Candida infection associated with a solitary mycotic common iliac artery aneurysm

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We report on a case of an isolated common iliac artery aneurysm infected by Candida albicans. To our knowledge, only one other case of this condition has been reported. The patient, a 49-year-old man with diabetes mellitus and a history of fungal urinary tract infections, had recurrent right knee pain and swelling. The knee effusion grew Candida. Mild right hydronephrosis and a 4.6-cm aneurysm of the right common iliac artery without involvement of the aorta or iliac bifurcation was revealed by means of a computed tomography scan. The aneurysm wall was inflammatory, and there was associated purulence at the time of operation. The right ureter was densely adherent to the anterior aspect of the aneurysm, but could be palpated and dissected free because of a ureteral stent that was placed before the surgical incision. The aneurysm was resected, and the proximal and distal margins were oversewn without graft placement. Candida was found in the resected aneurysm. The patient recovered without limb-threatening ischemia or claudication, but the distance he could walk remained limited because of right knee symptoms. The aneurysm may have formed by direct extension of infection from the right ureter or by hematogenous or lymphatic spread. This case raises interesting issues about operative strategies and etiology. (J Vasc Surg 2001;34:166-8.)

Osler first used the term “mycotic aneurysm” in 1885.1 He described the autopsy of a patient who had aortic valve vegetations and four aneurysms of the aortic arch, which were covered with “fresh fungal vegetation.” Osler was describing the mushroom-like appearance of the material lining the aneurysms rather than an actual fungal infection, but the easily misinterpreted terminology has persisted. Although “mycotic” literally means “fungal,” the medical literature refers to any infected aneurysm as a mycotic aneurysm. Isolated iliac artery aneurysms of any nature are uncommon,2 and, to our knowledge, only 1 other fungal infection of an isolated common iliac artery aneurysm has been reported.3 Our case is also unusual because there was no known history of systemic fungal infection. Presentation, possible etiologies, and treatment are discussed.

CASE REPORT

A 49-year-old man who had diabetes mellitus and did not have the human immunodeficiency virus came to the medical clinic with a 2-month history of intermittent right knee effusion. His medical history included hypertension, poorly controlled insulin-dependent, adult-onset diabetes mellitus, and a 2-year history of intermittent fungal urinary tract infections (UTIs) that were treated with fluconazole. There was no history of illicit drug use or urinary tract instrumentation.

Two months before his admission, the patient experienced painful right knee swelling. The results of arthrocentesis performed at an outside hospital were negative for crystals, and the culture showed no growth. His symptoms improved briefly, but recurred 1 month before admission. At that time, many white blood cells (WBCs) were shown by means of arthrocentesis, but, again, no crystals were seen, and the culture results were negative. The knee was injected with corticosteroids, and the patient was given indocin. The symptoms briefly resolved, but several days before admission, the right knee pain and effusion returned with much greater severity, requiring the patient to use a cane for ambulation. There was no history of fevers, chills, or other systemic symptoms.

On admission, the patient was afebrile. The right knee was erythematous and tender, and an effusion was present. There were no heart murmurs. The abdomen was not tender (the patient was taking narcotics for knee pain), without distention, and no masses were appreciated. There were petechiae around the right knee and multiple small skin discolorations on the foot, which were considered to be the result of a dermatitis, inflammatory reaction, or embolic phenomena. Arthrocentesis returned purulent material that had $471,000$ WBCs/mL (95% neutrophils), and culture results were positive for Candida albicans. The urine culture also grew Calbicium, but no growth of fungi or bacteria was shown by means of blood cultures performed throughout the patient’s hospital stay. The serum WBC count was 14,000 with no bands. The patient started taking amphotericin B and cephazolin, and another arthroscopy was performed to debride the knee as the workup continued.

Results of chest radiographs were normal. Mild osteoarthritis and an effusion were shown on radiographs of the knee. No valvular abnormalities, vegetations, or mural thrombi were shown.
by means of transthoracic echocardiography. Mild right-sided hydronephrosis, a dilated right ureter, and a 4.6-cm aneurysm isolated to the right common iliac artery were revealed by means of a computed tomography (CT) scan. The aneurysm had inflammatory changes and an irregular lumen (Fig 1). The aorta and the other iliac arteries appeared normal. Ankle-brachial indices (ABIs) were 0.78 for the right dorsalis pedis artery (DP) and 0.97 for the right posterior tibial artery (PT). ABIs for the left DP and PT were both normal.

A diagnosis of mycotic aneurysm with suspected distal embolization was made, and surgery was performed. A right ureteral stent was placed, and then a retroperitoneal approach was used to expose the aneurysm. The patient’s anatomy was as expected from the preoperative CT scan. The fusiform aneurysm had marked inflammatory changes and was surrounded by a pocket of purulent material. The right ureter was densely adherent to the anterior aspect of the aneurysm, but was readily palpable because of the ureteral stent. Proximal and distal control was obtained, including the aorta, the left common iliac artery, the right external iliac artery, and the right internal iliac artery. After dissection of the ureter from the aneurysm, the common iliac artery and aneurysm were resected, and the resection margins at the aortic bifurcation and the iliac bifurcation were oversewn. The distal resection margin was oversewn to maintain continuity between the right internal and external iliac arteries. Capillary refill of the right foot was 2 seconds, and a strong pedal Doppler signal was present, so no bypass graft was placed. A drain was placed, and the skin was left open.

Fungal elements consistent with *Candida* were shown by means of the results of a histologic examination of the aneurysm (Fig 2), and the results of a culture of the purulent material were positive for *C albicans*. Postoperative ABIs were 0.45 and 0.44 for the right DP and PT, respectively. The WBC count returned to normal on postoperative day 4, and the patient was discharged on postoperative day 10. Intravenous amphotericin B continued to be given, for a total of 2 g in a 4-week period.

No evidence of recurrent infection or ureteral dilatation was shown by means of CT scans performed 5 and 12 months postoperatively (Fig 3). Continuity between the internal and external iliac arteries was maintained. Twelve months postoperatively, the patient had experienced no claudication or rest pain, and ABIs remained stable. He did not participate in vigorous activity, however, in part because of modest limitations from his right knee.

**DISCUSSION**

Common medical terminology refers to infected aneurysms as “mycotic.” Only 2% of mycotic aneurysms have true fungal infections, and these are most often located in the aorta and cerebral vasculature. After extensive review, we could find only 1 other report of an isolated common iliac artery aneurysm caused by a fungal infection.

Historically, the etiology of mycotic aneurysms has been a result of cardiogenic bacterial emboli, but arterial trauma associated with drug abuse is now the most common cause of mycotic aneurysms. It is difficult to determine a common cause of true fungal aneurysms because of their rarity. Fungal endocarditis, parenteral hyperalimentation, and colonoscopic polypectomy have all been implicated as causes of systemic fungal infections. Our case...
is unusual because the patient had a history of fungal UTIs without a history of systemic fungal infection.

Although the specific cause of this aneurysm cannot be determined, several possibilities exist.\(^8\) It seems unlikely that an occult source for a systemic candidemia could have independently seeded the bladder, iliac artery, and knee without being detected at the initial or subsequent examination. It is also unlikely that the primary infection was at the knee, with hematogenous or lymphatic spread to the artery and bladder. It seems more plausible that a candidal UTI may have caused a subclinical systemic infection, seeding both the iliac artery and the knee. It is also possible that the iliac artery was infected by direct extension of Candida from the right ureter. Given the rarity of isolated common iliac artery aneurysms,\(^2\) a family and personal history that was negative for aneurysms, and the patient’s young age, it is unlikely that a preexisting aneurysm became infected. The history of fungal UTIs, lack of systemic septic illness, documented urinary retention, and negative blood culture results at all times lead to the suspicion that the aneurysm may have formed by direct extension of fungus from the right ureter.

Amycotic aneurysm presents difficult surgical options. Resection without bypass grafting can result in an amputation rate as high as 30%, and this risk is highest when the aorta, iliac bifurcation, or femoral bifurcation is involved.\(^8,9\) A common approach is to resect the aneurysm and perform an extra-anatomic bypass grafting procedure.\(^3-7,10\) This approach does not eliminate the risk of infected prosthetic material because of blood-borne bacteria or fungi, however.\(^9,10\) Other options include resection with in situ bypass grafting with either a synthetic or autologous graft. Placing synthetic material into a contaminated field carries a higher risk of graft infection, whereas a vein graft in a contaminated field can be complicated by pseudoaneurysm or anastomotic rupture. Bypass grafting with deep veins from the lower extremity has been superior to that with the saphenous vein, but this requires a more extensive procedure.\(^11\)

Little is known about the outcomes for fungal aneurysms because of their rarity, but the results for resection of mycotic aneurysms generally vary by anatomic location. Mycotic iliac aneurysms have a 67% sepsis rate when polyester fiber (Dacron) is placed in situ, with an overall mortality rate of 33%.\(^4\) True fungal graft infections are associated with a mortality rate of 35% or higher.\(^12\) In this case, the internal iliac artery did not have to be sacrificed, and distal perfusion was good, so we chose to avoid the risk of an extra-anatomic bypass or interposition graft. If the patient had had symptoms of claudication or rest pain, a bypass grafting procedure could have been performed subsequently. Because of the patient’s excellent recovery and absence of symptoms with resection alone, bypass grafting was not necessary.

Traditional antibiotic treatment is a cumulative 2- to 3-g dose of amphotericin. It is unclear whether treatment should be continued for an extended period. The largest review of fungal graft infections does not address maintenance antimicrobial treatment when a graft is placed.\(^7,13\) In this case of resection alone, continuing intravenous amphotericin for a total dose of 2 g in 1 month appears to have been efficacious in treating any remaining infection.

**REFERENCES**
