

AMSER Case of the Month

October 2024

70-year-old female with neck pain

HARBORVIEW
MEDICAL CENTER

UW Medicine  King County



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Patient Presentation

- **HPI:** 70-year-old female presenting with severe neck pain after ground level fall. She also had a one-month history of bilateral shoulder pain and paresthesia prior to the fall
- **PMHx:** Hypertension, hyperlipidemia, coronary artery disease, and heart failure with preserved ejection fraction. 15 pack years, quit 25 years ago
- **Admission vital signs:**
 - T: 36.8 C | BP: 110/76mmHg | HR: 89 bpm | RR: 17 rpm
 - GCS: 15
- **Physical exam:**
 - MSK: Midline tenderness of the cervical spine
 - Neuro: No focal neurologic deficits
 - No other abnormal findings

What Imaging Should We Order?

This imaging modality was ordered by the physician

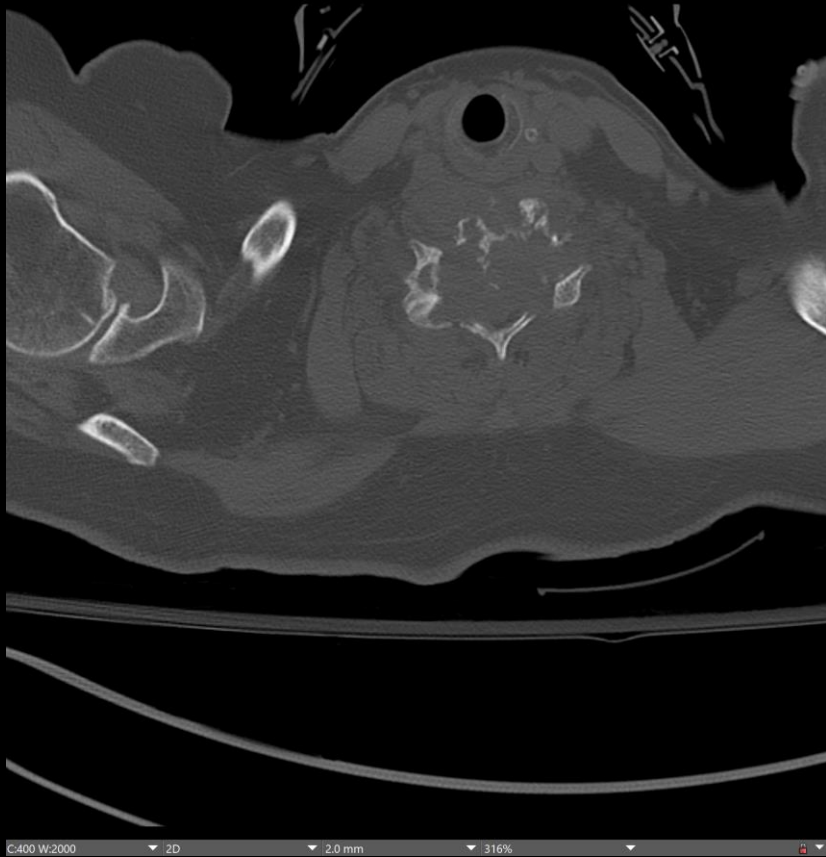
Select the applicable ACR Appropriateness Criteria

Variant 2:

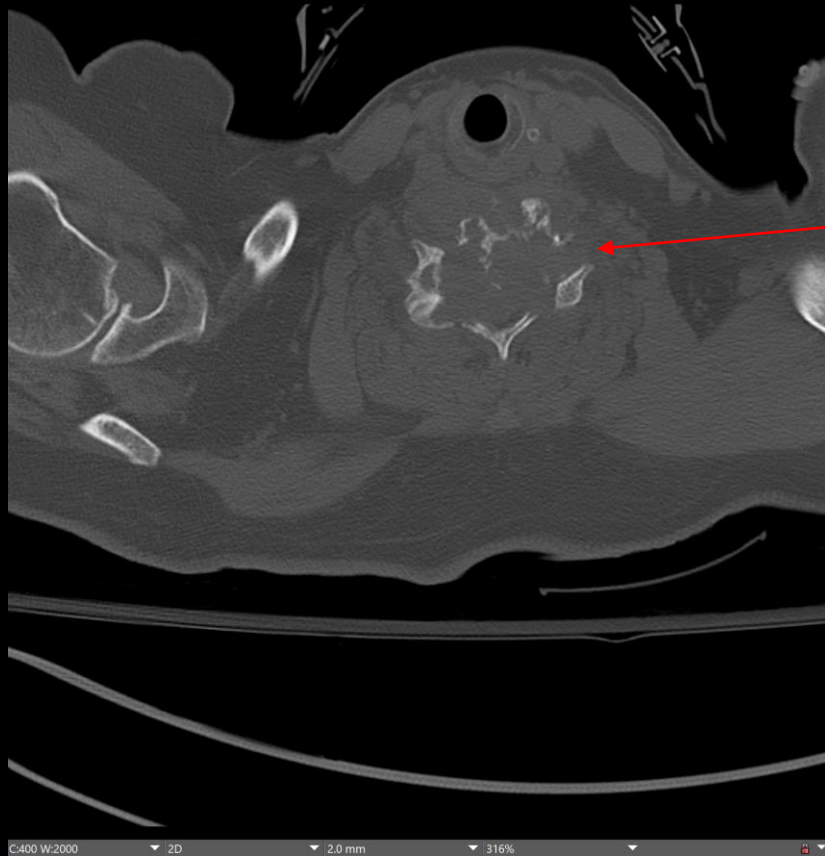
Age greater than or equal to 16 years. Suspected acute cervical spine blunt trauma. Imaging indicated by NEXUS or CCR clinical criteria. Initial imaging.

Procedure	Appropriateness Category	Relative Radiation Level
CT cervical spine without IV contrast	Usually Appropriate	☼☼☼
Radiography cervical spine	May Be Appropriate	☼☼
Arteriography cervicocerebral	Usually Not Appropriate	☼☼☼
CT cervical spine with IV contrast	Usually Not Appropriate	☼☼☼
CT cervical spine without and with IV contrast	Usually Not Appropriate	☼☼☼
CT myelography cervical spine	Usually Not Appropriate	☼☼☼☼
CTA head and neck with IV contrast	Usually Not Appropriate	☼☼☼
MRA neck without and with IV contrast	Usually Not Appropriate	○
MRA neck without IV contrast	Usually Not Appropriate	○
MRI cervical spine without and with IV contrast	Usually Not Appropriate	
MRI cervical spine without IV contrast	Usually Not Appropriate	

CT cervical spine without contrast



CT cervical spine without contrast



C5 and C6 pathologic fractures with a lytic soft tissue mass eroding the C5 and C6 vertebral bodies and posterior elements

Select the applicable ACR Appropriateness Criteria

This imaging modality was ordered by the physician

Variant 1: Indeterminate renal mass. No contraindication to either iodinated CT contrast or gadolinium-based MR intravenous contrast. Initial imaging.

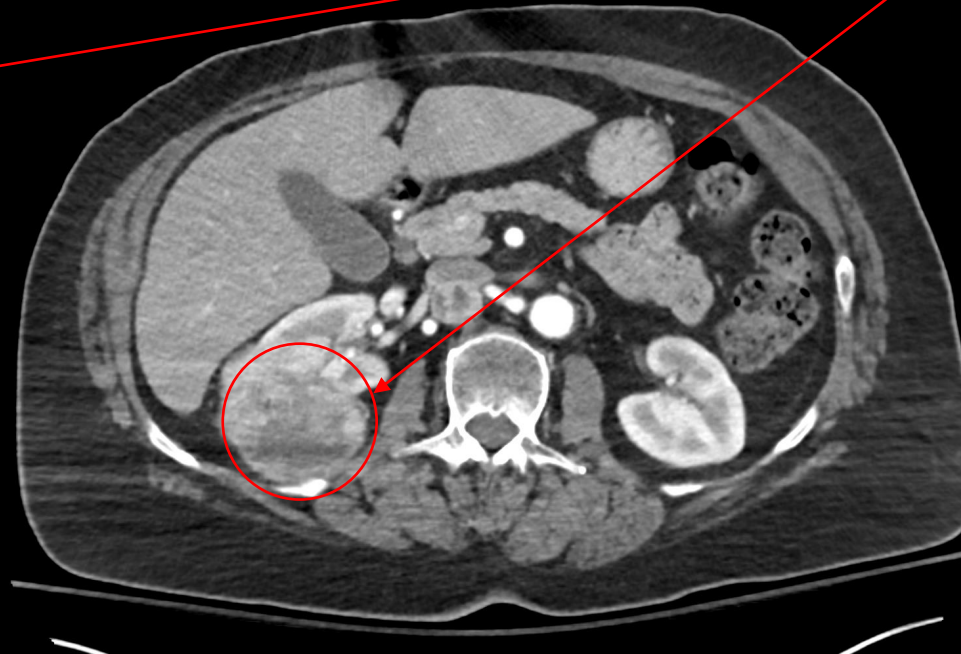
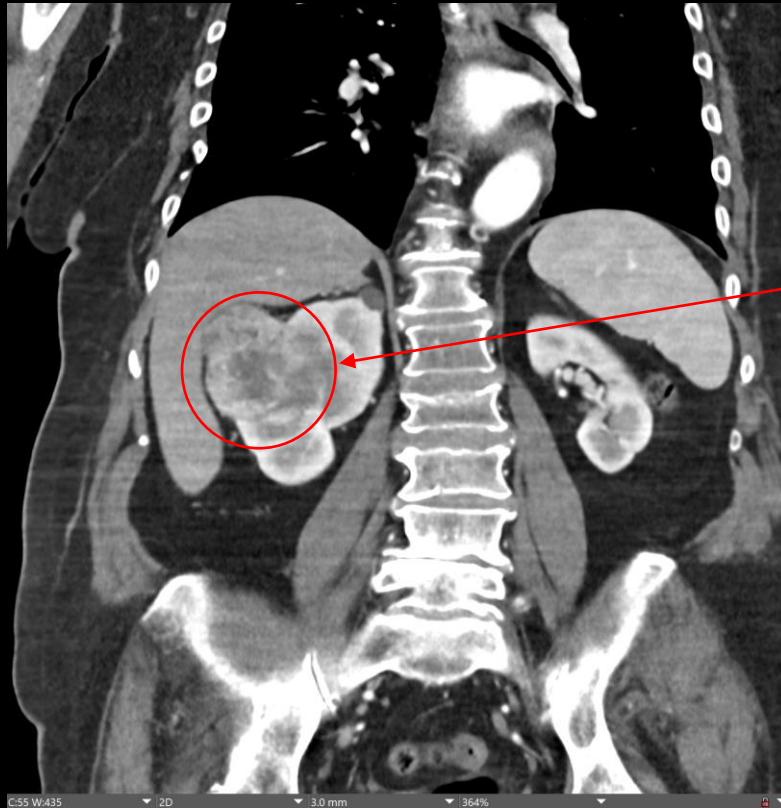
Procedure	Appropriateness Category	Relative Radiation Level
US abdomen with IV contrast	Usually Appropriate	○
MRI abdomen without and with IV contrast	Usually Appropriate	○
CT abdomen without and with IV contrast	Usually Appropriate	⊕⊕⊕⊕
US kidneys retroperitoneal	May Be Appropriate	○
MRI abdomen without IV contrast	May Be Appropriate	○
CT abdomen with IV contrast	May Be Appropriate	⊕⊕⊕
CT abdomen without IV contrast	May Be Appropriate	⊕⊕⊕
CTU without and with IV contrast	May Be Appropriate	⊕⊕⊕⊕
Arteriography kidney	Usually Not Appropriate	⊕⊕⊕
Radiography intravenous urography	Usually Not Appropriate	⊕⊕⊕
Image-guided biopsy adrenal gland	Usually Not Appropriate	Varies
MRU without and with IV contrast	Usually Not Appropriate	○

*The superior portion of an indeterminate renal mass was noted on spinal CT which prompted further evaluation given an unexplained pathologic fracture

CT abdomen with IV contrast

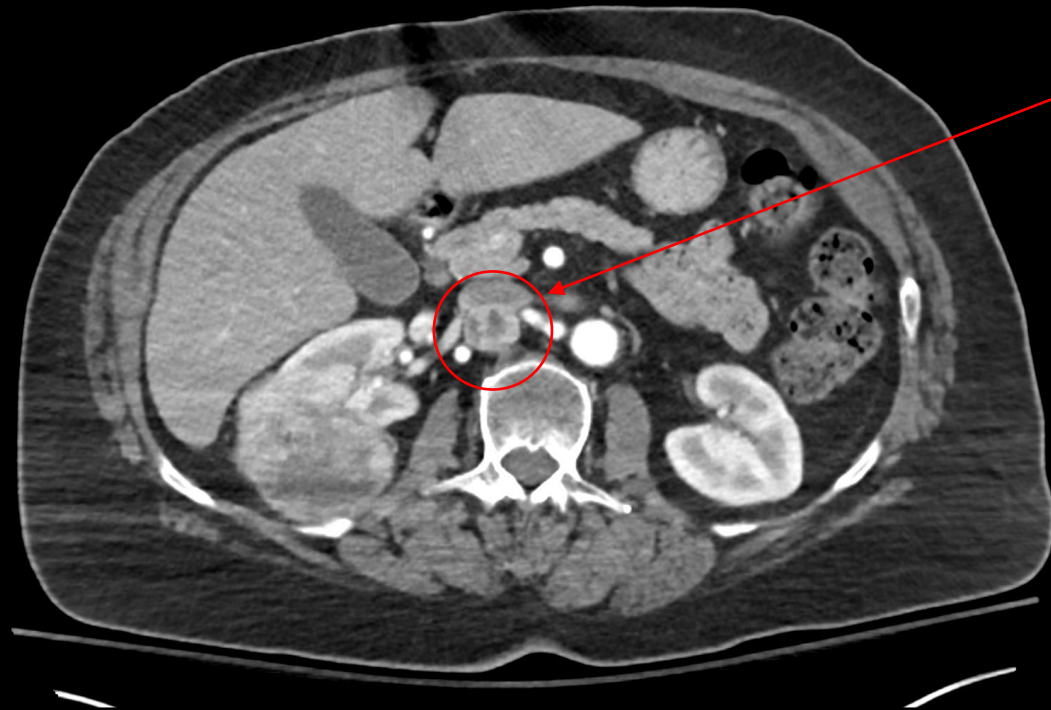


CT abdomen with IV contrast



Exophytic, likely solid, lesion in the interpolar region of the right kidney with indeterminate enhancement and surrounding rim of hyperenhancement measuring 8.3 x 6.7 x 7.0 cm. There is no involvement of the renal vein

CT abdomen with IV contrast



Adjacent enlarged retrocaval lymph node with necrotic center measuring 2.2 x 2.1 cm that appears to be abutting the IVC without direct invasion

Final Diagnosis:

Stage 4 renal cell carcinoma with spinal metastases

Case Discussion

- **Epidemiology:** Renal cell carcinomas are thought to be the 9th most common adult malignancy, representing 2% of global cancer diagnoses,² and are responsible for 80-85% of all primary renal neoplasms.¹ Age at presentation is typically between 50-70 years, and about twice as common in males as in women.^{3, 4}
- **Risk factors:** Smoking, obesity, HTN, family history, advanced kidney disease, and certain workplace chemical exposures.^{1, 3} The following hereditary diseases are also associated with an increased risk of RCC: tuberous sclerosis, Von Hippel-Lindau syndrome, and hereditary papillary renal carcinoma.¹

Case Discussion continued

- **Staging:** TNM staging of renal masses is determined by the size of the mass, its invasion beyond Gerota's fascia and into adjacent tissues, the presence of lymph node involvement, and the presence of metastases to local or distant organs and tissue. This patient's renal mass was greater than 7cm but less than 10cm, did not extend into the IVC or adrenal gland, had spread to regional lymph nodes, and distantly metastasized to the spine which designates it as T2aN1M1.¹
- **Pathophysiology:** The most common sites of renal cell carcinoma metastases are the lung, followed by bone involvement in 20-35% of cases.⁵ Osteolytic lesions of bone occur secondary to tumor-induced activation of osteoclasts by upregulation of RANK ligand.⁶ Pathologic fractures can be preceded by lesions producing prodromal pain such as in this patient who was experiencing bilateral shoulder pain one month prior to her fall.
- **Prognosis and management:** When metastases from renal cell carcinoma occur in the axial skeleton such as in this case, prognosis is poor with an average life expectancy of 12-24 months.⁷ This patient underwent decompressive laminectomy and hemilaminectomy of C5 and C6 and reconstruction with posterior instrument fusion.

References:

1. Garfield K, LaGrange CA. Renal Cell Cancer. [Updated 2023 Jul 31]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2024 Jan-. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK470336/>
2. Padala, S. A., Barsouk, A., Thandra, K. C., Saginala, K., Mohammed, A., Vakiti, A., Rawla, P., & Barsouk, A. (2020). Epidemiology of Renal Cell Carcinoma. *World journal of oncology*, 11(3), 79–87. <https://doi.org/10.14740/wjon1279>
3. Risk factors for kidney cancer: How do you get kidney cancer?. How Do You Get Kidney Cancer? | American Cancer Society. (n.d.). <https://www.cancer.org/cancer/types/kidney-cancer/causes-risks-prevention/risk-factors.html>
4. Weerakkody, Y. (2024, July 17). Renal cell carcinoma: Radiology reference article. Radiopaedia. <https://radiopaedia.org/articles/renal-cell-carcinoma-1?lang=us>
5. Umer, M., Mohib, Y., Atif, M., & Nazim, M. (2018). Skeletal metastasis in renal cell carcinoma: A Review. *Annals of Medicine and Surgery*, 27, 9–16. <https://doi.org/10.1016/j.amsu.2018.01.002>
6. Rizzo SE. Pathologic fractures. StatPearls [Internet]. May 22, 2023. Accessed August 11, 2024. <https://www.ncbi.nlm.nih.gov/books/NBK559077/#:~:text=Pathologic%20fractures%20occur%20through%20areas,bio%20mechanics%20secondary%20to%20pathologic%20bone>.
7. Langdon J, Way A, Heaton S, Bernard J, Molloy S. The management of spinal metastases from renal cell carcinoma. *The Annals of The Royal College of Surgeons of England*. 2009;91(8):649-652. doi:10.1308/003588409x432