Acess-related infections are the most important cause of the loss of vascular access for dialysis. The infections also may lead to devastating consequences, including sepsis with multi-organ failure, endocarditis, or metastatic infections such as endophthalmitis, osteomyelitis or epidural abscess. A small percentage of these complications are fatal. Overall, dialysis-related bloodstream infections are the second leading cause of death in patients undergoing hemodialysis, accounting for up to 10% of all deaths and approximately three fourths of all deaths caused by infection in patients undergoing hemodialysis. We report a case of infective endocarditis (IE) and metastatic endophthalmitis caused by arteriovenous (AV) fistula and graft infection. Appropriate and adequate antibiotic treatment for IE and endophthalmitis cured the patient.

**CASE REPORT**

A 55-year-old woman was admitted to Kaohsiung Military General Hospital (KMGH) on account of intermittent low-grade fever for 1 week. She was a victim of chronic glomerulonephritis (CGN) in the uremic stage and had received hemodialysis (HD) for 5 years. Because of repeated AV fistula/graft infection, and AV fistula and AV graft surgery about 40 times in the past 5 years, poor AV fistula function was reserved. P. aeruginosa arteriovenous graft infection of the right arm was diagnosed by wound culture on February 17, 2001. She had given up HD and she had received continuous ambulatory peritoneal dialysis (CAPD) procedure at KMGH since March 2, 2001. She felt chest distress and low-grade fever around 37.5~38 °C on April 12, 2001 and was admitted to KMGH because of a fever of unknown origin. During hospitalization, cardiac sonography and transesophageal echocardiography (TEE) confirmed a vegetation over the mitral valve. Blood culture yielded *Pseudomonas aeruginosa*. Endophthalmitis of the right eye was diagnosed by funduscopy because of painful redness of the right eye with exudative discharge. The patient was treated with ceftazidime for 9 weeks. Since then, she has been well, without any sequelae after 1 year of follow-up. Physicians should be aware of the possibility of infective endocarditis in an uremic patient who suffers from fever of unknown origin. Early diagnosis with an adequate tool such as TEE and appropriate treatment will lead to an excellent prognosis.
phils/lymphocyte ratio of 86.9/6.4, hematocrit of 23.7%, and platelet count of 176000/ mm.³ Blood cultures yielded *Pseudomonas aeruginosa* for 2 sets which was susceptible to ceftazidime by disk diffusion test. The peak serum inhibition test (SIT) and the peak serum bactericidal test (SBT) titer were 1:128 and 1:64, respectively. The trough serum inhibition test (SIT) and the trough serum bactericidal test (SBT) titer were 1:128 and 1:64, respectively. Transesophageal echocardiography (TEE) (Fig. 1) revealed a calcified, fixed mass around 5.4 cm² over the posterio-medial leaflet of the mitral valve with moderate mitral regurgitation. Bacterial endocarditis with vegetation over the mitral valve was diagnosed.

On day 6, antibiotic regimens with ceftazidime 2 g intravenously every 12 hours were prescribed. Two days later, the fever subsided and no more chest distress was noted. However, painful sensations and redness of the right eye with exudative discharge had developed. Metastatic endophthalmitis complicated with impaired of visual acuity of the right eye was diagnosed by an ophthalmologist. The visual acuity of the right eye was 0.3 at that time. A Roth’s spot in the right eyefundi was found by funduscopy (Fig. 2). Computed tomography of the brain demonstrated increased density of vitreous fluid in the right globe. On day 16, a ceftazidime shift to 2 g daily occurred till the patient was discharged. After parenteral antibiotic (ceftazidime) treatment for 9 weeks, the patient was afebrile and the metastatic endophthalmitis resolved progressively with the evidence of improved visual acuity of right eye from 0.3 to 0.7.

The patient was discharged in a stable condition. She was then regularly followed up at our outpatient department and the vegetation size was shrunk from 5.4 cm² to 1.25 cm².² There was no further problem in the subsequent 1 year.

**DISCUSSION**

Before 1960, end stage renal disease (ESRD) was uniformly fatal. During 1990 most patients with ESRD were supported with either HD or peritoneal dialysis. However, HD with AV fistula or AV graft is complicated by repeated stenosis, frequent thrombosis, and vulnerability to infection.² Arteriovenous graft infection is a serious adverse event in HD patients. However, there is little published literature describing consequences.³ Among AV graft infections with known organisms, the pathogen being gram-positive occurred in 97% of cases, and only 3% were caused by gram-negative rods.³ A number of studies have reported that 9% to 20% of AV grafts become infected.³ The development of IE in chronic HD patients appears to be relatively infrequent, with reported ranges of 1% to 12% of bacteremic patients developing IE.⁴

In most cases, IE is the consequence of bacteremia arising from tooth extraction, intravascular catheters, re-
spiratory tract infection and, less commonly, from a nosocomial wound. The occurrence of remote complications due to AV fistula has been known for many years. While infrequent, bacterial endocarditis is a more serious complication of AV fistula, and chronic overload of the heart in AV fistula lead to valvular damage. Hence, it increases susceptibility to bacterial invasion from any focus. The usual causes of IE are congenital heart malformation, acquired valvular disease and drug abuse. IE was diagnosed based on the criteria for bacterial endocarditis such as blood culture and vegetation shown by echocardiography. TEE is frequently being used in diagnosis of IE, as it is considered to be more sensitive.

Bloodstream infections in patients undergoing dialysis may occur from endogenous or exogenous sources. Exogenous infections occur when bacteria from catheters, dialysis equipment, or from the hands of hospital personnel gain access to the patient’s circulation. Endogenous infections arise from the patient’s own flora. Microbial agents in IE are usually Staphylococcus aureus, viridans streptococci, coagulase-negative staphylococci, and other streptococci and enterococci. Pseudomonas aeruginosa endocarditis usually occurred in intravenous drug abusers and was uncommon in nosocomial infection. At present, piperacillin and third-generation cephalosporins can be considered. Ceftazidime is a potentially important candidate for therapy of invasive infection with P. aeruginosa, such as infective endocarditis. In this case, the patient was afebrile and had no chest pain after being prescribed ceftazidime for 9 weeks. So, blood cultures, echocardiography and/or transesophageal echocardiography remain the diagnostic modalities of choice if IE is suspected. A prolonged course of intravenous antibiotics is indicated for the treatment of IE in chronic hemodialysis patients.

Surgical procedures in IE have many different aims: to correct valvular dysfunction, to remove infected tissue, and finally, to remove mobile vegetations, which are sources of systemic embolism. Early surgery during antibiotic treatment of IE has become more common.

There were 49 treatment attempts among 34 patients with left-sided endocarditis due to P. aeruginosa. Three of 26 attempts (12%) at medical treatment were successful. Thirteen of 23 patients (57%) treated with a combination of antibiotics and surgery were cured. The difference between these groups is significant. This patient suffered from mitral valve endocarditis due to P. aeruginosa treated successfully with ceftazidime for 9 weeks without surgery.

Approximately 10% of cases of endophthalmitis are caused by bacterial infection of the eye via the bloodstream, so-called metastatic endophthalmitis. In this case, the subsequent presentation of an acutely inflamed, painful eye led us to search for the source. Because IE and AV fistula/AV graft infection due to P. aeruginosa were identified from blood cultures (2 sets), therefore, metastatic endophthalmitis due to bloodstream infection are highly associated with each other.

Dialysis patients may be at increased risk for a number of reasons. General uremic immunosuppression could also be expected to predispose dialysis patients to disseminated infection, and granulocytic phagocytosis is the principal systemic defense mechanism against bacterial endophthalmitis. Metastatic bacterial endophthalmitis is an uncommon disease that classically occurs in the presence of an obvious septic focus. This patient had pseudomonal septicemia followed by developing eye pain. The source of infection in this patient was strongly suspected to be from endocarditis. Diagnostic vitrectomy has been accepted as a mainstay of diagnosis. Early endophthalmitis revealed by CT scan showed irregular nodular thickening of the posterior scleral uveal rim and increased intraocular attenuation. But, vitrectomy was not performed in this patient due to intolerance. Ceftazidime has been shown to be effective in treating P. aeruginosa endophthalmitis. We prescribed this regimen for IE and P. aeruginosa endophthalmitis at the same time. After parenteral antibiotic treatment for 9 weeks, the patient was afebrile and endophthalmitis resolved progressively because of the evidence of improved visual acuity of right eye from 0.3 to 0.7.

In summary, IE should always be considered in a hemodialysis patient, and distant metastasis is a major complication in an uremic patient. Early diagnosis and appropriate and adequate antibiotic treatment provide for a good prognosis.
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