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CLINICAL TRIAL

Infections of vector flow and palindrome catheters in permanent hemodialysis patients; epidemiology, surveillance, and evaluation during a 12-month period

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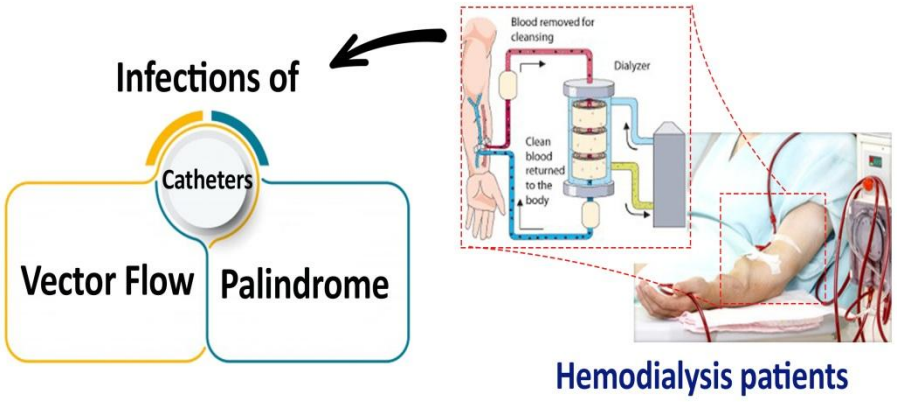
Highlights

- The role of infection and other conditions in survival rates of symmetrical tip flow and palindrome catheters in continuous hemodialysis patients was determined.
- Conditions in the efficacy of symmetrical tip, the Vector Flow compared with the Palindrome catheters in continuous hemodialysis patients were examined.
- Based on the results of the recent study, the mean survival rates of the Vector Flow was more significant than the palindrome in during 3 and 6 month follow-up. survival rate.

Graphical Abstract



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Abstract

Today, according to the high levels of chronic renal failure prevalence, the application of permanent catheters has been increased. Effective development and identification of influential factors can lead to the long-term usage of catheter, reduced complications and improved life quality in patients. The purpose of this study was to evaluate the infection of Vector flow and the Palindrome catheters during vascular access in permanent hemodialysis patients. This clinical trial study was conducted on 185 hemodialysis patients with a permanent catheter in the Imam Reza Hospital in Kermanshah, Iran (2018). The patients were randomly allocated to the Vector flow (n=76) and the palindrome (n=70) groups. Data analysis was performed using SPSS software and statistical tests. P-value < 0.05 were considered significant. Totally, of 185 hemodialysis patients (59.6%) were male and (44.5%) female (44.5%). The average survival of the Vector flow (52.1%) was 6.55 ± 3.88 for most patients, and the palindrome (47.9 %) was 5.22 ± 2.88. The survival rates of the Vector flow (6.55) were more than the palindrome was (5.22). Also, in this study, survival rates during 3 and 6 months follow-up, was more significant than the palindrome group (P = 0.049). Catheter removal due to infection was observed in 15 patients (P =1.0). In this study, factors of age, gender, out catheter infection did not affect the survival rates in both catheters. In this study, catheter function in the vector flow group was more significant than the Palindrome group. Results showed that different catheter such as shape, tip, and diameter, were not affected by the survival rates of the two types of catheters at 12 month. Also, factors such as infection age, gender, and occupation did not affect the survival rates of permanent hemodialysis catheters in the Vector flow and the palindrome.

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Introduction

Today, chronic kidney disease has an increased incidence rate in the world; hemodialysis is the most common end-stage renal disease (ESRD) (1). Hemodialysis is intended as the most common type of renal replacement therapy (2). Today, infection is the secondary cause be the death of Hemodialysis Patients., Although Vascular Access through intracranial catheters is essential for hemodialysis, using permanent venous catheters has increased (ESRD) (3). Many studies have shown that using a catheter for permanent vascular access is associated with increasing increased mortality risk of complications such as infection, thrombosis, obstruction and catheter removal (4). A complication of long-term use of tunnelled cuffed catheters for hemodialysis is the high rate of infection and thrombus-related dysfunction clinical performance of 2 widely used symmetric-tip hemodialysis catheters, dialysis adequacy based on Kt/V was consistently better with the VectorFlow catheter versus the palindrome. However, specific properties, including the design of the catheter tip, can reduce these complications (5). Currently, there is a need to improve the survival rates and reduce the mortality caused by the catheter (6). In order to e e-strategies designing the catheter tip, improving and reducing blood circulation can reduce the complications of thrombogenesis, blood transfusion (7). The Vector flow was associated with a reduction in shear stress compared with the Palindrome catheter; it is an optimized tip to reduce platelet activity to palindrome. As a result, reducing the survival of residence time and recirculation of the preventing thrombosis (8). The catheter tip strongly influences this performance (9). Although Vector Flow and Palindrome catheters design is the symmetrical tip. The vector flow of arterial and venous is entirely, and the blood pressure is zero (10). Demonstrated clinical application, catheter such as efficacy and using the technique for catheters is critical (11). Numerous designs for tunnelled hemodialysis catheter have been developed to improve catheter function and survival. We conclude that both catheters are equally effective on adequate hemodialysis and low recirculation (12). This study aimed to determine the role of infection and other conditions in the survival rates of symmetrical tip flow and palindrome catheters in continuous hemodialysis patients.

Materials and methods

This clinical trial study was conducted on 185 hemodialysis patients who have a permanent catheter in the Imam Reza Hospital in Kermanshah, Iran. During 2018 they were (n=110) adult male and (n=75) female. They were randomly allocated to the Vector flow (n=76) and palindrome (n=71) groups.

Data collection

In this study, data were collected by a checklist from the patient's files and reviewing the reports of the dialysis unit at Imam Reza Hospital in Kermanshah city, ran In addition, Data including the general characteristics of the patients: age, gender, occupation and outer catheter caused by an infection in the duration of hemodialysis. Effective survival rates of permanent hemodialysis catheters the Vector flow and palindrome.

Statistical analysis of data

Statistical calculations were performed with SPSS software, and Values were analyzed using paired Student's *t* and Mann-Whitney U tests. Data were presented as mean ± SEM. A $P< 0.05$ was considered statistically significant.

Results

Of the total of (n=185) hemodialysis patients, (59.6. %) were male and (44.5%) of the female; unfortunately, 14.1% (n=26) died and were excluded during the study. There was without significantly affecting catheter survival rate, sex, infection, age and occupation (Table 1).

Table 1. Comparison of frequency distribution of variables in the VF and the PA catheter.

Total	P-Value	Catheter type		Parameters	
N (%)		Palindrome N (%)	Vector Flow N (%)		
87 (59.6)	0.034	49 (68.6)	39 (51.3)	Male	Sex
(40.4)		22 (31.4)	37 (48.7)		
65 (44.5)	0.085	26 (37.1)	39(51.3)		
104 (71.2)	0.075	45 (64.3)	59(77.6)		
44 (31)	-	23 (31.3)	23(30.7)	Unemployed	
57 (40.1)		19 (28.4)	38 (50.7)	Housewife	Occupation
1 (7)		1 (1.5)	0 (0)	Student	
40 (28.2)		26 (38.8)	14 (18.7)	Employee	
4 (2.7)	1.0	2 (2.9)	2 (2.6)	Catheter removal Duo to infection	
185 (19.5)	0.226	74 (2.7)	80 (2.5)	Age	

In this study on 185 hemodialysis patients, 68.6% (n=71) have the PA group and 51.3% (n=76) of the VF group. The effect of the two catheters was compared over 3 and 6 months (Table 2). According to the findings, the survival rates during six months of follow-up in the VF group was 54.8% (n=40) greater than the PA group 38.2% (n=26). The Chi-square test showed no significant difference in survival rates in the two groups of the Catheters. (P-value = 0.049).

Table 2. Frequency distribution of survival rates during, 3 and 6 months in PA and VF groups.

Total		Catheter type		
N (%)	P-Value	VFN (%)	PAN (%)	Catheter Performance
127 (90.1)	0.482	67 (91.8)	60 (88.2)	<3 months
14 (9.9)		6 (8.2)	8 (11.8)	3 months <
66 (46.8)	0.049	40 (54.8)	26 (38.2)	<6 months
75 (53.2)		33 (45.2)	42 (61.8)	6 months <

Discussion

This study examined the conditions in the efficacy of symmetrical tip the Vector Flow compared with the Palindrome catheters in continuous hemodialysis patients. Results showed that the effect of infection on catheters in survival without be significant. Based on the results of the recent study, the mean survival rates of the Vector Flow was more significant than the palindrome in during 3 and 6-month follow-up the VF was greater than the PA catheter in survival (13, 14, 15). Also, there was no significant difference between the two permanent caters and factors such as infection, age, sex and occupation. Rupp et al., (2012) have shown been that permanent catheters have lower infections and more blood flow than temporary catheters, Duo to Mechanical complications occur in 5-19% of patients with infectious complications in 5-26% (outlet or tunnel infection) and thromboembolic complications occurring in 2-26% of them (12). Clark et al., 2015, compared the VF and PA catheters (6). The VF was associated with mean shear stress was 18% less than the mean PA, and Platelet Lysis Index (PLI) in the VF was 0.9 that less than PA 0.015, which caused be reduced the complications of thrombosis; different results indicated that the VF had better efficacy and improved, Moreover, it's approved in many studies (3). Mareels et al., (2007) compared with the VF and the PA Catheters, the shear stress, residence time (RT), Platelet Lysis Index (PLI), and recirculation, which reduces platelet activity to palindrome (9). Van et al., 2104 Specific mechanical features of catheters (5). May improve hemodynamic performance and decrease infection rates and thrombosis. The palindrome reduced comparison of the Vector Flow; the previous studies confirmed the Vector Flow catheter. For two different catheters no significant between survival catheters and under diseases such as diabetes and hyper aperture (16-21). However, based on a recent study, no significant was the survival rates of the catheters with conditions such as infection age, sex, and job were during 12 months of follow up, duration of vascular access.

Conclusion

The tip design of the Vector Flow may important role in catheter function and complication rates, influencing adequate hemodialysis treatment of patients. Two catheter infections occurred very low. There were no active complications during the follow-up periods of 12 months. In fact, the results obtained from this study provide a general overview to surgeons to consider physical factors such as catheter tip shape. Also, these effects of the catheter cause survival rates and reduce mortality. Therefore, improve the efficiency of this method without limitations such as infection, age, sex and occupation.

References

1. Sinnakirouchenan R, Holley JL. Peritoneal dialysis versus hemodialysis: risks, benefits, and access issues. Adv Chronic Kidney Dis 2011; 18(6): 428-432. https://doi.org/10.1053/j.ackd.2011.09.001
2. Go AS, Chertow GM, Fan D, McCulloch CE, Hsu CY. Chronic kidney disease and the risks of death, cardiovascular events, and hospitalization. New England J Med 2004; 351(13): 1296-1305. https://doi.org/10.1056/nejmoa041031
3. Clark TW, Isu G, Gallo D, Verdonck P, Morbiducci U. Comparison of symmetric hemodialysis catheters using computational fluid dynamics. J Vasc Interv Radiol 2015; 26(2): 252-529. https://doi.org/10.1016/j.jvir.2014.11.004
4. Lacson Jr E, Lazarus JM, Himmelfarb J, Ikizler TA, Hakim RM. Balancing fistula first with catheters last. Am J Kidney Dis 2007; 50(3): 379-395. https://doi.org/10.1053/j.ajkd.2007.06.006
5. Van Der Meersch H, De Bacquer D, Vandecasteele SJ, Van den Bergh B, Vermeiren P, De Letter J, De Vriese AS. Hemodialysis catheter design and catheter performance: a randomized controlled trial. Am J Kidney Dis 2014; 64(6): 902-908. https://doi.org/10.1053/j.ajkd.2014.02.017
6. Clark TW, Redmond JW, Mantell MP, Nadolski GJ, Mondschein JI, Dowd MF, Dagli MS, Sudheendra D, Shlansky-Goldberg RD, Cohen RD. Initial clinical experience: symmetric-tip dialysis catheter with helical flow characteristics improves patient outcomes. J Vasc Interv Radiol 2015; 26(10): 1501-1508. https://doi.org/10.1016/j.jvir.2015.06.033
7. Tal MG. Comparison of recirculation percentage of the Palindrome catheter and standard hemodialysis catheters in a swine model. J Vasc Interv Radiol 2005; 16: 1237-1240. https://doi.org/10.1097/01.RVI.0000171700.45582.9E
8. Ash SH. Advances in tunneled central venous catheters for dialysis: design and performance. Semin Dial 2008; 21(6): 504-515. https://doi.org/10.1111/j.1525-139X.2008.00494.x
9. Mareels G, Kaminsky R, Eloot S, Verdonck PR. Particle image velocime- try–validated, computational fluid dynamics-based design to reduce shear Stress and residence time in central venous hemodialysis catheters. J ASAIO 2007, 53(4): 438-446. https://doi.org/10.1097/MAT.0b013e3180683b7c
10. Trerotola SO, Kraus M, Shah H, Namyslowski J, Johnson MS, Stecker MS, Ahmad I, McLennan G, Patel NH, O'Brien E, Lane KA, Ambrosius WT. Randomized comparison of split tip versus step tip high-flow hemodialysis catheters. Kidney Int 2002; 62(1): 282-289. https://doi.org/10.1046/j.1523-1755.2002.00416.x
11. Clark TWI, Jacobs D, Charles HW, Kovacs S, Aquino T, Erinjeri J, Benstein JA. Comparison of heparin coated and conventional split-tip hemodialysis catheters. Cardiovasc Intervent Radiol 2009; 32(4): 703-706. https://doi.org/10.1007/s00270-009-9608-5
12. Rupp SM, Apfelbaum JL, Blitt C, Caplan RA, Connis RT, Domino KB, Fleisher LA, Grant S, Mark JB, Morray JP, Nickinovich DG. Practice guidelines for central venous access: a report by the American Society of Anesthesiologists Task Force on Central Venous Access. Anesthesiology 2012; 116(3): 539-573. https://doi.org/10.1097/ALN.0b013e31823c9569
13. Wen L, Zhang Y, Yang B, Han F, Ebadi AG, Toughani M. Knockdown of Angiopoietin-like protein 4 suppresses the development of colorectal cancer. Cell Mol Biol 2020; 66(5): 117-124. https://doi.org/10.14715/cmb/2020.66.5.21

14. Yang M, Abdalrahman H, Sonia U, Mohammed AI, Vestine U, Wang M, Ebadi AG, Toughani M. The application of DNA molecular markers in the study of Codonopsis species genetic variation, a review. Cell Mol Biol 2020; 66(2): 23-30. https://doi.org/10.14715/cmb/2020.66.2.3
15. Yang M, Shi D, Wang Y, Ebadi AG, Toughani M. Study on Interaction of Coomassie Brilliant Blue G-250 with Bovine Serum Albumin by Multispectroscopic. Int J Pept Res Ther 2021; 27(1): 421-431. https://doi.org/10.1007/s10989-020-10096-6
16. Wang S, Sun T, Sun H, Li X, Li J, Zheng X, Mallampati S, Sun H, Zhou X, Zhou C, Zhang H. Survival improvement in patients with non–small cell lung cancer between 1983 and 2012: Analysis of the Surveillance, Epidemiology, and End Results database. Tumor Biol 2017; 39(5): 1010428317691677. https://doi.org/10.1177/1010428317691677
17. Bishop AJ, McDonald MW, Chang AL, Esiashvili N. Infant brain tumors: incidence, survival, and the role of radiation based on Surveillance, Epidemiology, and End Results (SEER) Data. Int J Radiat Oncol Biol Phys 2012; 82(1): 341-347. https://doi.org/10.1016/j.ijrobp.2010.08.020
18. Wang XY, Du L, Von Seidlein L, Xu ZY, Zhang YL, Hao ZY, Han OP, Ma JC, Lee HJ, Ali M, Han CQ. Occurrence of shigellosis in the young and elderly in rural China: results of a 12-month population-based surveillance study. Am J Trop Med Hyg 2005; 73(2): 416-422. https://doi.org/10.4269/ajtmh.2005.73.416
19. Coetzer A, Coertse J, Makalo MJ, Molomo M, Markotter W, Nel LH. Epidemiology of rabies in Lesotho: The importance of routine surveillance and virus characterization. Trop Med Infect Dis 2017; 2(3): 30. https://doi.org/10.3390/tropicalmed2030030
20. Overman MJ, Hu CY, Wolff RA, Chang GJ. Prognostic value of lymph node evaluation in small bowel adenocarcinoma: analysis of the surveillance, epidemiology, and end results database. Cancer 2010; 116(23): 5374-5382. https://doi.org/10.1002/cncr.25324
21. Kamarajah SK, Frankel TL, Sonnenday C, Cho CS, Nathan H. Critical evaluation of the American Joint Commission on Cancer (AJCC) staging system for patients with hepatocellular carcinoma (HCC): a Surveillance, Epidemiology, End Results (SEER) analysis. J Surg Oncol 2018; 117(4): 644-650. https://doi.org/10.1002/jso.24908

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