

Lower-extremity Soft Tissue Infections With Intra-abdominal Sources

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abstract

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This article describes a series of 3 patients who presented with lower-extremity soft tissue infections. Each patient was treated with prompt debridement by an orthopedic surgeon (J.F.G.) and required at least 1 additional procedure by another surgeon.

These infections vary from superficial cellulitis to rapidly advancing necrotizing fasciitis. At times, the source of these infections is clear. Other times, no obvious source of infection exists, in which case the abdomen must be considered as a possible source of infection. A high level of suspicion, complete history and physical examination, and appropriate ancillary studies are required to make an accurate and prompt diagnosis. Options for the treatment of the intra-abdominal source of infection depend on the etiology of the infection and anatomic location of the process. Psoas abscesses can often be decompressed by an interventional radiologist using computed tomography guidance. In the case of bowel involvement, such as suspected carcinoma or diverticulitis, a general surgeon is necessary. When the appropriate diagnosis is made, soft tissue infections of the thigh often respond to appropriate surgical debridement and antibiotic therapy. It is important to remember the whole patient when evaluating soft tissue infections, especially in the thigh. A low threshold for imaging of the abdomen and pelvis is important, especially when the physical examination or medical history reveals the abdomen as a possible source of infection.

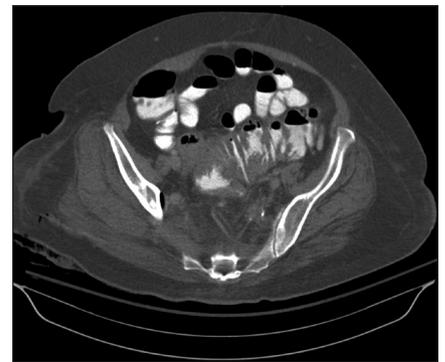


Figure: Computed tomography scan of the abdomen revealing a small abscess in the region of the sigmoid colon, with thickening of the bowel wall (center) and inflammation in the right gluteal musculature.

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Orthopedic surgeons often evaluate patients with suspected soft tissue infections of the extremities. This infectious process ranges from superficial cellulitis or abscess to pyomyositis. At the extreme, necrotizing fasciitis, a suppurative infection of the deep fascia, may be suspected.¹

When evaluating patients with soft tissue infections, a complete history and physical examination are essential. When the source of infection is not apparent, it is important to search for a systemic cause. In the lower extremities, the abdomen should be explored as a possible source of infection.

This article describes a series of 3 patients who presented with lower-extremity soft tissue infections. Each patient had intra-abdominal sources of infection. Addressing this retroperitoneal source resulted in clinical improvement and disease resolution. Each of the 3 patients consented for his or her case to be reported.

CASE REPORT

Patient 1

A 56-year-old woman with a history of diverticulitis was transferred to our facility after right thigh magnetic resonance imaging (MRI) revealed extensive edema, abnormal soft tissue about the right trochanter, and extensive air throughout the subcutaneous and deep tissues of the posterolateral thigh (Figure 1). The patient had been treated by her primary care physician for a presumed diverticulitis flare-up 1 week previously. On admission, the patient was afebrile, slightly tachycardic, and hemodynamically stable. White blood cell count was 22,400, C-reactive protein was 7.63, and hyponatremia with sodium was 126. The patient had been started on empiric broad-spectrum antibiotics (clindamycin and vancomycin) prior to arrival.

Physical examination revealed mild erythema, swelling, and tenderness, with fluctuance about the greater trochanter extending distally for approximately 8 cm. Hip range of motion (ROM) produced

significant pain out of proportion to the observed skin lesions. Crepitus existed just proximal to the knee, but no tenderness occurred with palpation or knee ROM. The patient underwent wide excision and drainage.

Surgical debridement involved an approximately 64-cm incision from the most proximal aspect of the posterior gluteus maximus and extending distally to just past the knee joint. A small incision was made in the fascial layer over the greater trochanter, and copious amounts of purulent fluid poured from the wound. The fascial incision was continued down the lateral side of the thigh, revealing profuse amounts of purulent fluid draining from nearly every compartment, including proximal to the femur; along the iliac crest at the greater trochanter; at the lesser trochanter; in the anterior, lateral, and medial compartments of the thigh; and distally to just above the patella. When irrigation and debridement were complete, the patient's hip and knee joints were examined. No purulent fluid egressed from either joint.

Blood cultures were negative; however, cultures from the right thigh were positive for *Candida albicans*, coagulase-negative *Staphylococcus*, and *Peptostreptococcus* species. Pathology samples from the right thigh revealed necropurulent tissue and chronic inflammation with fat necrosis, consistent with necrotizing fasciitis.

The patient underwent computed tomography (CT) of the abdomen and pelvis, which demonstrated a small area of perforated diverticulitis in the sigmoid colon tracking to the right and down just posterior to the obturator canal into the right upper leg, and thus, was the source of infection (Figure 2). She then underwent exploratory laparotomy, lysis of adhesions, sigmoidectomy with end-colostomy, and 2 additional right thigh debridements, with eventual resolution of the acute infection.

Last follow-up was 14 months postoperatively. The patient's thigh wound healed uneventfully, with no recurrences.

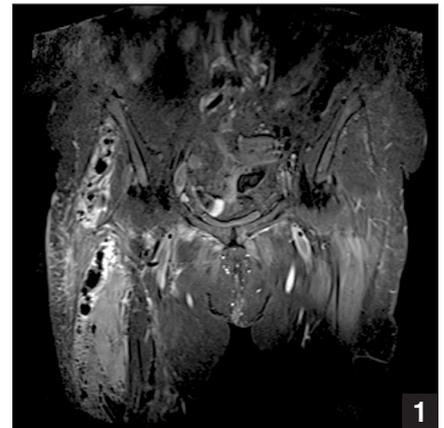


Figure 1: Short tau inversion recovery sequence magnetic resonance image of the pelvis revealing subcutaneous emphysema and increased signal in the thigh musculature, gluteal musculature on the right side, and increased signal along the fascial planes, signs of an advanced necrotizing soft tissue infection.

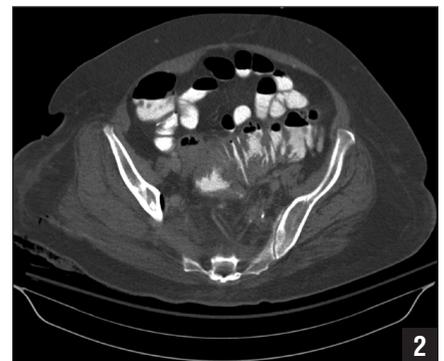


Figure 2: Computed tomography scan of the abdomen revealing a small abscess in the region of the sigmoid colon with thickening of the bowel wall (center) and inflammation in the right gluteal musculature.

Patient 2

A 70-year-old man with a history of metastatic rectal cancer presented to the emergency department with a several-week history of increasing left thigh and leg pain. He had undergone a low anterior resection 2 years previously, complicated by *Clostridium difficile* colitis and an anastomotic leak. This was treated with appropriate antibiotics (vancomycin initially and trimethoprim/sulfamethoxazole on discharge) and a diverting loop ileostomy. A postoperative barium enema showed a small abscessed cavity of approximately 2×2 cm right behind the anastomosis, which was

well contained. He underwent ileostomy takedown and reanastomosis. Postoperative CT revealed fluid behind the anastomosis in the presacral space. The fluid was a couple of centimeters in diameter and was asymptomatic; therefore, it was left untreated.

The patient was being actively treated with chemotherapy (oxaliplatin and avastin). He had been evaluated at another facility just prior to admission because of hyperglycemia, diarrhea, and left hip pain; he had stabilized and was discharged. The patient then presented to his general surgeon for routine follow-up. He was tachycardic, with a pulse of 110 beats per minute, and had significant left hip tenderness. He was transported to the emergency department for evaluation.

On presentation, pulse was 112 beats per minute, blood pressure was 103/75, respiratory rate was 15, temperature was 98.7°F, and oxygen saturation was 95% on a 2-L nasal cannula. He was hyponatremic (sodium 129) and acidotic and had a white blood cell count of 21.4, erythrocyte sedimentation rate of 38, and C-reactive protein of 338.56. Examination of the left hip revealed some induration and crepitus on the lateral aspect over the area of the greater trochanter and proximally in the gluteal muscles. Hip ROM caused pain over the lateral aspect of the thigh. Left hip radiographs demonstrated extensive soft tissue gas overlying the left hip, a sign of potential infection (Figure 3). The patient underwent decompression.

A standard lateral approach to the hip was made. When the iliotibial band was opened, liquid stool began draining from the wound. Pockets existed anterior and posterior to the femur. The general surgical team performed an exploratory laparotomy to find the source of the leak. When the abdomen was opened, no evidence existed of contamination. A possibility existed that this process was occurring low in the pelvis and was a perirectal abscess or a complication of the anastomosis. Transverse loop colostomy was performed for diversion.

The patient underwent 7 debridements of the left thigh while the general surgeons attempted to control the abdominal infection. Resolution of the intra-abdominal infection resulted in clinical improvement and resolution of the infection. He was stabilized and discharged to a skilled nursing facility.

Six months postoperatively, the hip wound was healed. The patient developed decubiti, which required partial sacrectomy. One year after initial thigh debridement, the patient died from multiple medical problems.

Patient 3

A 47-year-old man presented with right shoulder, hip, and knee pain (Figure 4). He had a medical history of hepatitis C, hepatic encephalopathy, and bilateral shoulder avascular necrosis after undergoing right shoulder hemiarthroplasty in 2005. Two years postoperatively, the patient underwent irrigation and debridement of the shoulder for septic arthritis. He underwent resection arthroplasty with an antibiotic spacer and subsequent repeat right shoulder hemiarthroplasty.

On presentation, the patient was afebrile and hemodynamically stable. On examination, he was oriented to person only. He had significant right shoulder pain with ROM. Examination of the right lower extremity revealed a right knee effusion but no obvious erythema. Pain occurred with knee and hip ROM, although localizing the pain was difficult. White blood cell count was 19.6, erythrocyte sedimentation rate was 33, C-reactive protein was 141.55, and sodium was 126. Plain right hip radiographs revealed signs of degenerative joint disease but no fracture or acute process. Plain right knee radiographs revealed a large joint effusion. Shoulder radiographs showed well-seated hardware.

Right shoulder and knee arthrocentesis was performed. Approximately 75 mL of cloudy, murky, purulent-looking material was obtained from the right knee, as well as several milliliters of cloudy, purulent material from the right shoulder. Synovial



Figure 3: Plain anteroposterior pelvis radiograph showing extensive subcutaneous air on the lateral aspect of the left hip, indicating the presence of gas-forming bacteria. Cultures from this specimen grew multiple aerobic and anaerobic bacteria.



Figure 4: Plain lateral right knee radiograph revealing a large joint effusion.

fluid from the right knee had a white blood cell count of 1,422,000. Synovial fluid from the right shoulder had a white blood cell count of 265,000. Cultures for both joints were positive for methicillin-resistant *Staphylococcus aureus* (MRSA). The patient underwent right knee and shoulder irrigation and debridement. Postoperative CT-guided right hip arthrocentesis was negative for infection.

The patient required several additional knee and shoulder debridements, including right shoulder resection arthroplasty. Approximately 2 weeks after initial debridement, the patient reported continued right thigh pain. Examination revealed that his thigh was erythematous, swollen, and indurated. Pelvis and right thigh MRIs (Figure 5) demonstrated myositis and su-

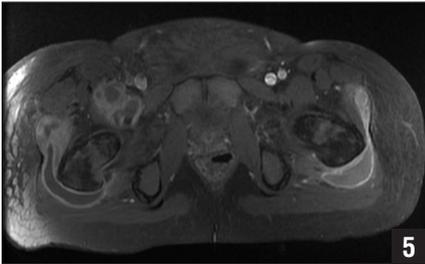


Figure 5: Axial T1-weighted pelvis magnetic resonance image with gadolinium revealing contrast enhancement of the right and left gluteal musculature, with an abscess on the right just posterior to the rectus femoris. Note the increased signal in the subcutaneous tissues and along the fascial planes on the right side, indicating fasciitis.

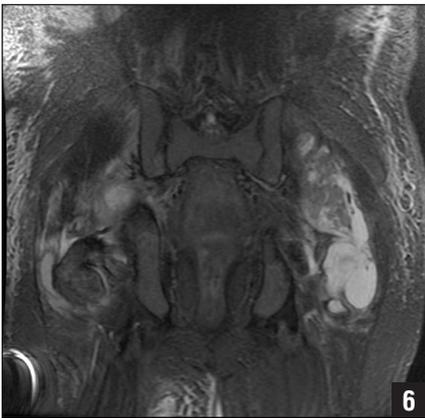


Figure 6: Short tau inversion recovery sequence magnetic resonance image of the pelvis, revealing multiple areas of increased signal, on the right and left sides. A large abscess exists on the left side in the psoas musculature, and large areas of myositis exist on the right side.

perforated cellulitis, with an anterior abscess underneath the fascia lata. The patient underwent right thigh debridement using an anterior approach. A large pocket of purulence and serosanguinous material existed in the interval between the tensor fascia lata and sartorius, which was debrided and copiously irrigated.

Further imaging demonstrated extensive, multiloculated abscesses in the retroperitoneum. Abscesses existed in the left gluteus medius and the right psoas muscle abscess, with extension into the epidural space (Figure 6). Interventional radiology placed a drain in the psoas abscess and the right gluteal abscess.

The infectious disease department managed his antibiotic regimen. He was initially treated with intravenous (IV) vancomycin and was switched to IV daptomycin. He was discharged with a peripherally inserted central catheter line for a prolonged course of IV daptomycin.

Follow-up CT approximately 3 months postoperatively demonstrated marked improvement in the right psoas abscess with a tiny residual, and the patient was asymptomatic. The right knee and shoulder incisions were well healed, with no signs of infection. A fistula in the right thigh continued to drain, but the patient was able to ambulate with no difficulty. Thirteen months postoperatively, the patient had no further recurrence of infection or pain.

DISCUSSION

Lower-extremity soft tissue infections are commonly treated by orthopedic surgeons. The infectious process can range from superficial to deep. When the source is clear, the treatment plan is often straightforward. Tenets of treatment include prompt recognition, appropriate thorough and systematic debridement, and initial broad-spectrum antibiotics, followed by culture-directed therapy.^{1,2} When appropriate, other medical services should be consulted to assist with the management of comorbidities.

When the source of infection is not apparent or the patient does not improve after initial treatment, a remote source of infection must be suspected. In lower-extremity soft tissue infection, the abdomen must be considered as a source, especially in patients with a history of cancer or who are otherwise immunocompromised. Initial evaluation should include CT of the abdomen and pelvis with IV and oral or rectal contrast.³ The abdomen and pelvis communicate with the extremities through fascial planes, and hematogenous spread is always a possibility. Maintaining a low threshold to image the abdomen and pelvis and involve other services is important to ensure appropriate care; multiple reports

have been published of an intra-abdominal source of infection or malignancy as the cause of necrotizing infections in the extremities.⁴⁻¹⁵

Options for the treatment of an intra-abdominal source of infection depend on the etiology of the infection and anatomic location of the process. Psoas abscesses can often be decompressed by an interventional radiologist using CT guidance. A general surgeon is necessary when bowel involvement is suspected, such as suspected carcinoma or diverticulitis.

CONCLUSION

When the appropriate diagnosis is made, soft tissue infections of the thigh often respond to appropriate surgical debridement and antibiotic therapy. It is important to remember the whole patient when evaluating soft tissue infections, especially in the thigh. A low threshold for imaging of the abdomen and pelvis is important, especially when history and physical examination or medical history reveal the abdomen as a possible source of infection. In addition, including a general surgery team in the evaluation may help with more prompt and appropriate recognition of the source of infection and, therefore, quicker resolution. ■

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