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Aortic Graft Infection and Vertebral Osteomyelitis With Iliopsoas Abscess Caused By A Streptococcus Equi Bacteremia: A Case Report.

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Abstract

Background: *Streptococcus equi* is a Lancefield group C beta-hemolytic pathogen that usually infects animals; human infections are rare but can be very severe. The *S. equi* subspecies *zooepidemicus* is the most frequently isolated in humans. Vascular graft infections are complications of vascular surgery still associated with high mortality rates. The incidence of vascular graft infection with *S. equi* is extremely low; so far, only three cases have been reported in the literature.

We aim to describe the first case of *S. equi* subspecies *zooepidemicus* bacteremia complicated by aortic graft infection and vertebral osteomyelitis with iliopsoas abscess, treated with local drainage and prolonged antibiotic therapy.

Report: A 59-year-old horse breeder presented with prolonged fever. He underwent a vascular aortic graft positioning two months before due to a spontaneous rupture of the infrarenal abdominal aorta. *S. equi* subspecies *zooepidemicus* was isolated from blood cultures, and involvement of the aortic graft, lumbosacral spine, and left iliopsoas was detected by radiological investigations.

Treatment consisted of local drainage, kept in place for 8 weeks, and a whole 12-week antibiotic course. In the earlwasase, ampicillin and gentamycin were started empirically. Then, a targeted therapy with penicillin G and daptomycin was administered. Later, intravenous fosfomycin was added to penicillin G to improve antibiotic performance on bone. Finally, the treatment was concluded with oral amoxicillin/clavulanic acid and intravenous dalbavancin administered twice. The patient is infection-free three years after discharge.

Discussion: Reports in the literature are minimal. It is known that vascular surgery associated with antimicrobial therapy is the optimal treatment option for aortic graft infection, but there are rarely prohibitive conditions for surgical treatment, and it becomes mandatory to consider other viable options. We performed in the first phase a vital bactericidal treatment, while perioperatively, we optimized bone penetration (the former adding daptomycin to penicillin G, the latter combining penicillin G with fosfomycin). In the last phase, we chose high dose dalbavancin as an amoxicillin/clavulanic acid partner thanks to *S. equi* homologies with S. *pyogenes*, maintaining a highly safety antibiotic regimen.

Conclusion: Our patient responded excellently to local drainage combined with medical treatment. In case of prohibitive conditions for surgery and severe infection with this rare pathogen, prolonged antibiotic therapy could be an acceptable alternative.

Keywords: Streptococcus equi, Aortic graft infection, Group C streptococcus

Introduction

Streptococcus equi is a group C beta-hemolytic zoonotic pathogen that commonly infects animals and rarely leads to human infections **[1]**. Although it is considered an opportunistic pathogen in horses, it can lead to severe conditions in humans. *S. equi* is divided into three subspecies: *S.equi* subspecies *zooepidemicus*, *S.equi* subspecies *rumi nator,* and *S.equi* subspecies *equi* **[2]**. Among the three subspecies, *S. equi zooepidemicus* is the most common pathogen isolated in humans. These infections are usually associated with contact with infected animals (equine or cattle) or consumption of unpasteurized dairy products **[1]**.

Human diseases with *S. equi* subspecies *zooepidemicus* can be associated with severe conditions such as toxic shock syndrome, endocarditis, meningitis, pneumonia, necrotizing myositis, arthritis, glomerulonephritis, aortitis and mycotic aneurysms **[3]**. The incidence of vascular graft infection with *S. equi* is extremely low, and so far, only three cases have been reported **[4,5]**; no one of them had associated vertebral osteomyelitis. Here, we describe the first case of an *S. equi zooepidemicus* bacteremia complicated with aortic graft infection and vertebral osteomyelitis with iliopsoas abscess.

Informed consent was obtained from the patient for being included in the study and publishing radiological images.

Case Presentation

A 59-year-old man was admitted to the Infectious Disease department with several days of fever and general fatigue. Two months before presentation, he underwent a vascular aortic graft positioning with a BeGraft aortic stent graft (Bentley, Hechingen, Germany) for a spontaneous rupture of the infrarenal abdominal aorta with hemorrhagic shock. In the early postoperative course, he developed a fever and was treated with intravenous amoxicillin/clavulanic acid for 14 days.

He had a medical history of lumbar disc herniation (L4-L5) but no known aortic aneurism risk factors. He was working as a horse breeder.

The patient was febrile at presentation, and vital signs were within normal limits. Physical examination was unremarkable, but due to his recent surgical history, he was hospitalized for further investigations. Initial laboratory workup revealed mild anemia (hemoglobin 10.5 g/dL) and elevated C-reactive protein (CRP, 53 mg/L) with normal white blood cell (WBC) count; procalcitonin (PCT) was slightly increased (0.18 ng/mL). Two of four blood cultures drawn on admission yielded a group C *Streptococcus* that was identified as *S. equi* subspecies *zooepidemicus* soon after. The *S. equi* in this case was susceptible to penicillin G (MIC 0.0312 mg/L), amoxicillin/clavulanic acid (MIC 0.0625 mg/L), cefotaxime (MIC 0.0625mg/L), ceftriaxone (MIC 0.0625 mg/L), moxifloxacin (MIC 0.5 mg/L) and vancomycin (MIC 0.5 mg/L), while it was resistant to clindamycin (MIC >0.5 mg/L).

Empiric antibiotic treatment with intravenous ampicillin and gentamycin was started upon admission. After blood culture results, a targeted therapy with intravenous penicillin G and daptomycin was performed. Repeated blood cultures after 24 and 96 hours after access were all negative.

A CT scan of the abdomen and an MRI of the lumbosacral spine showed an infected retroperitoneal hematoma, an L3-L4 vertebral osteomyelitis with paravertebral and intracanal purulent material, and a left iliopsoas abscess **(Figure 1)**. Corresponding abnormal fluorodeoxyglucose (FDG) uptake was demonstrated on an FDG-positron emission tomography CT (PET-CT) scan **(Figure 2)**.

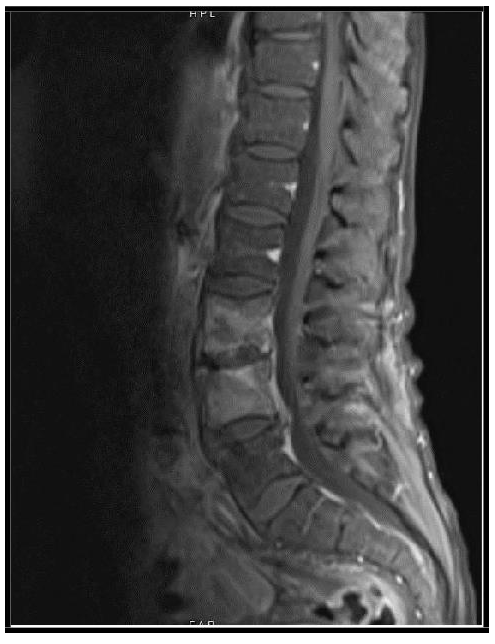

Figure 1. Magnetic resonance imaging showing L3-L4 vertebral osteomyelitis with paravertebral and intracanal purulent material.

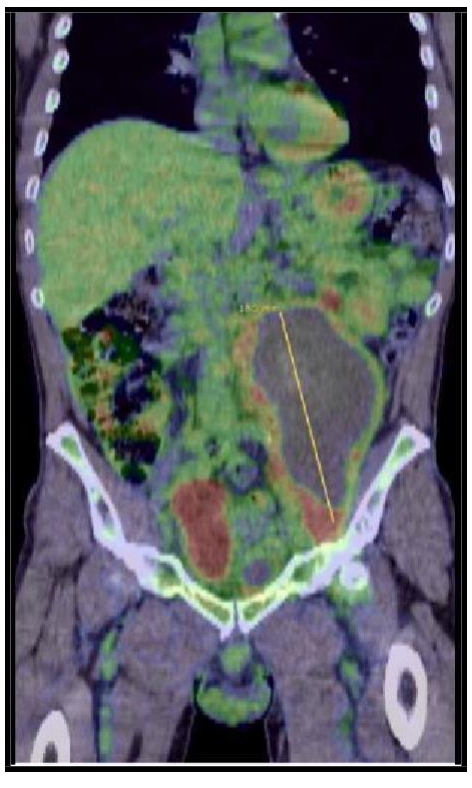

Figure 2. Positron emission tomography/computed tomography scan showing left iliopsoas abscess.

No pathological findings were observed at echocardiography.

To improve antibiotic penetration into bone, intravenous fosfomycin was added to penicillin G after a PET-TC scan, while daptomycin was discontinued. Open surgical treatment of vascular graft infection was considered too dangerous, so a CT-guided percutaneous drainage of the iliopsoas abscess was performed ten days after admission to the Infectious Disease department. Culture and 16S rRNA gene PCR detection performed on drained material were negative. Intravenous combination therapy (penicillin G and fosfomycin) was continued four weeks after the drainage positioning.

Clinical conditions were improved, the patient was permanently afebrile, and CRP became negative. At discharge, antimicrobial therapy was shifted to an oral regimen with amoxicillin/clavulanic acid in combination with intravenous long-acting dalbavancin administered twice (loading dose of 1500 mg at discharge and a second dose of 1500 mg one week after that). The drainage was kept in place for two months, and the patient completed a 12-week antibiotic course from admission.

MRI of the lumbosacral spine and PET-CT scan performed at the end of treatment showed an excellent improvement with resolution of the retroperitoneal hematoma and iliopsoas abscess; no more intracanal fluid collection was present, and metabolic gradients of vertebral osteomyelitis (defined as Standardized Uptake Value, SUV) were decreased.

The patient was followed up with an annual spinal MRI and PET-CT scan for two years after the end of treatment, and he did not develop any signs of recurrence.

Now, three years after the infection, he remains in good health.

Discussion

Aortic vascular graft infection is a severe complication of vascular surgery that remains associated with high morbidity and mortality rates. The infection rate can range from 1 % to 5 % **[6,7]**, and it is most common after emergency procedures **[8,9]**.

Aortic graft infection can appear months to years after graft placement, but disease associated with the repair of an aortic rupture usually occurs within 3 months postoperatively **[10]**.

Optimal treatment should include both medical and surgical therapies **[11]**. Unfortunately, removing the infected graft and constructing a new one in uninfected areas are not always possible: surgical treatments carry high mortality, and a considerable number of patients are unfit for surgery.

S. equi subspecies *zooepidemicus* belongs to the Lancefield group C beta-hemolytic Streptococci. It is an aerobic bacterium that frequently colonizes the mucus membranes of healthy horses and cattle; it can sometimes cause infections of the equine respiratory tract or mastitis in horses, cows, sheep, and other animals **[12]**. Human diseases are rare, generally reported after ingestion of contaminated dairy products **[13,14]** or after close contact with infected horses, as in our case.

Previous reports showed up to 70 % of human infections by *S. equi* subspecies *zooepidemicus* occur in patients with serious underlying diseases such as immunosuppression, malignancy, diabetes mellitus, or cardiovascular diseases **[15]**. However, our patient had an unremarkable past medical history with none of these disorders.

Only three cases of aortic graft infection caused by *S. equi* have been reported in the literature, but no one had concomitant osteomyelitis and muscular abscess. Parmar et al. **[4]** described a patient (a racehorse trainer) with an aortic stent graft infected by *S. equi*. This patient underwent an EVAR two years before the episode with no early postoperative complications. Due to the infection, the stent graft was surgically removed, and *S. equi* was isolated only by polymerase chain reaction (PCR) of the 16S ribosomal deoxyribonucleic acid (rDNA) subunit performed on intraoperative material as all cultures (blood, urine, sputum, stool, cerebrospinal fluid and also on material removed at operation) were negative. A long antibiotic course was performed: the initial empirical treatment (before surgical intervention) consisted of vancomycin, gentamicin, and rifampicin; perioperatively was treated with vancomycin and meropenem, then intravenous teicoplanin was continued for a further six weeks and finally switched to oral amoxicillin for two years. Altreuther et al. **[5]** reported two patients with *S. equi* subspecies *zooepidemicus* bacteremia and aortic graft infection: the first one, who also had a psoas abscess, responded well to CT- guided drainage of the infected material and penicillin administration (intravenously until one week after the drainage and then orally with life-long purpose). The second was treated with endovascular aneurysm repair (EVAR) and ceftriaxone for four weeks, followed by penicillin V per oral for three months.

For our patient, surgical treatment was not a viable option due to its high operative risk, so we performed percutaneous drainage of the iliopsoas abscess as in the first case reported by Altreuther et al. In the first phase, to maximize the chances of infection eradication, we performed a robust bactericidal treatment by adding daptomycin to penicillin G. With this aminoglycoside-sparing therapy, we broke down the risk of acute kidney injury while maintaining a high efficacy thanks to a synergistic effect and daptomycin high tissue penetration **[16,17]**.

Perioperatively, we optimized bone penetration using penicillin G in combination with fosfomycin. Later, we chose a dose of dalbavancin as an amoxicillin/clavulanic acid partner since *S. equi* shares about 80 % sequence homology with *S. pyogenes* **[2]**, and the safety and efficacy of dalbavancin in bone infections are already well-known **[18,19]**. In this way, we quickly achieved high effectiveness with handy administration.

In retrospect, we wonder if the patient had a mycotic aneurysm caused by *S. equi* primarily that led to the rupture of the infrarenal abdominal aorta. Early graft infections associated with the repair of an aortic rupture are usually the result of intraoperative contamination with staphylococci or gram-negative microorganisms, so the isolation of *S. equi* seems even more uncommon than usual. Therefore, our case reminds us of the importance of collecting blood cultures even in an emergency if there is a spontaneous aortic rupture in a patient without any risk factors.

Conclusion

We have described a case of *S. Equi.* subspecies *zooepidemicus* bacteremia complicated by aortic graft infection and vertebral osteomyelitis with iliopsoas abscess that responded well to local drainage combined with medical treatment. Even though vascular surgery associated with antimicrobial therapy remains the optimal treatment option, prolonged antibiotic therapy could be acceptable alternative in case of prohibitive conditions for surgery and severe infection with this pathogen. Moreover, long-acting drugs such as dalbavancin may also have a promising role in this rare streptococcal infection.

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