

CASE REPORT

Imaging

Emergency physician–performed bedside ultrasound of pyomyositis

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Funding and support: By JACEP Open policy, all authors are required to disclose any and all commercial, financial, and other relationships in any way related to the subject of this article as per ICMJE conflict of interest guidelines (see www.icmje.org). The authors have stated that no such relationships exist.

Abstract

Point-of-care ultrasound (POCUS) is an indispensable tool for emergency physicians in the rapid bedside diagnosis of skin and soft tissue infections. The utility of POCUS for the differentiation of cellulitis and subcutaneous abscess is well established; however, there is a paucity of studies highlighting POCUS as a first-line imaging approach for pyomyositis, an uncommon skeletal muscle infection and/or intramuscular abscess formation requiring emergent diagnosis. This report describes a case in which emergency physician–performed POCUS led to the early detection and timely management of pyomyositis in the emergency department.

KEYWORDS

emergency department, intramuscular abscess, muscle infection, point-of-care ultrasound, pyomyositis, ultrasonography

1 | INTRODUCTION

Pyomyositis is a bacterial infection, predominantly caused by *Staphylococcus aureus*, which is characterized by progressive inflammation of skeletal muscle and intramuscular abscess formation.^{1–3} This condition is rare in temperate climates, although with an increasing incidence in the United States.^{2,3} There are several known risk factors associated with pyomyositis, which include human immunodeficiency virus, diabetes mellitus, hematologic malignancies, rheumatologic disease, chronic kidney disease, cirrhosis, and malnutrition.^{1–4} Patients with underlying comorbidities have higher mortality rates and prevalence of gram-negative bacterial infections.⁵ The overall mortality rate of pyomyositis is ≈5%, which is typically attributed to multiorgan failure from severe sepsis or septic shock.^{2,4}

Point-of-care ultrasound (POCUS) is a first-line imaging modality for emergency physicians in the diagnosis of musculoskeletal infections, including cellulitis and soft tissue abscesses.^{6,7} Previous reports have described the utility of POCUS in the emergent diagnosis of

pyomyositis.^{8–13} The diagnosis of pyomyositis can be challenging in the acute setting, as the clinical symptoms are often nonspecific.² This report highlights the decisive role of emergency physician–performed POCUS in the emergency department (ED) management of a case of postoperative periprosthetic infection with both subcutaneous abscess and pyomyositis.

2 | CASE PRESENTATION

A 72-year-old man with a past medical history of hypertension and dyslipidemia presented to the ED with a chief complaint of left hip pain for 1 week. The patient had a left direct anterior total hip arthroplasty approximately one month prior and was doing well in physical therapy. He denied any acute trauma, injury, or falls. He endorsed worsening swelling, redness, and pain of the left hip at the surgical incision site. The patient reported that he had been seen in the orthopedic clinic several days previously for subjective fevers and mild purulent discharge from the surgical incision site; however, the prescribed antibiotics had

Supervising Editor: Yiju Teresa Liu, MD.

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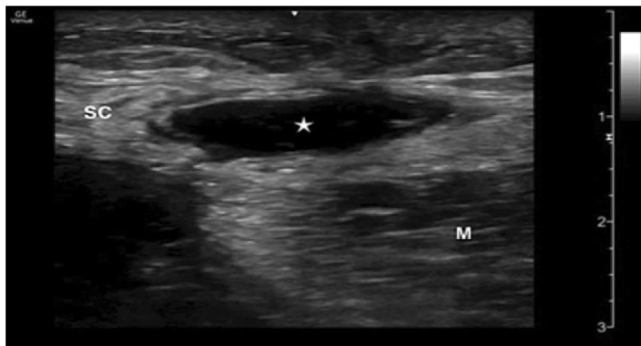


FIGURE 1 Point-of-care ultrasound of the left lateral thigh overlying the surgical incision site in the sagittal plane. There is a hypoechoic fluid collection (star) within the subcutaneous tissue representing a soft tissue abscess. SC, subcutaneous tissue; M, muscle

not improved his symptoms, and he was instructed to go to the ED. Upon arrival, the patient was in no acute distress, nontoxic appearing, and had the following vital signs: temperature 36.6°C, blood pressure of 109/56 mmHg, heart rate 55 beats per minute, respiratory rate 17 breaths per minute, and oxygen saturation of 100% on room air. Physical examination was remarkable for erythema, tenderness, induration, and fluctuance at the surgical incision site on the left proximal thigh without any active drainage. Notably, there was also significant localized tenderness to palpation of the anterolateral thigh distinctive from the adjacent surgical incision site infection. He had full painless range of motion of the hip, and the left lower extremity was neurovascularly intact.

POCUS was subsequently performed by an emergency ultrasound fellowship-trained attending and an emergency resident physician to further evaluate for a presumed postoperative skin and soft tissue infection. POCUS demonstrated a hypoechoic fluid collection in the subcutaneous tissue (at ≈ 1 cm of depth), consistent with a soft tissue abscess at the surgical incision site (Figure 1). POCUS also demonstrated an adjacent hypoechoic intramuscular fluid collection (at ≈ 2 cm of depth) in the left lateral thigh with associated muscle edema and the presence of abnormal muscle architecture (Figure 2A), which was highly suggestive of pyomyositis when compared with the appearance of normal striated muscle on the unaffected contralateral extremity (Figure 2B). At the location indicative of pyomyositis from the POCUS findings, it is noteworthy that the physical examination of the anterolateral thigh was remarkable for marked focal tenderness only, and the compartment was soft without overlying erythema, induration, or fluctuance.

Orthopedic surgery was immediately consulted based on clinical history, physical examination, and POCUS findings. Plain radiography of the left hip and femur were unremarkable. Blood cultures were drawn, and broad-spectrum intravenous antibiotics (vancomycin and piperacillin/tazobactam) were administered. Laboratory analysis showed a normal white blood cell count of 7.7 (4.0–10.5 $10^3/\mu\text{L}$) and an elevated C-reactive protein of 14.2 (0–0.30 mg/dL). Importantly, the POCUS findings were reviewed together with the orthopedic surgery team and no further advanced imaging was obtained

prior to surgery. The patient was admitted to the surgical service for definitive management and he was promptly taken to the operating room for irrigation and debridement and hardware exchange of the periprosthetic joint infection. The operative report confirmed both POCUS findings of a surgical incision site subcutaneous abscess and an adjacent intramuscular abscess/pyomyositis with nonviable hyperemic muscle tissue requiring extensive debridement. The patient was discharged on hospital day 4 in stable condition after an uneventful postoperative course with a plan for home intravenous antibiotics via a peripherally inserted central catheter and follow-up with orthopedic surgery.

3 | DISCUSSION

Pyomyositis is a rare disease affecting skeletal muscle and characterized by intramuscular abscess formation.^{1,2} The emergent diagnosis of pyomyositis is difficult because clinical symptoms can be vague and nonspecific.² Pyomyositis progresses through 3 distinct clinical stages. Notably, the first invasive stage may only manifest as mild local swelling and tenderness, which often leads to a delayed diagnosis until the second suppurative stage occurs, which is distinguished by marked focal muscle tenderness.² Subtle sonographic abnormalities in early pyomyositis, such as muscle edema, may be recognized more readily if compared to the unaffected contralateral extremity. The diagnosis may still be inconspicuous because erythema is frequently absent on skin examination.² The third stage involves even more pronounced findings concerning for a systemic infection.² Similar to most patients with pyomyositis, our case patient presented with marked focal muscle tenderness and an intramuscular abscess characteristic of the second clinical stage. It is imperative that emergency physicians maintain a high index of clinical suspicion for cases of early pyomyositis, otherwise the untreated infections could progress to severe sepsis and septic shock.

POCUS is an invaluable bedside tool for the prompt evaluation of musculoskeletal infections. The ideal first-line diagnostic approach for skin and soft tissue infections in the ED should use a combination of physical examination and ultrasonography. Implementing POCUS can increase the diagnostic accuracy in differentiating between cellulitis and soft tissue abscess, resulting in an appropriate shift in clinical management in upward of 10% of cases.^{6,7} The appropriate differentiation of a subcutaneous abscess with an intramuscular abscess/pyomyositis with POCUS is most simply made by appreciating that pyomyositis arises at deeper tissue depths within a muscle body whereas a subcutaneous abscess is contained to the soft tissue superficial to muscle layers. The sonographic appearance of pyomyositis include the early findings of diffuse muscle edema with the loss of normal striated muscle architecture, which may ultimately progress to the later findings of hypoechoic fluid collection(s) of an intramuscular abscess(es). The POCUS diagnosis of subcutaneous abscesses has a pooled sensitivity and specificity of 94.6% and 85.4%, respectively; however, the POCUS diagnostic characteristics for pyomyositis have yet to be established.⁷ Pyomyositis can subsequently be confirmed with computed tomography (CT) or magnetic resonance imaging (MRI) depending on

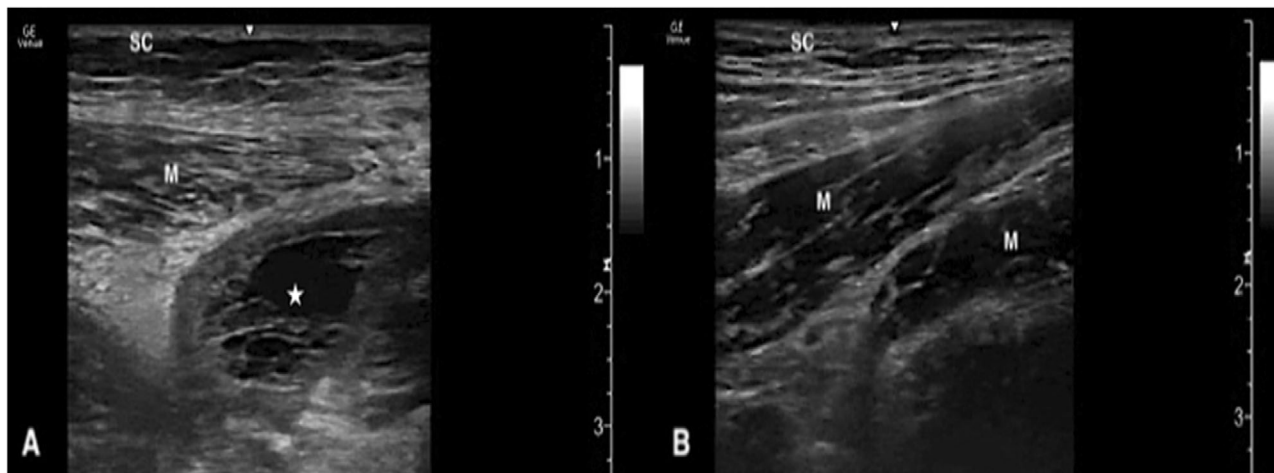


FIGURE 2 Point-of-care ultrasound of the affected left lateral thigh (A) and the unaffected right lateral thigh (B) in the sagittal plane. There is a large hypoechoic fluid collection (star) within the muscle, representing an intramuscular abscess. SC, subcutaneous tissue; M, muscle

availability in the emergent care setting.^{2,14} CT and MRI are considered the gold standards for the diagnosis of pyomyositis, and these modalities are also important in the exclusion of coexisting deeper musculoskeletal infections such as osteomyelitis.¹⁴ One notable study previously demonstrated that POCUS had a superior sensitivity over CT (96.7% and 76.7%, respectively) in the diagnosis of soft tissue abscesses; future research directly comparing POCUS versus CT and/or MRI for the diagnosis of pyomyositis would be informative.¹⁵ POCUS should be considered as the initial diagnostic modality for pyomyositis because of the critical advantages of widespread availability, lack of radiation exposure, and rapid bedside application in the ED. This report describes the pivotal role of POCUS in the prompt ED diagnosis and management of an infrequently encountered case of pyomyositis. Moreover, compared to prior POCUS case studies of pyomyositis which often subsequently require more advanced imaging with CT and/or MRI, this case is unique in that the patient was managed by orthopedic surgery solely based on the abnormal POCUS findings.^{10–13} Emergency physician-performed POCUS of pyomyositis warrants further clinical outcomes-driven investigation with larger scale ED-based studies.

4 | CONCLUSIONS

The diagnosis of pyomyositis can be challenging in the emergent or acute care setting. Bedside identification of pyomyositis with POCUS can expedite surgical consultation and timely antibiotic therapy in the ED. Future studies to determine the clinical impact and diagnostic accuracy of emergency physician-performed POCUS as a first-line imaging approach for pyomyositis will be difficult to accomplish given the low prevalence of this condition.

ACKNOWLEDGMENT

This research was supported (in whole or in part) by Hospital Corporation of America Healthcare and/or an Hospital Corporation of Amer-

ica Healthcare-affiliated entity. The views expressed in this publication represent those of the author(s) and do not necessarily represent the official views of HCA Healthcare or any of its affiliated entities.

CONFLICTS OF INTEREST

The authors declare no conflict of interest.

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How to cite this article: Al-Marzoog A, Cabrera G, Kalivoda EJ. Emergency physician-performed bedside ultrasound of pyomyositis. *JACEP Open*. 2021;2:e12394.
<https://doi.org/10.1002/emp2.12394>