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Vertebral Osteomyelitis and Psoas Abscess: A Clinical Spectrum

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ABSTRACT

Background: Vertebral osteomyelitis and psoas abscess are uncommon but potentially life-threatening infections that frequently present with vague and non-specific symptoms, particularly in the emergency department (ED). Their clinical overlap and insidious onset often lead to delayed diagnosis and increased morbidity.

Objective: To comprehensively review the clinical spectrum of vertebral osteomyelitis and psoas abscess, focusing on epidemiology, pathophysiology, clinical presentation, diagnostic challenges, and management strategies, with particular emphasis on implications for emergency medicine.

Methods: A narrative review of current literature was conducted, synthesizing evidence from peer-reviewed studies, clinical guidelines, and case series addressing vertebral osteomyelitis and psoas abscess.

Results: Both conditions share overlapping risk factors, microbiology, and clinical features. Back pain remains the most common presenting complaint, while classical signs such as fever and leukocytosis may be absent. MRI remains the diagnostic modality of choice. Early initiation of antimicrobial therapy and timely surgical or interventional management significantly improve outcomes.

Conclusion: Vertebral osteomyelitis and psoas abscess should be considered part of a clinical continuum. Early recognition in the ED requires a high index of suspicion, particularly in high-risk patients with persistent or atypical back pain. Prompt diagnosis and multidisciplinary management are essential to reduce morbidity and mortality.

INTRODUCTION

Back pain is among the leading causes of emergency department visits worldwide and represents a significant diagnostic challenge for clinicians.[1] While the majority of cases are benign and attributable to musculoskeletal causes, a small but critical proportion are due to serious underlying conditions such as spinal infections.[2]

Vertebral osteomyelitis, also referred to as spondylodiscitis, is an infection involving the vertebral bodies and intervertebral discs. Psoas abscess, on the other hand, is a suppurative collection within the iliopsoas muscle compartment.[3] Although traditionally described as distinct entities, these conditions frequently coexist due to their anatomical proximity and shared routes of infection, forming a spectrum of deep-seated infections.[4]

The diagnosis of these conditions is often delayed due to their insidious onset and lack of specific clinical features. Patients may present multiple times to healthcare facilities before a definitive diagnosis is established.[5] This delay is associated with increased risk of complications, including sepsis, neurological deficits, and prolonged hospital stays.[6]

In the context of emergency medicine, recognizing these conditions is particularly challenging yet crucial. Emergency physicians must differentiate benign back pain from potentially life-threatening pathology within limited time and resources. This review aims to provide a comprehensive overview of vertebral osteomyelitis and psoas abscess as a clinical spectrum, highlighting key diagnostic and management considerations relevant to the ED.

Epidemiology

The incidence of vertebral osteomyelitis has been increasing over recent decades, likely due to an aging population, increased prevalence of comorbid conditions, and improved diagnostic modalities.[7] Current estimates suggest an incidence ranging from 2.4 to 6.5 cases per 100,000 population annually, with higher rates observed in older adults.[8]

Men are more commonly affected than women, with a male-to-female ratio of approximately 2:1.[9] The condition predominantly affects individuals over the age of 50 years, although younger patients may be affected in the presence of risk factors such as intravenous drug use or immunosuppression.[10]

Psoas abscess remains relatively rare but is increasingly recognized due to advancements in imaging. It is classified into primary and secondary forms. Primary psoas abscess, resulting from hematogenous spread, is more common in younger individuals and in regions with high prevalence of Staphylococcus aureus infections. [11] Secondary psoas abscess, which arises from contiguous spread of infection, is more common in developed countries and is associated with gastrointestinal, genitourinary, or spinal pathology.[12]

The coexistence of vertebral osteomyelitis and psoas abscess is well documented, with studies reporting concurrent involvement in up to 30% of cases.[13]

Pathophysiology Vertebral Osteomyelitis

The pathogenesis of vertebral osteomyelitis typically involves hematogenous seeding of bacteria to the vertebral endplates via segmental arterial supply.[14] The relatively avascular intervertebral disc in adults predisposes to infection spreading from adjacent vertebral bodies.[15]

Once established, the infection can extend to:

- Intervertebral discs
- Epidural space (leading to epidural abscess)
- Paraspinal soft tissues [16]

Psoas Abscess

The psoas muscle originates from the lumbar vertebrae and extends to the lesser trochanter of the femur. Its anatomical proximity to the spine, gastrointestinal tract, kidneys, and major vessels makes it susceptible to infection via multiple routes.[17]

Mechanisms include:

- Hematogenous spread (primary abscess)
- Direct extension from vertebral osteomyelitis
- Spread from intra-abdominal infections such as Crohn's disease or appendicitis[18]

The fascial compartment surrounding the psoas muscle allows infection to spread extensively before clinical detection, contributing to delayed diagnosis.[19]

Microbiology

The microbiological profile of vertebral osteomyelitis and psoas abscess varies depending on the route of infection and patient characteristics.

The most common pathogen is Staphylococcus aureus, accounting for over 50% of cases.[20] Methicillin-resistant S. aureus (MRSA) has become increasingly prevalent, particularly in healthcare-associated infections.[21]

Other organisms include:

- Streptococci
- Enterobacteriaceae (e.g., Escherichia coli)
- Anaerobes (especially in secondary abscess) [22]

In regions such as South Asia, Mycobacterium tuberculosis remains an important cause, particularly in chronic or indolent cases.[23]

Polymicrobial infections are more frequently observed in secondary psoas abscess due to involvement of gastrointestinal flora.[24]

Clinical Presentation Vertebral Osteomyelitis

The hallmark symptom is persistent back pain, reported in over 85% of patients.[25] The pain is typically localized, progressive, and exacerbated by movement. Unlike mechanical back pain, it often fails to respond to conventional

analgesics.

Fever is present in only 35 – 60% of cases, making its absence unreliable for exclusion.[26] Neurological deficits may occur due to spinal cord or nerve root compression, particularly in advanced disease.[27]

Psoas Abscess

The classical triad of fever, back pain, and limp is observed in a minority of patients (<30%).[28] Instead, patients often present with vague symptoms such as:

- Lower back or flank pain
- Abdominal discomfort
- Hip pain or restricted movement
- Malaise and weight loss[29]

A characteristic finding is pain on extension of the hip (psoas sign), although this is not universally present.[30]

Overlap and Spectrum

The coexistence of vertebral osteomyelitis and psoas abscess results in a spectrum of clinical manifestations. Patients may initially present with isolated back pain and later develop systemic or abdominal symptoms as the infection progresses.[31

Diagnostic Challenges in the Emergency Department

The diagnosis of vertebral osteomyelitis and psoas abscess in the ED is particularly challenging due to:

- Non-specific symptoms
- Low initial suspicion
- Overlap with benign conditions[32]

Patients are frequently misdiagnosed with:

- Mechanical back pain
- Sciatica
- Muscular strain [33]

Repeated ED visits before diagnosis are common and represent missed opportunities for early intervention.[34]

Laboratory Findings

Laboratory investigations are supportive but not definitive. Common findings include:

- Elevated ESR and CRP (high sensitivity but low specificity)
- Leukocytosis (may be absent in up to 40% of cases)[35]

Blood cultures are positive in approximately 50 – 70% of cases and are crucial for guiding antimicrobial therapy.[36]

Imaging Modalities

Magnetic Resonance Imaging (MRI)

MRI is the gold standard for diagnosis, with sensitivity and specificity exceeding 90% [37]. It allows early detection of:

- Bone marrow edema
- Disc involvement
- Epidural and paraspinal abscesses[38]

Computed Tomography (CT)

CT is useful in detecting bony destruction and guiding percutaneous drainage procedures. However, it is less sensitive in early stages of infection.[39]

Ultrasound

Ultrasound may detect superficial or large psoas abscesses but is limited by operator dependency and depth of structures.[40]

Management Antimicrobial Therapy

Empirical therapy should cover:

- Staphylococcus aureus (including MRSA)
- Gram-negative organisms

Regimens are adjusted based on culture results.[41]

Treatment duration:

- Typically 6–12 weeks
- Longer in cases of tuberculosis or complications[42]

Interventional Management

Percutaneous drainage under CT or ultrasound guidance is effective for many psoas abscesses and avoids the need for open surgery.[43]

Surgical Management Indications include:

- Neurological compromise
- Spinal instability
- Failure of conservative therapy
- Large or multiloculated abscesses[44]

Complications

Delayed or inadequate treatment may result in:

- Sepsis and septic shock
- Epidural abscess
- Permanent neurological deficits
- Chronic osteomyelitis
- Increased mortality (up to 20%)[45–47]

DISCUSSION

The concept of vertebral osteomyelitis and psoas abscess as a clinical spectrum has important implications for emergency medicine. Their shared anatomical and pathological features necessitate a unified diagnostic approach.

A key challenge lies in differentiating serious pathology from benign back pain. Red flags that should prompt further evaluation include:

- Persistent or worsening pain
- Systemic symptoms
- Risk factors such as diabetes or immunosuppression
- Failure to respond to standard treatment[48]

Early MRI is critical in suspected cases, even when initial laboratory or radiographic findings are inconclusive.

Another important consideration is the global variation in etiology. In developing countries, tuberculosis remains a significant cause, requiring a different diagnostic and therapeutic approach.

A multidisciplinary approach is essential, involving emergency physicians, radiologists, infectious disease specialists, and surgeons.

Future Directions

Emerging diagnostic tools such as advanced imaging techniques and molecular diagnostics may improve early detection. Increased awareness among emergency physicians and the development of clinical decision tools may help reduce diagnostic delays.

Further research is needed to establish standardized protocols for early identification and management in the ED setting.

CONCLUSION

Vertebral osteomyelitis and psoas abscess represent a continuum of serious infections with overlapping clinical features. Their diagnosis in the emergency department is challenging due to non-specific presentations and frequent absence of classical signs.

Maintaining a high index of suspicion, particularly in high-risk patients, is essential. Early imaging, prompt antimicrobial therapy, and timely intervention can significantly improve outcomes and reduce morbidity and mortality.

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