

The role of Cefazolin in prophylaxis of central vein catheter-related infection in dialysis patients

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ABSTRACT

Objective: Dialysis via central vein catheter (CVC) is a temporary procedure for dialysis in chronic renal failure and is suitable in patients without artery-venous fistula (AVF) or in whom their AVF needs almost two months to be mature. Infection is one of the most common and dangerous complications during this procedure. Controversies are reported regarding the use of prophylactic antibiotics before the insertion. This study was done to measure the role of prophylactic antibiotics therapy in prevention of infections.

Methodology: This interventional study was conducted on end stage renal disease (ESRD) patients admitted to the referral hospital of Golestan province, Northeast of Iran for inserting CVC. In this study, 95 cases of ESRD were randomized into two groups. Intravenous Cefazolin (1 gram) was administered to the intervention or case group (54 patients) before CVC and control group had been administered no antibiotic (controls=41). Data regards to the infection-free catheter survival, fever and any symptoms of infection were recorded during 45 days of follow-up. Data were entered into SPSS-15 software and analyzed with one-way ANOVA test. Relative risk (RR) was calculated and compared between the two groups.

Results: Cumulative incidence was 15.2% and 27.1%, in cases and controls, respectively. Relative risk of infection was 1.78 fold in controls versus the cases, but it was not significant [RR=1.78; CI=1.141-2.421; P-value>0.05].

Conclusions: Relative risk of the infection was not significantly different in this study, but it could be suggested to try antibiotics before CVC and compare the results.

KEY WORDS: Central venous catheter (CVC), Infection, End stage renal disease (ESRD), Antibiotic.

Pak J Med Sci October - December 2011 Vol. 27 No. 5 1073-1075

How to cite this article:

Ghazimoghaddam B, Ghazimoghaddam K, Besharat S, Rajabli M. The role of Cefazolin in prophylaxis of central vein catheter-related infection in dialysis patients. Pak J Med Sci 2011;27(5):1073-1075

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- * Received for Publication: January 4, 2011
- * Accepted: November 2, 2011

INTRODUCTION

Despite central vein catheters' propensity for significant complications, they have become common means of vascular access in patients requiring hemodialysis maintenance in end-stage renal disease (ESRD). Advanced patient age, peripheral vascular disease (arterial and venous), late referral for vascular access are among the most important indications.¹ CVC is becoming a permanent vascular access in many situations where as imperfection or immaturities of AV fistula, long waiting list for kidney transplantation or maturation of an autologous fistula or graft, unsuitability of vascular anatomy.²

CVC popularity is because of clear advantages, such as the possibility of immediate use.

Infections, thrombosis and catheter dysfunctions are the most important catheter-related complications. Infections may occur with and without symptoms of systemic illness, so early diagnosis and appropriate antibiotic treatments are essential for saving the catheter.^{3,4} Infection is one of the most common and dangerous complications in this method.^{5,6} Infection is the major cause of morbidity and mortality associated with central vein catheters in patients on hemodialysis. The optimal strategy to combat infection is controversial.⁷ Catheter-related bacteremia can lead to distribution of infection to other sites.^{8,9} The rate of infection is significantly higher in temporary procedures than permanents such as AVF.¹⁰

Management of infection in hemodialysis patients is one of the challenging problems faced by surgeons and nephrologists. Patients on hemodialysis are immunocompromised and typically have significant co-morbid conditions placing them at high risk for the occurrence of infection.¹¹ It was reported that catheter infection carries an odds ratio for death as high as 20.45. It is estimated that 500–4,000 deaths annually can occur due to this type of infection. Besides, CVC infection could impose a major cost on health care system.¹²

In order to reduce the risk of infection, we studied the role of prophylaxis by Cefazolin. Cefazolin is an available and cost effective drug. It is effective against a wide range of bacteria such as *Staphylococcus Aureus*, and *Streptococcus* species which are the most causes of CVC related bacteremia. About more than half (52-60%) of infections in CVC are caused by gram-positive cocci only, including *Staphylococcus aureus*, coagulase-negative *Staphylococcus*, and *Enterococcus* species. Almost 20% were polymicrobial.^{13,14} This study was done to evaluate the role of prophylactic antibiotics in preventing infection in hemodialysis patients.

METHODOLOGY

This study was performed from December 2008 to January 2010. Our study patients were chosen among end stage renal disease patients who were candidate for inserting central vein catheter and were referred to our hospital. Among them patients who had diabetes mellitus, immunocompromised diseases, patients who were under corticosteroid therapy and those who had taken any kind of antibiotics during past seven days before catheterization were excluded. This study was a double-blinded clinical

trial study and was performed in accordance with the declaration of Helsinki and subsequent revisions and approved by the ethics committee at Golestan Medical University. Written informed consent was obtained before any procedure.

Randomly, patients were categorized into two groups. The intervention group was given 1gr Cefazolin before the catheterization; the control group was put on placebo. All procedures were done by an expert urologist and a nurse team. 1 gram Intravenous Cefazolin was administered to patients thirty to sixty minutes before the procedure. The infection-free catheter survival was recorded. None of the patients, or the nurses knew about the case or control groups. Fever and turbid discharge from the CVC origin were assessed in patients for about two months or till their AVF got matured. If any catheter-related infection symptoms were seen, the patient name and the group were entered to our data base.

Turbid discharge from the insertion site and oral temperature of more than 37.8°C as fever were assumed as symptoms of infection. In patients who had fever, other origins of fever were perused, and if there were no origin for the fever, we assumed that as catheter infections. Patients were observed for sixty days or until the AVF fistula was matured. Data were entered into SPSS-15 software and analyzed by ONE Way ANOVA. Relative risk (RR) was calculated and compared between the two groups.

RESULTS

During thirteen months, 271 chronic renal failure patients were referred for central vein catheter insertion. Ninety five patients were included in our study: 54 patients who were in intervention group and had undergone prophylactic therapy by 1 gram Intravenous Cefazolin and 41 in control group who received placebo before procedure, were evaluated. Patients mean age (\pm SD) was 52.86 (\pm 1.6). The youngest patient was 18 and the eldest one was 88 years old and 56 (58.9%) of patients were male.

Table-I: The average days of infection free catheter survival in the two studied groups.

	<i>Days of infection free catheter survival</i>	
	<i>Mean</i>	<i>SD</i>
Intervention group	48.03	28.85
Control group	46.68	25.31
Total	47.45	27.25
P-value	0.812	

No significant difference was seen between cases and controls as regards the mean day before removal of the catheter due to a complication (fever, discharge or both). Table-I Relative risk of infection in control group was 1.78 fold compared to cases. This difference was not statistically significant. [RR=1.78; CI=1.141, 2.421; P-value>0.05].

DISCUSSION

Infection, mainly related to vascular access, is one of the main causes of morbidity and a preventable cause of death in hemodialysis patients. Catheter-related bacteremia is a frequent complication associated with the use of catheters in hemodialysis.¹⁵ In the present study, it was reported that at least one sign of infection could be seen in both cases and controls after 47.45 ± 27.25 days prior to the CVC insertion. Thus, it seems wise inserting a permanent AV fistula before this period.

In a study, sixty four patients were evaluated. After 34 days, 24 (37.5%) patients showed the febrile state, and 27 (42.2%) patients had a discharge in the insertion of CVC.¹⁶ In another study in France (2002), local infection (n = 45, 1/1,000 catheter-days) was associated with bacteremia in 18 cases. Catheters were removed in 48% of the bacteremic episodes.¹⁷ Systemic antibiotic therapy as prophylaxis in CVC infection is not evaluated much yet. Most studies have demonstrated that the use of prophylactic antibiotics could result in reduction of catheter-related infections.¹⁸

In a similar study, Al-Hweish et al^{19,20} evaluated the role of vancomycin and gentamycin as a prophylaxis in preventing catheter-related bacterial infection in patients on hemodialysis. Infection-free catheter survival of intervention and control groups was evaluated for 18 months. The rate of bacteremia and clinical sepsis were significantly lower in intervention group. This study suggested that antibiotic therapy is useful in preventing catheter-related infection in patients on hemodialysis.

CONCLUSION

In our study, infection was seen about 1.78 times higher in controls than cases, but it was not significant statistically; may be small sample size and short term follow up were possible reasons of leading to non significance results. Although our study didn't find any statistically significant difference, but it seems that using antibiotics (Keflin in our study or Vancomycin or Gentamycin in similar studies) in case of prophylaxis is better than not to use it; although, no significant differences

were seen between the mean days of free-infection catheter survival between the two groups.

ACKNOWLEDGEMENTS

Authors like to thank Mr. N. Behnampour for his contribution in analyzing data. This was a thesis of Medical degree fulfillments in Golestan University of Medical Sciences.

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