Original Article

frequency of CVP Line with Thrombosis

A Single Centre Experience of Catheter Related Thrombosis in Tertiary Care Hospital Southren Punjab

Muhammad Farooq Bari[1], Ghulam Abbas[2], Shahzad Aalam[2], Muhammad Muzammil[2], Muhammad Yousaf[2] and Poonum Khalid[2]

ABSTRACT

Objective: To find out the frequency of CVP line associated thrombosis in patients suffering from end stage renal disease (ESRD) on hemodialysis.

Study Design: Cross-sectional / Descriptive study.

Place and Duration of Study: This study was conducted at the Department of Nephrology, Nishtar Medical University Hospital, Multan from October 2018 to March 2019.

Materials and Methods: A total of 86 adult patients with advanced stage renal failure who were referred or admitted in Nephrology department for insertion of central venous catheter for hemodialysis were studied and screened for catheter related thrombus.

Results: Among 86 patients under study, 52 (60.4%) were men and 36 (39.6%) patients were women. Mean age for study population was 46.52 ± 7.34 years. Among 86 patients, 29 (33.7%) were diabetic, 34 (39.5%) were hypertensive, 35 (40.6%) were smokers and 08 (9.3%) had past episode of thrombosis. Mean for the duration of catheter insertion was 82.52 ± 40.87 days and mean for the hemodialysis tenure was 23.46 ± 10.73 months. Significantly high proportion of our study cases i.e. 64 (74.4%) had to go through the process of hemodialysis twicea week. Catheter induced venousocclusion was noted in 28 (32.6%) of our study cases.

Conclusion: In our study, we noticed catheter induced venous occlusion was frequent in patients with end-stage renal disease (ESRD). Cather related venous thrombosis in CKD patients was found to have strong association with advanced age, duration of catheter insertion, male gender and dialysis duration.

Key Words: End-stage renal disease, catheter, thrombosis.

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INTRODUCTION

About 3 million people i.e 70% of people suffering from end stage kidney failure are managed by hemodialysis (HD)[1,2]. Though it is beneficial for life support, HD therapy poses threats of life threatening complications and mortality (one out of every six patients on HD die each year), and has its economic repercussions. Central venous catheters (CVCs) are the devices inserted into central veins like internal jugular, subclavian and femoral veins and have many uses like intravenous medications, total parenteral nutrition and short term vascular access for hemodialysis (HD)[3-6].

[1.] Department of Nephrology, DHQ, Khanewal.
[2.] Department of Nephrology, NMU, Multan.

Correspondence: Muhammad Farooq Bari, Consultant Nephrologist, DHQ, Khanewal.
Contact No: 0333-7641371
Email: farooqbari6@gmail.com

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Central venous catheters (CVCs) are used as bridging vascular access for the more permanent access arteriovenous fistula. Although National kidney foundation has recommended that central venous catheter be used in less than 10% hemodialysis patients,its use is still common and in USA 25% of end stage renal disease patients are still dialyzed with central venous catheters[6].

CVCs are associated with two main groups of complications; infectious and non-infectious. Infectious complication includes catheter related blood stream infection(CRBSI) and non-infectious complications include catheter related stenosis, CVP line associated thrombosis. All these complications increase the risk of morbidity and mortality multifold. Due to these complications, there is frequent interruption and delay in the treatment which result in inadequate dialysis and poor outcome. Catheter-related thrombosis (CRT)is the common complication and is due to the direct effects of the catheter on the endothelium of veins and blood flow[7].There are other factors which are also associated with high risk of CRT like underlying primary disease, hyper coagulability and site of placement of the catheter. Most common site of catheter placement is in upper extremity where CRT is reported more often.

Symptoms related to CRT are swelling of the relevant limb, pain, tenderness, increase temperature and edema. The complications associated with CRT are catheter malfunction and pulmonary embolism. Doppler ultrasound or venography is the primary modalities to diagnose CRT. These patients are treated with catheter removal and anticoagulation for 12 weeks to a year. The precautions to avoid CRT are proper placement of the CVC and avoidance of infections; prophylactic use of anticoagulation is not considered routinely at present.[8]Kujur et al [9]from India reported 33% frequency of catheter related thrombosis in their study conducted in such patients.

This study was designed to document the frequency of thrombosis related to catheter among patients with ESRD undergoing hemodialysis. Upon extreme research it was revealed that there is no such study done in Pakistan where disease is more common, so it seems reasonable to conduct this study in our local population. The data of this study will help us to formulate guidelines for the proper management of targeted population. The baseline data generated by this study will also be useful for our local researchers to design their future studies.

MATERIALS AND METHODS

Descriptive, case series design of study was conducted at the Department of Nephrology and medical unit IV, Nishtar Medical College/Hospital, Multan which is a tertiary care hospital for a period of six month from October 2018 to March 2019.

Sample Size: Sample size was estimated to be 86 cases by using following formula; $n= z^2pq/d^2$

Where z = 1.96, p = 0.33%[7] (frequency of catheter related thrombosis, q=1-p, d= 0.1)

Sampling technique; Non probability, consecutive sampling.

Data collection procedure; Eighty six (86) patients of either gender having ESRD requiring hemodialysis between the ages of 20 – 60 years were included in study. Patients having CAD(coronary artery disease), coagulopathy (INR >2), malignancy, bed ridden patients, post-surgical patients and those with CVA were excluded from the study.

Once the permission was taken from Institutional Review Board to conduct this study, informed consent was taken from individual study cases prior to participation in this study. Double lumen CVP catheter insertion was carried out by a trained resident supervised by qualified Nephrologist. Color Doppler ultrasound was performed on the 6th day of insertion of catheter for screening and thereafter when symptomatic. The presence/absence of thrombus was noted in the study proforma. All the information was entered in pre-designed proforma by the researcher. Data was computed and analyzed by using SPSS-20. Mean and standard deviation were calculated for numerical data like the age of patients, dialysis sessions per month, duration of catheter implantation, and duration of hemodialysis. Frequencies and percentages were calculated for categorical variables like thrombosis (Yes/No), gender, age groups, smoking and previous history of thrombosis. Stratification was done for age, gender, hypertension, diabetes, smoking, duration of catheterization and previous history of thrombosis. Once stratification was done, chi-square test applied and p-value <0.05 was taken as significant.

RESULTS

Among 86 patients under study, 52 (60.4%) patients were male and 36 (39.6%) patients were female (Table No. 1). Mean age of our study cases was 46.52 ± 7.34 years (with an age range 32 years to 58 years). Mean age calculated for the males was 43.75 ± 8.76 years while for female patients it was found to be 49.80 ± 5.63 years. We noticed that majority of our cases i.e. 56 (65.1%) were above 40 years of age.

Among 86 patients, 29 (33.7%) were diabetic, 34 (39.5%) were hypertensive, 35 (40.6%) were smokers and 08 (9.3%) had previous history of thrombosis. (Table No 1)

Mean duration of catheter placement was 82.52 ± 40.87 days and mean duration on hemodialysis was 23.46 ± 10.73 months. Majority of our study cases i.e. 64 (74.4%) had to undergo hemodialysis two times in one week. Most of the patient i. e 49(57%) had CVP line in jugular vein, other 15(17.4%) patients had CVP in subclavian vein and 22(25.6%)patients had catheter in femoral vein

TableNo. 1;Demographics of study population - N=86

Variables	Frequency
MALE	52 (60.4%)
FEMALE	34 (39.6%)
MEAN AGE	46.52 ± 7.34
DIABETES MEILITUS YES NO	 29 (33.7%) 57(66.27%)
HYPERTENSION YES NO	 34 (39.5%) 52(60.5%)
SMOKING YES NO	 35 (40.5%) 51(59.5%)
MEAN DURATION OF CATHETERS(DAYS)	82.52 ± 40.87
SITE OF CVC INSERTION JUGLAR SUBCLAVIN FEMORAL	 49(57%) 15(17.4%) 22(25.6%)

CVP line related thrombosis was seen in 28 (32.6%) of our study cases. Stratification was done regarding gender, hypertension and diabetes smoking, past history of venous thrombosis, site of catheter insertion. Our

results showed a significant relation between male gender and CVP line thrombosis(p-value 0.036). It was also noticed that site of location had also strong association with CVP line thrombosis, being highest in femoral vein followed by subclavian vein and then jugular vein.

Table No.2; Stratification of study population on the basis of outcome

Variables	Thrombosis		P-Value
	Yes (N=29)	No (N=57)	
GENDER			0.036
MALE(n=51)	22	29	
FEMALE(n=35)	07	28	
DIABETES MEILITUS			0.331
YES(n=28)	07	21	
NO(n=58)	22	36	
HYPERTENSION			0.357
YES(n=35)	14	21	
NO(n=51)	15	36	
SMOKING			0.641
YES(n=34)	10	24	
NO(n=52)	19	33	
FREQUENCY OF DIALYSIS			1.000
2/WEEK(n=65)	22	43	
3/WEEK(n=21	07	14	
PREVIOUS HISTORY OF THROMBOSIS			0.090
YES(n=07)	00	07	
NO(n=79)	29	50	
SITE OF CVC INSERTION			0.038
JUGLAR(n=49)	11	38	
SUBCLAVIN(n=15)	07	08	
FEMORAL(n=22)	11	11	

DISCUSSION

CVP line associated thrombosis is amongst the common complications in patients having CVP line insertion and puts enormous burden on clinicians regarding decisions about anticoagulant therapy selection and CVP line removal. Standard definitions of thrombotic complications are not available; most consensuses regarding definition is that venous thrombosis which usually occurs in the vein(s) where the catheter is inserted. This process starts initially with formation of thrombus in fibrin sheath, then tip of the catheter is blocked and finally it extends and occludes the whole venous lumen and at the end catheter related thrombus ensues[10].End-stage renal disease (ESRD) patients are dialyzed through arteriovenous fistula (AVF) or catheters. Catheter-related complications result in high all cause mortality[11, 12].

Recommendation for ESRD patients is that use of catheter as vascular access should be less than 10% and 65% of patients should have AVF as vascular access. But the use of dialysis catheter is still common as bridging access. In USA, this target still could not be achieved and 81% of patients are using a dialysis catheter as vascular access upon initiation of dialysis and waiting for AVF maturation or creation. Catheter related complications occurs 2.5–5.5 cases per 1000 patient-days or 0.9–2.0 events per patient per year. Complications related to thrombus-propagation challenges patients' safety and treatment efficacy, as well as puts enormous burden on medical resources such as poor flow through catheter causes recirculation, inadequate dialysis and anemia. There is also increase requirement of erythropoietin dose and these patients need more care[13].

In our study of 86 patients, 52 (60.4%) patients were menand34 (39.6%) patients were women. Different studies have reported end stage renal disease to be more common in male patients. Wang et al[13] in China, found that 57 % of ESRD patients were male which is concordant to our study results. In another study, Menon et al[14] also noticed male patients predominating over female patients (58 % versus 42 %) which is similar to that we found in our study. Iftikhar et al[15] from Lahore and Siddiqui et al[16] from Rawalpindi have found prevalence of ESRD to be 58% and 67% respectively in males in their studies. International data like Gazzaza et al from Saudi Arabia [17]Machingura et al[18] from Zimbabwe also reported that ESRD is more frequent in male population i.e. 61% and 70% respectively.

Mean age of patients in our settings was 46.52 ± 7.34 years (with an age range 32 years to 58 years). Mean age calculated for the males was 43.75 ± 8.76 years while for female patients it was found to be 49.80 ± 5.63 years. We noticed that most of our cases i.e. 56 (65.1%) were in fourth decade of life.

Machingura et al[18] reported that mean age of these patients of ESRD was 46.7±13.5 years on hemodialysis. These findings closely resemble to our results. Results of Siddiqui et al[16] and Anees et al[19] are also concordant to our findings regarding mean age of patients with ESRD on hemodialysis.

Among 86 patients, 29 (33.7%) were diabetic, 34 (39.5%) were hypertensive, 35 (40.6%) were smokers and 08 (9.3%) had previous history of thrombosis. Wang et al[13] from China reported 27 % diabetes which is close to our study results, however they reported hypertension only in 11% patients which is quite low than our findings. Anees et al[19], Caroline W et al[20] and Fallouh N et al[21]reported similar findings.

Mean duration for hemodialysis(HD) was 23.63 ± 11.34 months (with range of hemodialysis duration

between 3 months and 36 months) and most of our patients (58.3%) were on hemodialysis for more than 18 months. Major chunk of study population i.e. 64 (74.4%) had to undergo hemodialysis thricea week. According to Anees et al[19] mean hemodialysis durationis24.87 ± 22.1 months our findings follow the same trends. Wang et al[13] from China reported 26.5 months mean duration of hemodialysis which is consistent to our study results.

Mean duration of catheter placement was 82.52 ± 40.87 days (with minimum duration of placement was 18 days while maximum duration was 210 days) and most of study population i.e. 58 (67.4 %) had catheter placement for less than 90 days. Similar findings have been reported by other studies[13,22,23].

CVP line related thrombosis was seen in 28 (32.6%) of our study cases. Kujur et al[9] from India and others[24,25,26] reported 33% frequency of catheter related thrombosis in a prospective study conducted in such patients. Ravani et al.[27] noticed that risk of thrombotic complication was 34% among those who didn't have infectious complications and those participants who had one infectious complication the risk of catheter related thrombosis was 85%. These results are similar to our study results.

CONCLUSION

The results of this study had shown the high frequency of catheter-related thrombosis in end-stage renal disease (ESRD) patients. Male gender, age, site of catheter placement, duration of catheter placement and hemodialysis duration were significantly associated with thrombosis. Anticipation, early diagnosis and early management of thrombosis can play a key role to decrease disease morbidity and mortality. This will also improve quality of life of these patients and will also save their increased medical costs.

Author's Contribution:

Concept & Design of Study:	Muhammad Farooq Bari
Drafting:	Ghulam Abbas, Shahzad Aalam
Data Analysis:	Muhammad Muzammil, Muhammad Yousaf, Poonum Khalid
Revisiting Critically:	Muhammad Farooq Bari, Ghulam Abbas
Final Approval of version:	Muhammad Farooq Bari

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