

[Primary Care]

A Pain in the Psoas: Groin Injury in a Collegiate Football Athlete

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General medical conditions are an important part of the differential diagnosis in athletes presenting with pain or injury. A psoas abscess is a collection of pus in the iliopsoas muscle compartment and is a rare cause of hip, low back, or groin pain. Psoas abscesses may have significant morbidity and mortality, as 20% progress to septic shock. Presenting symptoms are generally nonspecific and the onset may be subacute. Clinical presentation may have features suggestive of other diagnoses, including septic hip arthritis, iliopsoas bursitis, and retrocecal appendicitis. Proper diagnosis and management is critical to prevent complications of septic shock and death. In this unique case, a 19-year-old Division 1 collegiate football player presented to the emergency department 4 days following injury to his right groin during football practice. He complained of severe right groin pain accompanied by fatigue, fevers, nausea, and diarrhea. He later developed septic shock with multisystem organ dysfunction, requiring advanced life support. Imaging revealed an abscess located in the right iliopsoas compartment. After proper treatment, the athlete eventually made a complete recovery, returning to collegiate football 4 months postinjury. A literature review found no described cases of psoas abscess related to athletes with acute hip flexor strain. This athlete had no known risk factors for psoas abscess. This case highlights the importance of maintaining a broad differential in an athlete presenting with pain after injury. Making the diagnosis of psoas abscess often requires a high degree of suspicion and timely acquisition of imaging studies. In this particular case, imaging was key to making a proper diagnosis and tailoring treatment not only to return him to sport but also to save his life.

Keywords: iliopsoas; psoas abscess; hip flexor strain

In athletes presenting with pain or injury, general medical conditions, including infections and neoplasms, are an important part of the differential diagnosis. Psoas abscesses are rare medical conditions in which a collection of pus forms in the iliopsoas muscle compartment.

The psoas and iliacus together are considered the iliopsoas muscle, the primary flexors of the hip. The psoas muscle is a long fusiform muscle arising from the transverse processes and lateral borders of T12 to L5 vertebrae. It courses caudally across the pelvic brim, passes deep to the inguinal ligament, anterior to the hip joint capsule to form the psoas tendon, and joins with the iliacus to insert on the lesser trochanter of the femur (Figure 1). The iliopsoas muscle is innervated by L2 to L4 and is located in an extraperitoneal space known as the iliopsoas compartment. Because of the proximity of the iliopsoas muscle with the digestive tract, urinary tract, and iliac lymph nodes, this structure may be predisposed to direct contact with infectious material from the adjacent structures.

Psoas abscesses are caused by bacterial infection of the iliopsoas muscle and are relatively rare. Infection can result

from contamination by local structures or by dissemination through hematogenous or lymphatic spread from distant sites. Common symptoms of a psoas abscess are nonspecific and may include pain and fever. Delays in diagnosis may lead to significant morbidity and mortality due to further spread of the infection.¹⁶

CASE PRESENTATION

A 19-year-old Division 1 collegiate football player presented to the training room 1 day after injuring his right groin during practice. He described a twisting injury on a planted foot, where he felt a pop and immediate pain in the anterior hip. He was diagnosed with groin strain and treated with rest, ice, and anti-inflammatory medication. Four days later, the team physician referred him to the emergency department for increasing groin pain accompanied by fever.

On arrival in the emergency department, the patient complained of severe right groin pain accompanied by increasing fatigue, fevers, nausea, and diarrhea over the previous 24 hours.

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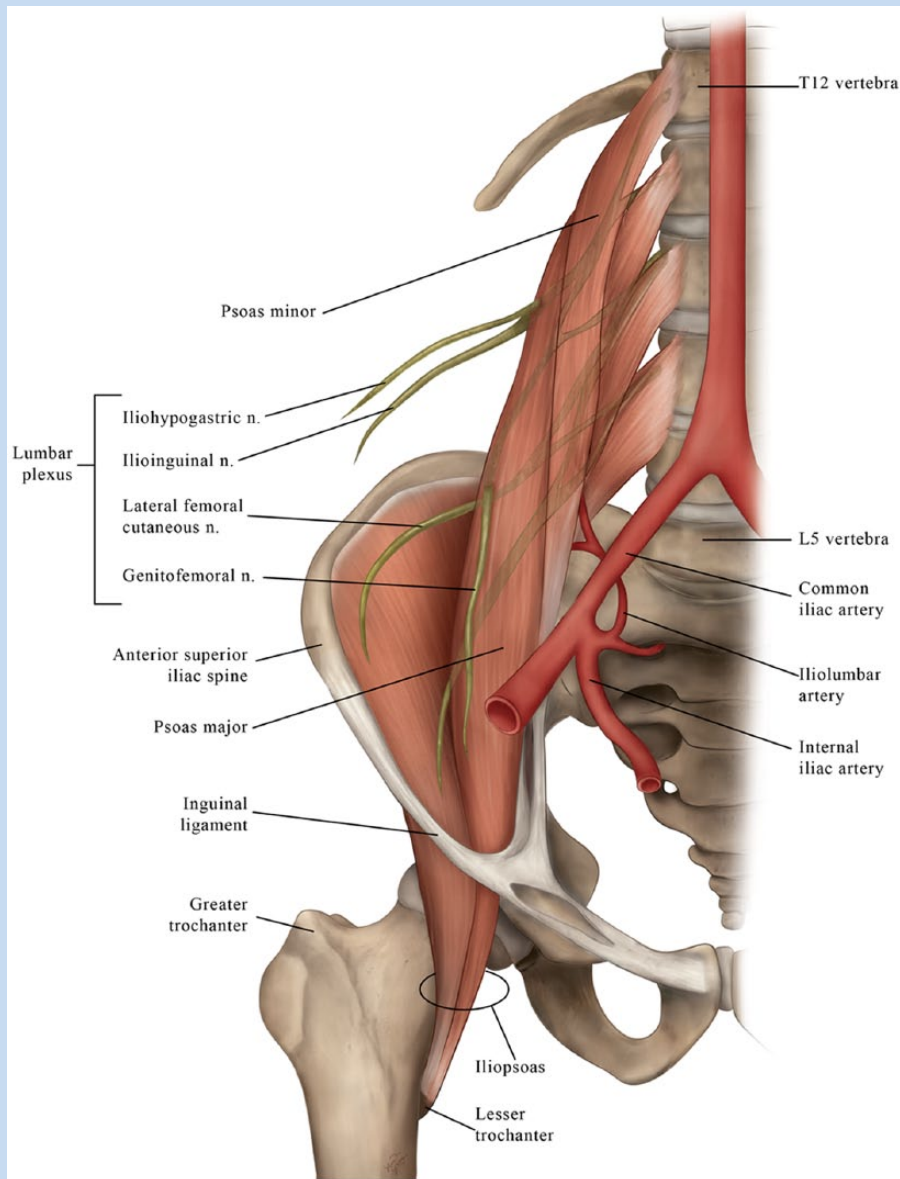


Figure 1. Anatomy of the psoas muscle. Medical illustration by Nicole Northup.

The patient was afebrile with a blood pressure of 114/68 mm Hg and a pulse of 109. Erythematous macular patches were present on his right lower extremity, and a right hip examination was significantly limited secondary to pain. He held the right hip in a flexed and slightly externally rotated position. Laboratory workup revealed mild leukocytosis (white blood count, 17.0×10^3 white blood cells per microliter) and isolated conjugated hyperbilirubinemia (total bilirubin, 4; direct bilirubin, 1.9 mg/dL). Computed tomography (CT) of the abdomen and pelvis showed a right iliopsoas muscle enlargement with a small avulsion fracture at the lesser trochanter and soft tissue stranding suggestive of possible superinfection (Figure 2). He was admitted to the hospital for pain control, intravenous fluids, and magnetic resonance imaging (MRI) with contrast to further evaluate the

psoas muscle. MRI was delayed because of the patient's inability to extend the hip secondary to pain.

Within 24 hours of admission, the patient developed oliguria with acute tubular necrosis and rhabdomyolysis. Contrast MRI was further delayed because of declining renal function. Within hours he became febrile, tachypnic, tachycardic, and hypotensive and was transferred to the medical intensive care unit for management of sepsis and acute kidney injury. Despite broad-spectrum antibiotic therapy, on hospital day 2 he developed septic shock with multisystem organ dysfunction including the cardiovascular, respiratory, and renal systems, and was intubated. A repeat CT revealed possible pyomyositis of the right psoas and he was taken to the operating room for exploration of the right retroperitoneum. The surgeon reported

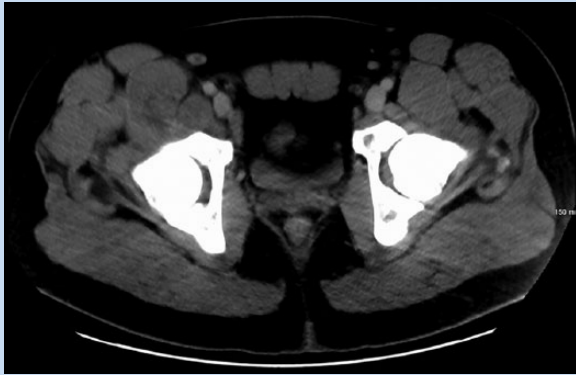


Figure 2. Computed tomography scan of an enlarged psoas muscle with soft tissue stranding.

minimal light turbid fluid; no frank purulence was noted. On hospital day 3 the patient continued to decline, requiring pressor therapy and continuous venovenous hemodialysis (CVVHD). MRI was obtained with gadolinium contrast, which showed a 14.2 × 5.7 × 5.3-cm abscess located in the right iliopsoas and distal myotendinous junction within the anterior thigh compartment (Figure 3). He returned to the operating room for anterior thigh incision, washout, and debridement of the necrotic right iliopsoas muscle. Cultures grew methicillin-sensitive *Staphylococcus aureus*. With targeted antibiotic therapy, the patient made a complete recovery, beginning rehabilitation 6 weeks postinjury and returning to collegiate football 4 months postinjury. At 1 year postinjury, he requested medical hardship due to an inability to return to his previous level of performance.

DISCUSSION

This athlete had no known risk factors for the development of psoas abscess. Psoas abscesses are classified as primary or secondary abscesses according to the mechanism of pathogenesis. Primary psoas abscesses arise resulting from hematogenous or lymphatic seeding of the psoas muscle from a distant site.^{18,21,22} Risk factors for primary psoas abscess include diabetes, intravenous drug use, renal failure, acquired immunodeficiency syndrome, and immunosuppression.^{16,18} Trauma and hematoma formation may predispose to development of a primary psoas abscess.^{9,21} In this case, infection of the psoas was thought to be primary due to hematogenous spread and seeding of a psoas hematoma following acute hip flexor or psoas strain. The infection may have been present prior to injury, although there were no signs or symptoms of infection to support this. Secondary psoas abscesses occur from direct spread of infection to the psoas muscle from an adjacent structure, including the vertebral bodies and discs, the hip joint, the gastrointestinal tract, the genitourinary tract, and vascular structures.^{1,18} Risk factors include trauma and instrumentation in adjacent regions,

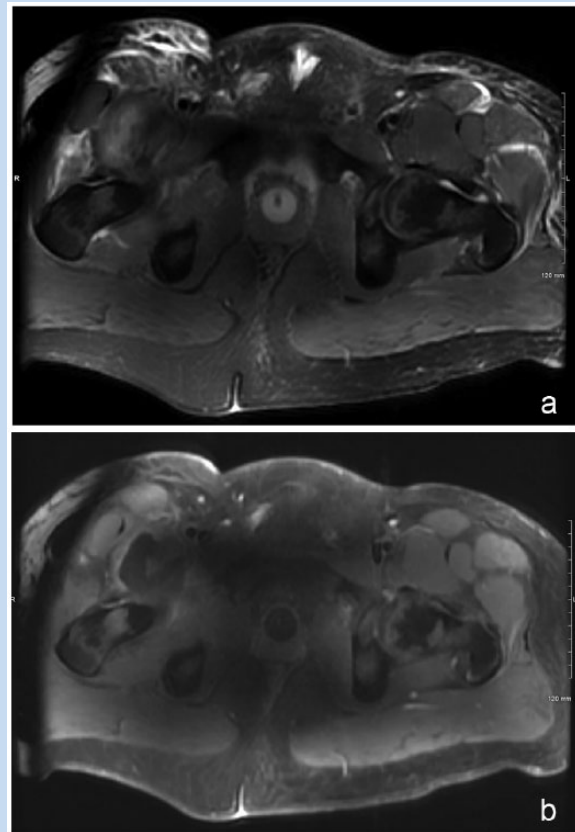


Figure 3. (a) Magnetic resonance T2 fat-saturated image of an enlarged psoas muscle. (b) Enlarged psoas muscle with enhancement postcontrast.

including inguinal, lumbar spine, and hip.^{1,5,6,12,15,26} Primary psoas abscesses are most frequently caused by a single organism, commonly *S aureus*, streptococci (4.9%), or *Escherichia coli* (2.9%).^{2,7,21,27} Secondary psoas abscess may be monomicrobial or polymicrobial (55%); 82% of these contained enteric organisms.²¹ In this case, the source of the infection was methicillin-sensitive *S aureus*, the most common cause of psoas abscesses. The patient responded well to a prolonged course of intravenous nafcillin. Had the organism been methicillin resistant, the infection would have been much more difficult to treat and our athlete may have had a worse outcome.

Psoas abscess is a rare cause of hip, low back, or groin pain, with an incidence reported in children and adolescents of 0.4 per 100,000. The frequency of diagnosis has increased due to advances in imaging technology,¹⁸ and it is more common in men than women, with a median age of diagnosis between 44 and 58 years.^{19,21} As with this athlete, presenting symptoms of psoas abscess are generally nonspecific, and the onset may be subacute, developing over days to months.¹⁵ Clinical presentation may have features suggestive of other diagnoses, including septic hip arthritis, iliopsoas bursitis, and retrocecal appendicitis. Signs and symptoms may include back or flank

pain (91%), fever (75%), inguinal mass, limp, anorexia, and weight loss.^{15,16,18,19,21} The “psoas sign” observed in our patient was pain exacerbated by extension of the hip, stretching the psoas muscle; thus, limitation of hip motion is common.²⁴

Proper diagnosis and management is critical to prevent severe complications of psoas abscess, including septic shock, paralytic bowel ileus, deep venous thrombosis, hydronephrosis, and death. Laboratory studies may reveal leukocytosis, anemia, and elevated inflammatory markers.^{3,15,18,19} CT imaging provides a definitive diagnosis for psoas abscess, although sensitivity may be limited early in the disease.^{8,16,19,25,28} Other findings may include a focal hypodense lesion, infiltration of surrounding fat, and gas or air within the muscle.²⁸ In this athlete, the avulsion fragment noted at the lesser trochanter on CT may have misled physicians, suggesting that pain was due to acute hip flexor injury, lowering infection on our differential. MRI may allow improved definition of soft tissues and adjacent structures.^{13,16,18} After the initial CT scan indicated potential superinfection, soft tissue imaging by MRI was ordered immediately. Unfortunately, the patient was unable to extend his hip to the neutral position required for optimal imaging secondary to severe pain. Imaging was further delayed as his renal function quickly declined and could not tolerate the gadolinium contrast necessary for proper evaluation of an infection. Ultrasound has a low sensitivity and specificity, and the presence of bowel gas and the pelvic bone may make ultrasound diagnosis technically difficult.¹⁴ Definitive diagnosis identifying the etiologic organism(s) requires culture; thus, both blood cultures and abscess material should be obtained. Ideally, these specimens should be obtained when a diagnosis of psoas abscess is confirmed and before initiation of antimicrobial therapy. Blood cultures are positive in 41% to 68% of cases.^{17,21} However, blood cultures throughout the course of disease were negative for bacteria in our athlete. Despite several days of broad-spectrum antibiotics, aspirate of the abscess material at the time of psoas washout and debridement yielded cultures positive for *S aureus*.

Treatment of psoas abscess involves drainage of the abscess and prompt initiation of appropriate antibiotic therapy. Abscess drainage may be achieved via percutaneous drainage or surgical intervention. In one study, percutaneous drainage was successful in 90% of cases.^{4,11,16,18,27} In this case, percutaneous drainage was not feasible, as no focal collection was identified early in the case. After repeat CT revealed possible pyomyositis, the patient was taken to the operating room for surgical exploration of the psoas muscle in the retroperitoneal compartment; however, no infection was identified at this time as the infection was localized more distally, near the psoas insertion on the lesser trochanter. Following acquisition of contrast-enhanced MRI and localization of the focus of infection, the patient returned to the operating room for exploration and drainage of the anterior thigh. Even at this time no localized fluid collection was identified, only necrotic psoas muscle. Directed antimicrobial therapy tailored to the culture and susceptibility results is preferred to empiric antibiotics. For circumstances in which prompt microbial diagnosis is not feasible, empiric antibiotic therapy should

include activity against *S aureus* and enteric organisms.¹⁰ The optimal duration of antibiotic therapy is unclear; however, 3 to 6 weeks after adequate drainage is thought to be sufficient. Follow-up imaging should be performed near the end of the antimicrobial therapy to ensure satisfactory response to therapy with elimination of the abscess. In our athlete, antibiotics were tailored to the culture and susceptibility results and were continued for a total of 6 weeks. Follow-up imaging with MRI showed improvement from prior imaging. Psoas abscesses portend significant morbidity and mortality, with mortality ranging between 2.4% and 19%.²⁰ In untreated cases, mortality approached 100%.¹⁶ Relapses due to inadequate drainage or antimicrobial therapy can occur up to 1 year after initial presentation in 15% to 36% of cases.^{3,19,23} Early diagnosis and proper therapy are critical to reduce these complications and the risk of death.

This case highlights the importance of maintaining a broad differential diagnosis in an athlete presenting with pain after injury. Making the diagnosis of a psoas abscess often requires a high degree of suspicion and timely acquisition of imaging studies. In this particular case, MRI was initially delayed secondary to the patient's pain level and declining kidney function, but was key to making a proper diagnosis and tailoring treatment. The most important factor in the care of this patient was maintaining a high index of suspicion and continuing to search for a cause and focus of infection.

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