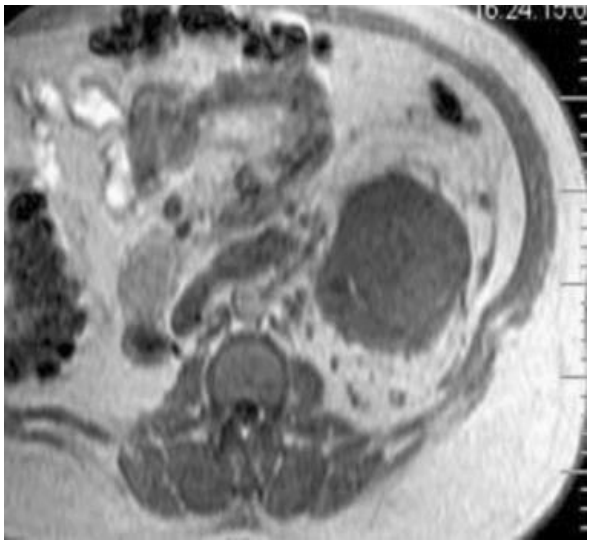
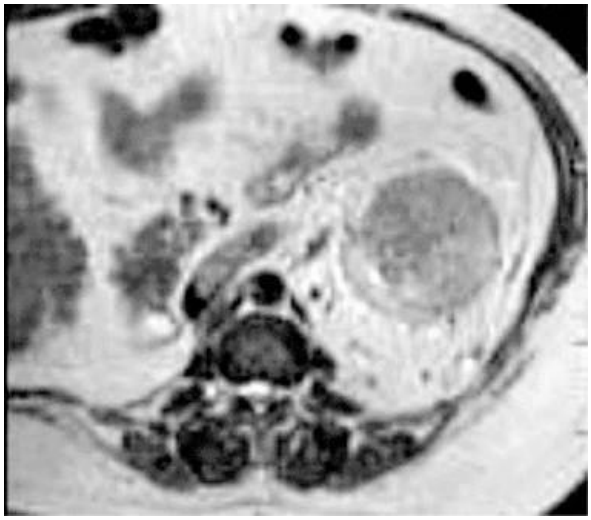


Figure – 10: Left renal cell carcinoma - T2-weighted axial MRI image with renal vein invasion and extension of tumor into the inferior vena cava.



References

1. Federle MP, Jeffrey RB, Woodward PJ, et al. Diagnostic Imaging: Abdomen, Published by Amirsys. Lippincott Williams & Wilkins, 2009.
2. McPhee SJ, Papadakis MA. Current Medical Diagnosis and Treatment, McGraw-Hill Professional, 2008.
3. Ng CS, Wood CG, Silverman PM, et al. Renal cell carcinoma: diagnosis, staging, and surveillance. AJR Am J Roentgenol., 2008; 191(4): 1220-32.
4. Sheth S, Scatarige JC, Horton KM, et al. Current concepts in the diagnosis and management of renal cell carcinoma: role of multidetector ct and three-dimensional CT. Radiographics, 2001; 21 Spec No (suppl 1): S237-54.
5. Palapattu GS, Kristo B, Rajfer J. Paraneoplastic syndromes in urologic malignancy: the many faces of renal cell carcinoma. Rev Urol., 2011; 4(4): 163-70.
6. Gultekin SH, Rosenfeld MR, Voltz R, et al. Paraneoplastic limbic encephalitis: neurological symptoms, immunological findings and tumour association in 50 patients. Brain, 2000; 123(Pt 7) (7): 1481-94.

7. Travis LB, Curtis RE, Glimelius B, et al. Bladder and kidney cancer following cyclophosphamide therapy for non-Hodgkin's lymphoma. J. Natl. Cancer Inst., 1995; 87(7): 524-30.

8. Shuch B, Bratslavsky G, Linehan WM, et al. Sarcomatoid renal cell carcinoma: a comprehensive review of the biology and current treatment strategies. Oncologist, 2012; 17(1): 46-54.