

AMSER Case of the Month

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Don't miss what you can't see

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Patient Presentation

HPI

- 81-year-old female with a history of ESRD on PD, cystic kidney disease, HTN, NAFLD, PAD, SMA stenosis, and DM type 2 presents to the ED endorsing new onset nontraumatic upper back pain that limits her movement. She also has reproducible right chest pain that she has had for 3 months.

Physical Exam

- Vitals on admission: Temp: 37.1 °C, BP: 147/75, HR: 67, Resp: 16, SpO2: 100
- Cardiovascular: Regular rate and rhythm, normal S1 and S2, no murmurs/rubs/gallops
- Musculoskeletal: Tenderness to palpation of upper spine, normal strength and tone
- Neurological: No gross motor or sensory deficits

Pertinent Labs and Imaging

- Labs:

- CBC: Hgb 10.8, Hct 33.3, RBC 3.6
- CMP: Glu 260, BUN 54, SCr 3.71, eGFR 12, ALT 9, AGap 14
- PTT: 37.4
- TROP T: 30

- EKG:

- Normal Sinus, cannot rule out anterior infarct

What Imaging Should We Order?

ACR Appropriateness Criteria

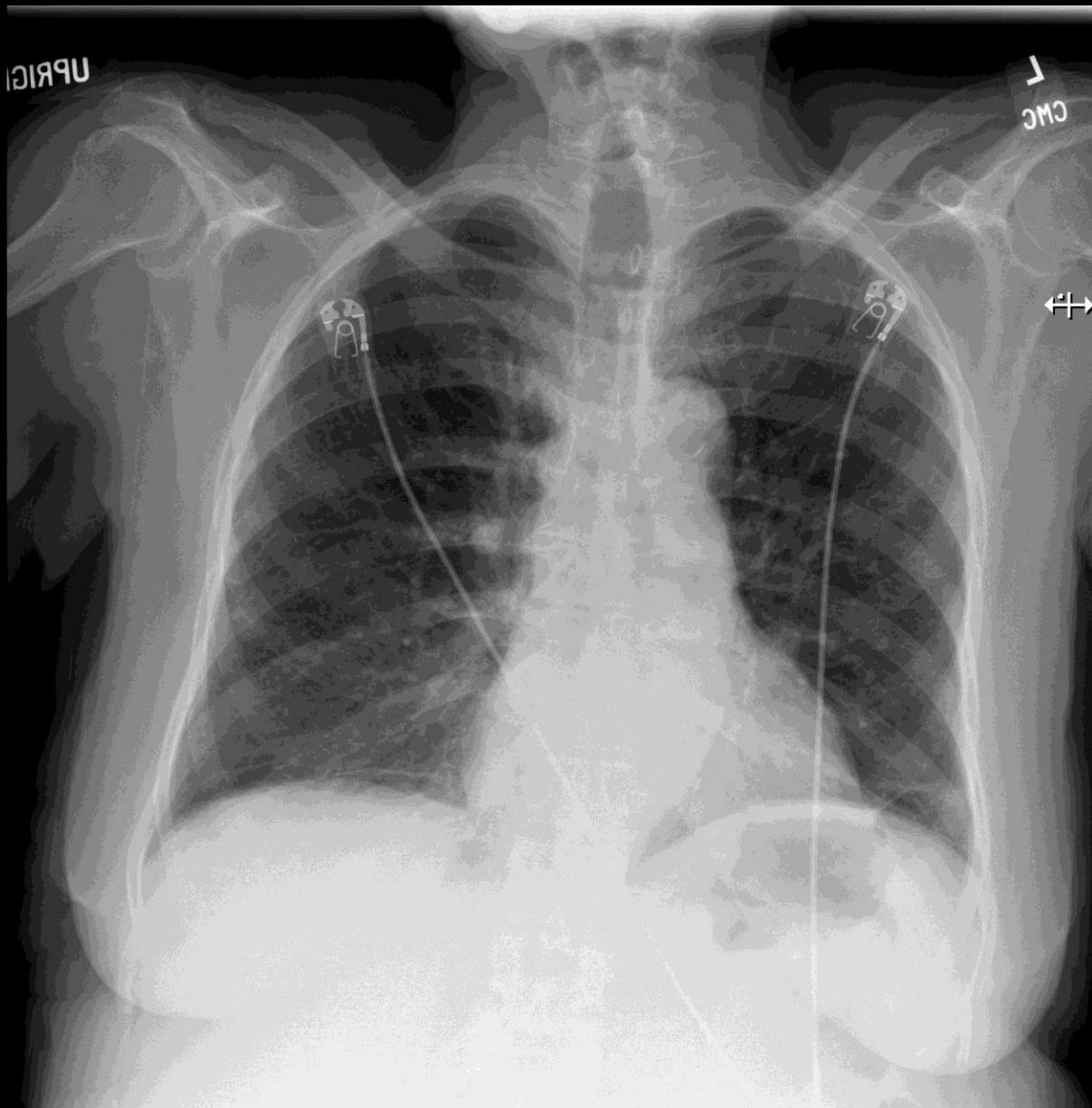
Nontraumatic Chest Wall Pain

Variant: 1 Nontraumatic chest wall pain. No history of malignancy. Initial imaging.

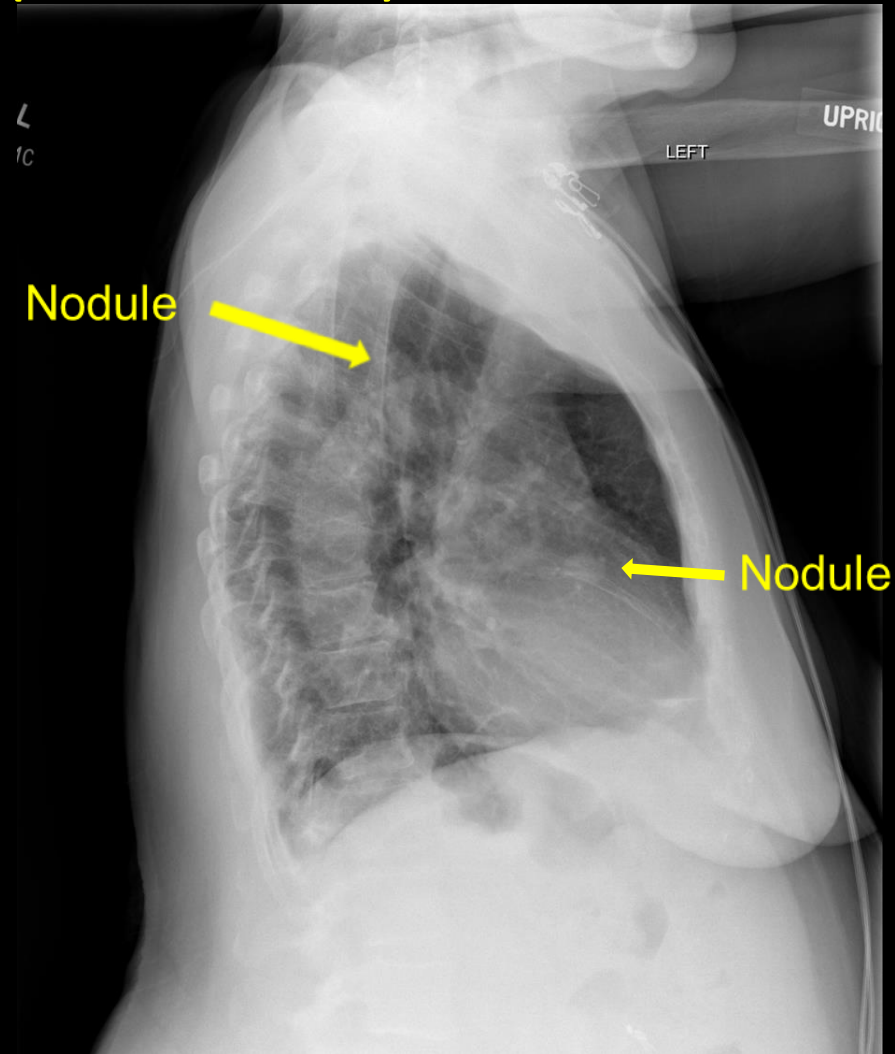
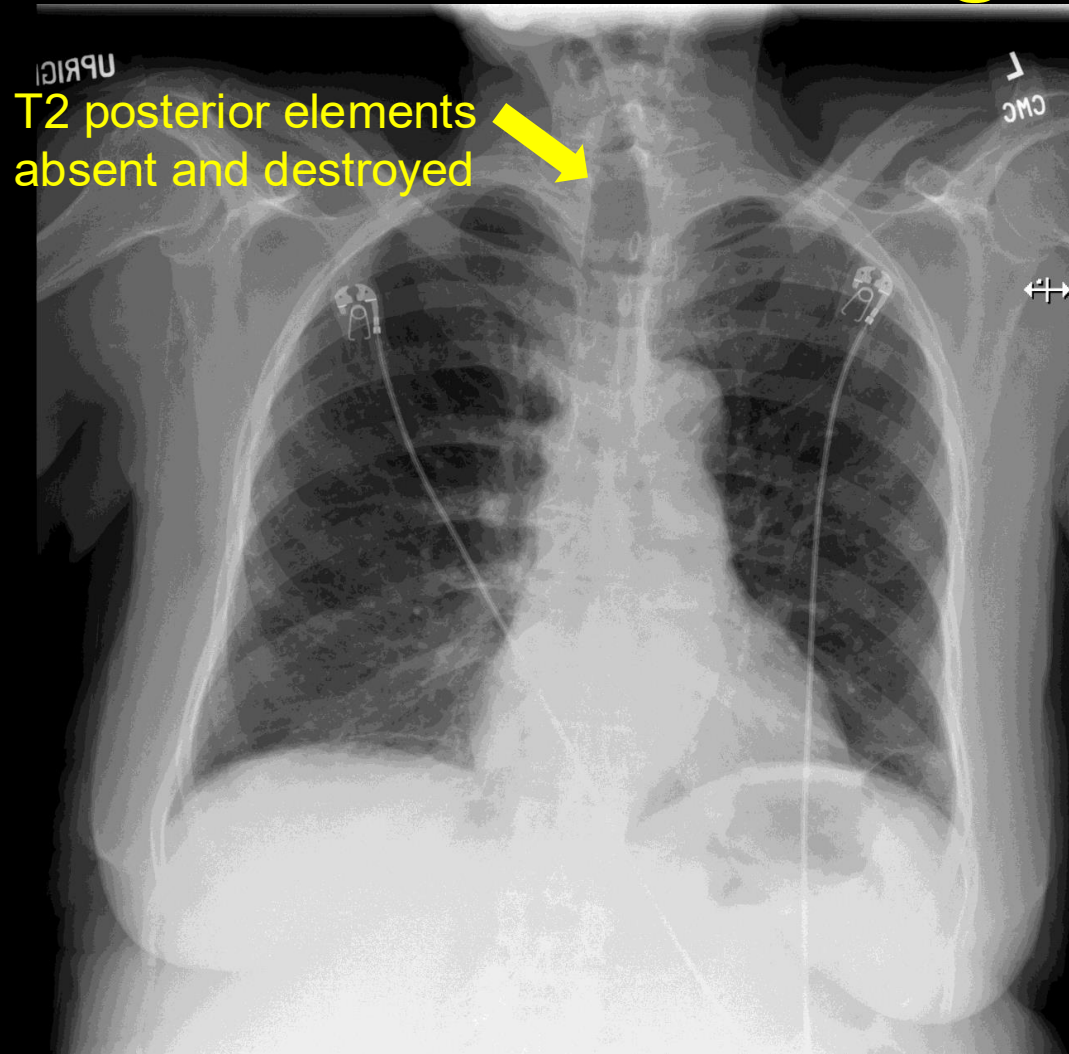
Procedure	Appropriateness Category	Relative Radiation Level
Radiography chest	Usually Appropriate	⊕
US chest	May Be Appropriate	○
Radiography rib views	May Be Appropriate	⊕⊕⊕
MRI chest without and with IV contrast	Usually Not Appropriate	○
MRI chest without IV contrast	Usually Not Appropriate	○
Bone scan whole body	Usually Not Appropriate	⊕⊕⊕
CT chest with IV contrast	Usually Not Appropriate	⊕⊕⊕
CT chest without and with IV contrast	Usually Not Appropriate	⊕⊕⊕
CT chest without IV contrast	Usually Not Appropriate	⊕⊕⊕
FDG-PET/CT skull base to mid-thigh	Usually Not Appropriate	⊕⊕⊕⊕
WBC scan chest	Usually Not Appropriate	⊕⊕⊕⊕

This imaging modality was ordered by the ER physician

Findings: (unlabeled)

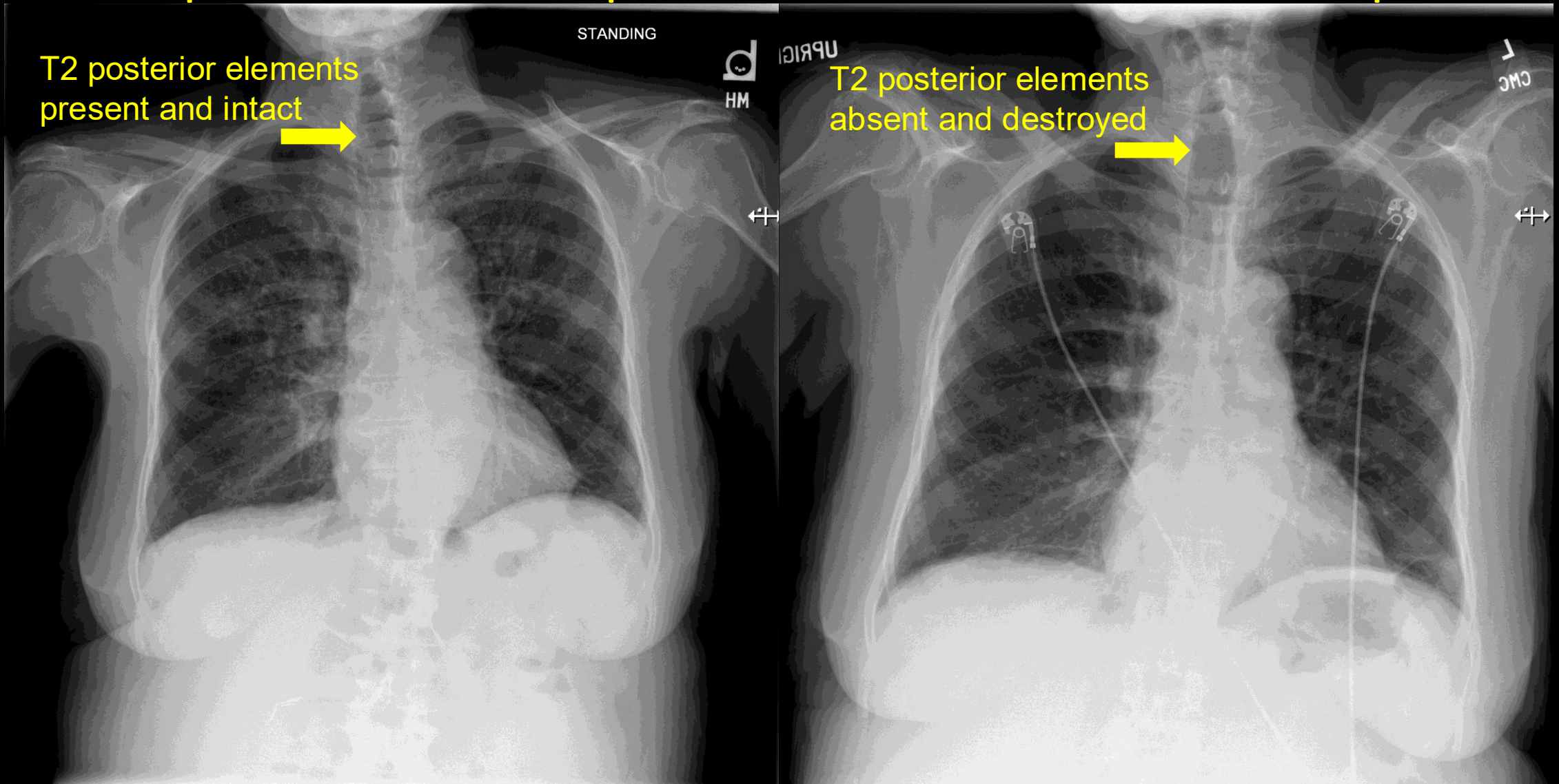


Findings: (labeled)



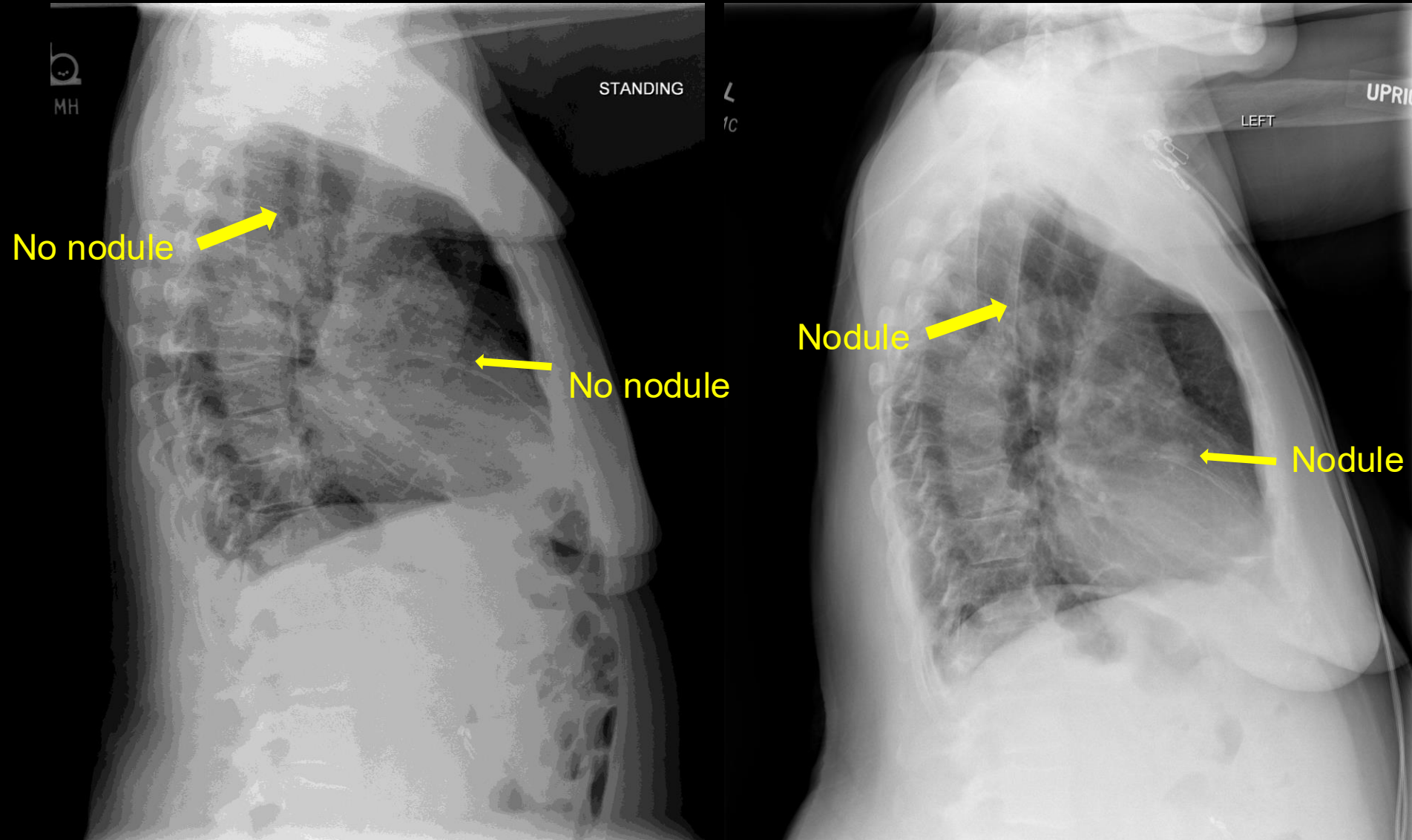
Lucency in the upper thoracic region on the frontal view with absence of the T2 spinous process. Multiple small nodular opacities. The largest of these nodules measures approximately 1.5 cm and is best seen on the lateral view anteriorly projecting over the heart.

Comparison with previous CXR 7 months prior



Prior

Comparison with previous CXR 7 months prior



Prior

What Imaging Should We Order Now?

ACR Appropriateness Criteria

Incidentally Detected Indeterminate Pulmonary Nodule

Variant: 1 Adult greater than or equal to 35 years of age. Incidentally detected indeterminate pulmonary nodule on chest radiograph. Next imaging study.

Procedure	Appropriateness Category	Relative Radiation Level
CT chest without IV contrast	Usually Appropriate	☼☼☼
Radiography chest	May Be Appropriate	☼
Image-guided transthoracic needle biopsy	Usually Not Appropriate	Varies
MRI chest without and with IV contrast	Usually Not Appropriate	○
MRI chest without IV contrast	Usually Not Appropriate	○
CT chest with IV contrast	Usually Not Appropriate	☼☼☼
CT chest without and with IV contrast	Usually Not Appropriate	☼☼☼
FDG-PET/MRI whole body	Usually Not Appropriate	☼☼☼
FDG-PET/CT whole body	Usually Not Appropriate	☼☼☼☼

This imaging modality was ordered by the ER physician



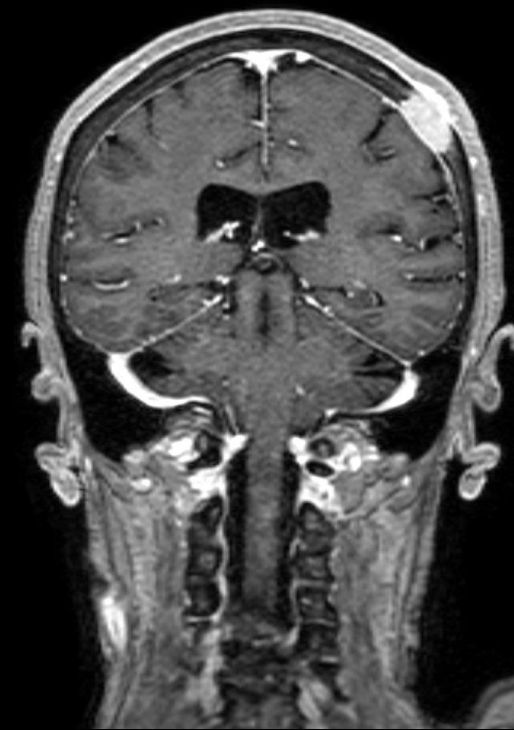
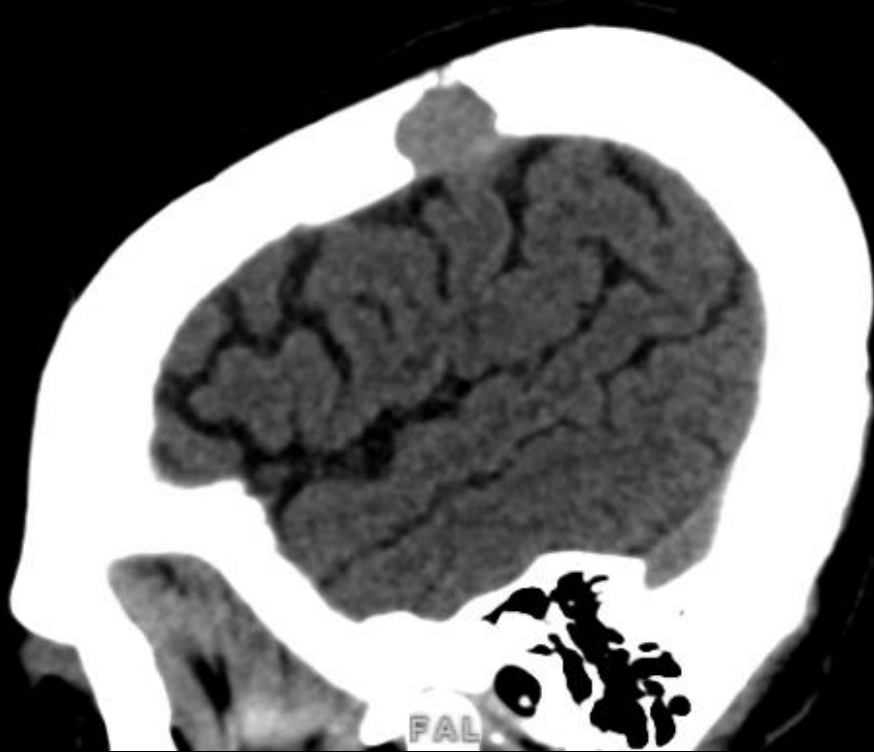
ACR Appropriateness Criteria

Variant: 6 Adult. Thoracic back pain without or with myelopathy or radiculopathy.
Radiograph shows bone destruction or fracture or spinal deformity. Next imaging study.

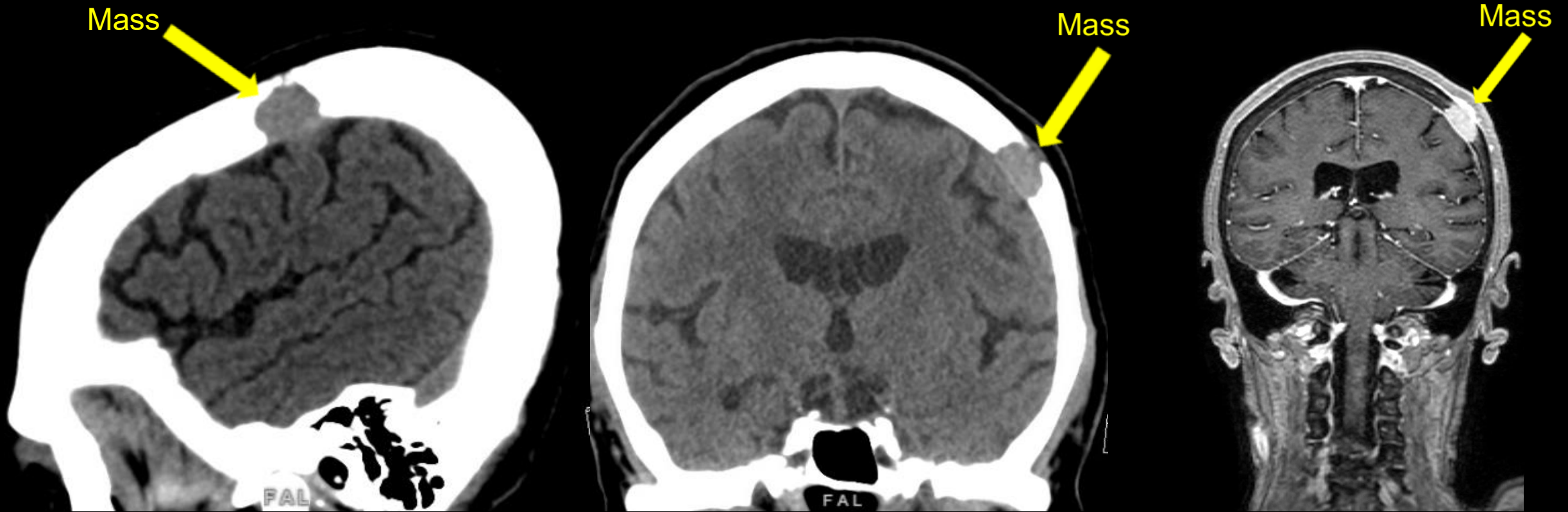
Procedure	Appropriateness Category	Relative Radiation Level
MRI thoracic spine without and with IV contrast	Usually Appropriate	0
MRI thoracic spine without IV contrast	Usually Appropriate	0
CT thoracic spine without IV contrast	Usually Appropriate	☢☢☢
CT myelography thoracic spine	May Be Appropriate	☢☢☢☢
MRI thoracic spine with IV contrast	Usually Not Appropriate	0
Bone scan whole body	Usually Not Appropriate	☢☢☢
Bone scan with SPECT or SPECT/CT thoracic spine	Usually Not Appropriate	☢☢☢
CT thoracic spine with IV contrast	Usually Not Appropriate	☢☢☢
CT thoracic spine without and with IV contrast	Usually Not Appropriate	☢☢☢☢
FDG-PET/CT skull base to mid-thigh	Usually Not Appropriate	☢☢☢☢

This imaging modality was ordered by the ER physician

Osseous CT and MR Findings (unlabeled)



Osseous CT and MR Findings (labeled)

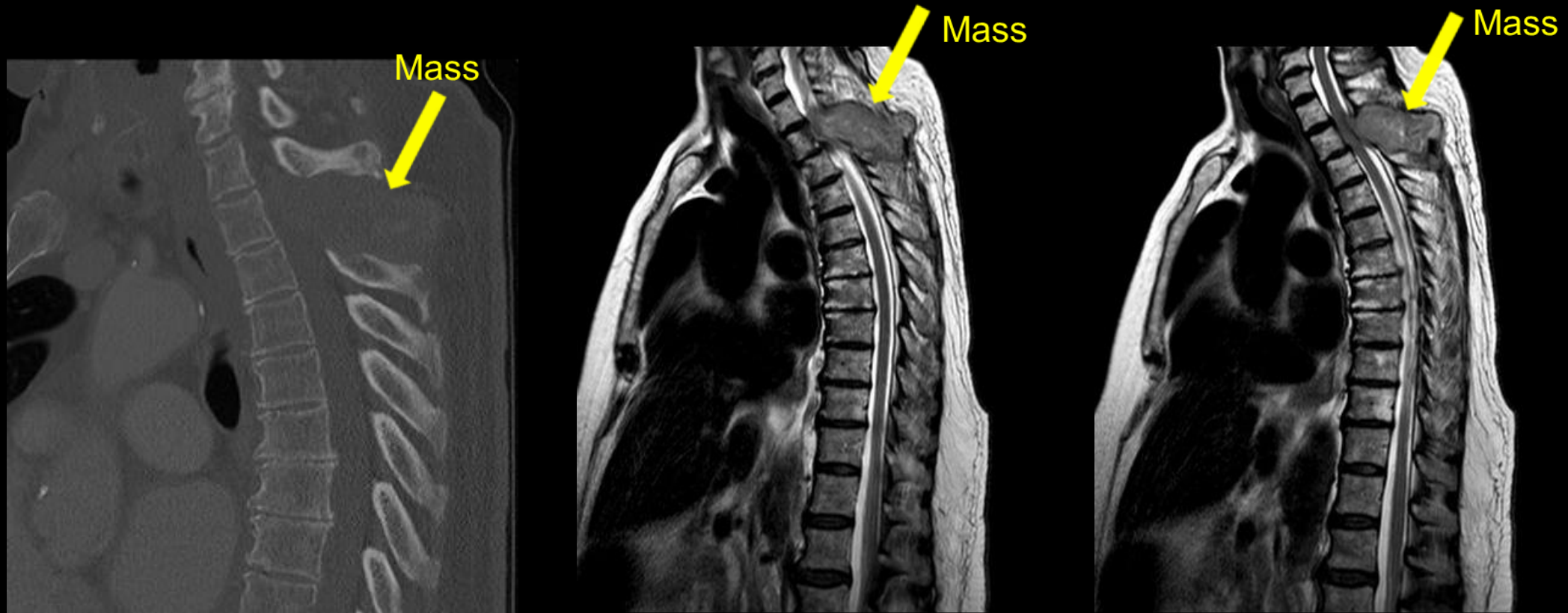


Head CT and MR: Soft tissue density centered within the left parietal calvarium approximately 1.5 cm with associated superficial and deep cortical destruction concerning for lytic metastasis.

Osseous CT and MR Findings (unlabeled)



Osseous CT and MR Findings (labeled)

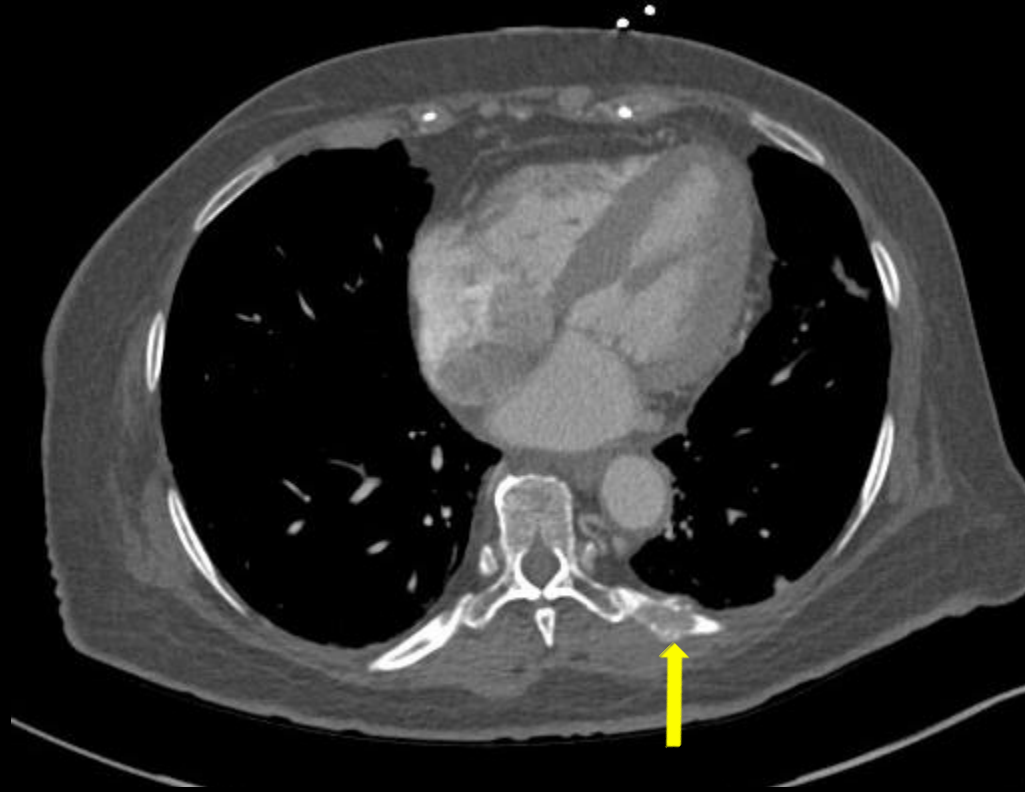


Spine CT and MR: Lytic destructive soft tissue mass concerning for metastasis at the level of T2 measuring approximately 4 x 5 x 3 cm. Osseous destruction of the posterior elements with destruction of the T2 spinous process and involvement of T1 and T3. Significant mass extension into the spinal canal and neural foramen.

Osseous CT Findings (unlabeled)

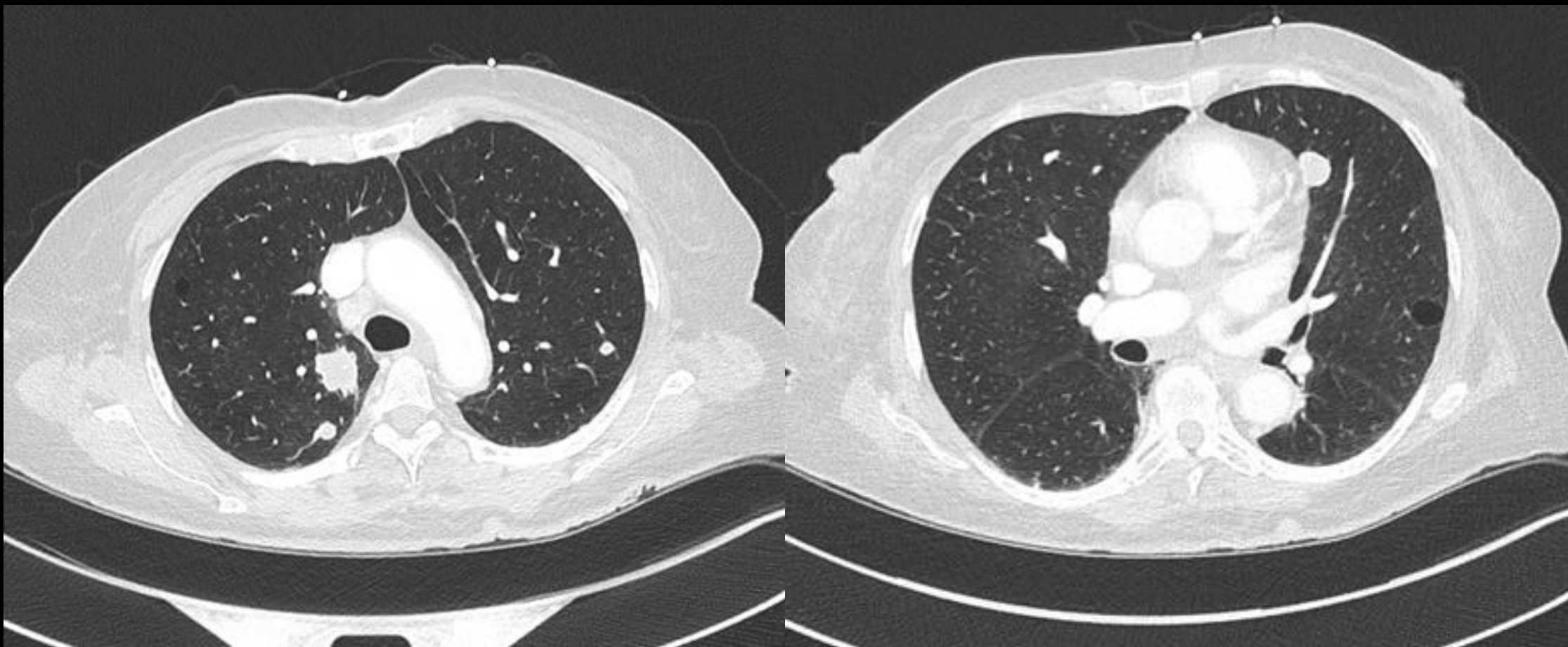


Osseous CT Findings (labeled)

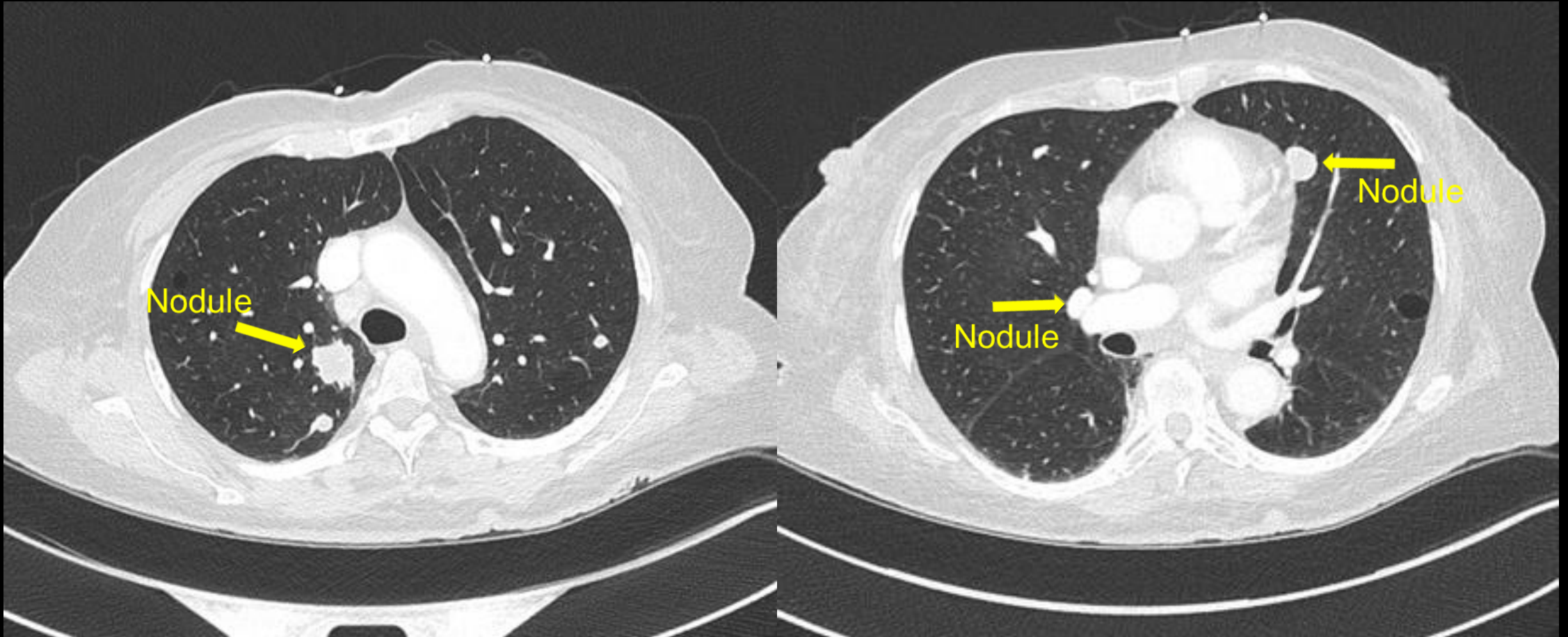


Lytic left posterior rib lesion consistent with a metastasis.

Lung CT Findings (unlabeled)



Lung CT Findings (labeled)



Scattered pulmonary parenchymal metastatic nodules.

Mediastinal CT Findings (unlabeled)



Mediastinal CT Findings (labeled)

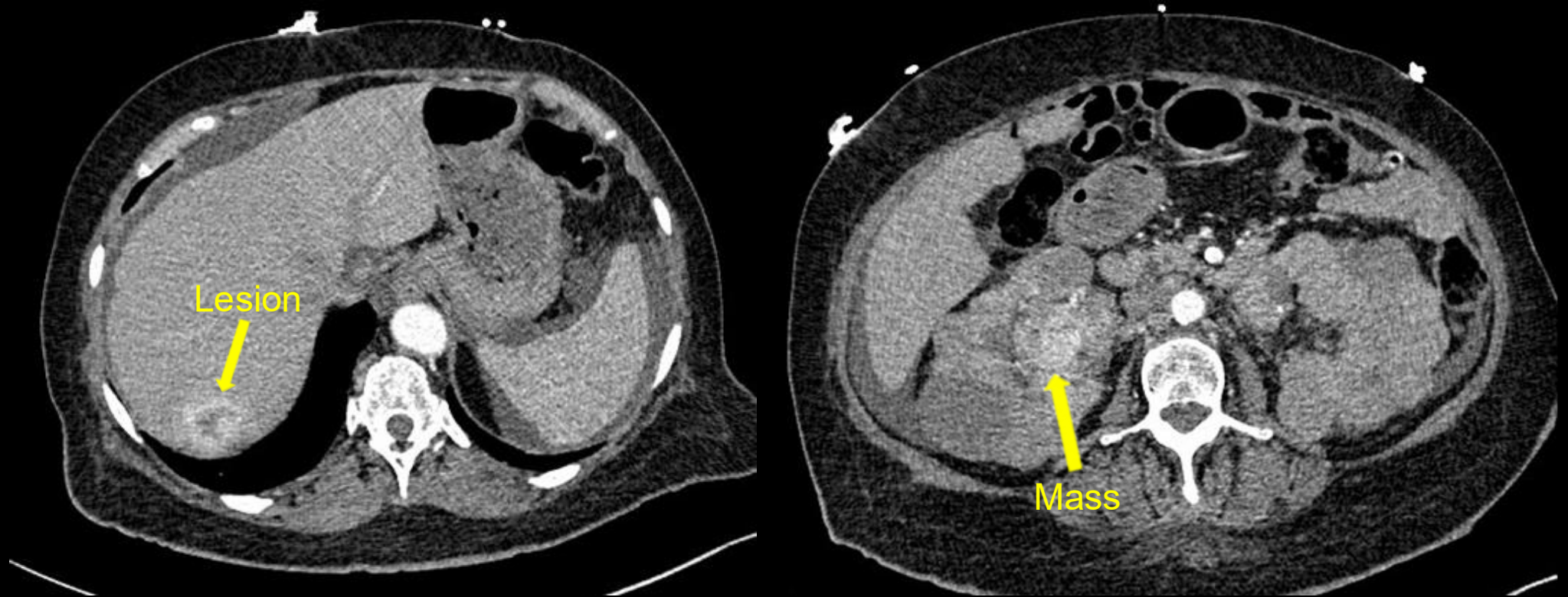


Enlarged and heterogenous mediastinal right paratracheal metastatic lymph node.

Abdominal CT Findings (unlabeled)



Abdominal CT Findings (labeled)



Rim-enhancing lesion within the right hepatic lobe, potentially metastatic focus. Underlying polycystic kidney disease, with heterogeneously enhancing right renal mass measuring up to 6.4 cm. This is favored to represent renal cell carcinoma given the interval enlargement of numerous cystic lesions in the bilateral kidneys since 2016.

Final Dx:

Metastatic Renal Cell Carcinoma

Case Discussion

- **Pathophysiology & Risk Factors**

- RCC arises from renal tubular epithelium; clear cell RCC (~75%) is commonly driven by VHL loss → HIF stabilization → VEGF/PDGF-mediated angiogenesis, producing a hypervascular tumor with avid heterogeneous enhancement on contrast CT.⁷
- ESRD/dialysis and acquired cystic kidney disease increase RCC risk; this patient also had HTN and T2DM, clinically relevant comorbid risk factors.^{7, 8}
- RCC is often clinically silent until advanced. The classic triad, hematuria, flank pain, and palpable mass, occurs in <10% of patients and usually represents late disease.⁷
- Approximately 20%–30% of patients present with metastatic disease; common sites include lung, bone, lymph nodes, liver, adrenal glands, and brain.⁷
- Case-specific pearl: comparison imaging helped reframe “cystic kidney disease” as an enlarging enhancing renal mass with disseminated pulmonary, osseous, hepatic, and nodal metastases.
- In ESRD, urinary and flank symptoms are masked by underlying renal disease, contributing to late or incidental diagnosis; here, RCC was favored based on interval enlargement of bilateral renal cysts since 2016, underscoring the value of comparison imaging.

Case Discussion

- **Imaging**

- CXR was diagnostic when read systematically: new T2 posterior element destruction plus bilateral pulmonary nodules. Seven-month comparison imaging confirmed interval osseous and pulmonary disease.
- After radiographic bone destruction, ACR Thoracic Back Pain Variant 6 supports MRI thoracic spine without and with IV contrast or MRI without contrast as Usually Appropriate; CT thoracic spine without contrast is also Usually Appropriate.²
- For RCC staging when contrast is permissible, ACR supports CT abdomen/pelvis with IV contrast and CT chest with IV contrast; noncontrast CT A/P and CT head are Usually Not Appropriate in that variant.¹
- Because this patient had severe renal dysfunction, noncontrast CT may reflect a safety tradeoff, but it limits evaluation of tumor enhancement and small metastases. ACR lists MRI abdomen/pelvis and noncontrast CT chest as alternatives when iodinated contrast is contraindicated.¹

Case Discussion

- **Treatment**

- Local control came first: C7–T5 posterior fusion addressed a T2 dorsal epidural metastasis with severe canal compromise and T1–T3 involvement before systemic therapy.⁹
- First-line metastatic clear cell RCC therapy is now combination-based: nivolumab/ipilimumab for selected intermediate/poor-risk disease or ICI + VEGF-TKI regimens such as pembrolizumab/axitinib, nivolumab/cabozantinib, or pembrolizumab/lenvatinib.^{3–6}
- For bone metastases, denosumab or zoledronic acid can reduce skeletal-related events; renal function, calcium/vitamin D status, and dental evaluation should guide use.⁹

- **Key Takeaways**

- Systematic CXR review matters: posterior element destruction and small pulmonary nodules may be the first clue to disseminated malignancy.
- Comparison imaging changed the case: T2 elements and lung nodules were new, supporting metastatic rather than chronic findings.

References:

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