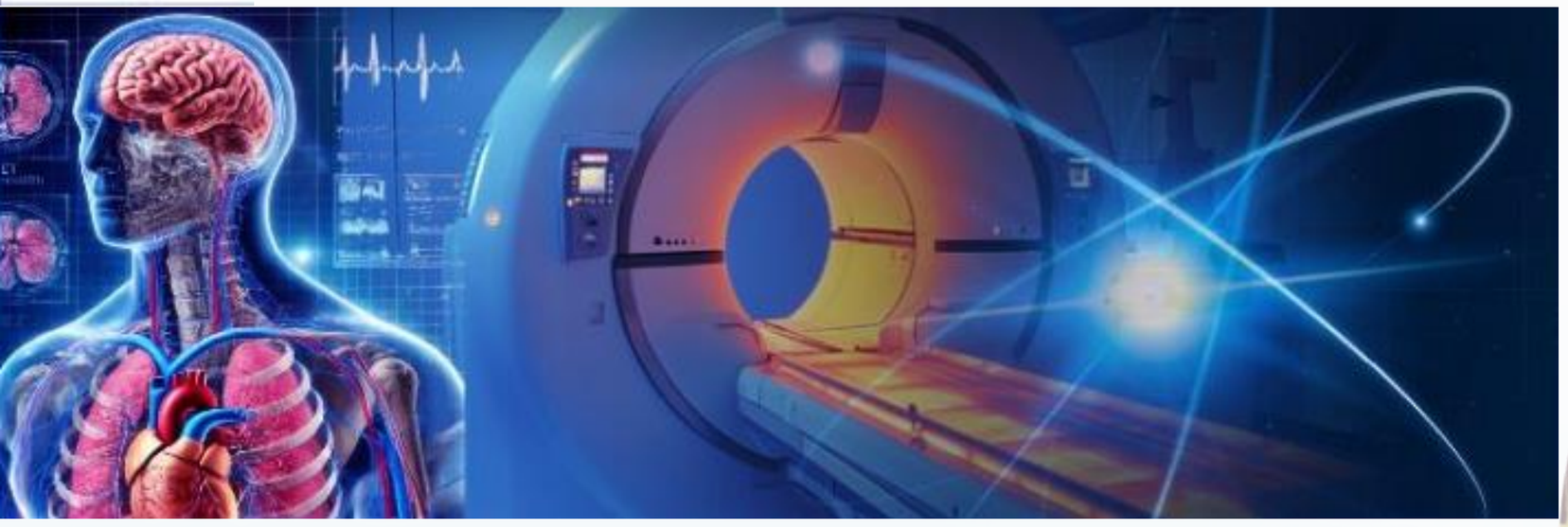

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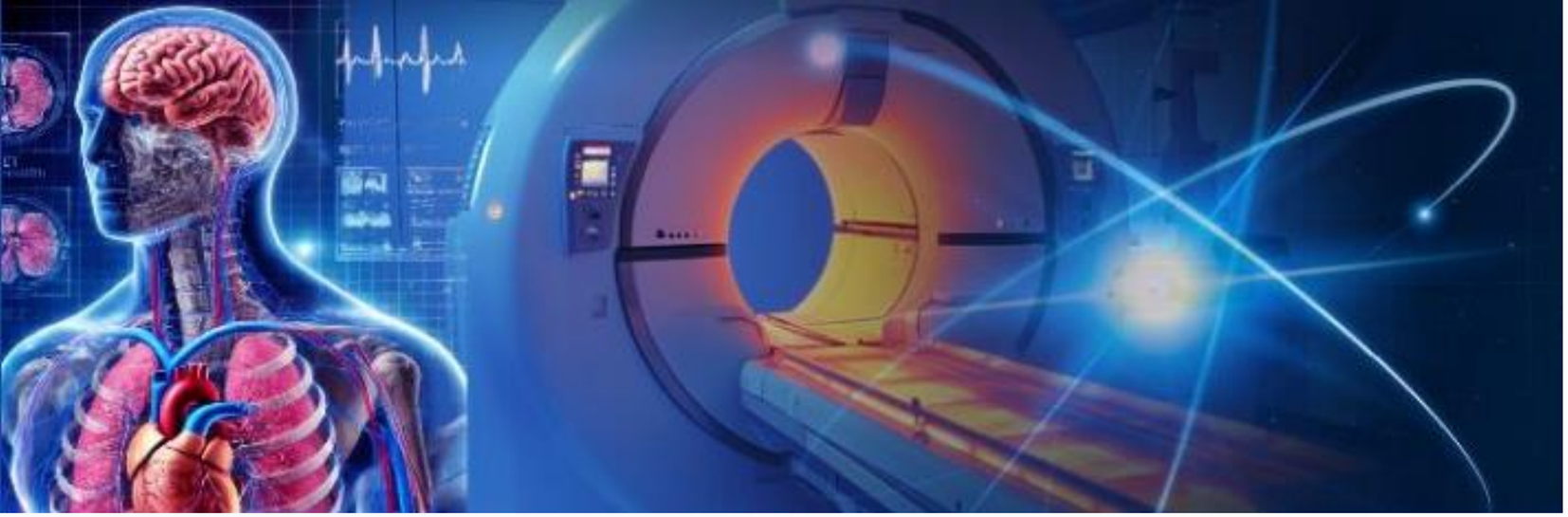

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Understanding Prostate-specific Membrane Antigen Antigen Reporting and Data System: A Practical Guide Guide for Prostate Cancer Imaging

- The PSMA-RADS system provides a standardized framework for interpreting PSMA-PET/CT scans in prostate cancer diagnosis and treatment. As imaging technology advances, there is a growing need for consistent reporting methods to accurately identify true prostate cancer lesions and distinguish them from false positives.
- We'll review how this classification system helps clinicians navigate diagnostic challenges and make informed treatment decisions.

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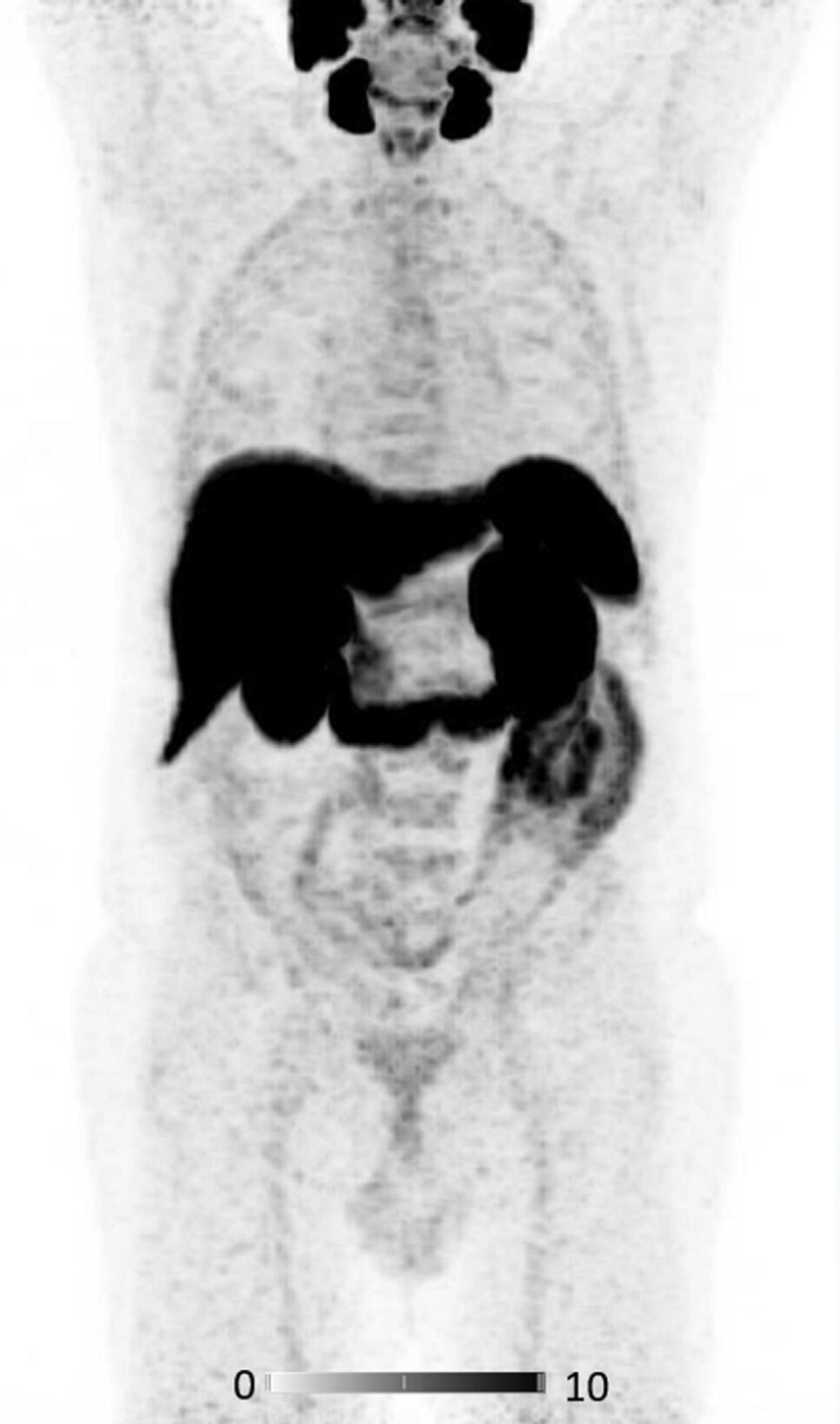

Understanding False Positives in PSMA-PET/CT

Skeletal System

Paget's disease, Schmorl's nodes, and fibrous dysplasia can show uptake mimicking prostate cancer metastases.

Central Nervous System

Ganglia and stroke areas may present with PSMA uptake not related to cancer.

Other Systems

Gastrointestinal tract (e.g., esophageal polyps) and respiratory conditions (sarcoidosis, tuberculosis) can create false-positive readings.

Increasing evidence shows that PSMA-PET/CT can produce false-positive findings across various organ systems. These non-cancerous conditions that demonstrate PSMA uptake create diagnostic challenges, highlighting the need for standardized reporting systems to improve interpretation accuracy.

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Existing PSMA Reporting Systems

1

PROMISE Criteria

Based on tumor-node-metastasis (TNM) classification system, providing anatomical context to PSMA findings.

2

E-PSMA Guidelines

Standardized reporting endorsed by the European Association of Nuclear Medicine for consistent interpretation.

3

PSMA-RADS 1.0

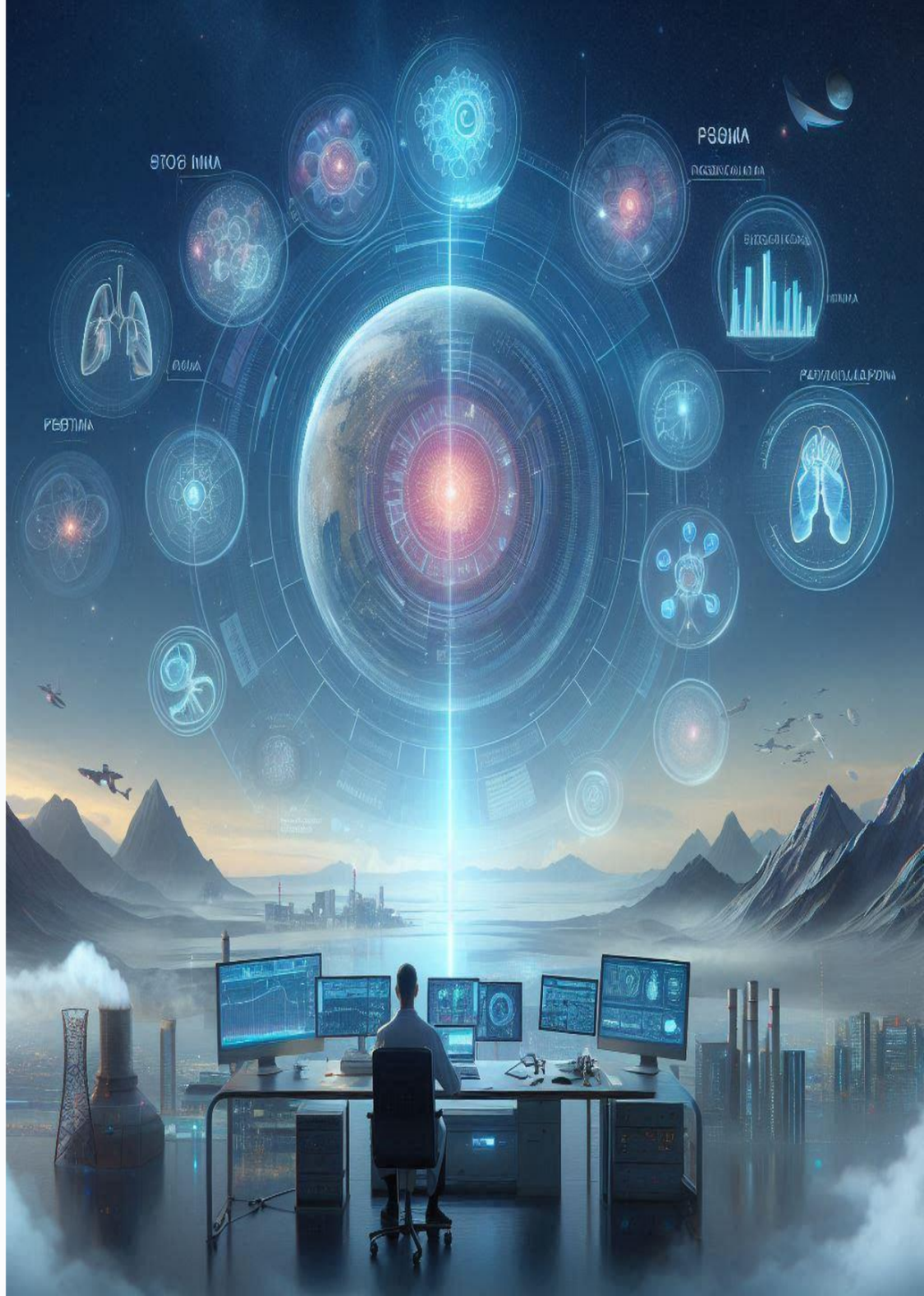
Introduced in 2017 as a framework to help navigate pitfalls in scan interpretation and standardize reporting.

4

PSMA-RADS 2.0

Updated version addressing limitations related to widespread metastatic disease and longitudinal assessments.

PSMA-RADS specifically designed to help clinicians navigate diagnostic pitfalls and provide a consistent framework for scan interpretation.



Clinical Validation of PSMA-RADS 1.0

Reader Concordance

Moderate to high concordance rates achieved for both 68Ga- and 18F-labeled radiotracers, even among less experienced readers.

Diagnostic Accuracy

Osseous PSMA-RADS 4/5 lesions demonstrated 94% specificity and 89% accuracy in identifying true prostate cancer.

Quantitative Integration

Successfully combined with quantitative metrics like maximum standardized uptake value and target-to-background ratio to improve lesion identification.

AI Applications

Framework has been applied to deep learning algorithms, providing reliable approaches for automatic lesion detection.

Since its introduction in 2017, PSMA-RADS 1.0 has been extensively studied in various clinical scenarios. Research has validated its utility not only in correctly classifying prostate cancer lesions but also in guiding PSMA-directed radioligand therapy decisions and supporting machine learning applications.

Improvements in PSMA-RADS 2.0

Simplified Categories

Consolidation of redundant subcategories for more streamlined reporting

Context-Based Classification

Allows upgrading of lesions based on overall disease status

Temporal Assessment

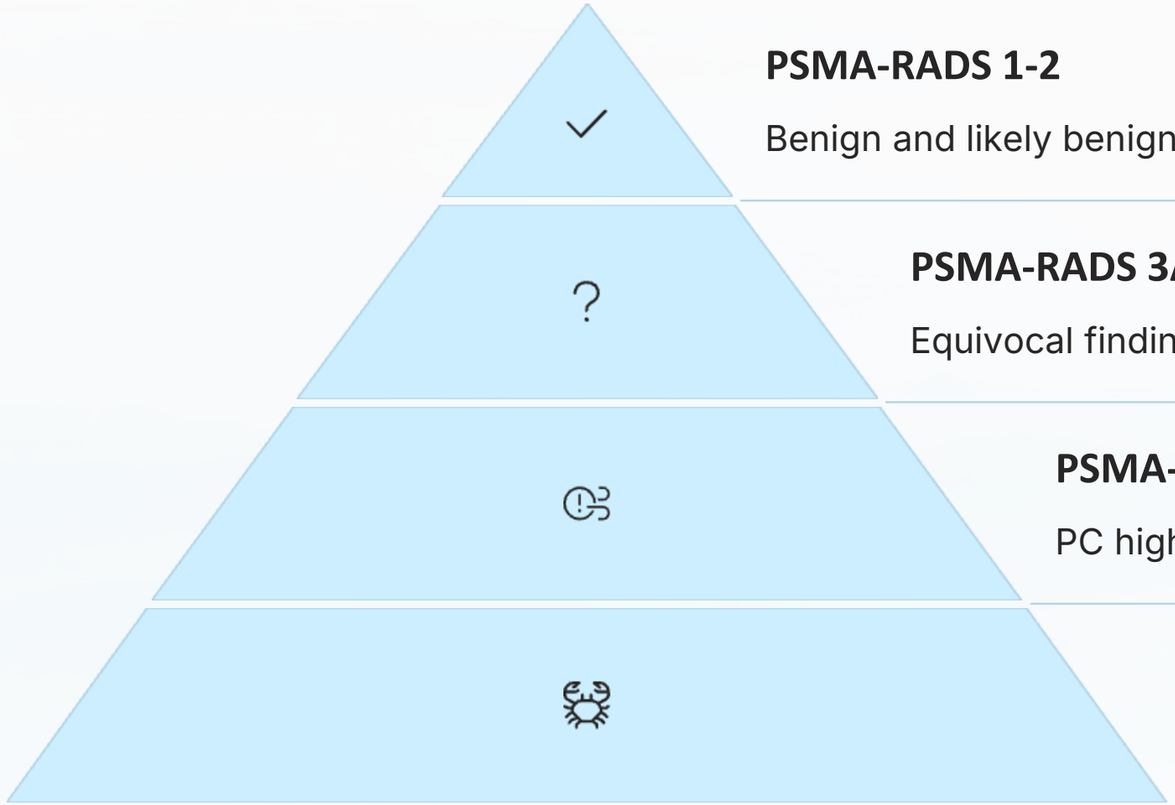
Recognition that stable untreated lesions are likely benign

Treatment Response

New framework for categorizing lesions after treatment

These enhancements make the system more practical for clinical use while maintaining the standardized approach that made the original version valuable for consistent reporting.

PSMA-RADS Version 2.0: Overview



PSMA-RADS 1-2

Benign and likely benign lesion characterized by biopsy or pathognomonic finding

PSMA-RADS 3A-D

Equivocal findings requiring follow-up

PSMA-RADS 4

PC highly likely with intense uptake but lacking definitive findings

PSMA-RADS 5/5T

PC almost certainly present or treated PC metastasis

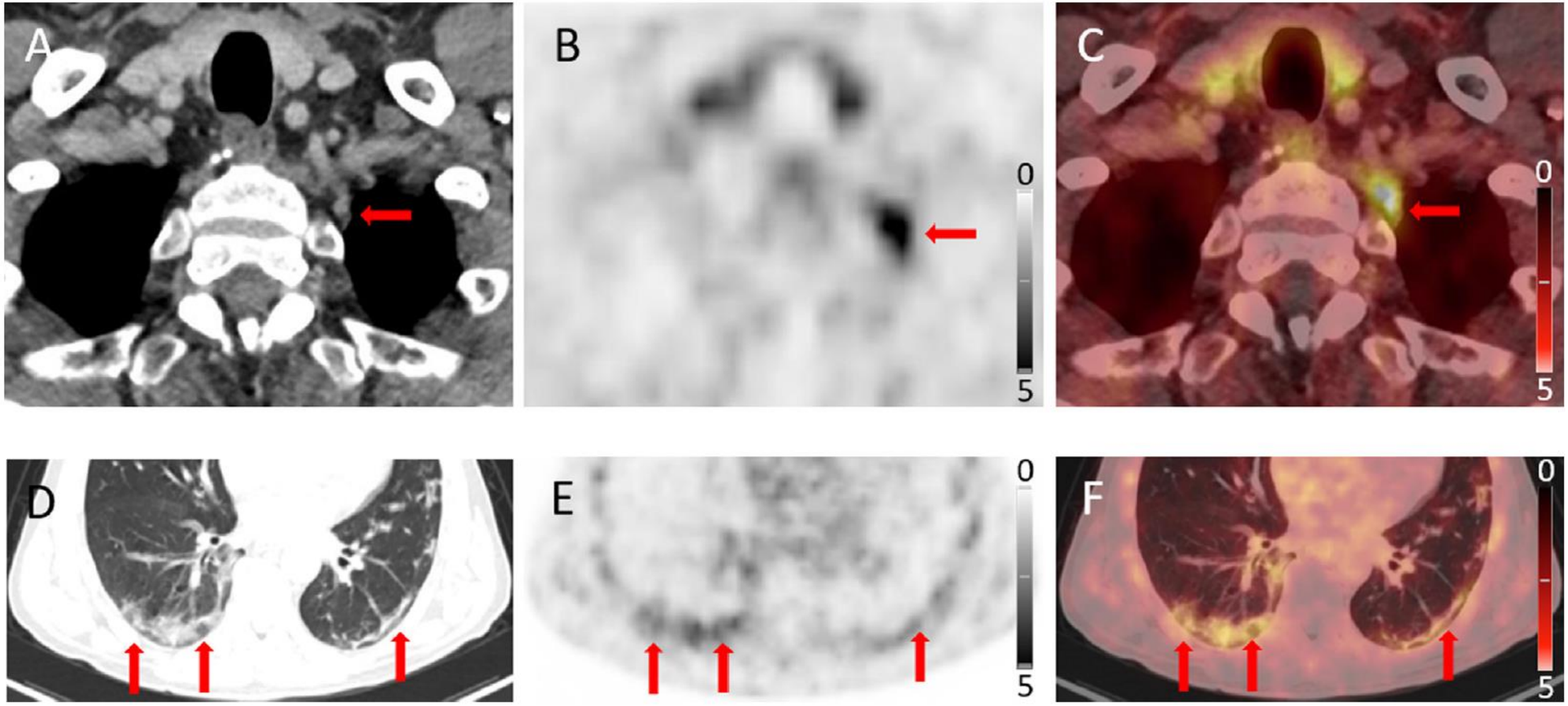
The updated PSMA-RADS version (2.0) includes that all definitively benign lesions, regardless of uptake, are categorized as PSMA-RADS 1, and that PSMA-RADS 3A/B and 3D may be reclassified to PSMA-RADS 4 in case of widespread metastatic disease (more than five malignant findings). PSMA-RADS 5 now incorporates effectively treated metastases after antiprostatic therapy (5T).

PSMA-RADS 1 (Definitly benign)

- Lesions have focal or diffuse uptake, but are known to be benign based on their pathognomonic appearance on anatomic imaging or are biopsy-proven benign lesions:

- ✓ Biopsied thyroid nodules
- ✓ Hepatic hemangiomas
- ✓ Adrenal adenomas
- ✓ Ganglia that may mimic lymph nodes

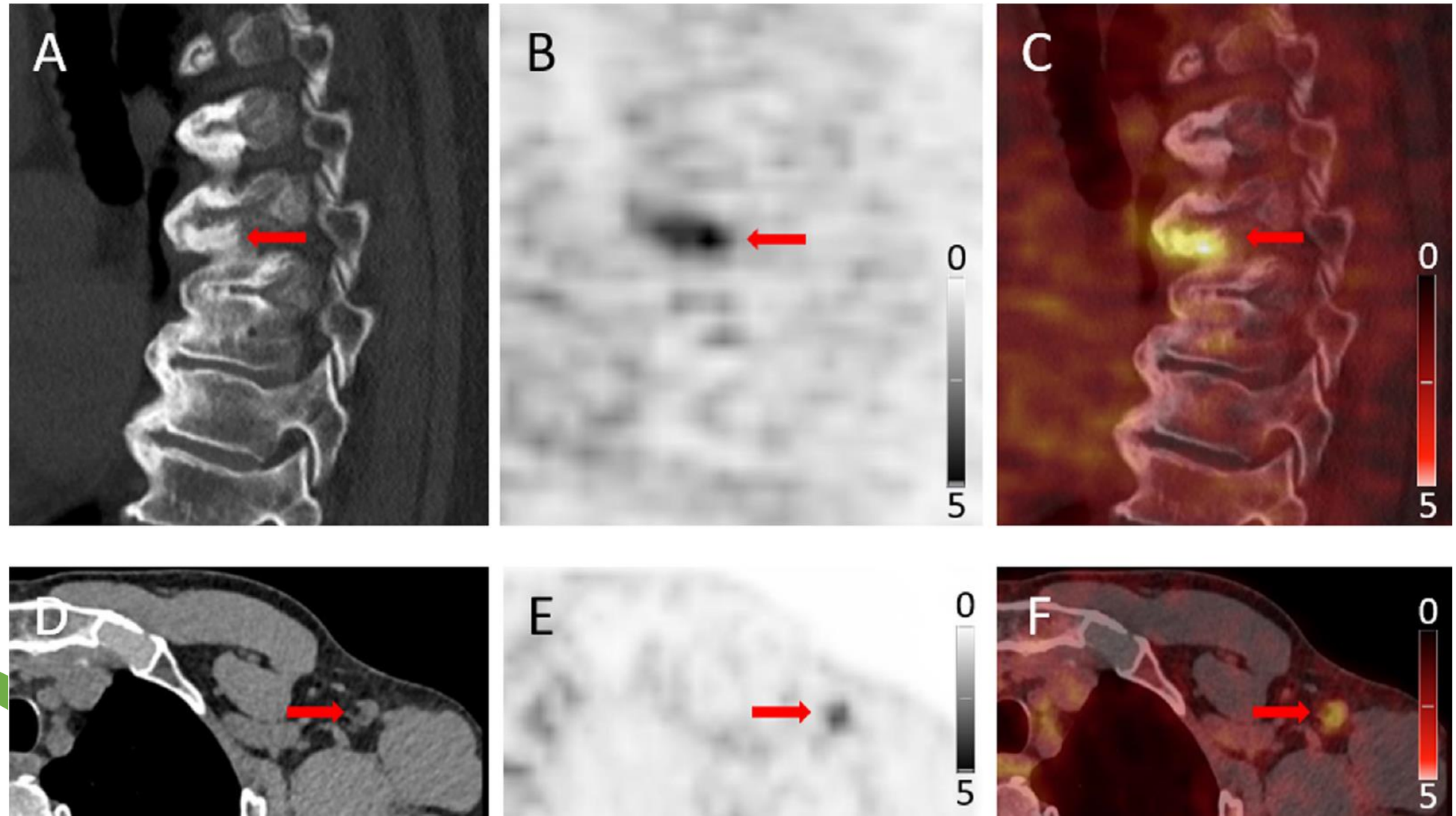
PSMA-RADS 1 examples



PSMA-RADS 2 (likely benign)

- **Equivocal** (focal, but low level such as blood pool) uptake in soft-tissue site or bone lesion atypical of PC involvement (eg,
  - ✓ axillary lymph node
  - ✓ hilar lymph node
  - ✓ uptake fused to bone lesion and strongly suspected of being degenerative or another benign etiology
- Upon follow-up, **stable lesions** without treatment are likely benign and could then be scored with PSMA-RADS 1 or 2

PSMA-RADS 2 examples



PSMA-RADS 3-A

(Equivocal, may be suggestive of PC)

Equivocal uptake in soft-tissue site typical of PC involvement

- Example:

small lymph nodes at sites typical for PC with focal but low uptake

- The lymph node sites that would be ‘‘typical’’ for PC will be context dependent

  - ✓ miN1 disease being typical in patients who are undergoing primary staging or at the time of first recurrence.

  - ✓ In more advanced patients, the common iliac, retroperitoneal, retrocrural, mediastinal, hilar, and supraclavicular nodes (ie, miM1a) are also typical

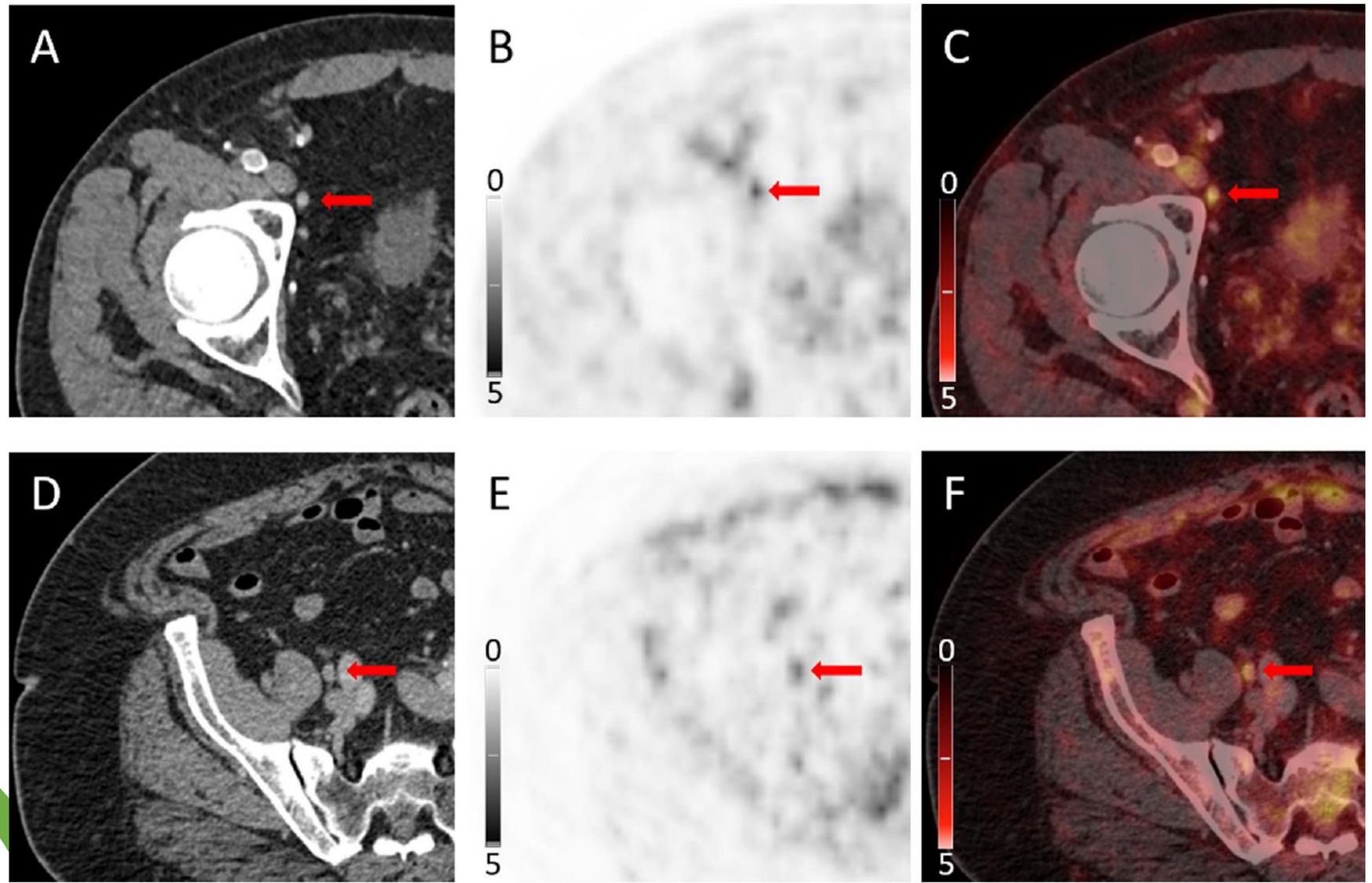
- In highly metastatic patients (>5 metastases), reclassify this lesion to PSMA-RADS 4

PSMA-RADS 3-A
(Equivocal, may be suggestive of PC)

Options:

- If targetable, biopsy (If it changes the management).
- Follow-up imaging (either anatomic or PSMA-targeted PET/CT) showing progression can establish diagnosis.
  - ✓ Evidence of disease progression (ie, increasing uptake or growth of findings on CT), this may lead to recategorization to PSMA-RADS 4 or 5.
  - ✓ Stable lesions without treatment may be benign and could then be scored with a PSMA-RADS score of 1 or 2.
  - ✓ In inconclusive cases, we would leave it to the discretion of the interpreting imaging specialist to recommend additional follow-up
- Recommend initial follow-up period of 3–6 mo.

RADS 3A – Equivocal Findings



PSMA-RADS 3-B

(Equivocal, may be suggestive of PC)

Equivocal uptake in bone lesion not definitive but also typical of PC on anatomic imaging

- Examples:

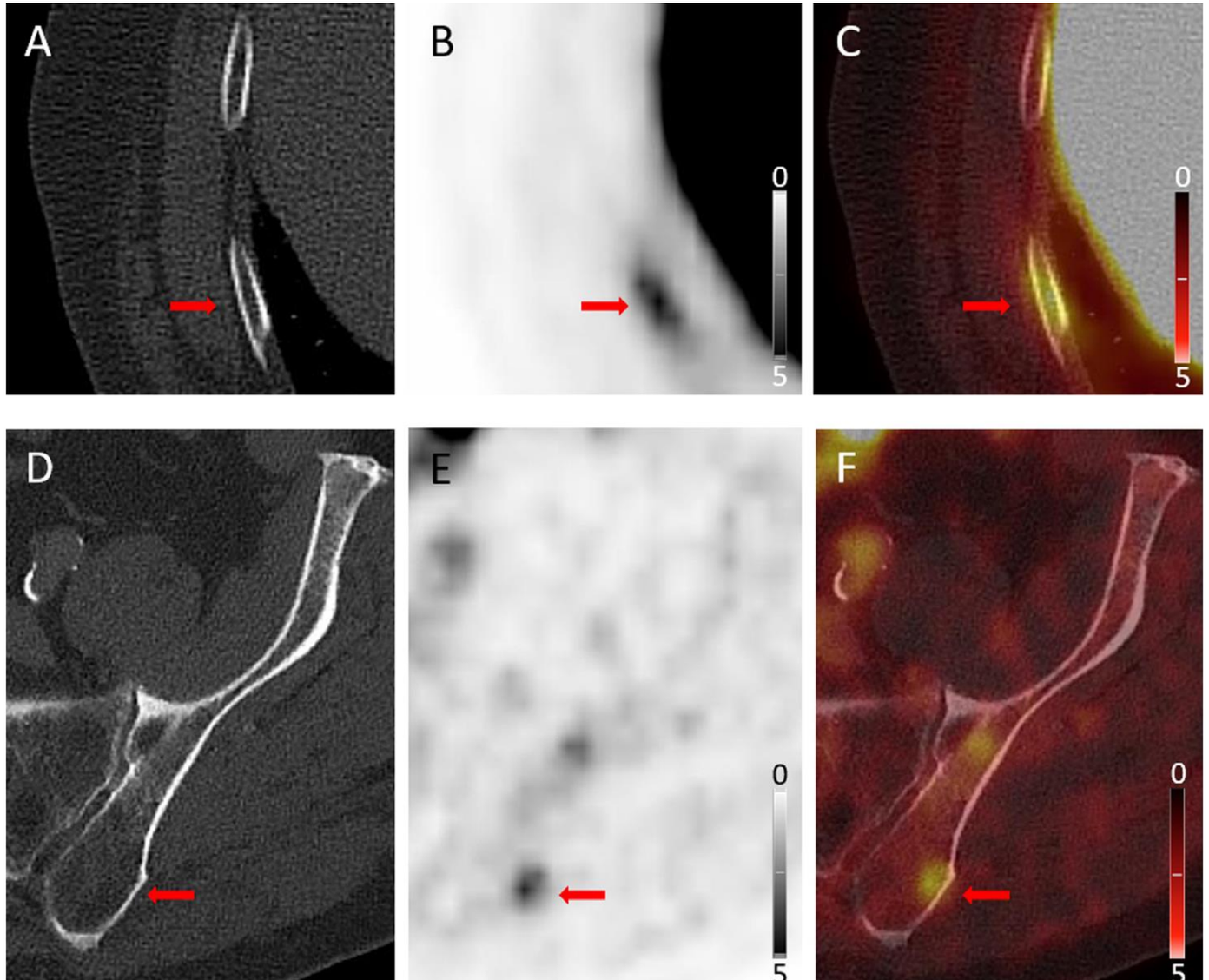
pure marrow-based lesion with little if any surrounding bony reaction
lytic or infiltrative lesion
classic osteoblastic lesion

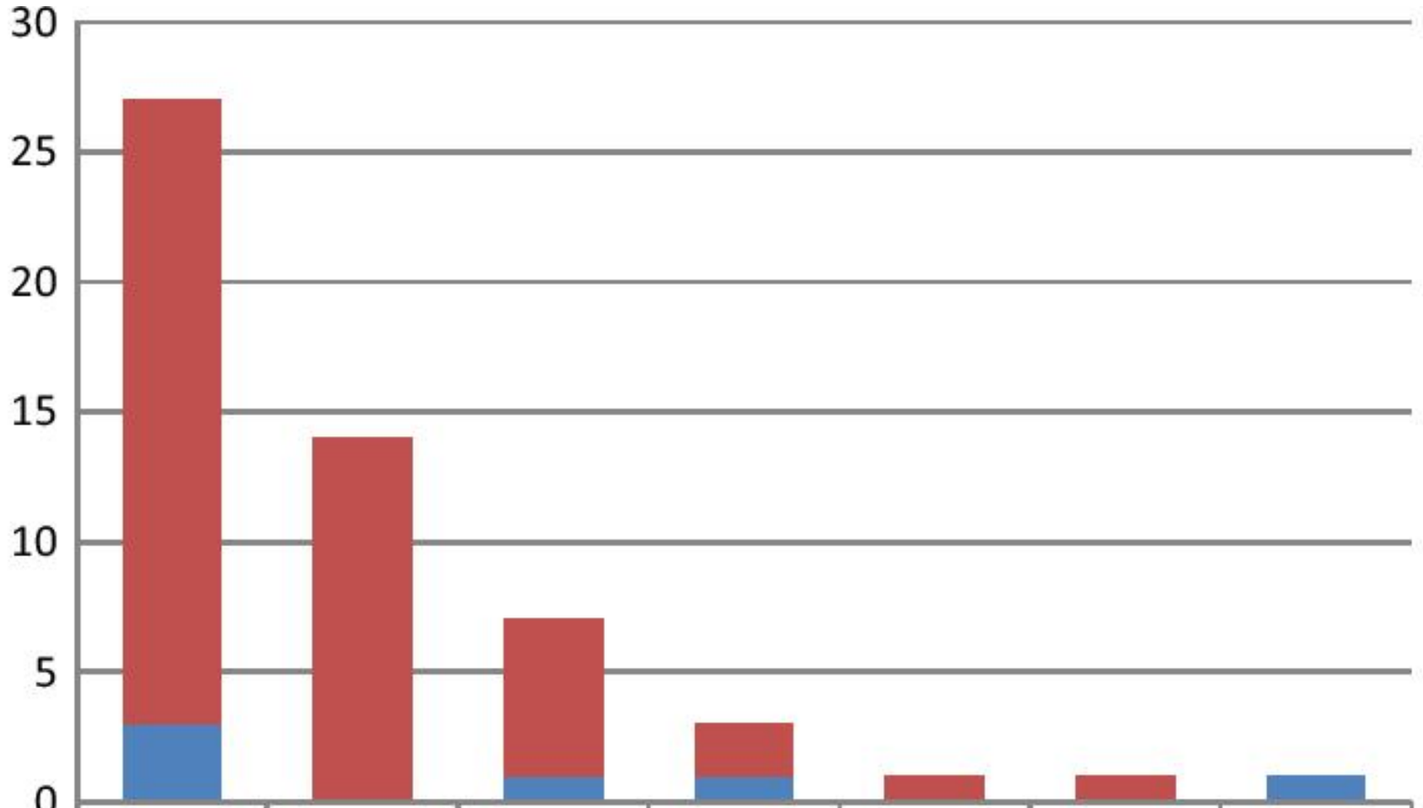
- Options:

Na18F-PET/CT
bone biopsy may be considered.
follow-up imaging (either anatomic or PSMA-targeted PET/CT) with evidence of progression may confirm diagnosis

- In highly metastatic patients (>5 metastases), reclassify this lesion to PSMA-RADS 4

RADS 3B – Equivocal Findings





	All	Ribs	Ilium	Spine	Scapula	Clavicle	Ramus pubis
Clinically insignificant	24	14	6	2	1	1	0
True lesions	3	0	1	1	0	0	1

RADS 3C – Equivocal Findings

Intense uptake in site highly atypical of all but advanced stages of PC, which requires further workup.

❖ Example:

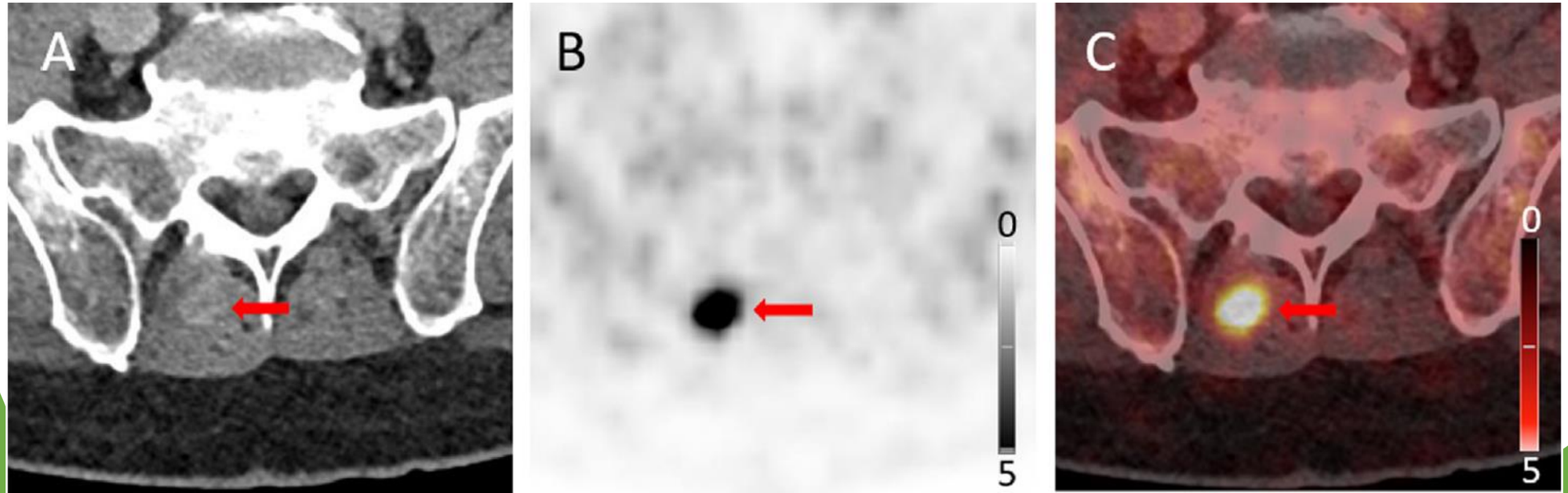
a focal soft tissue uptake in a patient with a low PSA level who is being evaluated for biochemical recurrence

❖ Options:

✓ Biopsy to confirm diagnosis histologically (is often preferred)

✓ organ-specific follow-up imaging (may be considered)

(eg, liver-protocol MRI to evaluate possible primary hepatocellular carcinoma)

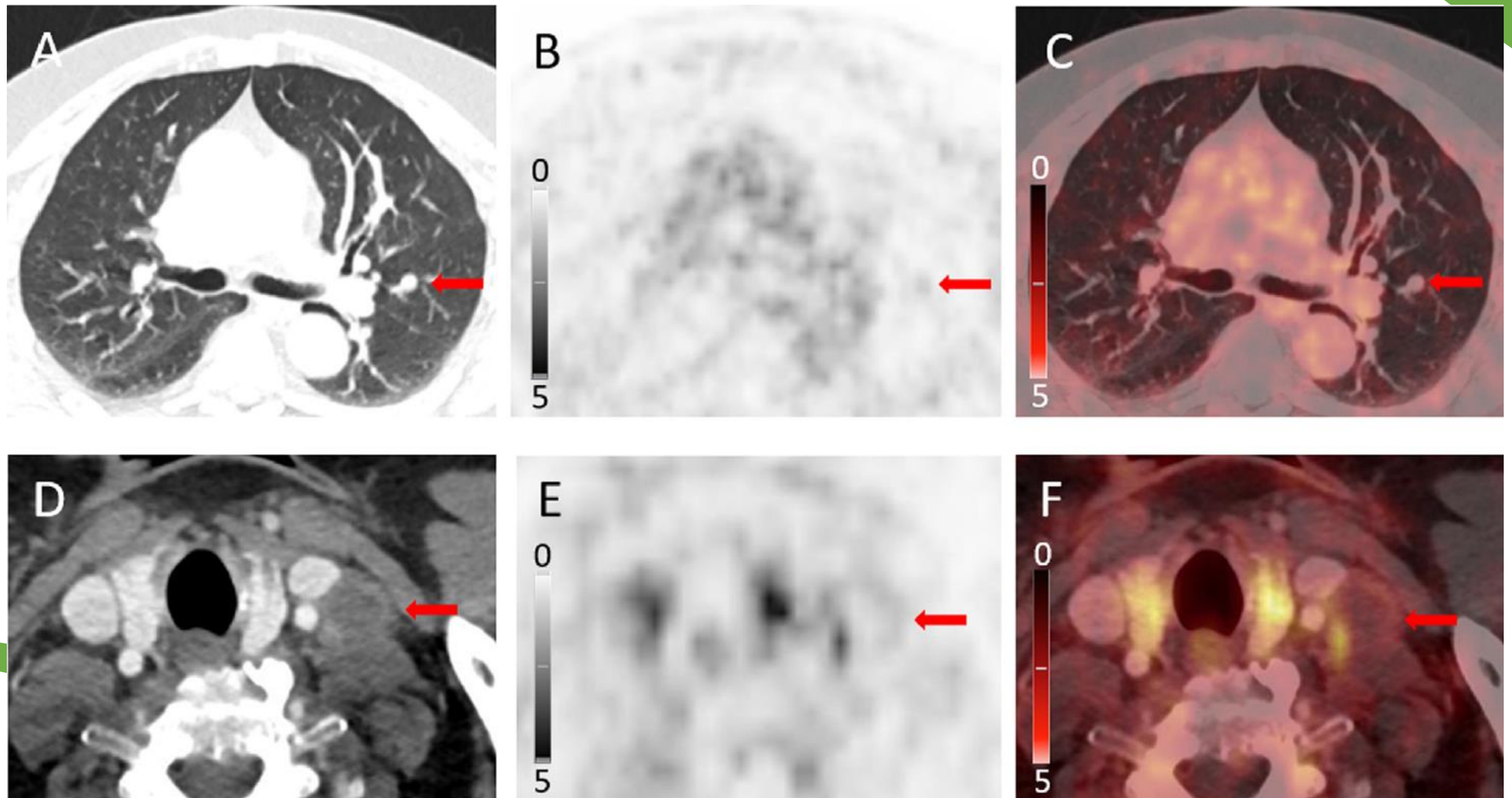


PSMA-RADS 3-D (Equivocal)

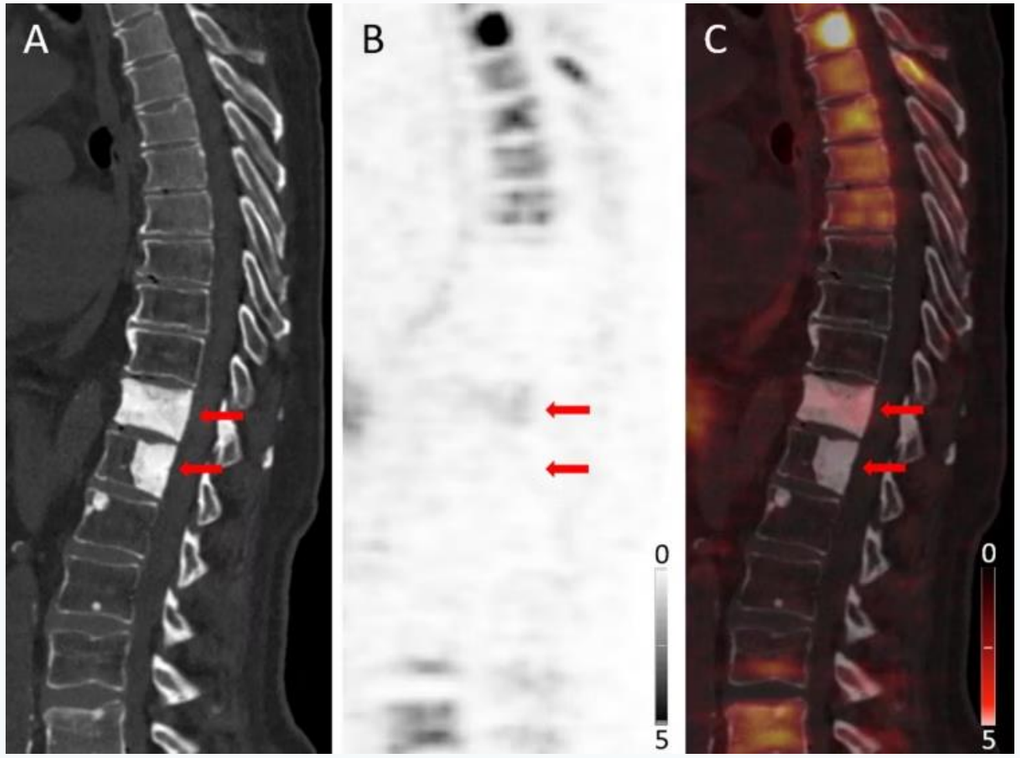
Any lesion on CT that requires further workup but does not show any tracer uptake

- Examples:
  - ✓ Infectious disease
  - ✓ Variety of other malignancies, including NEDPC or lung carcinoma, or other diseases requiring treatment
- options:
  - ✓ Biopsy to confirm diagnosis (often preferred)
  - ✓ Organ-specific close follow-up imaging (may be applicable)

RADS 3D – Equivocal Findings



Treated Metastases: PSMA-RADS 5T



Definition

PSMA-RADS 5T includes previously identified metastases after treatment (eg, irradiated sclerotic bone lesions) with or without uptake.

Clinical Significance

Such lesions do not necessarily show intense uptake, but should still be considered as (treated) sites of disease. PSMA-RADS 5T also includes lesions that completely disappear under treatment, that is, complete resolution of initially classified malignant findings with only non-specific remnants upon follow-up.

Impact on Overall RADS Score

For 5T, ORS would also be 5T if only one single lesion is identified on follow-up PET/CT. If there are still multiple lesions from different categories on follow-up scans, 5T would be ignored and the highest lesions would still dominate the ORS.

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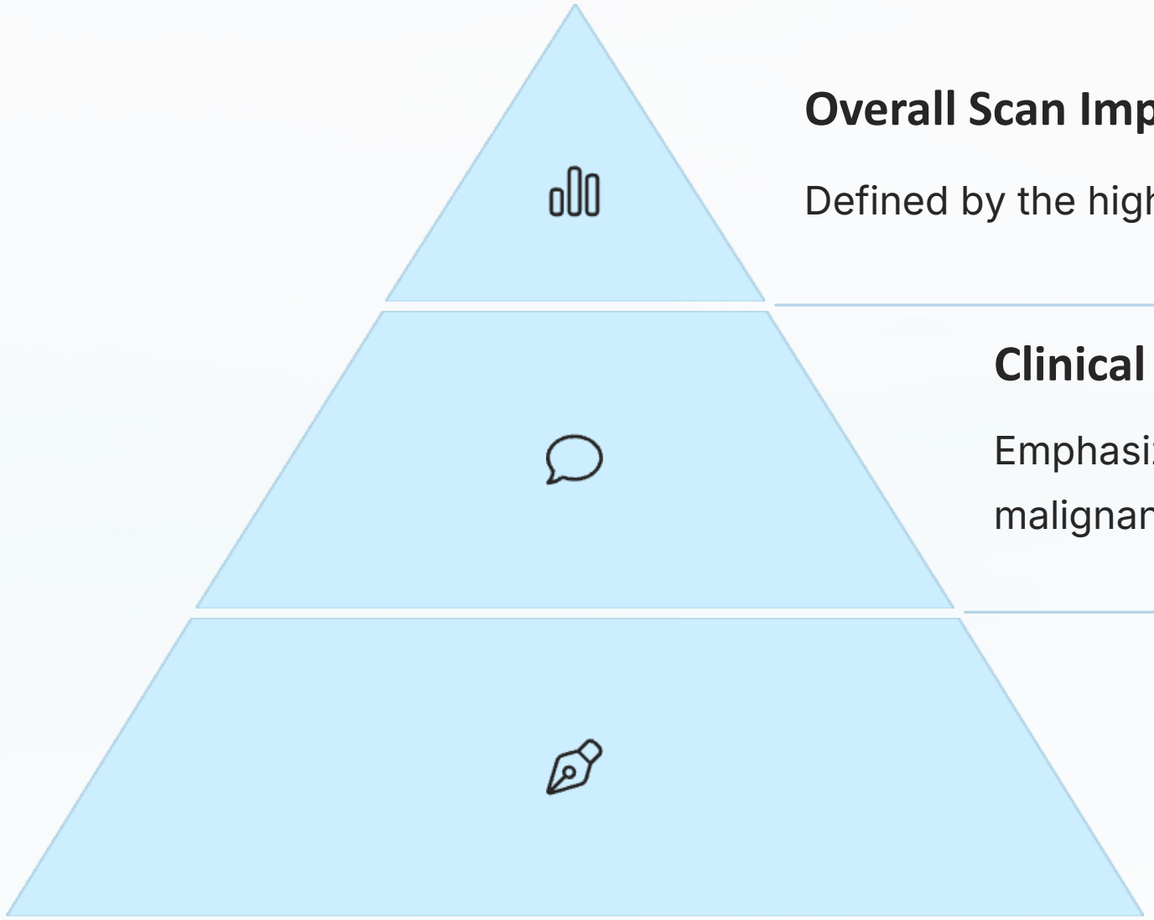
Overall RADS Score (ORS)



Overall Scan Impression

Defined by the highest PSMA-RADS score of any individual target lesion

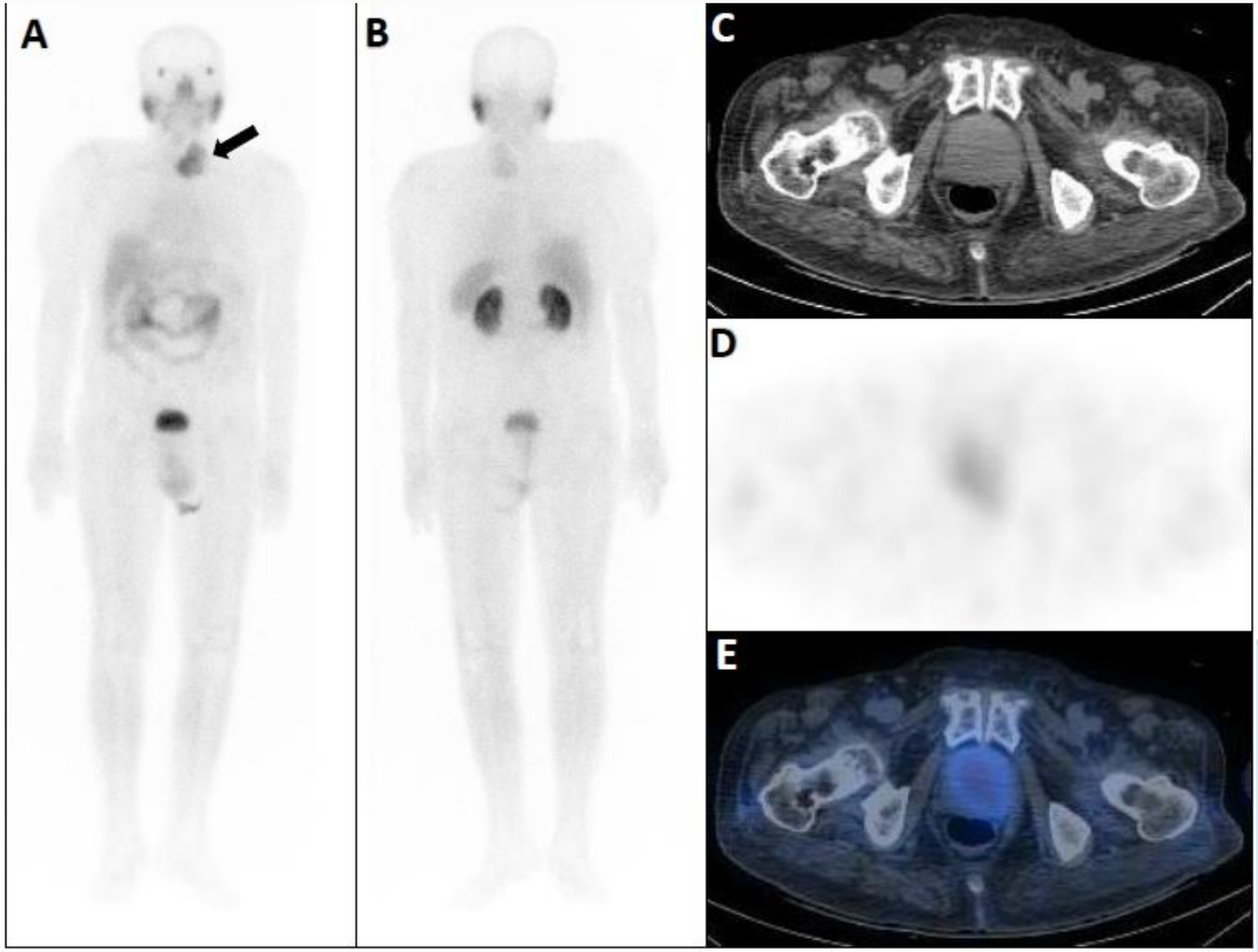
Clinical Relevance

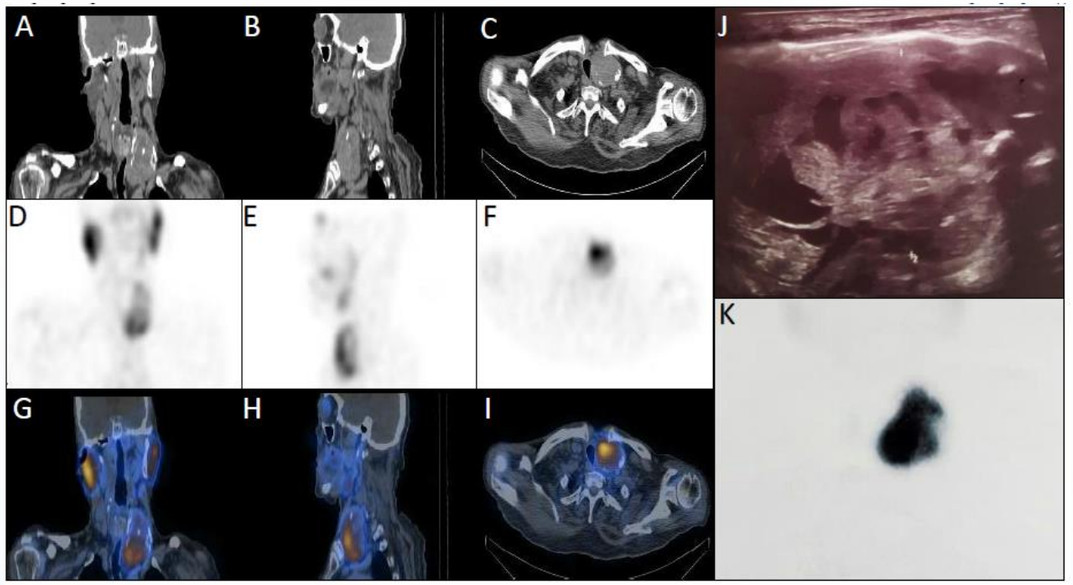
Emphasizes findings that trigger further workup or indicate malignancy

Treatment Planning

Helps define candidates for PSMA-targeted therapies

What’s Your RADS Category Suggestion?



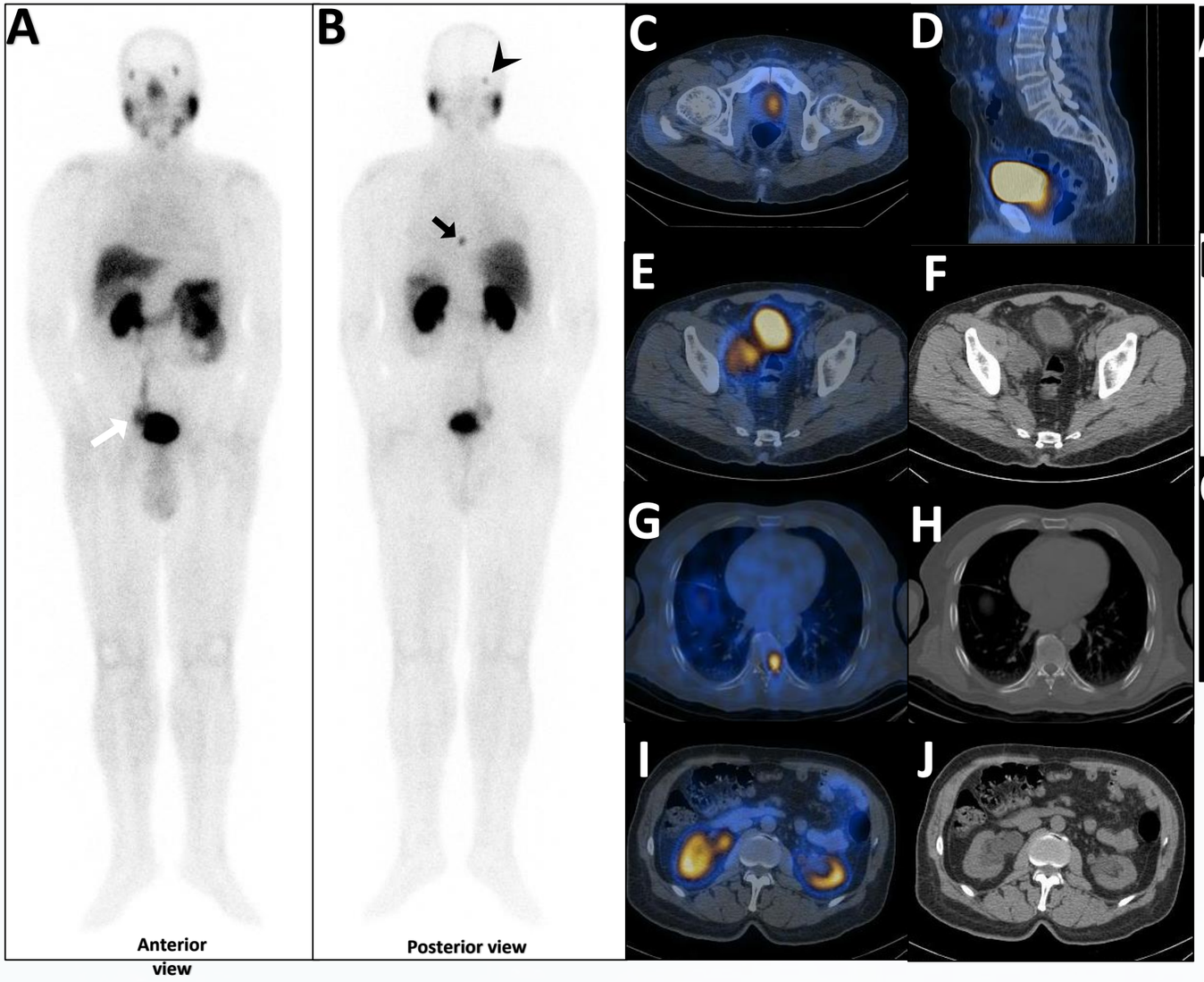


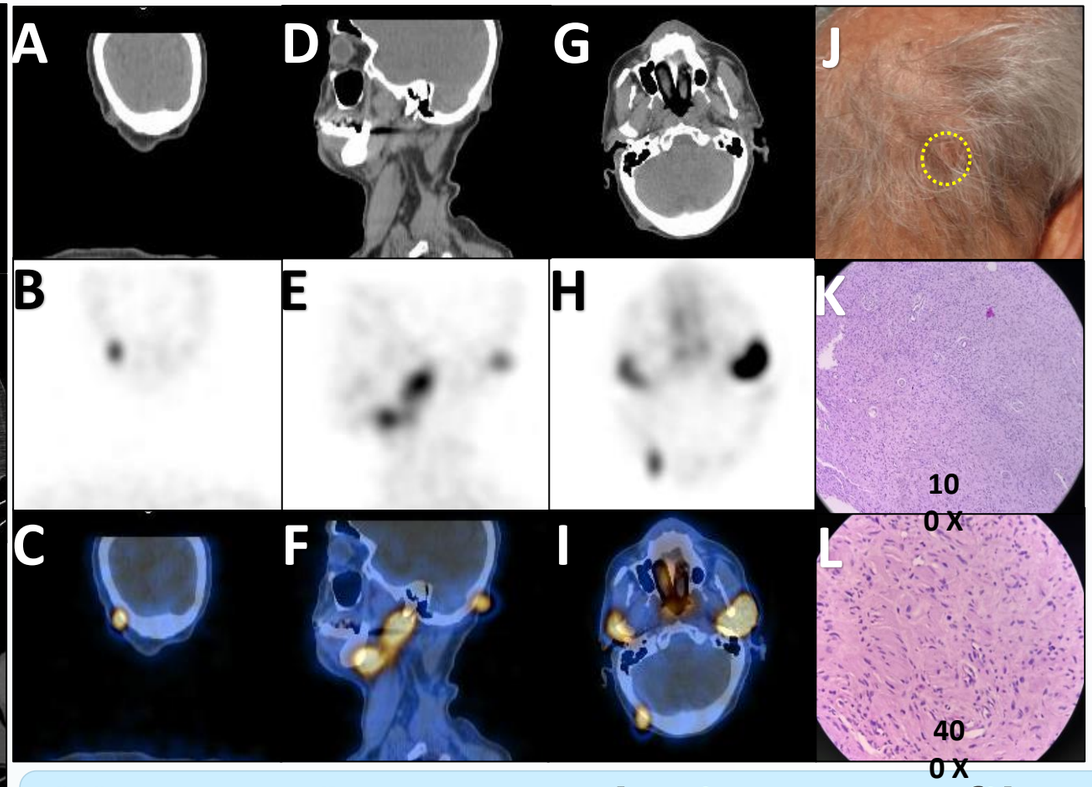
Benign thyroid nodule

PSMA RADS score: 1

Samadi MH, et al; CNM, 2025

What's Your RADS Category Suggestion?





99mTc-PSMA Uptake in Neurofibroma

PSMA-RADS category: 3C

Samadi MH, et al; CNM, 2025

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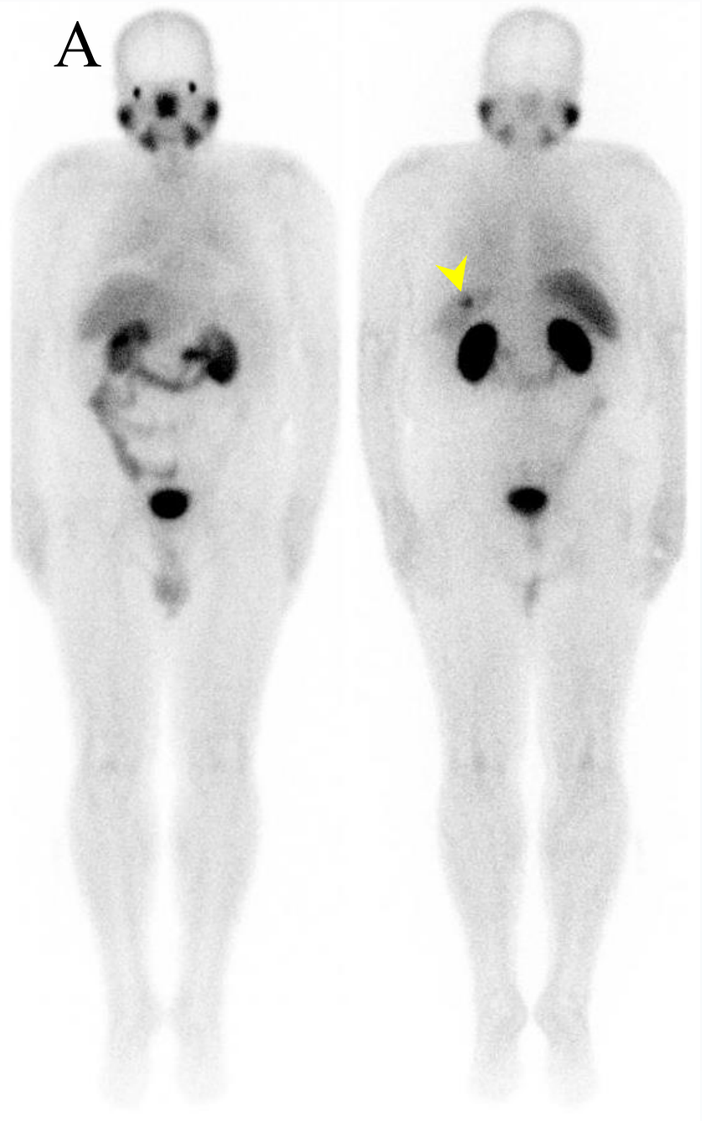
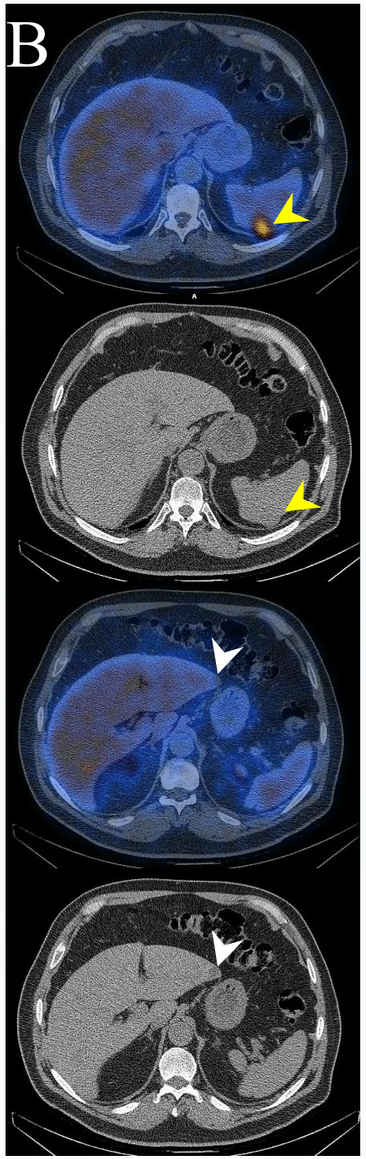
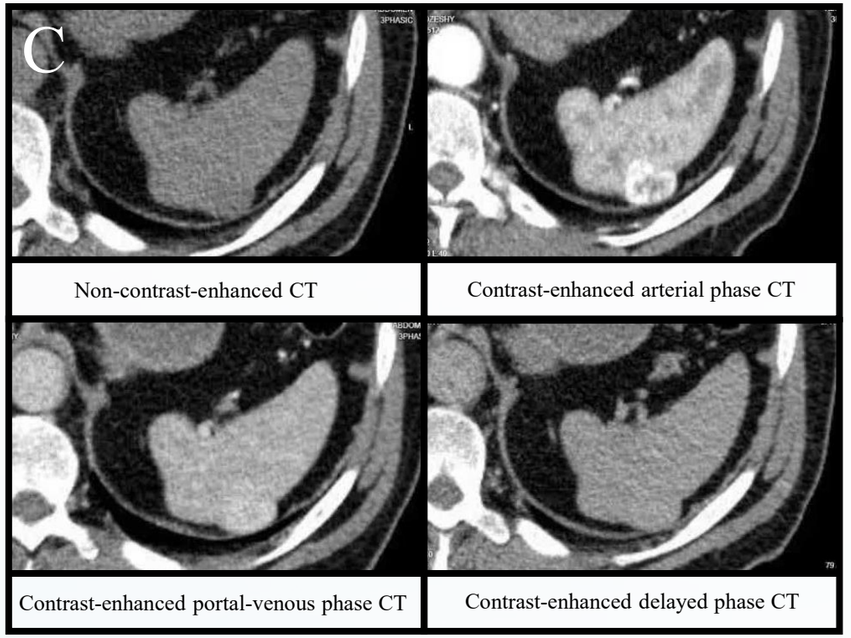
What’s Your RADS Category Suggestion?







Splenic Hemangioma

PSMA-RADS 3C

Change to PSMA-RADS 1 in further evaluation

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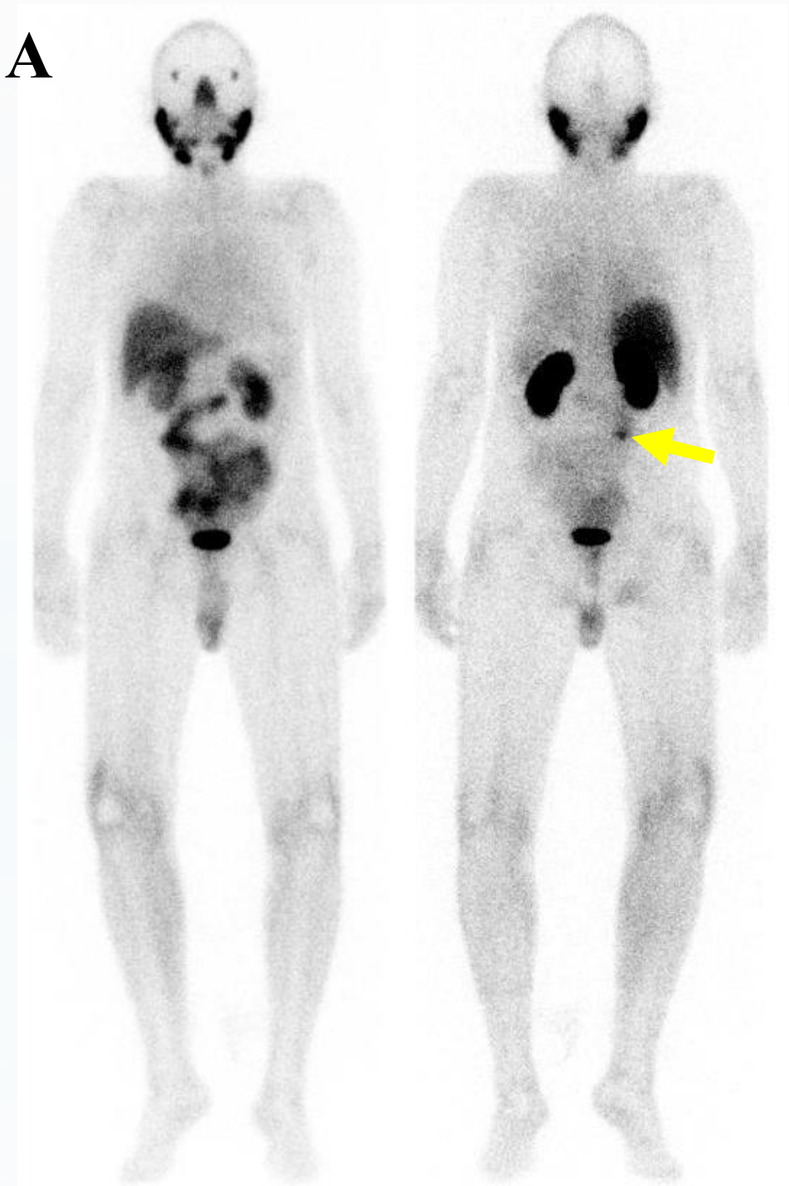
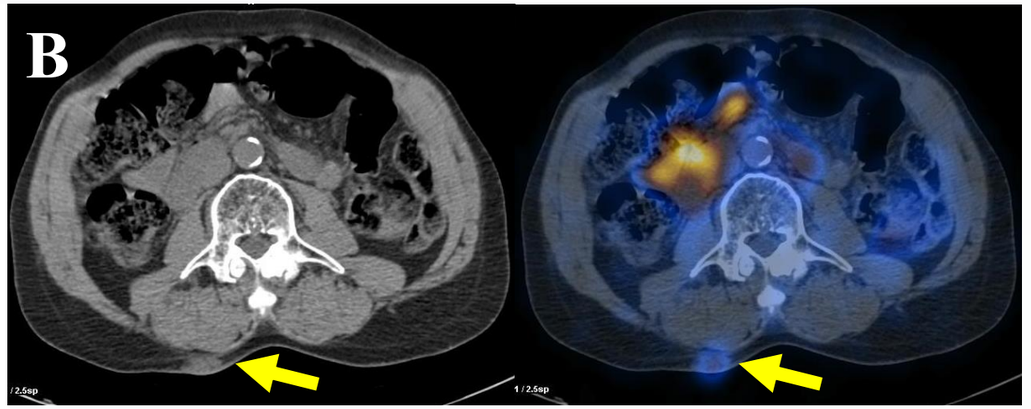
Samadi MH, et al; CNM, 2025

What’s Your RADS Category Suggestion?





Saber Tanha, et al; CNM, 2025

Subcutaneous Angiolipoma

Mild uptake in a soft tissue lesion

PSMA-RADS category: 3C

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What’s Your RADS Category Suggestion?

Cutaneous metastases from prostate cancer

Mild PSMA uptake in cutaneous and sub-cutaneous regions

PSMA-RADS category: 3 → **4**

Saber Tanha, et al; CNM, 2025

Dr.Somaye Barashki

TIPS FOR PSMA PET/CT READING

Probably NOT Prostate Cancer

- ❖ Faint
- ❖ Diffuse/ Not focal
- ❖ Isolated
- ❖ Symmetric (coronal)
- ❖ Uncommon location for prostate cancer spread
- ❖ Decreased uptake on late acquisition
- ❖ CT correlate pattern

Suspicious FOR Prostate Cancer

- ❖ Intense
- ❖ Focal
- ❖ Known other metastatic lesions
- ❖ Asymmetric
- ❖ Common location for prostate cancer spread
- ❖ Increased/Stable uptake on late acquisition

Dr.Somaye Barashki

Take-Home Message

- RADS-3 is NOT a failure – it’s a decision point.
- Standardized templates save time and medicolegal risk.

Thanks for your attention

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