Journal of Nursing and Occupational Health
JNOH, 2(2): 199-202
www.scitcentral.com

Review Article: Open Access

Care of Central Venous Dialysis Catheters (CVC)

Prevyzi Evangelia*

*Pathological Specialty, Renal Care Unit, General Hospital of Piraeus Tzaneio, Greece

Received May 05, 2020; Revised May 16, 2020; Accepted May 18, 2020

ABSTRACT

Introduction: The need for vascular access for performing hemodialysis, leads to the use of a central venous catheter (CVC). The use of CVC is associated with infections, particularly dangerous for hemodialysis patients. Nursing care has an important role in preventing infections caused by CVC.

Purpose: The purpose of this review was to explore the role of nursing care in the prevention of infections of hemodialysis CVC.

Methodology: The methodology used consists of searching and reviewing research studies by International (PubMed, Medline, KDIGO) and Greek (Iatrotek) databases care KFK Dialysis. The studies were carried out during the period 2006-2014.

Results: The role of nephrology nurse is particularly important both at placement and afterwards for the care of central venous dialysis catheter. He also holds an important role in assessment of the CVC state before and after the dialysis session. The key-elements of their care is the antiseptic solution, the use of ointments, input pads, the appropriate wash solution and securing the timely resumption of their dysfunction, replacing their time and end the training of nursing staff.

Conclusions: Strict adherence to protocols and international guidelines from the nurses, protects patients undergoing hemodialysis through central venous catheters, acute and chronic complications and ensure better quality of dialysis.

Keywords: Hemodialysis, Bacteremia, International Guidelines Dialysis Catheters, Central Venous Catheters, Nephrology Nurse Role

INTRODUCTION

Vascular access is a prerequisite for the application of dialysis. There are three main types of vascular access: Indigenous Arteriovenous Communication (fistula), Arteriovenous Graft and Central Venous Catheter (CVC). The use of CVCs in dialysis is necessary until the fistula matures, when the surgical creation of the fistula carries serious risks and when the patient's vascular anatomy is not appropriate [1,2]. The appropriate places for their placement are the internal scapulae and the femoral veins [3-5]. There are two types of CVCs in dialysis: Non-tunneled and tunneled. Non-tunneled CVCs that are commonly implanted in patients with acute renal failure and are not recommended for a long time predispose to an increased risk of infection. Tunneled CVCs are long-lasting surgical implants with a tunnel projector projecting under the skin and a Dacron button located at the CVC exit point. The Dacron button protects the CVC from the migration of microorganisms from the skin to the catheter entry point. They are mainly used in patients with end-stage renal disease. They have lower rates of infection than non-implanted [3-6]. Contraindications to the placement of CVC Hemodialysis are recent thrombolysis, burn, venous thrombosis, chest trauma with or without visible pneumothorax or hemothorax and possible injury to the superior vena cava. Complications from their placement and use are usually bleeding, pneumothorax- hemothorax, thrombosis, artery or nerve injury, air embolism, etc. [7-9]. However, the main complication associated with CVCs is Bacteriaemia CLABSI (Central Line Associated Blood Stream Infection), which is the second leading cause of death in dialysis patients. The most common mechanisms of CLABSI Bacteremia are the colonization of the subcutaneous part of the CVC by microbes in the skin flora and the colonization of catheter ligands by pathogenic microbes, due to improper management during placement or care. As a result, a biofilm is created, consisting of proteins and coagulation factors which covers the CVC and promotes the development of thrombophlebitis and the adhesion of germs. These germs multiply rapidly and are resistant to antibiotics. The main clinical manifestations are inflammation, purulent discharge at the point of entry of dialysis, fever, chills and hypotension [9-12]. The diagnosis is confirmed by positive

Corresponding author: Prevyzi Evangelia, Pathological Specialty, Renal Care Unit, General Hospital of Piraeus Tzaneio, Greece, Tel: 6976793948; E-mail: litsaprev@gmail.com

Citation: Evangelia P. (2021) Care of Central Venous Dialysis Catheters (CVC). J Nurs Occup Health, 2(2): 199-202.

blood cultures. They should be taken with caution as false results can lead to incorrect removal of the CFC and increase the residence time [9-12].

PURPOSE

The purpose of this review was to investigate the role of nursing care in the prevention of infections associated with CVC in dialysis.

METHODOLOGY

The methodology followed in the present review was based on review and research studies, which were conducted during the period 2003-2014 and were obtained from international (PubMed, Medline, KDIGO) and Greek (Iatrotek) databases on the contribution of nursing care to prevention of CVC-related dialysis infections. Excluded from the review were studies involving children and dialysis patients treated in the Intensive Care Unit.

RESULTS

The nephrology nurse is required to have a high level of knowledge and specific skills in the care of CVC dialysis to avoid infections. Michiel [11] report that the introduction of a protocol for meticulous care is associated with a significant reduction in the incidence of CLABSI (Central Line Associated Blood Stream Infection) associated with CKD dialysis. Beathard [12] pointed out that adherence to international guidelines and protocols for the proper management of CVC is associated with a reduced incidence of infection. According to Murphy [13], the care of CVCs involves their care during placement, during their connection and disconnection with the blood lines in the dialysis machine and at their exit from the Artificial Kidney Unit. A review of the literature showed that the main points of care of CVD dialysis are the antiseptic solution, the use of ointments, the patches at the entry points, the appropriate solution for rinsing and securing them, the early diagnosis and restoration of their malfunction, the administration of medication in case of infection, the replacement time, the hand antiseptic and finally the training of the nursing staff.

According to the international guidelines of the NKF (National Kidney Foundation), the appropriate antiseptic solution is 70% alcohol, povidone iodide and 2% chlorhexidine alcoholic gluconate. Chlorhexidine 2% alcoholic gluconate is preferred as its action is not affected by blood and sebum while it has a residual effect that lasts up to 24 h. An important point of care before using the antiseptic solution is the removal of blood clots and dirt with sterile gauze impregnated with N/S0.9%. The use of organic solvents, oxygen, gasoline or acetone is prohibited. At the point of entry friction is applied from the center to the periphery, for 30 seconds if it is a 2% chlorhexidine alcoholic gluconate solution and for 2 min if it is povidone iodide. It is necessary for the point to dry well to complete the antiseptic [14]. The use of antibiotic ointments at the point of entry of CVCs is not allowed as they are a background for the development of fungal infection and antimicrobial resistance. However, in dialysis patients their use is recommended only if their material is compatible with the ointment, as found by researchers [15-17]. In addition, showed after 6 years of research that there has been a reduction in infections from CVC dialysis after the use of ointment. It is also recommended to cover the entry point with adhesive transparent patches, semi-permeable, sterile of germs, to protect against external contamination and allow monitoring of the entry point. In case of bleeding or sweating, patches of small sterile gauze are used to allow control. It is necessary for the transparent patches to be changed every 7 days while the gauze patches to be changed every 2 days. The patches can be replaced earlier if they are detached or soiled. The immediate use of plaster is also prohibited. In dialysis patients in whom a bacteremia would have serious consequences, chlorhexidine-soaked patches may be used, which reduce the rates of CLABSI bacteremia and dermatitis or allergic reactions [13-16]. Regarding the appropriate rinsing and securing solution for dialysis CFCs, Zhao et al. [18] concluded that anticoagulants such as heparin should not be used due to bleeding. The recommended rinsing and locking solution are Sodium Citrate, as it has been observed to be superior in action to heparin for the prevention of infections and thrombosis as well as Sodium Citrate preparations combined with antibiotics or taurolidine. The same conclusion was reached by Power et al. [19]. Sodium Citrate is a solution for rinsing and securing as it has been observed that it is superior in action to heparin for the prevention of infections and thrombosis as well as the combined Sodium Citrate formulations with antibiotics or taurolidine. The same conclusion was reached by Power et al. [19] who recommend injecting the solution into the dialysis CVC after the session to maintain its functionality and prevent the formation of biofilm. During the flushing procedure, a separate syringe is used for each lumen, the ends of the lumen of the CVC are disinfected with 2% chlorhexidine, the previous locking solution is removed 3-5 ml respectively, 10 ml N/S0.9% is injected in each strand of CVC and finally inject as much insurance solution as it is written on each strand separately. The diagnosis of infection from CVC dialysis is made with clinical manifestations (erythema, heat, pus discharge) and positive blood cultures. They should be taken with caution as false results may lead to incorrect catheter removal or catheter retention, which are associated with increased mortality, as found by researchers [20]. Also, the same researchers report that the removal of CVC requires a positive blood culture and a quantitative culture of the CVC with a growth of ≥103 CFU / ml of the same pathogen as the blood culture. Otherwise, a semi-quantitative culture of the CVC limb with a growth of ≥1.5 CFU / ml of the same pathogen as the blood culture is required. Betjes [21] adds that peripheral venous blood is needed to obtain blood cultures. If this is not possible, then blood is obtained from both catheter tubes. The discovery of three times as many colonies in one of the two tubes

documents CLABSI bacteremia. Researchers [22] point out that CVC dialysis is not removed if blood is taken simultaneously from the CVC and peripheral vein and a number of colonies is found three times larger in the blood sample from the CVC than in the blood sample from the peripheral vein. The blood sample from the CVC is positive two hours earlier than the blood sample from the peripheral vein. Blood samples should be taken before the start of antibiotics 15 minutes apart or one after the other. The restoration of their malfunction is an important point for their care. According to Vanholder et al. [23] CVC dialysis malfunction occurs when blood flow during the dialysis session is & lt; 300 mL/min. It is then deemed necessary to replace the CVC by means of a wire guide in strict compliance with the antiseptic rules. Also, the malfunction of CVC Hemodialysis can be treated conservatively, either by injecting a thrombolytic product (RtPA, urokinase) or by injecting an antibiotic (vancomycin) as indicated. Medication in case of infection is another important element of the care of CVC Hemodialysis. According to Troidle and Finkeistein [24] medication can be topical or oral (peros). They state that it is not always necessary to remove the CVC dialysis. However, when the infection persists for more than 48 hours, intravenous antibiotic infusion is needed through the CVC Hemodialysis with simultaneous reception of oral antibiotics (peros) for up to 3 weeks. Lok and Mokrzycki [25] consider as an important measure for the treatment of the infection, the securing of the tubes of the CVC Hemodialysis with antibiotic solution, during the infection. Replacement time of CVC Hemodialysis is a very essential issue for the prevention of infections. According to Santorio et al. [26] it is not necessary to replace permanent silicone dialysis CVCs before one year as long as no malfunction or infection has been observed. Prevention measures are individualized according to the needs of each patient. They recommend, for their longevity, strict observance of the antiseptic rules not only when the patient is connected to the dialysis machine but also when he is disconnected from it. For Clark and Barsuk [27] antiseptics of the hands are an integral part of CVC dialysis care. Antiseptics of the hands with disinfectant soap, the use of disinfectant solution as well as the use of gloves during their management are essential. Special care is required in hand antiseptic, in connecting and disconnecting the CVC dialysis tubes with the dialysis machine. In addition, this prevents the horizontal transmission of infections from patient to patient in Artificial Kidney Units [28]. Given that the use of CVC dialysis has become more frequent in recent years, researchers [29] argue that training of the staff of the Artificial Kidney Units regarding the care of CVC dialysis is necessary. In addition, nephrology nurses are required to comply with international guidelines and attend seminars to update their knowledge of CVC-related infections.

CONCLUSION

Based on the above, it is clear that nephrology nurses are responsible for the viability of CVC Hemodialysis, which are necessary for the performance of hemodialysis. Quality and high-level care consists of continuous updates and research on the care of CVC dialysis. Nephrology nurses need to understand that, for some patients with end-stage renal disease, CVC is a “lifeline” and it is their duty to protect it from complications.

REFERENCES

1. Vats HS (2012) Complications of Catheters: Tunneled and non-tunneled. Adv Chronic Kidney Dis 19(3): 188-194.
2. Quarello F, Forneris G, Borca M, Pozzato M (2006) Do central venous catheters have advantages over arteriovenous fistulas or grafts? J Nephrol 19(3): 265-279.
3. Roussos X (2009) Intensive care. Paschalidi, Athens.
4. Carrion J (2012) Vascular access devices (VADs) for hemodialysis. Nurse J 6(1): 28-32.
5. Gallieni M, Brenna I, Brunini F, Mezzina N, Pasho, S et al. (2014) Dialysis central venous catheter types and performance. J Vasc Access 5(7): 140-146.
6. Mondillo F, Bortone S, Nargi P, Capozzi M, Spagnuolo T, et al. (2006) Fourteen year of hemodialysis with central venous catheter: mechanical long-term complications. J Vasc Access 7(2): 60-65.
7. Noordzij M, Jager KJ, Kramar R, Collart F, Heaf JG, et al. (2014) Use of vascular access for haemodialysis in Europe: a report from the ERA-EDTA Registry. Nephrol Dial Transplant 29(10): 1956-1964.
8. Niyyar VD, Chan MR (2013) Interventional nephrology: Catheter dysfunction and troubleshooting. Clin J Am Soc Nephrol 8(7): 1234-1243.
9. Pantelias K, Grapsa E (2012) Vascular access today. World J Nephrol 1(3): 69-78.
10. Haddad NJ, Van Cleef S, Agarwal AK (2012) Central venous catheters in dialysis: The Good, the bad and the ugly. TOUN J 25(1): 12-18.
11. Michiel GH, Betjes MD (2011) Hemodialysis: Prevention of Catheter Bloodstream Infection: Essential elements of catheter care. Nat Rev Nephrol 7(5): 1-9.
12. Beathard GA, Urbanes A (2008) Infection associated with tunneled hemodialysis catheters. Semin Dial 21(6): 528-538.
13. Murphy DJ, Needham DM, Goeschel C, Fan E, Cosgrove SE, et al. (2010) Monitoring and reducing central line-associated bloodstream infections: A national survey of state hospital associations. Am J Med Qual 25(4): 255-260.

14. Guidelines for vascular access (2006) Guideline 7. Prevention and Treatment of Catheter and Port Complications, AJKD 48(1), pp: 248-S257.

15. Rayner HC, Pisoni RL (2010) The increasing use of hemodialysis catheters: Evidence from the DOPPS on its significance and ways to reverse it. Semin Dial 23(1): 6-10.

16. Rosenblum A, Wang W, Ball LK, Latham C, Maddux FW, et al. (2014) Hemodialysis catheter care strategies: A cluster-randomized quality improvement initiative. Am J Kidney Dis 63(2): 259-267.

17. Battistella M, Bhola C, Lok CE (2011) Long-term follow-up of the hemodialysis infection prevention with Polysporin Ointment (HIPPO) study: A quality improvement report. Am J Kidney Dis 57(3): 432-441.

18. Zhao Y, Li Z, Zhang L, Yang J, Yang Y, et al. (2014) Citrate versus heparin lock or hemodialysis catheters: A systematic review and meta-analysis of randomized controlled trials. Am J Kidney Dis 63(3): 479-490.

19. Power A, Duncan N, Singh SK, Brown W, Dalby E, et al. (2009) Sodium citrate versus heparin catheter locks for cuffed central venous catheters: A single-center randomized controlled trial. Am J Kidney Dis 53(6): 1034-1041.

20. Galleni M, Martina V, Rizzo MA, Gravellone L, Mobilia F, et al. (2011) Central venous catheters: Legal issues. J Vasc Access 12(4): 273-279.

21. Betjes MG (2011) Prevention of catheter-related bloodstream infection in patients on hemodialysis. Nat Rev Nephrol 7(5): 257-265.

22. Harwood L, Wilson B, Thompson B, Brown E, Young D (2008) Predictors of hemodialysis central venous catheter exit-site infections. CANNT J 18(2): 26-35.

23. Vanholder R, Canaud B, Fluck R, Jadoul M, Labriola L, et al. (2010) Diagnosis, prevention and treatment of hemodialysis catheter-related bloodstream infections (CRBSI): A position statement of European Renal Best Practice (ERBP). CKJ 3(2): 234-246.

24. Troidle L, Finkeistein FO (2011) Catheter-related bacteremia in hemodialysis patients: The role of the central venous catheter in prevention and therapy. Int J Artif Organs 31(9): 827-833.

25. Lok CE, Mokrzycki MH (2011) Prevention and management of catheter-related infection in hemodialysis patients. Kidney Intern 79: 587-598.

26. Santorio D, Benedetto F, Mondello P, Pipito N, Barilla D, et al. (2014) Vascular access for hemodialysis: Current perspectives. Int J Nephrol Renovasc Dis 7: 281-294.

27. Clark EG, Barsuk JH (2014) Temporary hemodialysis catheters: Recent advances. Kidney Int 86(5): 888-895.

28. Allon M (2009) Treatment guidelines for dialysis catheter-related bacteremia: An update. Am J Kidney Dis 54(1): 13-17.

29. Clark EG, Schachter ME, Palumbo A, Knoll G, Edwards C (2013) Temporary hemodialysis catheter placement by nephrology fellows: Implications for nephrology training. Am J Kidney Dis 62(3): 474-480.