Staphylococcus Aureus Endocarditis in an Uremic Patient Undergoing Continuous Ambulatory Peritoneal Dialysis

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Abstract

Staphylococcus aureus (S. aureus) infection is a frequently encountered problem in hemodialysis patients. As this organism is prone to develop metastatic infection, each episode of *S. aureus* bacteremia put the patients at risk of developing endocarditis. However, it is rarely reported in patients undergoing peritoneal dialysis although these patients were also susceptible to *S. aureus* infection.This report presents a case of endocarditis in an uremic patient undergoing chronic peritoneal dialysis therapy. This patient presented with *S. aureus* bacteremia of unknown focus, but she experienced an episode of *S. aureus* peritonitis just two months ago. This patient died of complications despite aggressive treatment with appropriate antibiotics.This experience indicates that uremic patients undergoing peritoneal dialysis therapy are also susceptible to developing endocarditis due to *S. aureus* infection. Clinicians should be aware of this risk. Aggressive investigation for endocarditis should be undertaken when the *S. aureus* bacteremia course is prolonged or recurrent in dialysis patients. (J Intern Med Taiwan 2009; 20:264-269)

Key Words：***Staphylococcus aureus*, Endocarditis, Peritonitis, Hemodialysis, Peritoneal dialysis**

Introduction

Infection is second to cardiovascular disease as a cause of death in patients with end-stage renal disease[1,2]. Of these, vascular access infection and peritonitis are the most common source of bacteremia[3-6]. Gram-positive cocci, particularly *Staphylococcal aureus (S. aureus)* account for the major causative pathogen[4-7] in these infections. As this organism is easily predisposed to metastatic localization, *S. aureus* bacteremia may put the patients at risk of seeding bacteria on the cardiac valve and subsequently developing endocarditis.

The occurrence of endocarditis in hemodialysis patients has been well addressed[8-12]. However, the reports of endocarditis in peritoneal dialysis patients are relatively uncommon despite S. aureus bacteremia is also common in patients receiving peritoneal dialysis therapy. In this report, we present this case of infective endocarditis in continuous

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ambulatory peritoneal dialysis (CAPD) therapy. This patient had preceding *S. aureus* infection before the development of endocarditis.

Case report

A 67-year-old woman with gouty nephropathy was diagnosed with uremia and started CAPD therapy since 1992. During the course of peritoneal dialysis, she experienced an episode of peritonitis due to *S. aureus* infection in Jan 2001. This infection was controlled with pareneteral oxacillin for 2 weeks.

On Mar 8, 2001, she arrived at our hospital because of fever and general malaise for several days. The patient denied having cough, abdominal pain, dysuria or joint pain. Physical examination on admission revealed that the patient was alert, body temperature was 40℃, heart rate was 68 beat/min, respiratory rate was 23 times/min, and blood pressure was 132/64 mmHg. Neither a crackling sound nor cardiac murmur was heard. The patient's abdomen was soft and flat. Neither tenderness nor rebounding pain was elicited by palpation. Additionally, there was neither cutaneous nor nail color change. No pus discharge was observed over the exit site of Tenchoff catheter. Chest x-ray showed mild blunting of the left costophrenic angle and was otherwise normal. Laboratory data showed a peripheral WBC count of 156 x 10^9/l with 94% neutrophil. Drained dialysate was clear. Microscopic examination identified dialysate WBC count of 2/HPF, neutrophil/lymphocyte ratio of 0/2, and RBC count of 0/HPF. Urine routine and sediment analysis were normal.

Dialysate culture was negative for bacteria. However, blood cultures revealed growth of oxacillin-sensitive *S. aureus* (OSSA). The diagnosis of bacterial endocarditis in this patient was based on two major criterion (typical microorganism for endocarditis from separate blood cultures and the echocardiographic findings) and one minor criteria (fever) of the Duke criteria[13,14].

Treatment with intravenous oxacillin 1.0 gram at 6-hour interval was prescribed immediately. As no infectous focus was identified at that time, endocarditis was suspected. Transthoracic echocardiographic examination showed negative finding. However, further examination by transesophageal echocardiography identified a vegetation on the posterior mitral leaflet. The oxacillin dose then was maximally increased to 2.0 gram at 4-hours intervals.

On Mar. 11, the patient had a sudden consciousness change and weakness in four limbs. Septic embolization was suspected. A computed tomogram scan and brain magnetic resonance imaging showed cortical atrophy and multiple lacunar infarcts. Study of cerebrospinal fluid showed negative finding. The surgical intervention for vegetation was planned, but the family refused. The patient's general condition and neurological deficit did not improve despite continuous antibiotic therapy. On Apr 9, bradycardia and apnea suddenly developed. The patient died despite aggressive CPCR (cardiac pulmonary cerebral resuscitation).

Discussion

S. aureus bacteremia is often associated with metastatic complications such as osteomyelitis, septic arthritis and infective endocarditis. The reported incidence of infective endocarditis in patients with S. aureus bacteremia varies widely. Its range is from 4% to 64% depending on the patient population, for example, whether the presence of entry portal or not[15,16].

Given that *S. aureus* is the most common pathogen infecting dialysis patients, development of S. aureus endocarditis in this populatioln is not unexpected. A vascular access device in place may mask and mislead physician to overlook the potential metastatic infections. Nicholls et al.[17] who identified 6 cases of endocarditis or osteomyelitis in

uremic patients with *S. aureus* septicemia recommended that septicemia management in these patients must include search for metastatic infection.

Infective endocarditis in hemodilaysis patients has been reported by several investigators. Mohamed et al.[10] described a case of otherwise nonthreatening fistula infection leading to serious complication of infective endocarditis. Robinson et al.[8] reported 20 cases of infective endocarditis among 450 chronic hemodialysis patients during a 7-year period. MaCarthy et al.[11] identified 20 episodes of infective endocarditis in 17 patients during a 14-years period of observation at the Mayo Clinic (10 episodes in 223,358 outpatient hemodialysis sessions). Hanslik et al.[12] showed a 21-54 times higher risk for developing endocarditis in French dialysis patients. United States Renal Data System (USRDS)[18] reported that the risk for developing infective endocarditis was significantly higher in hemodialysis patients than the general population (RR : 17.86, 95%CI : 6.62-48.9). These reports indicated that risk of endocarditis in hemodialysis patients is increased owing to the high incidence of vascular access infection.

However, data from USRDS demonstrated that peritoneal dialysis patients had an age-adjusted incidence ratio for endocarditis of 10.54 (95%CI, 0.71- 158.13), but not statistically significantly increased compared to the general population[18]. It is not clear why the occurrence of endocarditis in peritoneal dialysis patients is not as common as that in hemodialysis patients. This complication was rarely reported in the peritoneal dialysis patients in the literature to date. Di Bisceglie et al.[19] reported one case of bacterial endocarditis developed from an infected peritoneal dialysis catheter. He proposed that the absence of direct access to the circulatory system may account for the low incidence of S. aureus endocarditis in CAPD patients.

Asymptomatic *S. aureus* colonization occurs most commonly in the anterior nasal vestibule, but occasionally in the axilla, the inguinal and perineal skin areas. Luzar et al.[20] conclude that the nasal carriage of *S. aureus* is associated with an increased risk of catheter-exit-site infection in ambulatory peritoneal dialysis. The incidence of staphylococcal nasal colonization in these hemodialysis patients are reported to vary between 40% and 81% as compared with 20% to 40% carriage rates among nondialyzed patients[21]. The *S. aureus* colonization rates of patients undergoing continuous ambulatory peritoneal dialysis are reported to be between 39% and 45%[22].

The carriers of *S. aureus* had a significantly higher rate of exit-site infection than the noncarriers (0.40 vs. 0.10 episode per year; P = 0.012)[20]. The infecting organism phage type highly matched the carriage organism in 93% of the carriers in whom infection developed[23]. Some study also demonstrated that staphylococcal carriage prophylaxis using either oral rifampin or mupirocin ointment in the nares or exit site reduces significantly the rate of exit-site infection due to *S. aureus*[24]. For patients undergoing CAPD therapy, *S. aureus* is also the most common infective pathogen due to peritonitis and catheter related infection. So identification and preventively treatment of all the *S. aureus* nasal carrier before the implantation of the catheter may decrease the subsequently infection[25].

Doulton et al.[26] suggested the frequently calcified valve was another risk factor of developing infective endocarditis, because valve calcification is common after 5 years on dialysis. The mitral valve was the most commonly affected valve (43.3%). The other risk factor for the complicated infective endocarditis in dialysis patients is hemoaccess via dual-lumen catheters. Our patient had no known conventional risk factors, such as drug addiction or rheumatic heart disease, for endocarditis. In this case, the endocarditis event may be just a coincidence. This antecedent *S. aureus* peritonitis

may be the same cause of subsequent endocarditis although we did not confirm the correlation by genotyping these pathogens.

MRSA infected endocarditis patients were significantly more likely to have complicating renal insufficiency and to experience persistent bacteremia than those with endocarditis due to methicillin-susceptible *S. aureus* (MSSA)[27]. Some study showed that MSSA (OSSA) infective endocarditis patients experienced a significantly higher rate of major embolism than MRSA infective endocarditis patients[28]. But patients infected with MRSA tend to be older and have more comorbid conditions than patients infected with MSSA. After adjusting these confounding factors, the complication rate of MRSA infected patients was not higher than that of MSSA infected patients[29].

The clinical presentation of this patient was initially diagnosed as recurrent catheter infection. Endocarditis was suspected only when bacteremia persisted without appropriate response to antibiotic therapy. Thus, the potential possibility of endocarditis should always be born in mind when dialysis patient develops vascular access-related infections. Furthermore, transthoracic echocardiography failed to demonstrate vegetation in both cases. In our case, vegetation was demonstrated late because transesophageal echocardiography examination was performed only when rapid clinical deterioration occurred. Thus, surgical intervention was late.

This experience indicates that transesophageal echocardiography, rather than transthoracic echocardiography, is a superior image study for confirming the presence of vegetation. Several reports described similar findings[8,11,30]. Shapiro et al.[30] reported that transesophageal echocardiography is significantly more sensitive than transthoracic echocardiography and highly specific for identifying valvular vegetation Transesophageal echocardiography should be performed even when transthoracic echocardiography fails to demonstrate vegetation in patients at risk for infectious endocarditis.

The 65% of the embolic events occurred during the first two weeks despite adequate antibiotic therapy for infectious endocarditis. The larger (> or = 10 mm) vegetations, the higher incidence of embolism. The risk of embolization seems to increase significantly also in mitral endocarditis and staphylococcal endocarditis[31]. The stroke complication incidence in *S. aureus* infective endocarditis was higher than non *S. aureus* infective endocarditis (21.3% vs. 14.3%)[32]. When endocarditis is complicated by cerebral embolic events, it is recommended that urgent valve replacement operation should be performed within 72 h of the cerebral embolism, when the risk of secondary cerebral hemorrhage appears to be low[33]. Denial of surgery because of local or general factors in patients that meet criteria for surgical intervention in acute infective endocarditis is prognostically ominous[28].

Based on this case, we remind all physicians that potential endocarditis should be kept in mind in every CAPD patient with *S. aureus* bacteremia. Aggressive investigation for endocarditis should be undertaken when *S. aureus* bacteremia of unknown cause developed, or when the bacteremia course is prolonged.

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金黃色葡萄球菌在連續性可動式腹膜透析病人造成心內膜炎

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摘 要

金黃色葡萄球菌感染在血液透析病人是經常可見的問題，此種細菌易於造成轉移性感染，因而引發心內膜炎。然而金黃色葡萄球菌感染而造成心內膜炎在腹膜透析病人是相當少見的。本案例報告一個腹膜透析的病人，因金黃色葡萄球菌而造成敗血症，經過一系列的檢查，發現在二尖瓣後葉有贅生物。病人於發病前2個月曾有過一次金黃色葡萄球菌導致的腹膜炎。由此案例可知尿毒症的病人經由腹膜透析治療，當受到金黃色葡萄球菌感染，仍易於變成心內膜炎。臨床醫師應了解此一風險，當長時間且反覆性的菌血症發生時要積極的檢查是否爲心內膜炎。