

Case Series

Severe Tricuspid Valve Endocarditis Related to Tunneled Catheters in Chronic Hemodialysis Patients: When Should the Catheter be Removed?

Yassamine Bentata*, Intissar Haddiya, Nabila Ismailli, Adnane Benzirare, Omar Elmahi, Abderrahim Azzouzi

MedicalSchool, University Mohamed First, Oujda, Morocco.

Abstract

Introduction: Hemodialysis (HD) patients are predisposed to infective endocarditis (IE) mainly due to repeated manipulation of the vascular access. However, catheter seeding and IE may also result from a distant infection site.

Case series: A diabetic patient who was maintained on regular HD through a permanent catheter in the right internal jugular vein presented with septicemia of urinary origin due to *Pseudomonas aeruginosa*. He was treated with injectable antibiotics for 15 days. Few days after the end of the treatment period he presented with inflammation of the catheter exit site. Blood cultures revealed *Pseudomonas aeruginosa* and echocardiography showed a large vegetation on the tricuspid valve, confirming the diagnosis of IE. The patient improved after catheter removal and treatment with ceftazidime, vancomycin and amikacin. Another patient who was maintained on chronic HD through a tunneled catheter in the right internal jugular vein presented with a limited infection in the sub-cutaneous tunnel of the catheter that improved after treatment with injectable antibiotics. Two months later, he presented with severe sepsis without signs of local infection of the catheter. Chest radiography showed right sided infiltrates. Injectable antibiotic therapy was given without improvement. Blood cultures were negative but echocardiography showed a large tricuspid valve vegetation. Antibiotic regimen was modified to include vancomycin, amikacin and ceftazidime and the catheter was removed. Unfortunately, the patient died two days after diagnosing IE.

Conclusion: catheter seeding and IE may be a consequence of sepsis originating away from the HD catheter site. Tunneled catheters may need to be pre-emptively removed in such situations to prevent serious IE.

Keywords: Hemodialysis; Infective Endocarditis; Tricuspid Valve

The authors declared no conflict of interest

Editorial Comment

The manuscript describes two cases of infective endocarditis thought to be due to distant infection with or without secondary seeding of the fixed jugular catheters. Authors aimed to stress the message that central catheters should be removed in bacteremic patients in order to prevent or reduce the incidence of infective endocarditis and they have referred to paucity of literature information in this regard.

Indeed, catheter-related bacteremia has been regularly investigated over the past 2 decades but the question of catheter removal in patients with bacteremia due to distant infection is not easy to answer. In this later situation, it is usually difficult to verify catheter bacterial seeding and hence, to predict the likelihood of catheter contribution to persistence of infection or response to treatment. The implicitly stated answer in the literature is that catheter should be removed if the patient is hemodynamically unstable, or if he does not show a satisfactory initial response to antimicrobial therapy in 48-72 hours.

Assem El-Sherif

Associate editor, AJNT

Introduction

Infections are the second most common cause of mortality among chronic hemodialysis (HD) patients after cardiovascular causes. The predisposition to infections is mainly linked to the repeated manipulation of the vascular access. Bacteremia incidence is dependent on the type of vascular access used; being higher with permanent catheters and synthetic grafts than native arteriovenous fistulas [1, 2]. Alteration of the immune system in the

* Corresponding author; Avenue Hassan II, Rue Kadissia, numéro 12, Oujda 60 000, Morocco ; E. mail: bentatayassamine@yahoo.fr.

chronic HD patient also contributes to the predisposition to infections [3]. Moreover, the bone mineral disorder and chronic inflammation observed in chronic HD lead to valvular and perivalvular calcifications and changes [4]. These alterations occur at an early stage of renal failure and primarily involve the mitral and aortic valves [5]. In this context, infectious endocarditis should be very frequent, but only few series are published in the literature. This apparent under-reporting of the incidence of infectious endocarditis among chronic HD patients with bacteremia is probably related to the difficulty of diagnosing IE and/or to the treating doctors' unfamiliarity with IE.

Case 1

This is a 56-year-old Caucasian male patient, type 2 diabetic since 2002, on chronic HD since February 2011. Periodic HD was initiated with a permanent catheter in the right internal jugular vein after immediate failure of three upper limb native arteriovenous fistulas that were never punctured. In November 2011, the patient presented with vomiting, asthenia, temperature of 40°C, chills with burning sensations during micturition. The blood workup showed leukocytosis with 17,000 cells/mm³, anemia with hemoglobin of 7 g/dL, and a serum C reactive protein level of 80 mg/L. Cyto-bacteriological examination of the urine identified *Pseudomonas aeruginosa*. The diagnosis of septicemia of urinary origin was adopted; treatment based on injectable ceftriaxone and ciprofloxacin was initiated and continued for 15 days. However, a few days after the end of treatment, signs of infections reappeared, this time in the form of bronchitis, while the urinary symptoms had disappeared. Examination of the patient revealed inflammation of the catheter exit site with exudation of pus. Blood cultures performed on peripheral blood and blood contained in the catheter revealed *Pseudomonas aeruginosa*. Laboratory workup showed elevated serum concentrations of pro-calcitonin (5 ng/mL), C reactive protein (160 mg/dL) and erythrocyte sedimentation rate (136 mm/h). Abdominal ultrasound showed significant splenomegaly and transthoracic echocardiography showed a large vegetation on the tricuspid valve 1.2 x 1.0 cm with grade III tricuspid regurgitation. The diagnosis of IE on a native tricuspid valve was made. Thoracic CT angiography was performed and did not show signs of pulmonary infarction. The tunneled catheter was removed, antibiotic treatment based on ceftazidime, vancomycin (trough level kept between 20 and 25 mg/L) and amikacin was initiated to cover both pseudomonal and a possible staphylococcal infections. Treatment duration was six weeks. Dialysis sessions were maintained and carried out using a temporary femoral catheter placed five days after removal of the first tunneled catheter. Recovery under treatment was favorable, with apyrexia achieved

72 hours after the start of antibiotic treatment and progressive normalization of all biological parameters. Weekly echocardiograms were performed and showed no worsening of the cardiac function. Decrease in the size of vegetation (1.1 x 0.9 cm) was documented three months after the start of the treatment. No septic embolism was noted, and one year after the endocarditis episode, the patient remained stable from a cardiac standpoint.

Case 2

This is a 37-year-old Caucasian male patient on chronic HD since January 2005 with ESRD due to undetermined etiology. The patient was addict to cannabis and his serology was positive for both hepatitis C and B viruses and he had never received treatment for the viral hepatitis. He underwent placement of seven native arteriovenous fistulas, which were complicated by immediate or early thrombosis and needed four short-term catheters for dialysis. An initial tunneled central venous catheter was inserted in the right internal jugular vein in September 2010 and was removed 6 months later due to a catheter-related bacteremia. A second tunneled catheter using the left internal jugular vein was inserted in March 2011. In August 2012, the patient presented with a limited infection in the sub-cutaneous tunnel of the catheter. Given the absence of fever, clinical features of infectious process, and because of the difficulty of obtaining another vascular access; injectable antibiotic therapy was given with favorable clinical response. In October 2012, the patient presented with severe sepsis of pulmonary origin without signs of local infection of the catheter. The blood workup showed leukocytosis with 15,000 cells/mm³, anemia with hemoglobin of 5 g/dL, and a serum C reactive protein level of 190 mg/L. Chest radiography showed right sided infiltrates. Injectable antibiotic therapy was begun with a third generation cephalosporin and ciprofloxacin. In view of the lack of clinical and biological improvement, an echocardiography was performed and showed a large tricuspid valve vegetation 2.7 x 1.2 cm. Antibiotic regimen was modified to include vancomycin, amikacin and ceftazidime. The catheter was removed. The blood cultures carried out returned negative. Forty eight hours after the IE diagnosis, the patient died following respiratory failure most likely secondary to a massive septic pulmonary embolism.

Discussion

Infective endocarditis (IE) in hemodialysis (HD) is significantly more common and causes greater morbidity and mortality than in the general population. Its incidence is estimated to be 308/100,000 patient-years, which is 50

Table-1: The clinical, microbiological, echocardiographic and prognostic features of infective endocarditis in chronic hemodialysis reported by recent studies

	Montasir <i>et al</i> (2004-2009)	Tao <i>et al</i> (1990-2009)	Rekik <i>et al</i> (1997-2006)	Kalakan- nan <i>et al</i> (1990-2004)	Nori <i>et al</i> (1999-2004)	Spies <i>et al</i> (1991-2001)	Doulton <i>et al</i> (1970-2002)
Number of cases	5	6	16	69	54	40	30
History of diabetes mellitus	-	-	6.2%	37.7%	42%	50%	28.5%
Access type							
Arteriovenous fistula or graft	60%	84%	75%	33.3%	26%	78%	53.9%
Catheter	40%	16%	25%	66.7%	74%	30%	44.7%
Valve type							
Native valve	80%	100%	100%	95.7%	87%	95%	100%
Prosthetic valve	20%	0%	0%	4.3%	13%	5%	0%
Valve affected							
Mitral valve	40%	50%	56.2%	49.3%	50%	53%	43.3%
Aortic valve	40%	40%	25%	21.7%	43%	20%	36.6%
Mitral +Aortic valves	20%	10%	12.5%	13%		20%	16.7%
Tricuspid valve	0%	0%	6.2%	10.1	19%	6%	0%
Blood culture negative	20%	33%	6.5%	0%	2%	10%	-
Organism							
Staphylococcus	50%	33%	68.8%	72.3%	40%	50%	76.6%
Enterococcus	50%	16%		7.2%	33%	23%	10%
Streptococcus			25%	4.3%			
Gram negative species					13%	10%	
Pseudomonas aeruginosa	0%	0%	0%	5.8%		2.5%	0%
Klebsiella pneumoniae		16%				2.5%	
Candida species			6.2%			3%	
Others				10.4%			3.4%
Valvular Surgery	40%	50%	31%	21.7%	24%	37.5%	40%
Mortality	60%	25%	44%	49.3%	61%	52.5%	31%

to 180- fold higher than the 1.7 to 6.2 cases per 100,000 patient-years reported for the general population [6, 7].

The use of a permanent or temporary catheter is strongly associated with IE in dialysis patients and exceeds 60% in some series [8, 9]. Diabetes mellitus is also often associated with the occurrence of IE in dialysis patients [8-10]. IE in patients on chronic HD affects mainly native valves accounting for more than 80% of cases. The mitral valve is involved in more than 50% of cases, the aortic valve in more than 30% and concomitant involvement of both valves is relatively frequent. The tricuspid valve is rarely affected. In large series involvement of the tricuspid valve varies from 6.2% to 19% [8, 9, 14].

Staphylococcus aureus is the main cause of vascular access-related bacteremia among patients receiving long

term HD (up to 70% of cases) [8, 11, 13, 14]. Enterococcus and streptococcus are in second place (10-30%) [9, 12]. The gram-negative species are rarely found (0-13%) [8-12]. Pseudomonas has been identified in only two series [8, 10]. The clinical, microbiological, echocardiographic and prognostic features of IE in chronic HD reported by recent studies are shown in Table-1.

Treatment is primarily medical, consisting of antibiotic treatment adapted to the organism identified in blood cultures. When a permanent catheter is used, its removal and the later insertion of a second catheter are highly recommended.

Herein, we report two cases of severe IE of the tricuspid valve in two chronic HD patients with multiple comorbidities and a history of failure of several native

vascular access points. The patients were dialyzed by internal jugular tunneled catheters. In both cases, the IE episodes were preceded by severe sepsis of urinary and pulmonary origins without clinical signs of catheter or tunnel infection.

These cases raise a question not adequately addressed in guidelines regarding such infections in chronic HD patients who are in a state of immune system alteration. Should the tunneled catheter be removed when bacteremia secondary to a distant infection not related to the catheter is detected? Furthermore, how should one proceed when the situation involves a precious vascular access with difficulty in obtaining another vascular access in a timely fashion?

Conclusion

Infection of permanent or temporary central venous catheters constitutes the main portal of entry for IE. However, catheter seeding and IE may also be a consequence of sepsis originating away from the catheter site. Tunneled catheters may need to be pre-emptively removed in such situations to prevent serious IE. More studies are needed to guide practice in this clinical scenario.

References

1. Marr KA, Sexton DJ, Conlon PJ, Corey GR, Schwab SJ, Kirkland KB. Catheter-related bacteremia and outcome of attempted catheter salvage in patients undergoing hemodialysis. *Ann Intern Med.* 1997 Aug 15;127(4):275-80.
2. Kessler M, Hoen B, Mayeux D, Hestin D, Fontenaille C. Bacteremia in patients on chronic hemodialysis. A multicenter prospective survey. *Nephron.* 1993;64(1):95-100.
3. Minnaganti VR, Cunha BA. Infections associated with uremia and dialysis. *Infect Dis Clin North Am.* 2001 Jun;15(2):385-406, viii.
4. Umana E, Ahmed W, Alpert MA. Valvular and perivalvular abnormalities in end-stage renal disease. *Am J Med Sci.* 2003 Apr;325(4):237-42.
5. Madu EC, D'Cruz IA, Wall B, Mansour N, Shearin S. Transesophageal echocardiographic spectrum of calcific mitral abnormalities in patients with end-stage renal disease. *Echocardiography.* 2000 Jan;17(1):29-35.
6. Abbott KC, Agodoa LY. Hospitalizations for bacterial endocarditis after initiation of chronic dialysis in the United States. *Nephron.* 2002 Jun;91(2):203-9.
7. Mylonakis E, Calderwood SB. Infective endocarditis in adults. *N Engl J Med.* 2001 Nov 1;345(18):1318-30.
8. Kamalakannan D, Pai RM, Johnson LB, Gardin JM, Saravolatz LD. Epidemiology and clinical outcomes of infective endocarditis in hemodialysis patients. *Ann Thorac Surg.* 2007 Jun;83(6):2081-6.
9. Nori US, Manoharan A, Thornby JI, Yee J, Parasuraman R, Ramanathan V. Mortality risk factors in chronic haemodialysis patients with infective endocarditis. *Nephrol Dial Transplant.* 2006 Aug;21(8):2184-90.
10. Spies C, Madison JR, Schatz IJ. Infective endocarditis in patients with end-stage renal disease: clinical presentation and outcome. *Arch Intern Med.* 2004 Jan 12;164(1):71-5.
11. Montasser D, Bahadi A, Zajjari Y, Asserraji M, Alayoude A, Moujoud O, Aattif T, Kadiri M, Zemraoui N, El Kabbaj D, Hassani M, Benyahia M, El Allam M, Oualim Z, Akhmouch I. Infective endocarditis in chronic hemodialysis patients: experience from Morocco. *Saudi J Kidney Dis Transpl.* 2011 Jan;22(1):160-6.
12. Tao JL, Ma J, Ge GL, Chen LM, Li H, Zhou BT, Sun Y, Yea WL, Miao Q, Li XM, Li XW. Diagnosis and treatment of infective endocarditis in chronic hemodialysis patients. *Chin Med Sci J.* 2010 Sep;25(3):135-9.
13. Doulton T, Sabharwal N, Cairns HS, Schelenz S, Eykyn S, O'Donnell P, Chambers J, Austen C, Goldsmith DJ. Infective endocarditis in dialysis patients: new challenges and old. *Kidney Int.* 2003 Aug;64(2):720-7.
14. Rekik S, Trabelsi I, Hentati M, Hammami A, Jemaa MB, Hachicha J, Kammoun S. Infective endocarditis in hemodialysis patients: clinical features, echocardiographic data and outcome: a 10-year descriptive analysis. *Clin Exp Nephrol.* 2009 Aug;13(4):350-4.