Aortic endograft infection due to *Pasteurella multocida* following a rabbit bite

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Abdominal aortic endograft infection is a serious complication after an endovascular abdominal aortic aneurysm repair. *Pasteurella multocida*, a gram-negative bacterium, is a commonly found organism in the mouth flora of many house pets. We report a case of an aortic endograft infection caused by *P multocida* after a rabbit bite. Successful treatment was performed by extra-anatomic revascularization followed by endograft removal. (J Vasc Surg 2006;43:393-5.)

Infection of an aortic endograft is a rare but potentially devastating complication after endovascular repair of an abdominal aortic aneurysm (AAA). The exact incidence of this complication remains unclear but is likely to increase as long-term follow-up surveillance continues and more patients undergo endovascular AAA therapy in the future. Similar to other vascular graft infections, the offending bacterial organisms of an aortic graft infection are typically derived from the skin flora or gastrointestinal tract.[1]

Pasteurella multocida is a gram-negative bacillus that represents part of the normal flora of both the nasopharyngeal and gastrointestinal tracts of many livestock, poultry, and domestic pet species. Infection of a prosthetic implant due to *P multocida* is extremely uncommon and is largely noted in the orthopedic literature.[2-4] We report the first known case, to our knowledge, of an endovascular stent-graft infection caused by *P multocida* after a bite by the patient's household rabbit. A review of *P multocida*-related vascular graft infections as well as the clinical consequences and treatment strategies are also discussed.

CASE REPORT

A 68-year-old man with an asymptomatic aortic aneurysm measuring 5.7 cm in diameter underwent an uneventful endovascular AAA repair. An Excluder bifurcated aortic endograft (W. L. Gore & Associates, Flagstaff, Ariz) was placed in the infrarenal aorta and bilateral common iliac arteries via bilateral groin cutdowns. The total operative time was 95 minutes. The postoperative course was unremarkable, and he was discharged home on the third postoperative day. Postoperative surveillance studies with computed tomography (CT) at 6, 12, and 24 months showed successful aneurysm exclusion, with a decrease of aneurysm size to 5.4 cm in diameter.

Twenty-eight months after his endovascular AAA repair, he presented with fever and cellulites of his right calf following a bite from his household pet rabbit. He was seen by his primary care physicians, who documented painful and swollen inguinal lymph nodes. The patient was treated empirically with oral penicillin for 2 weeks, but without significant improvement.

The patient was admitted to the hospital after the completion of the antibiotic treatment with persistent pyrexia and abdominal pain. An abdominal computed tomography (CT) scan revealed a presumptive diagnosis of aortic endograft infection as manifested by air and fluid collection adjacent to the aortic endograft (Fig). Results of pertinent laboratory studies included an elevated leukocyte count of 19,000 cells/mL with left shift. He was treated with intravenous ciprofloxacin and piperacillin-tazobactam.

He underwent an operative intervention that included a staged right axillo-bifemoral bypass grafting with an 8-mm Hemashield graft (Boston Scientific, Natick, Mass) followed by endograft removal via an abdominal laparotomy 3 days later. At the time of the endograft removal, purulent fluid was noted surrounding the endograft. Bacterial culture later grew moderate *P multocida* sensitive to all antibiotics known to have activity to this organism.

The proximal aortic stump was oversewn and reinforced with multiple layers of polypropylene sutures. The abdominal fascia was closed, but the abdominal skin incision was left open for secondary wound healing. The patient had an uneventful postoperative recovery and was discharged home 8 days later. He received oral ciprofloxacin (740 mg, twice daily) for 6 months. At a 6-month follow-up visit, his abdominal wound had healed, and he remained free of any infection.

DISCUSSION

Prosthetic graft infection is a well-known complication after vascular reconstructions. Most infections involving vascular prosthetic grafts are caused by bacteria commonly found in skin flora, such as *Staphylococcus aureus* and *Staphylococcus epidermidis*.[1] Enterococci, aerobic gram-negative rods, and diphtheroids have also been reported to cause infection.[1] To date there are only three cases in the literature of vascular graft infection caused by *P multocida*.[5-7] All of these patients underwent arterial graft implantation during open vascular reconstructive procedures. In two of these cases, the graft infections were caused by a dog bite and a dog lick of an amputation site, respectively.[5,7] The third case was a patient who presented with an anastomotic pseudoaneurysm of an infected aortobifemoral graft after a cat bite.[6]

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Competition of interest: none.

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0741-5214/$32.00

doi:10.1016/j.jvs.2005.10.067

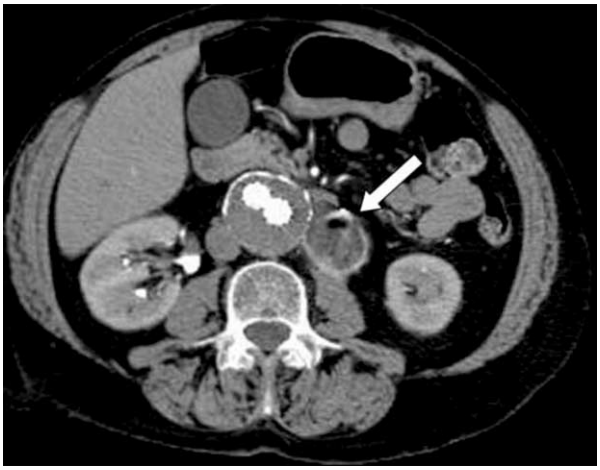

Fig. A computed tomography scan of the abdomen revealed evidence of aortic endograft infection, with left periaortic air and fluid collection above the left psoas muscle.

In these three reported cases, the *P multocida*-related graft infections were believed to be hematogenous in nature, and the durations of graft infection after revascularization were 13 months, 24 months, and 6 years, respectively.[5-7] Our case is unique, because this not only represents the first reported case of aortic endograft infection caused by *P multocida* but also underscores a potential disease transmission route via a household rabbit.

P multocida is a gram-negative bacillus that is found in the mucous membranes of both the nasopharyngeal and gastrointestinal tracts of many animals including livestock, poultry, and domestic pet species.[8] In humans, infection is usually associated with an animal bite or scratch that can lead to skin and soft tissue infection. It is estimated that 5% of dog bites and 30% of cat bites become infected.[8] *P multocida* can also be found in the nasal sinuses, lungs, and eye membranes of healthy rabbits and represents a major infectious agent of rabbits.[8]

In addition to local cellulitis and abscesses, *P multocida* infection in humans has been linked to upper respiratory infection, gastroenteritis, pyelonephritis, and meningitis.[9] Prosthetic implant infection involving *P multocida* is extremely uncommon, and most reported cases were related to artificial knee or hip joints.[2-4] In the vascular literature, only three cases of *P multocida*-related vascular graft infection after open bypass grafting procedures have been described.[5-7]

Regardless of the prosthetic type, the treatment of choice is removal of the infected prosthesis plus antibiotic therapy. In the setting of soft tissue or skin infection caused by *P multocida*, effective treatment can be achieved with a β-lactam antibiotic along with a β-lactam inhibitor such as amoxicillin-clavulanic acid. *P multocida* is also sensitive to penicillin and extended spectrum penicillins, fluoroquinolones, and tetracyclines.

Infection of endovascular grafts is not a new phenomenon and has a reported incidence in the literature of 0.3% to 5%, which is similar to that for open repair.[1,10] This rate is likely underestimated and will presumably increase as long-term follow-up from endovascular repair of AAAs continues. Furthermore, the presence of endoleak, allowing for perfusion and possible seeding of hematoma as well as thrombus around the endograft, are features not present during open repair and could account for increased possibility of infection. Although many infections occur from contamination of the graft at the time of placement, secondary infection can occur from remote sources, hematogenous seeding, and mechanical erosion leading to aortoenteric fistulas.[11]

Prompt diagnosis of infected endovascular grafts is important, but diagnostic evaluation often poses a clinical challenge. Signs of fever, malaise, and leukocytosis are suggestive of possible systemic or graft infection. Radiologic studies can serve as important adjuncts in the diagnosis of endovascular graft infections. Frequently, perigraft inflammatory changes and fluid collections will be seen on an abdominal CT scan and are highly suggestive of an abdominal infectious process, as was demonstrated in our patient. The presumptive diagnosis of endograft infection in our patient was made on the basis of the CT scan, while the intraoperative findings as well as subsequent bacterial culture confirmed the definitive finding of a *P multocida*-related endograft infection.

A nuclear medicine scan with indium may give additional information in the case of equivocal CT findings. This scan may also assist in identifying remote sources of infection responsible for hematogenous graft infection.[12] In a review of 62 cases of infected endovascular grafts, Fiorani et al[10] reported that patients commonly presented with vague symptoms, but upon further work-up, were found to have abdominal abscesses, groin fistulas, and septic embolization.

Morbidity and mortality rates from infected endovascular prosthesis are substantial. Medical therapy with antibiotics without surgical removal of the infected endovascular prosthesis can lead to devastating outcomes. To achieve successful results, a combination of explantation with or without extra-anatomic bypass and intravenous antibiotics should be used. The technical aspects of device explantation will vary with the type of graft deployed and the vascular anatomy. Furthermore, factors related to the initial decision to use endovascular techniques may play a critical role, as pre-existing comorbidities may limit surgical options and increase morbidity and mortality.[13]

In one of the largest reports of endovascular prosthetic infections that included 62 patients with infected endovascular grafts, 49 were treated surgically, resulting in an overall mortality of 27% and operative mortality of 16%.[10] In contrast, 11 patients were treated conservatively without surgery, resulting in four deaths and a mortality rate of 36%. In our patient, a staged axillo-bifemoral bypass graft was performed first, followed by aortic endograft removal via an abdominal laparotomy 3 days later. From a technical standpoint, the aneurysm sac was opened followed by endograft removal before the aortic cross-clamp was applied. Despite the presence of barbs in the proximal Gore Excluder en-

dograft, which was designed to ensure secure aortic neck fixation, we had no difficulty removing the infected Excluder endograft from the aortic aneurysm. Once the endograft was removed, the proximal aortic stump was reinforced with multiple layers of mattressed sutures and the surrounding infected aneurysm tissues were débrided. With this strategy, we were able to achieve a satisfactory treatment outcome. The patient recovered fully and remained free of infection 6 months after the operation.

CONCLUSION

We describe a first reported case of endovascular graft infection due to *P multocida* following a bite by the patient's rabbit. The patient was successfully treated with an extra-anatomic bypass graft followed by endograft removal. In addition, he was treated with long-term antibiotic therapy. Prosthetic infections with *Pasteurella* species are rare but have previously been reported, with good results overall. Emphasis must be placed on aggressive treatment when such infection is identified, however, because failure to remove an infected endograft can lead to significant morbidity and mortality. Our case underscores the importance of educating patients and their families about the risks of vascular prostheses infection around household pets, with emphasis placed on appropriate evaluation and treatment of bites and scratches.

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Submitted Jul 4, 2005; accepted Oct 14, 2005.