



## 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 RADIOGRAPHY (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](#)

## COMPUTED TOMOGRAPHY

- Initial investigation of choice for staging of renal cell carcinoma. [1-3](#)
- 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). [6-9](#)
- 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

- Most accurate imaging modality for assessing venous thrombus (83-100% sensitivity). [5,7,10-13](#)
- 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.

## COMPUTED TOMOGRAPHY CHEST

- 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.

## 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](#)

## REFERENCES

1. Zagoria RJ, Bechtold RE. **The role of imaging in staging renal adenocarcinoma.** Seminars in US, CT, and MRI 1997;18(2):91-9.
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). [Click here to view reference](#)
4. Johnson CD, Dunnick NR, Cohan RH, et al. **Renal adenocarcinoma: CT staging of 100 tumours.** AJR 1987;148(1):59-63. (Level III evidence)
5. Fein AB, Lee JKT, Balfé DM. **Diagnosis and staging of renal carcinoma: a comparison of MR imaging and CT.** AJR 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 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). [Click here to view 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. Schwerk WB, Schwerk WN, Rodeck G. **Venous renal tumour extension: a prospective US evaluation.** Radiology 1985;156:491-5. (Level II evidence). [Click here to view 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.

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.

### Website

For more information go to [www.imagingpathways.health.wa.gov.au](http://www.imagingpathways.health.wa.gov.au)

### Copyright

© Copyright 2009, Department of Health Western Australia. All Rights Reserved.

This web site and its content has been prepared by The Department of Health, Western Australia. The information contained on this web site is protected by copyright.

### Legal Notice

Please remember that this leaflet is intended as general information only. It is not definitive and The Department of Health, Western Australia can not accept any legal liability arising from its use. The information is kept as up to date and accurate as possible, but please be warned that it is always subject to change.

