Mycotic aneurysm: a rare complication of vertebral osteomyelitis

MARÍA C. BETANCOURT, MD*; RAYSA MENA, MD*; MIGUEL COLÓN, MD, FACP†

We report the case of a 49-year-old man that presented with persistent low back pain after being treated for vertebral osteomyelitis. An abdominopelvic CT scan with intravenous contrast showed a mycotic aneurysm of the abdominal aorta. The patient was taken to the operating room where a bypass reconstruction surgery was successfully performed.

The history, pathophysiology, most common organisms, risk factors, and clinical presentation of mycotic aneurysms are discussed. The importance of a high index of suspicion for prompt and proper diagnosis and treatment, is emphasized to create awareness about this dreadful complication of vertebral osteomyelitis.

Key words: Mycotic aneurysm, Vertebral osteomyelitis, Back pain.

A 49 year-old man with epilepsy, hypertension, hepatitis C, intravenous drug abuse and heavy alcohol intake was admitted to a nearby hospital due to low back pain. The patient reported a blunt trauma to his back during a fist fight several months prior to admission. Since then, he had been suffering from low back pain not relieved with oral analgesics. He had also undergone two spinal blocks without significant improvements of his symptoms. A lumbar spine MRI and CT scan were performed showing severe degenerative disc disease and osteomyelitis, for which he was hospitalized and received a 42 days course of intravenous antibiotics.

Six months after discharge, the patient continued with low back pain. Upon evaluation at our institution he also reported unquantified fever, sweating, and difficult ambulation due to pain. He denied abdominal pain, nausea, vomiting, diarrhea, changes in bowel habits, urinary urgency or incontinence, weakness or paresthesias.

Physical examination revealed a temperature of 36.6, heart rate of 83 bpm, respiratory rate of 18 and blood pressure of 130/70. Heart rate was regular with no audible murmurs or gallops. Lungs were clear to auscultation bilaterally. Abdomen was soft and depressible with no tenderness or palpable masses or visceromegaly. The rest of the physical examination was unremarkable except for a slow ambulation with the help of a cane.

Laboratories upon admission showed WBC count of 6.3, Hgb 13.8, PTT 16.5, erythrocyte sedimentation rate of 5, C-reactive protein of 0.052mg/dl, and negative HIV. Serum chemistry and urinalysis were within normal limits. Chest X ray did not show any acute cardiopulmonary process. Blood cultures showed no growth in 5 days.

An abdominopelvic CT scan with intravenous contrast (Figure 1) showed erosive changes at vertebral bodies L3 to L5 suggestive of osteomyelitis and diskitis. The abdominal aorta presented a double lumen capting contrast superiorly to the bifurcation of the common iliac arteries. An area of fluid density was visualized surrounding this

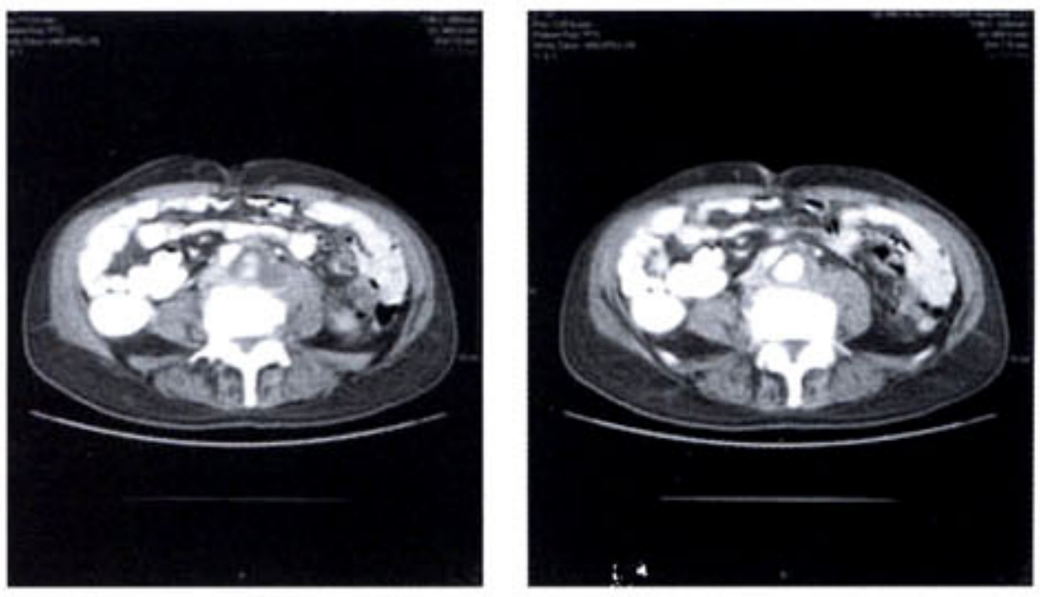

Figure 1: (A) An abdominopelvic CT scan with intravenous contrast showing erosive changes at vertebral bodies L3 to L5 suggestive of osteomyelitis and diskitis. The abdominal aorta presents a double lumen capting contrast superiorly to the bifurcation of the common iliac arteries. An area of fluid density is visualized surrounding this double lumen and is intimately associated with the vertebral bodies at L3-L5 levels, suggesting a mycotic aneurysm. (B) Abdominopelvic CT scan 7mm below (A).

*Internal Medicine Resident, San Juan City Hospital, †Professor of Infectious Diseases, San Juan City Hospital.

Address correspondence to: Maria C. Betancourt, MD, Internal Medicine Department, San Juan City Hospital, CCMS #79, PO Box 70344, San Juan, P.R. 00936-8344.

double lumen and was intimately associated with the vertebral bodies at L3-L5 levels. These findings are highly suggestive of a mycotic aneurysm of the abdominal aorta. The patient was then taken to operating room where a bypass reconstruction was successfully performed.

Discussion

A mycotic aneurysm can be defined as a localized irreversible dilation of the arterial wall as the result of an infectious process. The term "mycotic aneurysm" has been used since 1885 when Osler described beadlike aneurysms resulting from infection on a vessel wall of a patient with bacterial endocarditis (1). The lesion seemed like "fresh fungus vegetations" (2), for which he used the term "mycotic", even when the etiology was not related to a fungal infection.

Before the advent of antibiotic use, mycotic aneurysms were associated to patients with infective endocarditis in 86% of cases (1). Thus, the most common organisms were *Streptococcus pneumoniae* and *Haemophilus influenzae* (3,4). However, as antibiotic therapy has evolved, the incidence of bacterial endocarditis has diminished, with a concomitant change in the microbiology of these vascular infections. Today, 60% of cases of mycotic aneurysms of the aorta are related to gram positive cocci, with *Staphylococcus aureus* being the most common (40% of gram positive infections) (5). Gram negatives also play an important role, with *Salmonella* (second in incidence with 15 to 24% of cases (6,7)) and *Pseudomonas aeruginosa* being the most common. *Streptococcus pneumoniae* has recently regained importance with emerging cases of penicillin resistant cases. *Streptococcus pneumoniae* has been occasionally associated with sickle cell disease, but is also rarely reported as a cause of vertebral osteomyelitis, which may be an initial focus of infection leading to aneurysm formation. Other rare pathogens, usually in immunocompromised hosts, include fungi (*Candida, Cryptococcus and Aspergillus*), gram negatives (*Klebsiella, Campylobacter, Yersinia*, and *Brucella*), gram positives (*Rothia entocariosa, Clostridium, Corynebacterium*) and others like *Coxiella burnetti* and *Mycobacterium tuberculosis* (9).

Mycotic aneurysms are classified according to the mechanism by which they are formed. True mycotic aneurysms involve all layers of the arterial wall. Those that involve only a portion of the arterial wall are called false or pseudoaneurysms (9). True mycotic aneurysms are the result of "septic emboli originating from endocarditis on a normal or atherosclerotic aorta" with subsequent degeneration and enlargement of the arterial wall to form an aneurysm (3). On the other hand, an already formed aneurysm may become infected as the result of bacteremia and hematogenous seeding of the aortic wall. A traumatic infected aneurysm results from direct trauma in which pathogens are inoculated directly into the vessel wall. This has been described as a complication of a stab wound, or even self induced, iatrogenic, or due to intravenous drug abuse. Although bacterial endocarditis has historically been suggested as the source of infection, emboli may arise from a concomitant or contiguous site of infection. In 17% of cases (9), mycotic aneurysms have been identified as a complication of vertebral osteomyelitis, needle punctures or wounds overlying superficial vessels.

Regardless of the mechanism by which the mycotic aneurysm forms, theories suggest that septic emboli lodge into the vasculature that supplies the aortic walls, also known as the vasa vasorum. As a result, blood supply is impaired and the muscular layers of the vessel are destroyed. Arterial pressures cause the vessel to dilate and enlarge until the aneurysm is formed (3).

Mycotic aneurysms may occur anywhere in the cerebral or systemic circulations, although increased incidence at sites of vessel bifurcation has been described (10). They have been reported on the abdominal aorta (31%), femoral artery (38%), superior mesenteric artery (8%), carotid artery (5), iliac (6%), and brachial (7%) (9, 6).

Although an infected aortic aneurysm is a very rare condition that can occur in any patient, some predisposing factors have been described. Patients at higher risk include those immunocompromised, as in diabetics, alcoholics, HIV, and those treated with steroids or chemotherapy. Age over 50 year-old has been described as a risk factor in view of the higher incidence of atherosclerosis (9, 11, 12). Especially in the elderly, atheromatous plaques provide an easier attachment site for microorganisms due to its irregular surface. The presence of any of these factors should raise concern about the possibility of a mycotic aneurysm among the differential diagnosis.

The clinical presentation of a mycotic aneurysm may be nonspecific and depends on the site of the lesion. Patient may present with general malaise, weakness, fever, back or abdominal pain. A painful and pulsatile or enlarging mass that has been classically described may not be present in most patients. Patients may present with complaints of gastrointestinal bleeding (aortoduodenal aneurysm) (9), limb ischemia, dysphagia (subclavian artery), endobronchial mass (pulmonary artery), or osteomyelitis of spine (9). Laboratories may show leukocytosis and anemia. Although positive blood cultures confirm a suspected mycotic aneurysm on imaging studies, they may be negative in up to 50% of cases (3).

In the past, most cases were diagnosed postmortem (1), but the advent of imaging technology has increased the

capability of diagnosis. Computed tomogragy (CT scan) with contrast has been considered the study of choice (9, 13). It has 100% sensitivity for abdominal aortic aneurysms and offer better visualization of the retroperitoneal structures, size definition, and extention to periaortic tissue (14). Ultrasound can also be useful for diagnosis and may be performed bedside, which may be very important and time saving for unstable patients. But on the other hand, ultrasound may limit image in obese patients and cannot detect leakage, rupture or branch of the artery involved (14). Angiography has been considered as the definitive diagnostic tool (9, 15) since it determines the exact location, extravasation or occlusion and helps in surgery planning (9). Nonetheless, this test is limited by the risks of complications, costs, and is time-consuming, for which it is not routinelly used for aneurysm diagnosis (14). Magnetic resonance has been used in place of angiography (9) and plays a role in stable patients and in those allergic to dyes (14), and also helps in surgery planning.

A high index of suspicion accompanied by an early, accurate diagnosis and proper surgical and medical treatment may decrease patient's mortality in up to 38% of cases(16). Treatment consists of prompt surgical repair and antibiotic therapy. Antibiotics should be given according to the pathogens suspected upon patient presentation. Once blood culture results are available, therapy should follow sensitivities. Therapy should be started before surgical intervention and continued for a minimum of six weeks postoperativelly (3). A longer course may be considered for patients showing persistently increased inflammatory markers as increased white blood cells, C- reactive protein and erythrocyte sedimentation rate. In cases of immunocompromised patients, life long suppressive therapy has been considered (6).

As compared to nonmycotic aneurysms, the size of the aneurysm does not determine the time for surgery. Independent of the size, all mycotic aneurysms should be surgically intervened as soon as they are diagnosed. Some of the surgical techniques used include arterial ligation, in situ repair and reconstruction, in situ bypass reconstruction and embolization. The choice of technique depends on the anatomical site of the lesion and availability of graft material (9).

Conclusion

This is a case of a 49 year old man with multiple predisposing factors for a mycotic aneurysm formation. These factors include history of intravenous drug use, chronic alcohol abuse and blunt trauma to the low back. Imaging studies confirmed the presence of lumbar vertebral osteomyelitis and diskitis. A direct extension from a contiguous site of infection may have accounted for the mycotic aneurysm formation.

With this case we have tried to create awareness of this dreadful complication of vertrebral osteomyelitis. A high level of suspicion may be lifesaving, leading to an early and accurate diagnosis, accompanied by prompt surgical intervention and antibiotic treatment.

Resumen

Reportamos el caso de un hombre de 49 años de edad que se presentó con dolor persistente de la espalda baja luego de haber recibido tratamiento para osteomielitis vertebral. Una tomografía computarizada con contraste intravenoso mostró un aneurisma micótico de la aorta abdominal. El paciente fue llevado a la sala de operaciones donde se reparó exitosamente la lesión vascular.

Se discute la historia, patofisiología, patógenos más frecuentes, factores de riesgo, y presentación clínica de los aneurismas micóticos. Se da énfasis a la importancia de un alto grado de sospecha para el diagnóstico temprano de esta peligrosa complicación de la osteomielitis vertebral.

References

1. Long R, Guzman R, Greenberg H, Safneck J, Hershfield E. Tuberculous mycotic aneurysm of the aorta. Chest. 1999;115:522-531
2. Chan, FY, Crawford, ES, Coselli, JS, et al. In situ prosthetic graft replacement for mycotic aneurysm of the aorta. Ann Thorac Surg 1989;47:193.
3. Lehner, S., MD, Wittgen, C., MD. Infections of the aorta: Case report and review of treatment. Vascular. 2005;13(4):252-256
4. Clagett GP. Vascular infection. In: greenfield L, Mulholland M, Oldham K, Zelenock G, editors Surgery: scientific principles and practice. 3rd ed Williams, and Wilkins, Philadelphia: Lippincott; 2001.p.1646-1658.
5. Bayer AS, Scheld WM. Endocarditis and intravascular infections. In: Mandell GL, Bennett JE, Dolin R, editors Principles and practice of infectious diseases. 5th ed Philadelphia: Churchill Livingstone; 2000.p.857-902.
6. Brown, SL, Busuttil, RW, Baker, JD, et al. Bacteriologic and surgical determinants of survival in patients with mycotic aneurysms. J Vasc Surg 1984;1:541.
7. Moneta, GL, Taylor, LM Jr, Yeager, RA, et al. Surgical treatment of infected aortic aneurysm. Am J Surg 1998;175:396.
8. Naktin J, DeSimone J. Lumbar vertebral osteomyelitits with mycotic abdominal aortic aneurysm caused by highly penicillin-resistant streptococcus pneumoniae. Journal of Clinical Microbiology, December 1999,p.4198-4200, Vol. 37,No.12.
9. Spelman D. Mycotic aneurysms. UpToDate. September 2005.
10. Shaikholeslami, R, Tomlinson, CW, Teoh, KH, et al. Mycotic aneurysm complicating staphylococcal endocarditis. Can J Cardiol 1999;15:217.
11. Samore, MH, Wessolossky, MA, Lewis, SM, et al. Frequency, risk factors, and outcome for bacteremia after percutaneous

transluminal coronary angioplasty. Am J Cardiol 1997;79:873.
12. Stengel, A, Wolferth, CC. Mycotic (bacterial) aneurysms of intravascular origin. Arch Intern Med 1923;31:527
13. Soravia-Dunand, VA, Loo, VG, Salit, IE. Aortitis due to salmonella: Report of 10 cases and comprehensive review of the literature. Clin Infect Dis 1999;29:862.
14. O'Connor R. Abdominal aneurysm. Emedicine.com. 2006
15. Benjamin, ME, Cohn, EJ Jr, Purtill, WA, et al. Arterial reconstruction with deep leg veins for the treatment of mycotic aneurysms. J Vasc Surg 1999;30:1004.
16. Johnson, JR, Ledgerwood, AM, Lucas, CE. Mycotic aneurysm. New concepts in therapy. Arch Surg 1983;118:577.