

Diagnostic Imaging Pathways - Renal Cell Cancer (Staging)

Population Covered By The Guidance

This pathway provides guidance on the staging of adult patients with renal carcinoma confirmed by biopsy or previous imaging.

Date reviewed: January 2012

Date of next review: 2017/2018

Published: November 2012

Quick User Guide

Move the mouse cursor over the **PINK** text boxes inside the flow chart to bring up a pop up box with salient points.

Clicking on the **PINK** text box will bring up the full text.

The relative radiation level (RRL) of each imaging investigation is displayed in the pop up box.

SYMBOL	RRL	EFFECTIVE DOSE RANGE
	None	0
	Minimal	< 1 millisieverts
	Low	1-5 mSv
	Medium	5-10 mSv
	High	>10 mSv

Pathway Diagram

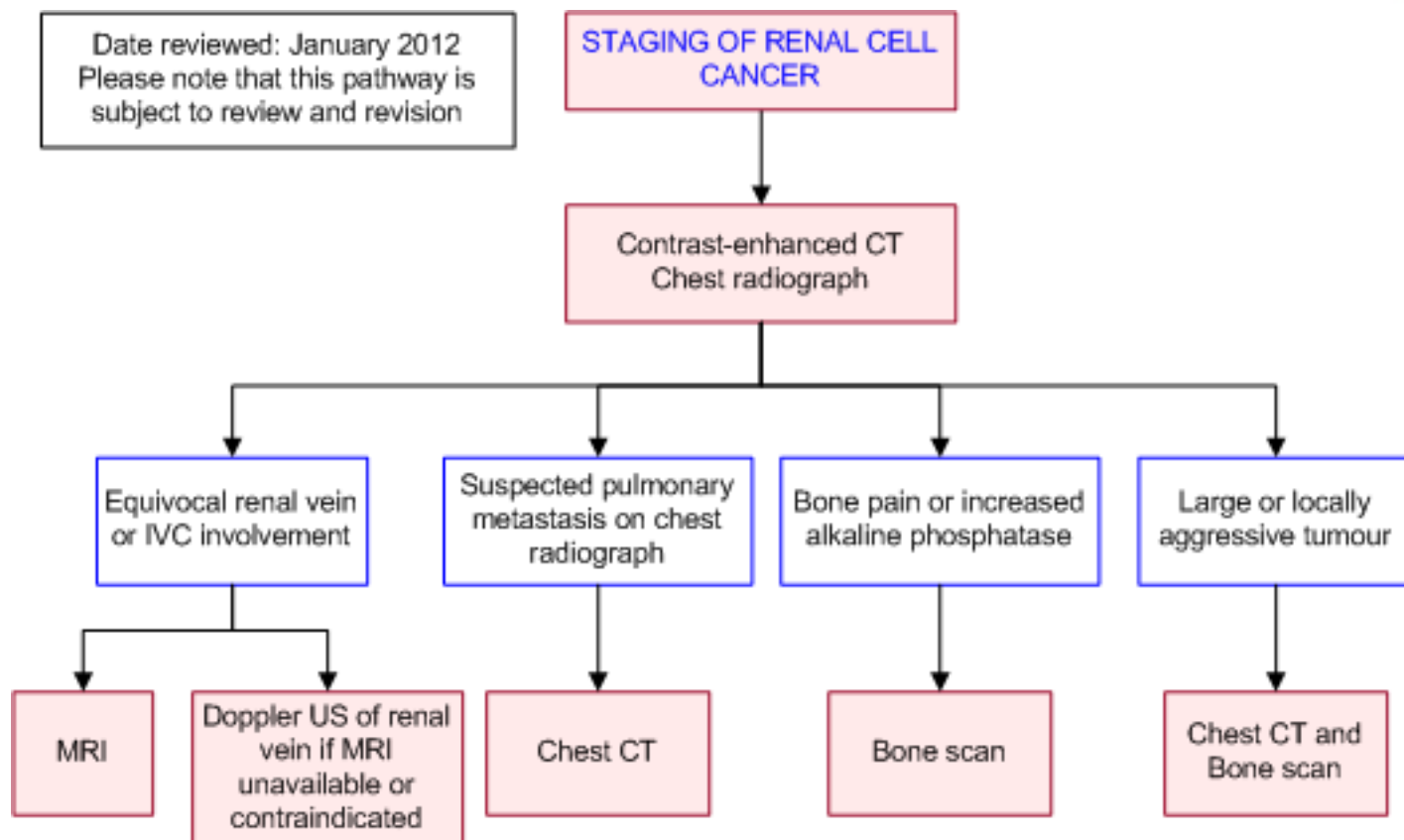


Image Gallery

Note: These images open in a new page

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Renal Cell Carcinoma

Image 1 (Computed Tomography): Large right kidney mass with central necrosis consistent with renal cell carcinoma. There is tumour extension into the right renal vein (arrow).

2a



Renal Cell Carcinoma

Image 2a: Nephrectomy showing a circumscribed and encapsulated renal cell carcinoma arising from the lower pole of the kidney. The cut surface shows a heterogeneous appearance typical of malignancy with patchy areas of necrosis (blue arrow) and haemorrhage (red arrow).

2b



Image 2b (H&E, x10): Histological section of a conventional clear cell renal cell carcinoma showing sheets and nests of malignant cells with intervening thin-walled vessels. The cells demonstrate irregular and hyperchromatic nuclei surrounded by abundant clear cytoplasm (clear cells).

Teaching Points

- Staging is usually by CT of the abdomen and chest radiograph
- Other modalities used include chest CT if there is a suspicion of metastasis on chest radiography, nuclear medicine bone scan if the patient has bone pain and MRI or Doppler US if there is equivocal IVC invasion on CT

Bone Scan

- Routine bone scans are not warranted and should be reserved for patients with an elevated alkaline phosphatase, bone pain, or an extremely large and aggressive tumour [2,15](#)

Chest Computed Tomography (CT)

- Indications [14](#)
 - When the chest radiograph is suspicious or positive or
 - In large and locally aggressive tumours to help confirm or exclude metastases and defining the extent of disease

Computed Tomography (CT)

- Initial investigation of choice for staging of renal cell carcinoma [1,2,3](#)
- 85-91% sensitivity for detecting caval thrombus [3,5,7](#)
- Limitations - poor differentiation between stage I disease and stage II disease (little significance in treatment planning) [4](#)

Doppler Ultrasound

- If MRI is unavailable, Doppler US is useful for assessment of tumour extension into the renal veins, the inferior vena cava, and the right side of the heart (sensitivity approaching 100% for delineating tumour thrombus in the intrahepatic or suprahepatic inferior vena cava) [6,7,8,9](#)
- Advantages [1](#)
 - Non-invasive
 - No exposure to ionising radiation
 - Does not require contrast material
 - Relatively inexpensive and widely available
- Limitations
 - Inferior to CT and MRI for overall staging of renal adenocarcinoma (low sensitivity for detection of tumour thrombus in the infrahepatic inferior vena cava or distal renal vein) [7](#)
 - Image distortion secondary to bowel gas and fat

Magnetic Resonance Imaging (MRI)

- Most accurate imaging modality for assessing venous thrombus (83-100% sensitivity) [5,6,7,10,11,12,13](#)
- Indicated when there is equivocal renal vein or inferior vena caval involvement on CT [5,10](#)

- Advantages [1](#)
 - Multiplanar imaging
 - Superior soft tissue contrast
 - Does not require intravascular contrast material
 - No exposure to ionising radiation
- Disadvantages - limited availability and high expense

Staging of Renal Cell Carcinoma

- The goal of imaging in patients with renal cell carcinoma is to separate candidates for surgical cure from those with advanced disease [1](#)
- For surgical candidates, imaging allows delineation of the extent of disease for treatment planning [1](#)
- Renal cell carcinoma staging system [1](#)

Robson Stage	Disease Extent	TNM Stage
I	Tumour confined to kidney (<2.5cm)	T1
	Tumour confined to kidney (>2.5cm)	T2
II	Tumour spread to perinephric fat or adrenal	T3a
IIIA	Tumour spread to renal vein	T3b
	Tumour spread to inferior vena cava	T3c
IIIB	Tumour spread to local lymph nodes (LN)	N1-3 M0
IIIC	Tumour spread to local vessels and LNs	T3b N1-3
IVA	Tumour spread to adjacent organs (except ipsilateral adrenal)	T4a
IVB	Distant metastases	M1 N4

Plain Chest Radiograph (CXR)

- Used as a screen for metastatic disease in renal cell carcinoma [1](#)
- A standard frontal and lateral chest radiograph excludes most pulmonary metastases [1](#)

References

References are graded from Level I to V according to the Oxford Centre for Evidence-Based Medicine, Levels of Evidence. [Download the document](#)



1. Zagoria RJ, Bechtold RE. **The role of imaging in staging renal adenocarcinoma.** Semin Ultrasound CT MR. 1997;18(2):91-9. (Review article)
2. Benson MA, Haaga JR, Resnick MI. **Staging renal carcinoma: what is sufficient?** Arch Surg. 1989;124(1):71-3. (Level II/III evidence)
3. Dinney CPN, Lannon SG, Awad SA, et al. **Analysis of imaging modalities, staging systems, and prognostic indicators for renal cell carcinoma.** Urology. 1992;39(2):122-9. (Level II evidence). [View the reference](#)
4. Johnson CD, Dunnick NR, Cohan RH, et al. **Renal adenocarcinoma: CT staging of 100 tumours.** AJR Am J Roentgenol. 1987;148(1):59-63. (Level III evidence)
5. Fein AB, Lee JKT, Balfe DM. **Diagnosis and staging of renal carcinoma: a comparison of MR imaging and CT.** AJR Am J Roentgenol. 1987;148(4):749-53. (Level II/III evidence)
6. Habboub HK, Abu-Yousef MM, Williams RD, et al. **Accuracy of color Doppler sonography in assessing venous thrombus extension in renal cell carcinoma.** AJR Am J Roentgenol. 1997;168:267-71. (Level III evidence)
7. Kallman DA, King BF, Hattery RR, et al. **Renal vein and inferior vena cava tumour thrombus in renal cell carcinoma: CT, US, MRI, and venacavography.** J Comput Assist Tomogr. 1992;16:240-7. (Level II evidence). [View the reference](#)
8. Didier D, Racle A, Etievent JP, et al. **Tumour thrombus of the inferior vena cava secondary to malignant abdominal neoplasms: US and CT evaluation.** Radiology. 1987;162:83-9. (Level III/IV evidence)
9. Schwerek WB, Schwerek WN, Rodeck G. **Venous renal tumour extension: a prospective US evaluation.** Radiology. 1985;156:491-5. (Level II evidence). [View the reference](#)
10. Hricak H, Thoeni RF, Carroll PR, et al. **Detection and staging of renal neoplasms: a reassessment of MR imaging.** Radiology. 1988;166:643-9. (Level III evidence)
11. Goldfarb DA, Novick AC, Lorig R, et al. **Magnetic resonance imaging for assessment of vena caval tumor thrombi: a comparative study with venacavography and computerized tomography scanning.** J Urol. 1990;144:1100-4. (Level III evidence)
12. Semelka RC, Shoenut JP, Magro CM, et al. **Renal cancer staging: comparison of contrast enhanced CT and gadolinium enhanced fat-suppressed spin-echo and gradient echo MR imaging.** J Magn Reson Imaging. 1993;3(4):597-602. (Level II evidence)
13. Horan JJ, Robertson VN, Choyke PL, et al. **The detection of renal carcinoma extension into the renal vein and the inferior vena cava: a prospective comparison of venography and MRI.** J Urol. 1989;142(4):943-7. (Level II/III evidence)
14. Lim DJ, Carter MF. **Computerized tomography in the preoperative staging of pulmonary metastases in patients with renal cell carcinoma.** J Urol. 1993;150(4):1112-4. (Level III evidence)
15. Campell RJ, Broaddus SB, Leadbetter GW Jr. **Staging of renal carcinoma: cost effectiveness of routine pre-operative bone scans.** Urology. 1985;25(3):326-9. (Level III evidence)

Further Reading

1. Fritzsche PJ, Millar C. **Multimodality approach to staging renal cell carcinoma.** Urol Radiol. 1992;14:3-7. (Review article)

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