

# Disseminated Nocardiosis Masquerading as Soft Tissue Malignancy: A Case Report

## Abstract

**Case:** A 59-year-old man, immunosuppressed after renal transplant, presented with a painful posterior thigh mass concerning for malignancy, as well as pulmonary and posterior chest wall nodules. Cultures and mass spectrometry identified *Nocardia paucivorans*. The patient underwent operative irrigation and debridement of the posterior thigh and chest wall, with 12 months of antibiotic therapy.

**Conclusion:** A two-week delay in appropriate treatment was due to low suspicion for infectious etiology. Since cultures generally take weeks for positive diagnosis, advanced molecular or biochemical methods should be utilized. This case demonstrates importance in maintaining a high index of suspicion for nocardiosis in immunocompromised patients with soft tissue masses.

## Introduction

- Nocardiosis:**
- Caused by 40 species
  - 500-1000 cases in US annually
  - Opportunistic disease affecting mostly immunocompromised
  - 1/3 cases in immunocompetent
  - Local disease: lung nodules, cutaneous abscesses
  - Disseminated: any organ
  - Prognosis varies widely: 100% survival rate for localized cutaneous disease in immunocompetent vs 15% for disease disseminated to CNS in immunocompromised
  - Most cases from *Nocardia asteroides*, *Nocardia farcinica*, or *Nocardia brasiliensis*
  - *Nocardia paucivorans*: rare causative organism, only 51 documented cases
  - Only one other case of intra-muscular abscess: iliopsoas muscle of an immunocompetent patient with dissemination throughout brain and lungs

## Case Presentation

- 59-year-old male:**
- 53-pack-year tobacco history
  - Immunosuppressed due to renal transplant 3 years prior (renal vasculitic destruction)
  - No prophylactic antibiotics
  - 4 months prior: squamous cell carcinoma of the vocal cords, radiation therapy, laryngeal tissue necrosis, 31-day hospital stay for hyperbaric therapy, resultant deep vein thrombosis and saddle pulmonary embolism
  - CT for PE: nodule in right upper lobe of lung, concerning for malignancy (Figure 1)
  - PET scan: high-uptake lesions in right posterior chest wall and left posterior thigh (Figure 2)

- Presentation to Ortho Oncology Clinic:**
- 4 months of progressive posterior left thigh pain
  - Exam: firm soft tissue mass in hamstring musculature
  - Labs: mild leukocytosis ( $12.8 \times 10^9$  cells/liter)
  - Radiographs: no bony lesions nor calcifications of the mass (Figure 3)
  - MRI: 7x5x18cm lesion with heterogeneous signal intensity within the proximal hamstring musculature (Figure 4)
  - Presumed to be soft tissue tumor based upon clinical history and imaging characteristics

- Diagnosis:**
- Incisional biopsy: edematous skeletal muscle with no concern for malignancy
  - Two weeks later: cultures grew nocardia and speciation revealed *Nocardia paucivorans* through MALDI mass spectrometry, with no antibiotic resistance
  - MRI: no CNS involvement



Figure 1. Computed tomography for pulmonary embolism. Red arrows point to nodule incidentally found in right upper lobe.

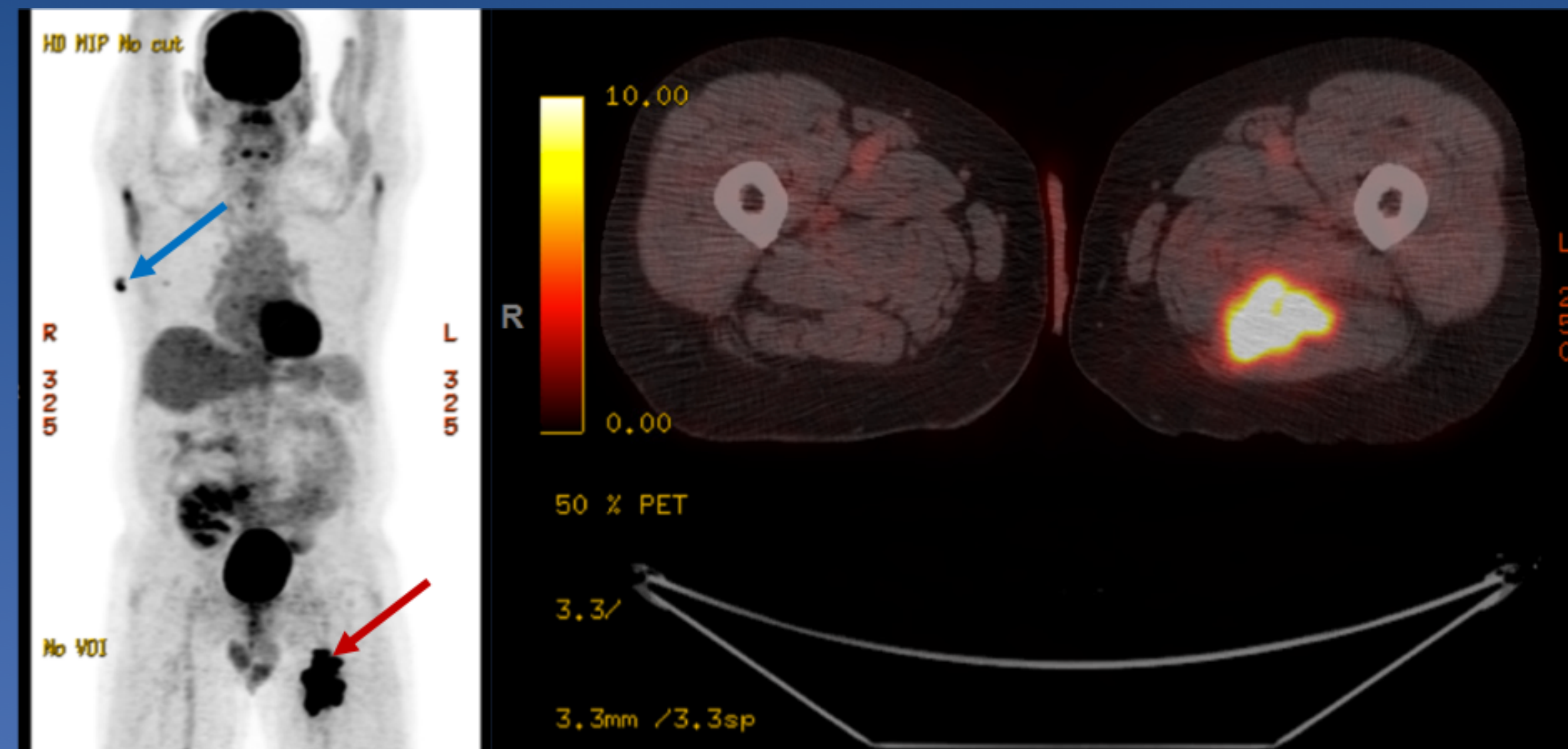


Figure 2. Positron emission tomography to assess pulmonary nodule for hypermetabolic activity. The pulmonary nodule did not light up, yet a superficial posterior right-sided chest wall mass (blue arrow) and a posterior left-sided thigh mass (red arrow) did light up.

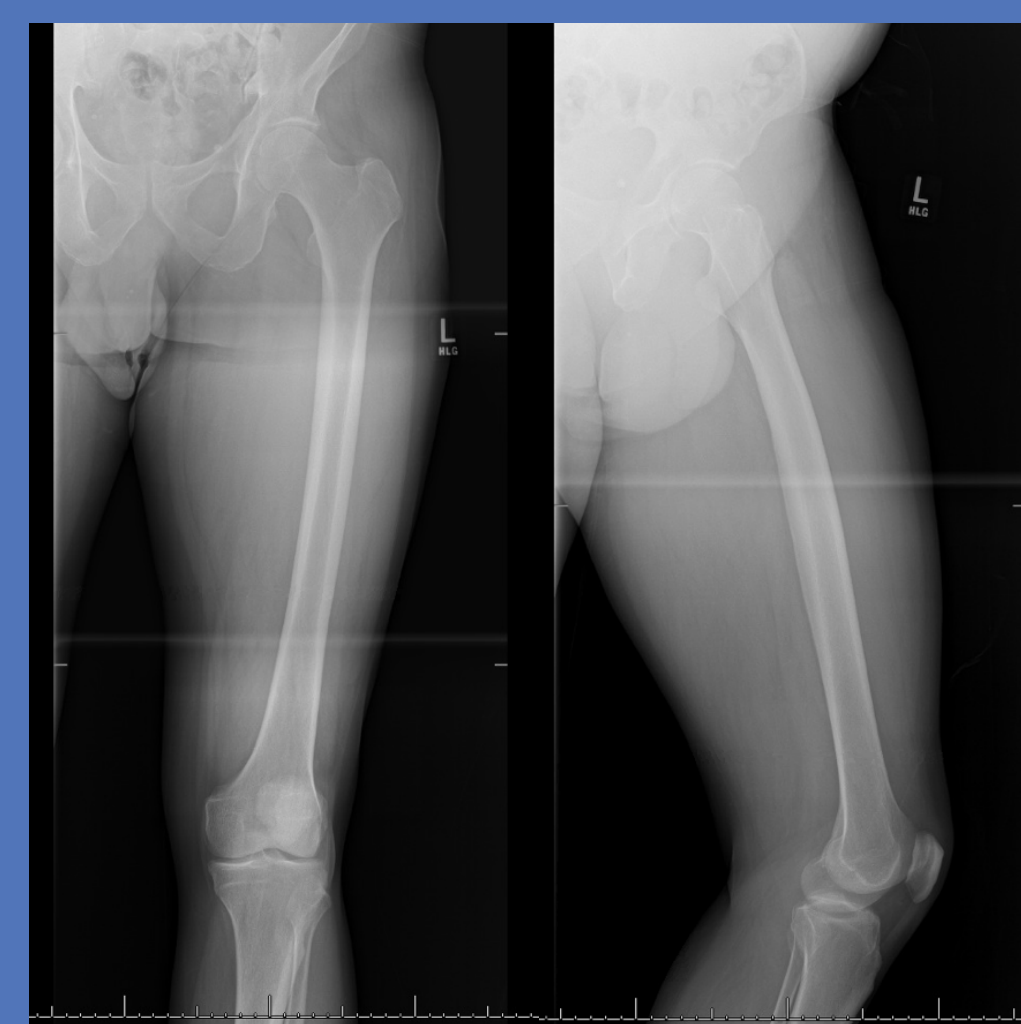


Figure 3. Anteroposterior and lateral radiographs of the left femur reveal no bony involvement nor calcifications of the left thigh mass.

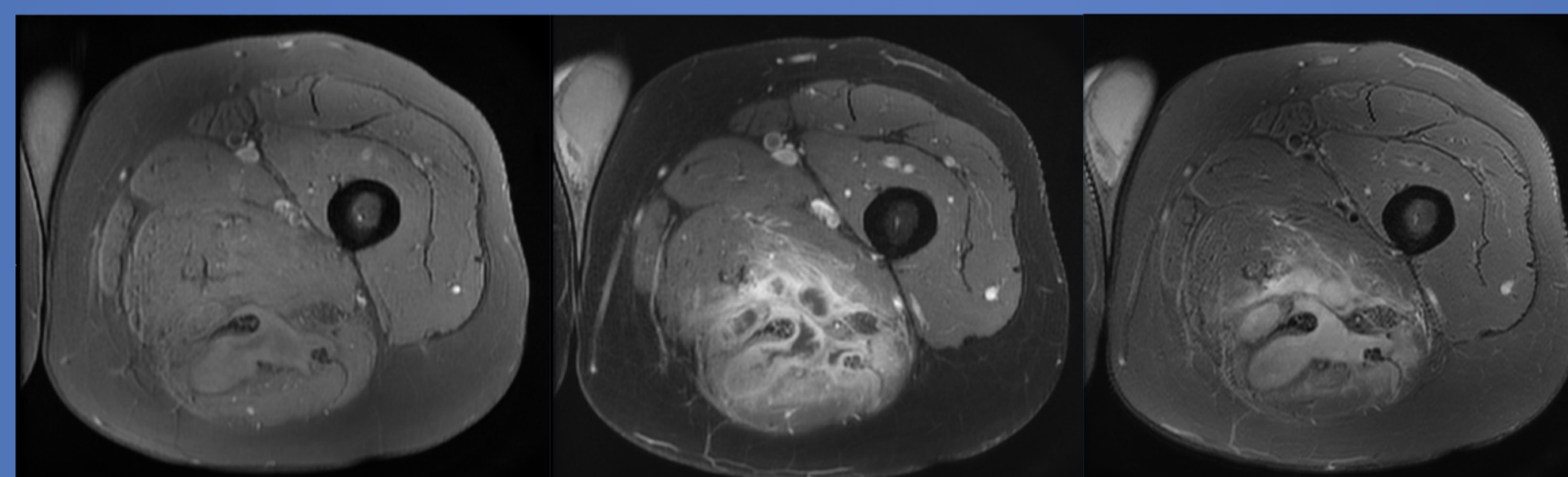


Figure 4. Magnetic resonance imaging of the left thigh reveals heterogeneous signal intensities on T1-weighted sequences both pre-contrast (left) and post-contrast (middle). The T2-weighted sequence (right) reveals circumferential enhancement with relative homogeneity of the mass. A necrotic core is visible and the margins are ill-defined. Marked peri-lesional enhancement indicates invasion and edema disproportionate to the size of the lesion. These findings favor neoplasm over infection[33-35].

## Operative Procedure

- Post-Biopsy:**
- Two weeks of rapidly-progressive posterior thigh pain and increasing narcotic use
  - Leukocytosis rose to  $18.2 \times 10^9$  cells/liter
  - CT: enlargement of thigh abscess to 10x10x17cm (Figure 5)

- Surgical Debridement:**
- 300cc of brown purulent fluid from left thigh abscess (Figure 6)
  - Intact hamstring musculature (Figure 7)
  - Wound VAC applied, then closed primarily one week later
  - Right posterior chest wall mass: well-circumscribed soft tissue mass (Figure 8)

- Post-Operative Course:**
- Antibiotics: post-op on trimethoprim/sulfamethoxazole and imipenem
  - Path: skeletal muscle with extensive granulation tissue from the thigh and adipose tissue with histiocytes and abscess formation from the chest wall
  - Cultures: *Nocardia paucivorans* from both sites
  - Discharge: six weeks of trimethoprim/sulfamethoxazole and ceftriaxone, followed by 12 months of trimethoprim/sulfamethoxazole monotherapy
  - Four months post-op: both incisional sites well-healed, PET scan revealed no residual hypermetabolic activity at either site
  - Lung nodule: reduced from 6.7mm to 4.5mm on antibiotics

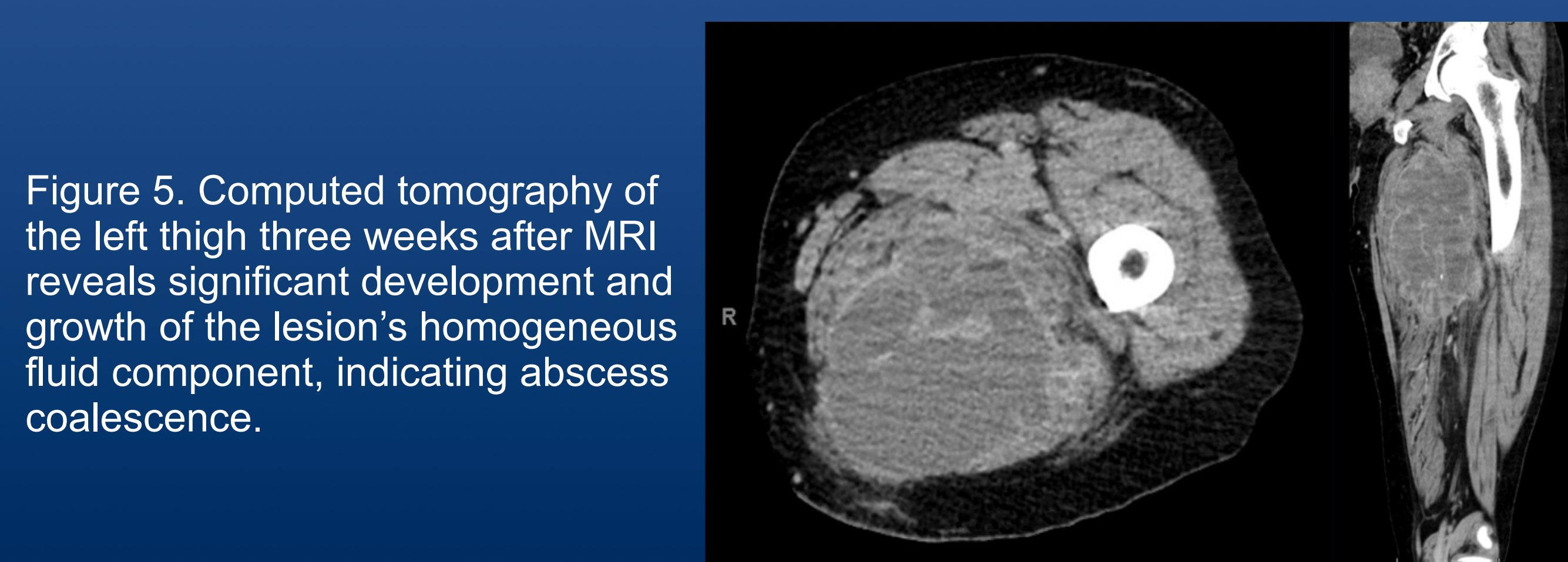


Figure 5. Computed tomography of the left thigh three weeks after MRI reveals significant development and growth of the lesion's homogeneous fluid component, indicating abscess coalescence.

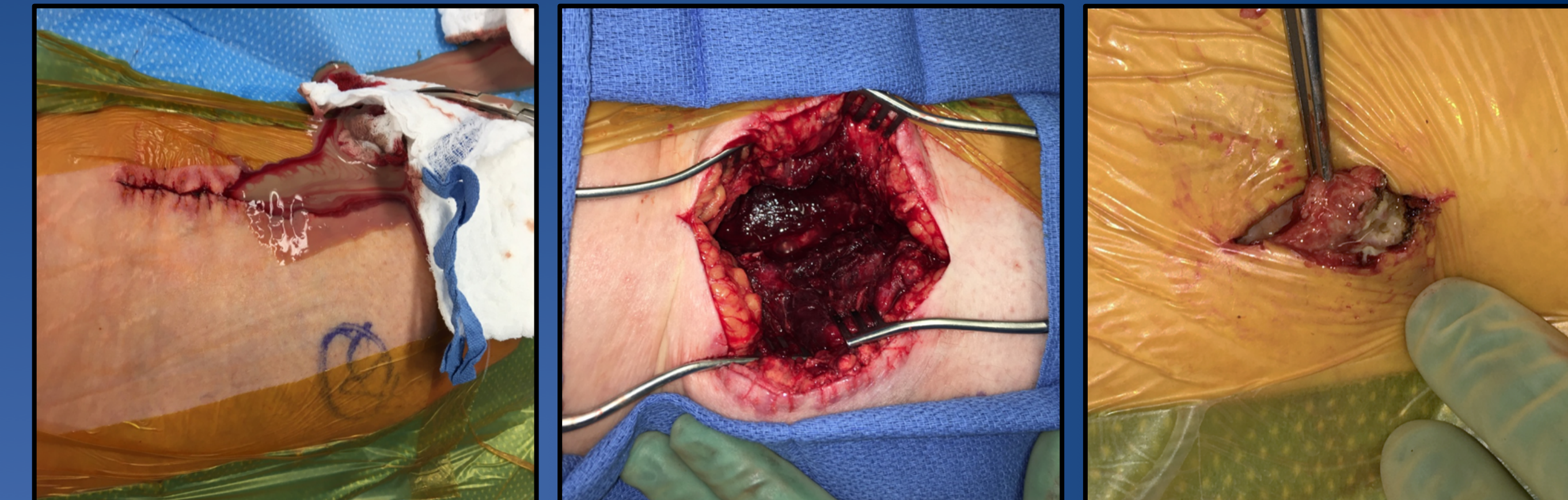


Figure 6. Upon re-opening the incisional biopsy site, about 300cc of bloody, brown purulent discharge expelled.

Figure 7. Following thorough irrigation and debridement of the posterior thigh abscess, intact and viable hamstring musculature can be seen.

Figure 8. Incisional removal of a granuloma in the patient's posterior right-sided chest wall, followed by thorough irrigation, debridement and primary skin closure.

## Discussion

### Neoplasm vs Infection:

- Soft tissue masses: maintain high suspicion for both neoplastic and infectious etiologies (significant presentation overlap)
- Factors favoring neoplasm: patient's new lung nodule in setting of history of cancer and significant smoking history, chronic immunosuppression, rapid disease progression
- Factors favoring infection: immunocompromised state with a recent month-long hospital stay, significant leukocytosis given patient's degree of immunosuppression, progressively painful nature of the lesion
- Infectious differential diagnosis for this presentation: tuberculosis, histoplasmosis, cryptococcus, nocardiosis

### Nocardial Abscesses:

- Intra-muscular nocardial abscesses are a rare manifestation with no well-described characteristic symptoms
- Extensive literature review: only 20 cases of nocardial abscesses
  - Location: 9 abscesses in the thigh, 6 in the iliopsoas muscle, 2 in the calf muscles, 1 in the gluteal muscles, 1 in the lower abdominal wall musculature, 1 in the deltoid muscle
  - Clear predilection for lower extremity and hip flexor musculature
  - Primary vs dissemination: 10 cases primary to the muscle, 10 disseminated from elsewhere (mostly pulmonary origins)
  - Outcomes: 17 patients survived, 2 died, 1 outcome not provided
  - Speciation: *Nocardia farcinica*, *Nocardia asteroides*, *Nocardia paucivorans*, *Nocardia brasiliensis*, *Nocardia pseudobrasiliensis*, *Nocardia abscessus*

### *Nocardia paucivorans*:

- Rare causative organism: only 51 cases described (including this one)
- Only one other case of intra-muscular abscess described: iliopsoas muscle of immunocompetent patient with dissemination throughout brain and lungs
- First isolated in sputum of asymptomatic person in 2000, with reports of human infection published in 2002
- Now known to have similar infectious trends, dissemination predilections and treatment responses as many other nocardia species

### Treatments and Prognoses:

- Modern treatment: trimethoprim/sulfamethoxazole with ceftriaxone, amikacin or imipenem
- Optimal treatment: has not yet been determined through controlled trials
- Resistance: beginning to emerge to commonly-used therapies
- Prognosis: good for most cases of nocardiosis
  - Localized skin and soft tissue infections have cure rates of 88-100%
  - Disseminated disease with brain abscesses in *immunocompetent* patients: cure rate of 80%
  - Disseminated disease with brain abscesses in *immunocompromised* patients: cure rate of less than 15%

## Learning Points

- This report details opportunistic nocardia infection presenting as soft tissue tumor
- Likely to become more common as rates of both immunosuppression and nocardiosis rise
- Lesions that are hypermetabolic on PET scan are rightfully worked up as malignancies, especially when a patient has history of cancer
- Important though to maintain high suspicion for infectious etiologies as well
- Delays in diagnosis and appropriate treatment can lead to higher rates of dissemination with markedly worsening prognoses
- Urgent speciation of pathogens is vital, as nocardiosis and tuberculosis share many similarities in presentation and early culture growth but therapies for each infection have essentially no overlap
- Therefore, it is of critical importance to utilize contemporary molecular or biochemical tools for rapid pathogen identification, speciation and susceptibility determination
- Doing so will provide each patient with the best chance for success

References available upon request